

PSYCHOSOCIAL EFFECTS OF ISOLATION AND FEAR OF CONTAGION OF COVID-19 ON THE MENTAL HEALTH OF DIFFERENT POPULATION GROUPS

EDITED BY: María Cristina Richaud, Rubén N. Muzio, Viviana Noemí Lemos,
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Editorial: Psychosocial effects of isolation and fear of contagion of COVID-19 on the mental health of different population groups

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Editorial on the Research Topic

Psychosocial effects of isolation and fear of contagion of COVID-19 on the mental health of different population groups

The pandemic outbreak of COVID-19 has confronted us more than a health crisis, expanding the magnitude of its consequences as a human, economic, and social crisis and becoming a case of global disaster. Different conditions as the characteristics of the catastrophe and the socio-cultural context determined the impact of the catastrophe (Ozer et al., 2003; Porter and Haslam, 2005). In the current COVID-19 outbreak, several psychological problems, as well as consequences in mental health, as stress, depression, anxiety, and intolerance of uncertainty, have increasingly emerged throughout time while the disease continues to spread.

Necessary precautions to moderate the spread of the disease, such as isolation, produced an increase of people anxiety and stress even if they had not been infected with COVID. At the same time, being locked up for 2 weeks or more can be affected by the pressure on finances, the danger of unemployment, uncertainty about how to collect salaries and pensions, lack of social contact, apprehension toward the unknown, and worries for the health of oneself and others. In people with psychopathology these factors can have an even greater impact. Research on responses to previous pandemics such as SARS, Ebola, and H1N1 (Brooks et al., 2020) and recently COVID-19 (Dong and Bouey, 2020) indicated that it could cause long-term problems in the general population

such as depression, high irritability, anxiety, family conflict, domestic violence, use of substances and alcohol, and Post Traumatic Stress Disorder.

Also it is important, as was mentioned earlier, to take the characteristics of each context into account when detecting the specific stressor that impact on psychological wellbeing. Indeed, different countries took particular health measures to face the pandemic based on consideration of the characteristics of the health system, political decisions, and cultural traits of the population (Barbagelata et al., 2020).

So, the COVID-19 pandemic has generated dissimilar psychological, social, and health difficulties in the different population groups analyzed.

This Research Topic aimed to collect evidence, through the results of different research teams in different countries, and according to the characteristics of the preventive measures taken by the health authorities of each place, about the effects of isolation and the fear of contagion by COVID-19, in different population groups: children, adolescents, the elderly, parents, healthcare workers, between others.

In this Research Topic we have collected thirty one Original Research articles (meta-analysis, transversal and cross cultural studies) that presents a comprehensive review about the psychological consequences of COVID-19 in topics including: Fear of COVID, Stress and lockdown, Effect on wellbeing; Post-traumatic stress, Effects on mental health, Vaccination, Parental influence and children behavior, Effects on anxiety, depression and loneliness, Prosociality, Cyberchondria, Burnout and stress, and Personality, in the populations groups: general population, college students, patients with schizophrenia, youths, adolescents, middle school students, university students, employees, teachers, healthcare workers, and sports players, from Israel, Spain, Argentina, Ecuador, México, China, Peru, Romania, Iran, Colombia, Italy, United Kingdom, and Pakistan, among others.

Fear of COVID

Bitton and Laufer analyze whether greater resilience arises when someone is in permanent insecurity compared to exposure to an unknown threat such as COVID-19. Results indicated that Israelis living in a permanent conflict zone had similar levels of resilience as those not exposed to conflict. Luo et al. carried out a meta-analysis. They have reviewed a total of 44 articles with a sample size of 52,462 and concluded that in all the countries studied, the average fear of COVID was high. Therefore, it is important to consider the effects of COVID-19 on mental health. Rania and Coppola analyzed the answers of 500 Italian people, after the spread of the vaccination. The results showed that fear of COVID-19 produces emotional disturbance in the entire

population, with young people feeling the most alone and the least admitting social distancing. Older people and those with high incomes are the ones with the least stress.

Stress and lockdown

Rodriguez et al. found that women perceived more stress than men and the same occurs with people with low income or economic instability. On the other hand, lower stress has been found in couples without children isolated in residential zones. Older people and those with high incomes were the ones with the least stress. Li L. et al. carried out a study with a sample of 3,398 residents in China. The results indicated that there were several variables that influenced the application of strategies on home quarantine, such as gender, region, employment, depression, perceived social support, among others.

Huang et al. analyzed the effect of the COVID-19 on the feelings of 7–9 Chinese students during the confinement for the pandemic. They concluded that the students suffered feelings of loss of control and negative emotions that differed significantly according to demographic variables at different times during the pandemic.

Effect on wellbeing

Dai et al. found that health and wellbeing were affected due to the COVID and lockdown measures and that Emotion Regulation intervention reduces the negative psychological impacts for improving quality of life. Tan et al. analyzed a sample of 1,871 Chinese students during the COVID-19 pandemic. The results indicated that resilience positively impacted on psychological wellbeing and that enhancing resilience mitigates the impact of environmental stress on psychological wellbeing. Tan et al. analyzed a sample of 1,871 Chinese students during the COVID-19 pandemic. The results indicated that resilience positively impacted on psychological wellbeing and that enhancing resilience mitigates the impact of environmental stress on psychological wellbeing. Boluarte-Carbajal et al. carried out a study with a Peruvian sample to evaluate socio-demographic variables and mental health during COVID-19 pandemic. They found that the fear of COVID-19, the Negative Affect and the Positive Affect influenced on the appearance of anxiety and depression. Yasmin et al. studied online a sample of 420 participants from Pakistan during COVID pandemic. The individuals informed in general that their mental health experienced a negative impact, have suffered family abuse, and have scored high on General Anxiety Disorder and low on wellbeing.

Post-traumatic stress

Qiu et al. carried out a systematic review and meta-analysis and revised a total of 106 studies. They concluded that post-traumatic stress appears frequently among persons that suffer infectious disease outbreak and that it would be important to take preventive measures against post-traumatic stress.

Effect on mental health

Li Y. et al. carried out a systematic review and meta-analysis based on about 27 articles with a total of 706,415 participants. They found that depression and anxiety strongly raised among college students during the COVID-19 pandemic. Zurlo et al. carried out a repeated cross-sectional survey with the objective of study the impact of the COVID-19 pandemic in Italian university students' customary life. The results indicated that psychopathological symptoms such as depression and phobic-anxiety, among others, have grown significantly since the beginning of the pandemic. At the same time, with the advance of the pandemic, psychological symptoms and stress due to COVID increased significantly. Silva Soares et al. carried out a cross-sectional study of 401 Brazilian physical sports and e-sports players, evaluating social connectedness, depression, anxiety, stress, and demographic variables. The main findings were: (1) social connection and mental health were significantly related in all the samples, (2) when the differences between the physical and e-sport samples were studied, only a difference in social connection and depression was found, (3) in the total sample a relationship was found between social connection with depression, anxiety, and stress.

Vaccination

Jacob et al. studied the vaccination intention in a sample of 864 adults from Romania and concluded that vaccination intention was directly predicted by fear of the pandemic and indirectly by the perceived threat of getting sick and the benefits of vaccination. Caycho-Rodríguez et al. explored conspiracy beliefs about COVID-19 and the respective vaccine in thirteen Latin American countries. They found greater conspiracy ideas in women, less educated people, and those who were informed about the vaccine from family and friends.

Parental influence and children behavior

Khozaei and Carbon analyzed the effect of parental stress on children's physical activity and wellbeing in a sample of Iranian children and their parents. They concluded that parents with greater stress and more restrictive put their children at

risk of having alterations in their mental health. Kurata et al. conducted an online survey in three Asian countries and in the United States to assess parental stress, anxiety, and fear related to COVID-19. The results indicated that parental stress had significantly increased during the pandemic in all the countries studied. Vargas Rubilar et al. studied 646 mothers of school-age children in Argentina during the COVID-19 lockdown. They found that the mothers presented moderate stress and that it was not caused only by the pandemic but by other contextual variables, such as the number of children, among others.

Effect on anxiety, depression, and loneliness

Shen et al. conducted a study in a sample of 2,361 residents and indicated that anxiety and depression in the period of low transmission were potential factors for long-term depression and anxiety for some residents. Zhang et al. analyzed how coping style mediates in the relation between loneliness and depression and how gender mediates in the relation between loneliness and coping styles during the COVID-19 pandemic. They studied 337 Chinese college students during the COVID-19 lockdown and found that less loneliness means less depression, and that positive coping prevents depression and loneliness. Mei et al. studied 1,414 Chinese company employees, through a 1-year longitudinal study during the COVID pandemic. The results indicated the existence of a dynamic relationship between social support and mental health over time, that social support predicted the appearance of depressive symptoms and interpersonal sensitivity, and that depression predicted social support. Chocho-Orellana et al. carried out a cross-sectional study through an online survey in an Ecuadorian and Spanish sample. The results indicated significantly more depression, anxiety and stress after quarantine in Ecuadorians. Second, public prosociality, lower stress as challenge, higher stress as threat and empathy are predictors of depression and anxiety. Finally, in both countries depression, anxiety and stress increased after the lockdown. Burkova et al. studied a sample of 15,375 participants from 23 countries during the COVID pandemic. They found that gender, country, and personal aspects significantly influenced anxiety, and that people from countries with higher anxiety perceived the pandemic as more dangerous. Those who trusted state authorities presented lower levels of anxiety.

Prosociality

Mesurado et al. analyzed the efficacy of a short, online intervention program (Hero Program) during the lockdown due to COVID-19, to increase the positive emotions and prosocial behavior of Colombian adolescents. They indicated that Hero

Program was efficacious for promoting joy, gratitude, serenity, and personal satisfaction and that these emotions predisposed Colombian adolescents to act prosocially.

Cyberchondria

Peng et al. investigated the status and influencing factors of cyberchondria (the anxiety-amplifying effects of online health-related searches) in 674 residents in China during the COVID-19 epidemic. Their findings showed that nearly a quarter of the participants scored high in cyberchondria during the pandemic, being health anxiety and COVID-19-related online information-seeking behavior, including online duration, topics and choice on different information channels, important influencing factors of cyberchondria.

Schizophrenia

Caqueo-Urizar et al. have analyzed the psychosocial effects of the COVID-19 pandemic on 120 Chilean patients with schizophrenia, and their caregivers. The results showed that patients with schizophrenia who had been in quarantine for almost a year showed similar levels of concern as their caregivers in the domains of health and social life. However, caregivers showed significant differences from patients in the areas of income, concern, and employment status. In addition, patients who were infected with COVID-19 showed lower levels of wellbeing and worse psychological recovery.

Healthcare workers

Richaud et al. analyzed the difference in psychological distress of the healthcare workers in three different periods of the COVID-19 pandemic in Argentina, through a repeated cross-sectional online survey. The results indicated differences between the evaluated periods. Perceived concerns about the possibility of infecting loved ones and infecting themselves were greatest in the periods after the onset of the pandemic. In addition, the perception of how the work environment worsened and how lack of sleep interfered with their work, the same as depression, anxiety, and intolerance of uncertainty were also higher in periods 2 and 3. Finally, the indicators of high tension and concurrent lack of emotional control, which was greater in the last periods evaluated, were also expressed in the coping strategies.

Burnout and stress

Vargas Rubilar and Oros carried out a study with 9,058 Argentine teachers, who had to complete online self-report measures, during the COVID-19 pandemic. The results

indicated that more than 60% of the educators reported high and moderately high levels of stress. The more stress they perceived, the higher the manifestation of unwanted psychophysical symptoms. Professional burnout was higher for teachers with a higher load of stress and with more psychophysical indicators of discomfort. Pelly et al. performed a longitudinal study to examine the wellbeing of 621 full-time workers assessed before and during the first lockdown in the United Kingdom. Overall, levels of stress, self-rated mental health, positive emotions and life and job satisfaction are not adversely affected by the restrictions. There is a reduction in the burnout symptoms of disengagement and exhaustion and in the frequency with which negative emotions are experienced at work. Workers gained autonomy, they were closer to their co-workers, and more engaged to their organizations, but their home-life was more unsatisfactory.

Personality

Cirimele et al. studied using a person-oriented approach, the relation of personality profiles (positivity, irritability, and hostile rumination) and the ability to express positive emotions and regulating anger emotion, with adaptive and maladaptive outcomes during the first Italian lockdown. They administered an online survey and included 1,341 participants living in Italy. Overall, the findings evidenced the existence of three different profiles (i.e., Resilient, Vulnerable, and Moderate) and, especially for the vulnerable profile and young adults, a greater maladaptive consequence of the quarantine.

Author contributions

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Conflict of interest

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Psychological Well-Being in Chinese College Students During the COVID-19 Pandemic: Roles of Resilience and Environmental Stress

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Psychological well-being is an important indicator of well-being and has been found to be associated with a multitude of positive life outcomes. Using data collected from 1,871 Chinese college students from September 23 to October 5, 2020, this study examined students' psychological well-being during the COVID-19 pandemic and investigated how resilience and pandemic-related environmental stress may affect psychological well-being. Results showed that resilience had strong positive effects on psychological well-being during the pandemic. Meanwhile, environmental stress had a moderate effect and marginally reduced psychological well-being. The magnitudes of the estimates suggested that increasing resilience can effectively buffer the negative effect of environmental stress on psychological well-being.

Keywords: psychological well-being, resilience, environment stress, students, COVID-19, China

INTRODUCTION

The outbreak of a novel coronavirus disease (COVID-19) has caused serious health threats around the world (Ali et al., 2020). The World Health Organization (WHO) announced that the COVID-19 outbreak could be characterized as a pandemic on March 11, 2020 (WHO, 2020). Empirical evidence has shown the negative effects of the pandemic on the psychological and mental well-being of the general population across several countries (Castelli et al., 2020; Solomou and Constantinidou, 2020; Wang et al., 2020; Xiong et al., 2020). Studies have also focused on the well-being of more specific groups of people, including health care workers (Di Tella et al., 2020; Pappa et al., 2020; Tan et al., 2020) and college students across the globe (Cao et al., 2020; Li et al., 2020; Ma et al., 2020; Wang and Zhao, 2020; Romeo et al., 2021). Wang et al. (2020) conducted an online general population survey between January 31 and February 2 in 2020 to investigate psychological well-being during the initial stages of the COVID-19 outbreak in China. The sample included 1,210 individuals from 194 cities in China. About 54% of the sample stated the psychological effect of the outbreak on them was moderate or severe. Seventeen percentage of the sample experienced moderate to severe depressive symptoms, and 29% of them had moderate to severe anxiety symptoms. Females, students, and individuals with poor health reported higher levels of anxiety and depression (Wang et al., 2020). Likewise, Castelli et al. (2020) utilized an anonymous online survey from March 19 to April 5, 2020 in Italy and found that 20% of the 1,321 participants reported significant post-traumatic stress symptoms. Meanwhile, 69% experienced clinically significant anxiety symptoms, and 31% of the participants experienced

clinically significant depressive symptoms. The toll of the pandemic on mental health appears to have been especially heavy for health care workers [see Pappa et al. (2020) for a review], particularly those who work with COVID-19 patients (Di Tella et al., 2020).

Evidence has suggested that university students have higher levels of anxiety and depressive symptoms than general workers during the pandemic (Romeo et al., 2021). In particular, medical students have reported greater mental health problems than the general student population (Cao et al., 2020; Ma et al., 2020). In a February 2020 online survey of Chinese college students from 108 colleges ($N = 746,217$), about 35, 21, and 11% of students reported probable acute stress, depression, and anxiety, respectively (Ma et al., 2020). Ma et al. (2020) also found that epidemic severity in students' respective provinces (measured by cumulative cases of each province prior to March 2020) was positively associated with depression and anxiety. Similarly, in a sample of 7,143 Changzhi Medical College students, Cao et al. (2020) found that about 25% of the students experienced mild or moderate anxiety. Protective factors against anxiety included urban residence, stable family income, and cohabitation with parents. However, having relatives or friends infected with COVID-19 was a risk factor for anxiety. The results also showed that social support reduced level of anxiety (Cao et al., 2020). Likewise, Li et al. (2020) surveyed undergraduate students ($N = 555$) from Hebei Agricultural University between December 2019 and February 2020, finding that students exhibited increased negative affect and symptoms of anxiety and depression after 2 weeks of shelter-in-place during the month of February (Li et al., 2020). Finally, Wang and Zhao (2020) examined anxiety symptoms within a sample of 3,611 Chinese university students just prior to the start of their 2020 spring term. Their anxiety score was significantly higher than the national norm (40.5 vs. 29.8, $p \leq 0.001$), with about 15% of students meeting the cutoff point of 50 points for a positive anxiety screening.

The pandemic's negative effects on mental health are evident, but current scholarship paints a relatively less clear image of the potential protective factors that may bolster psychological well-being during this challenging time, especially for college students. Understanding the experience of college students during a global pandemic is crucial, given that the college years have been indicated as a critical period for life development (Long, 2008; Li et al., 2012; Costa et al., 2013; Marginson, 2017). Previous research has focused on the manifestation of psychological well-being through anxiety and depression, rather than positive definitions and protective factors. That is, existing studies in the context of the COVID-19 pandemic examine only the absence of illness instead of the presence of wellness. Thus, research has overlooked human capacity, factors that contribute to our thriving, and protective elements associated with well-being (Ryff and Singer, 1996; Ryff, 2014).

Ryff and Singer (1996) proposed that positive psychological well-being contains multiple dimensions, including self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. The 6-dimension conceptualization of psychological well-being has been utilized as a comprehensive indicator of psychological

functioning and life outcomes in various studies [for a review, see Ryff (2014)]. The integration of mental health and life-span development theories points to the converging aspects of positive psychological functioning (Ryff and Singer, 1996). Studies have shown that life events and experiences, such as relocation (Bardi and Ryff, 2007) and parental death (Maier and Lachman, 2000), are associated with psychological well-being. In addition, psychological well-being is also a good indicator of negative mental health, such as depression (Keyes, 2005), and future life outcomes (Boyle et al., 2009, 2010).

Resilience, or the ability to adapt to various stressors (Wagnild and Young, 1993; Connor and Davidson, 2003), allows individuals to positively cope with adversity and encourages positive adjustment and development in the midst of challenging circumstances (Rutter, 2006; Bajaj and Pande, 2016). Studies have found that high levels of resilience can improve mental health and psychological well-being (Millea et al., 2008; Liossis et al., 2009; Dray et al., 2017). For example, studies on resilience interventions have pointed to the relation between increasing resilience and reducing mental health issues like depressive symptoms, internalizing and externalizing problems, and psychological distress [See Dray et al. (2017) for meta-analysis; Millea et al. (2008)].

Finally, environmental stress and context have been shown to have profound effects on mental health and psychological well-being (Downey and van Willigen, 2005; Gong et al., 2016; Gatersleben and Griffin, 2017; van den Bosch and Meyer-Lindenberg, 2019). For example residential proximity to industrial activity (Downey and van Willigen, 2005) and other physical stimuli and stressors (van den Bosch and Meyer-Lindenberg, 2019) can negatively affect mental health, such as increasing risk of depression (van den Bosch and Meyer-Lindenberg, 2019). Further, studies have shown that exposure to natural disasters (e.g., earthquakes and tsunamis) is associated with poor mental health and increased suicide rates (Kölves et al., 2013; Musa et al., 2014; Ando et al., 2017). There is also growing evidence of the COVID-19 pandemic's harmful effects on individual psychological and mental well-being (Solomou and Constantinidou, 2020; Wang et al., 2020). Thus, as confirmed COVID-19 cases are reported in the city- and province- levels, local residents may experience heightened environmental risks (i.e., COVID-19 exposure) and greater environmental stress.

Taken together, exposure to environmental stress caused by COVID-19 at the community- and city- levels is likely to affect individual psychological well-being; however, given that resilience may act as a protect factor that promotes psychological well-being, we sought to examine these three variables in relation to one another.

This paper aims to examine the extent of positive psychological well-being in Chinese college social sciences students during the COVID-19 pandemic and to investigate how resilience and environmental stress caused by COVID-19 affect psychological well-being. Based on the above conceptual framework and existing literature, we hypothesize that:

Hypothesis 1 (H1): resilience was positively associated with psychological well-being of Chinese college students.

Hypothesis 2 (H2): environmental stress, caused by COVID-19 pandemic, was negatively associated with psychological well-being of Chinese college students.

MATERIALS AND METHODS

Data and Sample

An online anonymous survey from junior and senior students in China was utilized to collect the data for this study. Twelve universities located across north, east, south, west and middle regions of China, were selected to have a diverse sample. To be included in this study, participants had to (a) be in their junior or senior year of college and (b) be a social science major. Once universities were chosen, we contacted each university's department of social science and invited junior and senior students to participate in the online survey. We limited our sample to junior and senior students in order to assess the full extent of COVID-19 exposure on college students. Students in the sample had all experienced at least 1 year of college in the past, prior to the onset of the COVID-19 pandemic; they also all experienced interruptions related to the pandemic. As a result, we were able to investigate the level of psychological well-being among students who had experienced college pre-COVID-19, as well as whether resilience increased students' psychological well-being during the COVID-19 pandemic in China. A total of 2,229 students were invited to participate on September 23, 2020, and reminders for invited students were sent 3 and 7 days later. Thousand eight hundred and eighty one students participated in the online survey by October 5, 2020. We excluded the data of ten students due to incomplete survey answers, leaving a final analytical sample of 1,871 students. The response rate was 80%. The research protocol was approved by the research review committee at one of the co-authors' university. An informed consent process was implemented prior to the survey. Students were informed of their voluntary participation and their ability to discontinue survey participation at any time.

Measures

Psychological well-being was measured by the shortened version of the Psychological Well-being Scale (Ryff and Keyes, 1995). The 18-item scale is broken down into six facets. The first facet, autonomy, refers to self-determination and independence, including the ability to resist social pressures around certain ways of thinking and behaving. Environmental mastery refers to the ability to manage the environment, choosing or creating contexts that are congruent with personal needs and values. The facet of personal growth measures the extent to which an individual feels that they are engaging in continued development. Positive relations refers to the perception that one has warm and trusting interpersonal relationships. Next, purpose in life refers to being goal-driven or being guided by a sense of direction in life. The final facet, self-acceptance, is defined as having a positive attitude toward the self. This involves having self-acceptance and positive feelings about past experiences (Ryff and Keyes, 1995). Each facet was measured by three items. Respondents rated how strongly they agreed or disagreed with corresponding statements using a 7-point scale, in which 1 indicated "strongly agree" and 7

indicated "strongly disagree." Item responses were reverse-coded so that greater scores indicated greater psychological well-being. The scores of the subscales and the total score were calculated by summing up the corresponding items. Each subscale ranged 3–21, while the score of the whole scale ranged 18–126. The 18-item scale has been used in Chinese population in previous studies with reliability above 0.86 (Wang and Kanungo, 2004; Xu et al., 2020). In our study, the Cronbach's alpha was 0.88.

Two key independent variables in this study were resilience and environmental stress caused by COVID-19 pandemic. Resilience was measured by a shortened version of the Resilience Scale by Wagnild and Young (1993). The 14-item Resilience Scale (RS-14; Wagnild, 2016) assesses resilience-related traits that have been shown to mitigate harmful effects of adverse life circumstances on psychological adjustment (Wagnild and Young, 1993). Past studies have provided evidence of RS-14's cross-ethnic validity among different populations in the U.S., as well as reliability among Chinese adolescents (Pritzker and Minter, 2014; Shi et al., 2016). Participants were prompted to consider the degree to which each item in RS-14 described their experiences over the past 4 weeks. Possible responses ranged from 1 to 7, or strongly disagree to strongly agree, respectively. To calculate the resilience scores, all item responses were added together. Total scores ranged 14–19, with higher scores representing greater spot-measurement of resilience. The Cronbach's alpha for RS-14 for our study sample was 0.91.

Environmental stress caused by the COVID-19 pandemic was measured by the cumulative number of confirmed COVID-19 cases by province. We assigned the cumulative confirmed case number to all students in the same college based on the province in which the college was located, as community- and city-level indicators did not exist in China. Confirmed COVID-19 cases at the province level may capture the extent of COVID-19 disease-related exposure risks and stress faced by the students (Ma et al., 2020). Province-level COVID-19 confirmed cases were retrieved from Caixin (2020) and included confirmed cases up to September 15, 2020.

Socioeconomic characteristics of the respondents acted as control variables in this study. These characteristics included the students' age, gender (0 = male; 1 = female), ethnicity (1 = Han; 0 = other), and household registration (i.e., rural, city, or city with prior rural registration). Information regarding participants' family socioeconomic characteristics was collected as well. These included parents' marital status (i.e., married, separated, divorced, and widowed), parents' highest educational attainment (i.e., elementary school or below, middle school, high school, and some college or above), number of family members, annual family income, and whether their family had received welfare in the last year (0 = no; 1 = yes).

Analytical Strategy

To examine the distribution of our main variables, we conducted descriptive analysis. This was followed by ordinary least squares (OLS) regression analysis, which allowed us to approximate the net effects of our main independent variables on our dependent variable, while also accounting for the students' socioeconomic characteristics. In this study, we hypothesized that the students'

TABLE 1 | Descriptive statistics of key variables.

	%	Mean (S.D.)
Psychological Well-being [24–121]		81.7 (12.3)
Autonomy [3–21]		12.9 (2.7)
Environmental Mastery [3–21]		13.8 (2.7)
Personal Growth [3–21]		14.2 (2.5)
Positive Relations with Others [3–21]		13.9 (3.1)
Purpose in Life [3–21]		13.5 (2.6)
Self-acceptance [3–21]		12.7 (2.9)
Resilience [14–98]		68.6 (13.4)
Number of COVID-19 Cases in Province		14,264 (26,894)
Gender [%]		
Female	67.0	
Male	33.0	
Age		20.6 (1.0)
Household Registration [%]		
Rural	38.7	
City, rural before	8.9	
City	52.4	
Grade [%]		
Junior	60.7	
Senior	39.3	
Ethnicity [%]		
Han	89.4	
Others	10.6	
Parent Marital Status [%]		
Married	89.0	
Separated	0.8	
Divorced	6.9	
Widowed	2.4	
Others	0.9	
Parent Highest Education Achievement [%]		
Elementary School and Below	6.9	
Junior High School	28.1	
High School	25.2	
College and above	39.8	
Family Income		90,990 (122,030)
Welfare Status		
No	74.7	
Yes	25.3	
Number of Family Members		3.9 (1.2)

N = 1,871.

psychological well-being would be determined by their resilience, COVID-19 infection among family and friends, and their socioeconomic characteristics. Both descriptive analysis and OLS regression analysis were performed using STATA statistical software 16.0.

RESULTS

Descriptive Statistics

Table 1 presents the descriptive statistics for the main variables. The average score of psychological well-being was 81.7 with a

TABLE 2 | Regression analysis of psychological well-being.

	β	S. E.	<i>P</i>
Resilience	0.51	0.02	***
ln (# of Province COVID-19 Cases)	−0.03	0.13	+
Female	0.03	0.53	
Age	0.00	0.31	
Household Registration: City, rural before	0.01	0.90	
Household Registration: City	0.06	0.66	*
Junior	−0.01	0.58	
Han	0.01	0.79	
Married	0.03	0.78	
Junior High School	−0.06	1.04	
High School	−0.03	1.10	
College and above	−0.01	1.16	
Family Income	0.04	0.23	+
Welfare Status	0.03	0.62	
Number of Family Members	−0.03	0.23	
Adjusted R-square	0.29		

N = 1,871. +*p* < 0.10; **p* < 0.05, ****p* < 0.001.

standard deviation (SD) of 12.3. Scores ranged from 24 to 121. Overall, the psychological well-being of the students was high. Among the six subscales of psychological well-being, the highest score was personal growth (14.2), followed by positive relations with others (13.9), environmental mastery (13.8), purpose of life (13.5), autonomy (12.9), and self-acceptance (12.7). The average resilience score was 68.6 with a SD of 13.4, and a range of 14–98. The average COVID-19 confirmed cases in students' provinces was 14,264 (SD = 26,894), ranging from 157 to 68,139. The large range and high standard deviation of this variable together suggest that students resided in provinces with quite different levels of COVID-19 cases. The variance of COVID-19 cases at the province level allows us to examine whether local COVID-19 infection rates affected students' psychological well-being during the pandemic.

Table 1 also presents the descriptive statistics of individual socio-demographic characteristics. Majority of the sample was female, mirroring the social science student population in China. The mean age of the sample was 20.6 (SD = 1.0). Over half of the students (52.4%) had city household registration (HR), followed by 38.7% with rural HR, and 8.9% with city but prior rural HR. Majority of students reported that their parents were married (89.0%). The average family income was 90,990 RMB (about 13,580 USD) in the past year, with a standard deviation of 122,030 RMB (18,170 USD). About 25% of students reported that their families received at least one form of social welfare, such as low-income assistance, food subsidies, and other subsidies, in the past year.

Multivariate Analyses

Table 2 presents the OLS regression standardized estimates of psychological well-being. Given the wide range of COVID-19 cases by province, the variable was first transformed into a natural log number, then entered into regression analyses. The results indicated that resilience and HR had significant effects on

TABLE 3 | Regression analysis of psychologic well-being subscales.

	Autonomy			Environmental mastery		
	β	S. E.	P	β	S. E.	P
Resilience	0.31	0.01	***	0.47	0.01	***
ln (# of Province COVID-19 Cases)	−0.03	0.03		−0.02	0.03	
	Personal growth			Positive relations		
	β	S. E.	P	β	S. E.	P
Resilience	0.33	0.01	***	0.34	0.01	***
ln (# of Province COVID-19 Cases)	−0.06	0.03	**	−0.03	0.04	
	Purpose in life			Self-Acceptance		
	β	S. E.	P	β	S. E.	P
Resilience	0.29	0.01	***	0.48	0.01	***
ln (# of Province COVID-19 Cases)	−0.04	0.03	+	0.01	0.03	

N = 1,871. +*p* < 0.10; ***p* < 0.01, ****p* < 0.001.

psychological well-being. Increasing one standard deviation of resilience led to a 0.51-SD increase in psychological well-being. The finding supports our first hypothesis. Compared to students with rural HR, students with city HR had greater psychological well-being ($\beta = 0.06$). Province-level COVID-19 cases and family income also showed marginal effects on the psychological well-being. A one-SD increase in family income was associated with a 0.03-SD increase in psychological well-being, while the estimated effect of COVID-19 cases on psychological well-being was −0.03. This finding marginally supports our second hypothesis. It is evident that resilience had a large effect on the degree of psychological well-being among the students, while HR, family income, and the number of COVID-19 cases had modest effects on their well-being.

We conducted robustness tests on the six subscales of psychological well-being. The regression analyses were conducted similarly to the analysis that produced the results of **Table 2**, but the dependent variable was replaced by each of the six subscales of the psychological well-being measure. The results are presented in **Table 3**. For simplicity, we only present the standardized estimates of our key variables, resilience and number of confirmed COVID-19 cases in this table. The results for other variables have been made available in the supplementary materials. Resilience shows significant and positive effects on all six subscales, while confirmed COVID-19 cases shows significant negative effects on personal growth and marginally negative effects on purpose of life. A one-SD increase in resilience was associated the following: 0.48-SD increase in self-acceptance, 0.47-SD increase in environmental mastery, 0.34-SD increase in positive relations with others, 0.33-SD increase in personal growth, 0.31-SD increase in autonomy, and 0.29-SD increase in purpose of life. Students at colleges where confirmed local COVID-19 cases were one SD higher than average had 0.06 SD less personal growth scores, as well as 0.04 SD less purpose in life scores.

DISCUSSION

Empirical evidence has shown that the pandemic poses negative effects on the psychological and mental well-being of various populations across countries (Cao et al., 2020; Castelli et al., 2020; Di Tella et al., 2020; Pappa et al., 2020; Solomou and Constantinidou, 2020; Xiong et al., 2020). Less is known about the effects of the pandemic with regards to positive dimensions of health, such as psychological well-being, as well as with regards to the protective factors that bolster psychological well-being. We sought to examine the psychological well-being of college students given the time spent in college is a critical developmental period (Long, 2008; Costa et al., 2013; Marginson, 2017). Although it is important to identify factors associated with mental health problems such as anxiety, studies on factors increasing the presence of wellness are important to better understand humans' capacity to thrive in adverse conditions and circumstances (Ryff and Singer, 1996; Ryff, 2014).

The findings of this study, unlike previous studies from the early stages of the pandemic (Cao et al., 2020; Li et al., 2020; Ma et al., 2020; Wang et al., 2020; Romeo et al., 2021), show that a majority of Chinese students had good overall psychological well-being in September 2020. This difference may be attributed to the actions taken to control the COVID-19 outbreak in China. As the rate of confirmed cases slowed down, China's government gradually removed lockdown measures for many cities in March 2020. The first and last city to enter and lift lockdown, Wuhan, removed lockdown measures on April 8, 2020. Confirmed COVID-19 cases in China have been kept stable at around 90,000 cases since the removal of these lockdown measures (Caixin, 2020). In September 2020, a majority of colleges in China resumed the academic school year, including in-person teaching on most campuses (Nierenberg and Pasick, 2020); in all, life in China has begun to look the way that it did pre-COVID-19 (Hernández, 2020).

The students in this study scored relatively high in the psychological well-being subdimensions of personal growth, positive relations with others, environmental mastery, and purpose in life. It is worthy to note that autonomy and self-acceptance scores were relatively lower than other scores. Overall, students in the survey expressed relatively high feelings related to continued development but less so on possessing a positive attitude toward the self during the pandemic. Lower scores for positive attitudes toward the self might be attributed to students' perceived lack of control during the pandemic. Positive self-regard, self-esteem, and self-perception have been found to be greater among adolescents with an internal locus of control (LOC) (Cazan and Dumitrescu, 2016). LOC refers to the extent to which an individual believes their outcomes are affected by their own actions (Rotter, 1990). Those with external LOC believe their own actions have little to no effect on outcomes, while those with internal LOC believe that they are able to control their outcomes. It is possible that during the pandemic, students felt a loss of control, which subsequently led to a decrease in positive self-regard.

With respect to the two key independent variables examined in this study, a majority of students had a high level of resilience. Since we purposely sampled students across China, there was great variance in the numbers of confirmed COVID-19 cases by province. Some provinces had only 157 confirmed cases (e.g., Jilin Province), while others reported over 68,000 confirmed cases (e.g., Hubei Province). This variance allowed us to examine the extent to which environmental stress caused by COVID-19 cases affects the living environment and, subsequently, the psychological well-being of students during the pandemic.

The findings from the regression analyses indicate strong and robust effects of resilience on psychological well-being during the pandemic. Resilience significantly increased overall psychological well-being scores, as well as well-being as it pertains to each of the six dimensions. This is consistent with existing studies that have found that resilience positively predicts psychological well-being specifically among students in higher education (Souri and Hasanirad, 2011; Malkoc and Yalcin, 2015). Among Chinese student populations, a positive relation between resilience and psychological well-being has been found in undergraduate nursing students specifically (Smith and Yang, 2017). Our study adds to the existing literature by contextualizing the importance of this relation during a collective trauma (i.e., the COVID-19 pandemic) within a more representative student sample in China.

Our results also indicate that environmental stress has an effect on psychological well-being to some degree. Province-level COVID-19 cases had marginal effects on overall psychological well-being. The number of confirmed province-level COVID-19 cases was negatively associated with overall psychological well-being. The number of confirmed COVID-19 cases appeared to have stronger effects on personal growth and purpose in life. Our finding that environmental stress only marginally affected psychological well-being may be due to the fact that COVID-19 confirmed cases were measured at the province level, rather than at the city- or community-levels. The community and city environment indicators may be better measures of environmental stress since they represent students' more

immediate environments; however, due to data limitations, we were unable to control for confirmed COVID-19 cases at more local levels.

Combining the findings from overall psychological well-being and the subscales of psychological well-being, our study suggests that resilience and environmental stress indeed affect students' well-being during the pandemic. These findings offer practical implications for mental health providers. The magnitudes of the estimates suggest that increasing resilience can effectively improve psychological well-being and buffer the negative effects of environmental stress on psychological well-being during the COVID-19 pandemic. Thus, programs that increase student resilience can also improve their psychological well-being during the pandemic. Recent studies have shown that several programs, including mindfulness, mental awareness, and life skills programs, can positively affect students' resilience (Bajaj and Pande, 2016; Galante et al., 2018; Lu et al., 2018; Huang et al., 2019). Thus, colleges may seek to offer their student communities opportunities for mindfulness-related training and life skills programs during the pandemic.

Finally, the findings of this study also revealed that several socioeconomic characteristics, such as low family income and rural HR, are related to low psychological well-being. This is consistent with previous studies that have indicated that individuals with low socioeconomic characteristics had higher health risk perception compared to their counterparts (Commodari et al., 2020). Additionally, this is consistent with more recent findings that have emphasized that these already-vulnerable populations experience heightened vulnerability during the COVID-19 pandemic (Douglas et al., 2020; Rudenstine et al., 2021). In particular, U.S.-based low-income college students appear to experience high prevalence of both anxiety and depression symptoms (Rudenstine et al., 2021). In our sample, students with rural HR may be disadvantaged similarly, as they typically have low socioeconomic characteristics compared to students with city HR. As such, these students may have lower psychological well-being due to perceived lack of supports. Thus, interventions and services to improve student psychological well-being may require targeted outreach to high-risk subgroups. In the Chinese university context, this includes low-income students and students with rural HR.

This study has several limitations that may provide research implications for future studies. First, analysis using a cross-sectional dataset may only approximate associative relations among variables. Thus, we are unable to infer causal relations among our main variables—resilience, environmental stress, and psychological well-being during the COVID-19 pandemic. A longitudinal study design may better approximate such relations. Next, this study is subject to omitted variable bias, considering that unobserved variables (e.g., peer support and academic stressors) may have affected psychological well-being within the student sample. Third, we used measurements that relied on self-reporting to assess for resilience and psychological well-being. Issues with self-reporting include both unintended and intended reporting errors. For example, in the case of

social desirability bias, students may be compelled to over-report their psychological well-being due to stigma related to poor mental health. To address this, future studies can use data triangulation by gathering information from peer and teacher reports to verify the findings of this study. Additionally, although the study sample size and diversity of colleges from which we drew our sample increase our confidence in the results, the generalizability of these findings to the larger college population in China is unknown and requires further research. Fifth, the small effects of province-level COVID-19 cases may be a result of measurement errors between smaller communities and the province itself. Future research using community indicators of environmental stress is warranted to examine the effects of immediate environmental stress on psychological well-being.

CONCLUSION

With data collected from 1,871 college students across China, we investigated the degree of positive psychological well-being in college students studying social science during the COVID-19 pandemic. We examined how resilience and environmental stress may affect the students' psychological well-being. Results of OLS regression analysis show that during the pandemic, resilience had a strong positive relation with psychological well-being, while environmental stress marginally reduced psychological well-being. Despite the limitations that we have discussed, the present study contributes to existing knowledge on the factors that may contribute to the psychological well-being of Chinese students during the COVID-19 pandemic.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Rutgers University IRB. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

YT, CH, and YG: conceptualization and resources. YT and CH: methodology and software. CH, SC, and SZ: validation. YT, CH, YG, SC, and SZ: formal analysis and writing—original draft preparation. YT, CH, YG, and SZ: investigation and data curation. All authors contributed to the article and approved the submitted version.

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COVID-19 Lockdown: Key Factors in Citizens' Stress

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Background: Confinement due to COVID-19 can have a short- and long-term impact on mental health (increased levels of stress and anxiety and emotional upheaval) and on people's quality of life. Knowing what factors are behind the stress can benefit the development of strategies and resources for future situations of a similar nature. The purpose of this study is to examine the incidence of a series of sociodemographic factors, confinement conditions, and work situation on the stress reported by confined citizens.

Method: The sample is made up of 2008 citizens (19.9% men), the Perceived Stress Scale of 14 items (PSS-14) was used to assess the stress level of the population, as well as a sociodemographic questionnaire and different questions aimed at obtain information about the characteristics of the confinement and the employment situation. Data were collected using exponential snowball-type non-probability sampling.

Results: The results suggest that sociodemographic factors such as age, gender, and income level could be good predictors of confinement stress. Post-confinement work expectancy along with pre-confinement working conditions can be key to protecting the well-being of confined populations.

Limitations: This is a transversal study that forces us to be cautious with causal interpretations. The questionnaire was administered online, which means it excluded a good proportion of the population.

Conclusion: The perception of stress being higher in women than men, with the lowest stress in older people and those with higher reported incomes. Stress levels increase as populations spend more weeks in confinement and the pre-confinement work situation seems key to protecting the well-being of the population. A lower stress is observed among stable couples without children confined in residential or suburban areas. Low income or economic instability is associated with a higher rate of stress and anxiety. The results can contribute to prioritizing actions and aid by contributing to the formation of teams and the design of tools for work in the current pandemic situation.

Keywords: health and well-being, stress, COVID-19, context effects, survey research

INTRODUCTION

In order to tackle the COVID-19 pandemic, the greatest social-healthcare challenge at the moment, unprecedented restrictions on daily life have been placed on citizens all over the world. Confinement to the home, which is what most governments chose, may have short- and long-term impacts

on people's mental health and quality of life. In this novel context, we look at a series of factors that may explain people's stress response during their confinement due to COVID-19. The importance of this study lies in the opportunity to understand the factors behind confinement stress, facilitating the development and resources to deal with similar situations in the future.

Stress and Well-Being

MERS-Cov in Korea in 2013, Serious Acute Respiratory Syndrome (SARS), and Ebola are three examples of relatively recent serious health emergencies, which had different effects on the psychological and physical health of healthcare workers and the general population. Increased stress, anxiety, emotional unrest, worry, and depressive symptoms are the most commonly reported effects in populations that have suffered confinement or a large-scale health emergency of this type (Mohammed et al., 2015; Jalloh et al., 2018; Min et al., 2018; Brooks et al., 2020; Molero et al., 2020).

Stress is conceptualized as a person's response process when they perceive a situation or event as threatening or overwhelming due to them not having sufficient resources to deal with it (Meléndez et al., 2018). In the current situation of confinement, because of COVID-19, the perception of not controlling the environment and the sensation of being overwhelmed by events may trigger the stress process in a population (Meléndez et al., 2018). This situation demands individuals to make increased efforts and potentially compromises their health (Quick et al., 1987; Greenberg et al., 2002; Durán, 2010; Sánchez, 2013) along with the various dimensions of their well-being (Cohen and Wills, 1985; Cohen and Williamson, 1991; Cohen and Herbert, 1996; McEwen, 1998; Trujillo and González-Cabrera, 2007).

Stress and Sociodemographic Factors

In a recent systematic review, Brooks et al. (2020) stated that sociodemographic factors may be the predictors with the greatest psychological impact on the stress of confinement. Being female has been associated with more depressive symptoms, with more anxiety, and more reported stress during the periods of confinement (Taylor et al., 2008; González-Sanguino et al., 2020; Kang et al., 2020; Pappa et al., 2020; Qiu et al., 2020; Wang et al., 2020a,b). In addition, although we have studies that finding no significant relationship between age and stress (Wang et al., 2020a), most authors suggest that people at younger (non-infant) ages would demonstrate higher rates of stress during confinement. Although those studies refer to people aged between 18 and 25 or 21–38 years old (Taylor et al., 2008; Kang et al., 2020; Ozamiz-Etxebarria et al., 2020; Qiu et al., 2020; Shanahan et al., 2020; Wang et al., 2020b), one might expect, as noted by González-Sanguino et al. (2020), age be a protective factor against the psychological impact of stress.

During a pandemic, one of the measures that governments usually employ is the cancellation of a large part of productive activity to safeguard workers and reduce transmission. This cancellation of work means workers interrupting their professional activity, often accompanied by a suspension or reduction of income. This economic instability may explain not only distress during the confinement, but also anger and anxiety once the lockdown has been lifted (Brooks et al., 2020; Lozano-Vargas, 2020; Shanahan et al., 2020; Wang et al., 2020a).

Although there are studies suggesting that educational levels do not have significant associations with indices of population stress (Hawryluck et al., 2004; Brooks et al., 2020), we have included this sociodemographic parameter in order to contribute to clarifying contradictions. Lozano-Vargas (2020) and Qiu et al. (2020) noted greater stress in individuals with higher educational qualifications (university level) based on greater awareness and understanding of the risks of the illness. However, studies, such as Wang et al. (2020a), reported that it was precisely those with the least educational qualifications who reported higher stress owing to the perception of vulnerability, lack of knowledge, and their difficulty in understanding the situation. We have also included civil or marital status as a sociodemographic variable, despite having some evidence that it cannot be significantly associated with perceived stress during the periods of confinement (Brooks et al., 2020; Lozano-Vargas, 2020; Wang et al., 2020a), as one might expect people in stable partnerships to feel more able to call on their support network of friends and family than single people, for example (Ma et al., 2020).

Stress and Conditions of Confinement

In addition to sociodemographic characteristics, the condition in which one is confined in the home, such as whether it is with children or not, the place itself, and the length of time, may affect people's levels of stress. Thus, apart from the stress classically associated with playing the parent–child role (Abidin, 1997; Raphael et al., 2010), one might expect that being in lockdown with children may be an additional challenge to parents who are obliged to balance full-time childcare with their own working responsibilities (Sprang and Silman, 2013; APA, 2020; Esteves et al., 2020).

Furthermore, although there is evidence that spending confinement in a densely populated city is a risk factor, affecting people's stress (Özdin and Bayrak Özdin, 2020; Recchi et al., 2020; Tadesse et al., 2020), some authors have suggested that confinement in urban areas may even be a protective factor (Cao et al., 2020). It is possible that the population confined in urban areas would have less anxiety than those in rural areas as cities would tend to be more economically prosperous (Guessoum et al., 2020; Shigemura et al., 2020) and have better healthcare resources to cope with the disease (Cao et al., 2020).

No doubt one of the key conditions of confinement when it comes to explaining the stress response is the time that individuals have spent in confinement. We can expect that the longer the confinement, the greater the stress, and the worse the mental health (Hawryluck et al., 2004; Marjanovic et al., 2007; Reynolds et al., 2008; Brooks et al., 2020).

Stress and Working Conditions

As we noted above, when lockdown was declared, many workers stopped going to work and had to adapt to a change in their working conditions. Remote working is a clear example, although many people had their work temporarily suspended, and in the worst cases, indefinitely suspended. Given that in the current situation, defined by severe uncertainty, working conditions during confinement may affect populations' well-being and psychological health; in this study, we explore the extent to

which they contribute to the stress response (see for example, Artazcoz et al., 2004; Brand et al., 2008; Bakioğlu et al., 2020).

Compared to those with permanent, full-time work, those most vulnerable to stress will be the unemployed or those with temporary or occasional work (Khan et al., 2002; DiGiovanni et al., 2004; Song et al., 2009; Ma et al., 2020; Mimoun et al., 2020; Shanahan et al., 2020). As we suggested above, economic security may act as a protective factor against depression, anxiety, and post-traumatic stress in the present situation (González-Sanguino et al., 2020).

MATERIALS AND METHODS

Participants

During the period of confinement, 2008 people (19.9% men) responded voluntarily and anonymously to an online questionnaire aimed at discovering their situational stress responses and the coping strategies they were using. The respondents' were aged between 18 and 75 years old ($M_{age} = 38.30$; $SD=11.92$). A total of 1745 respondents completed a Spanish version of the questionnaire, and 263 completed an English version. Although 63.2% of respondents were resident in Spain, we also received responses from various Latin American countries – 6% from Argentina, 7.5% from Ecuador, 7.6% from Mexico, among others – and from residents in the United States (11.6%).

Instruments

We examined a series of sociodemographic factors (gender, age, civil status, educational level, and income) to determine their relationship to the stress response to confinement. In addition to recording the amount of time (in weeks) that participants had been confined, we asked about their confinement situation (with parents, parents and children, single parent and children, with a partner, or alone) and the type of residence, where they were confined (urban, rural, or suburban/residential). We also asked participants about their working conditions prior to confinement (full-time, part-time, occasional or self-employed, homemaker, pensioner, or not working/studying), the conditions of work during confinement (remote working, attending work, mixed remote and *in situ* work, temporary suspension of work, or loss of employment) and their work-related expectations for after the confinement.

To evaluate people's levels of stress we used the 14-item Perceived Stress Scale (PSS-14) created by Cohen et al. (1983). This is a scale that has traditionally been reported to exhibit good internal and structural consistency (Cohen and Williamson, 1988; Remor, 2006; González and Landero, 2007; Campo et al., 2009; Cohen and Janicki-Deverts, 2012; Lee, 2012).

In line with theory and psychometric studies with PSS (both PSS-14 and PSS-10), in our study, it demonstrated a two-factor structure made up of elements worded positively and negatively (Taylor, 2015) which, with eigenvalues over 1, explain 52.54% of the variance. The factorial analysis we carried out for the whole sample allowed us to differentiate between control of stress ($\alpha = 0.83$) and perceived stress ($\alpha = 0.85$). Both chi-square from the transformation of the determinant of the correlation matrix (Bartlett's sphericity of 0.000) and the size of the correlation coefficients (KMO = 0.918) indicated the suitability of the factorial structure.

Procedure

Using non-probabilistic exponential snowball sampling, we constructed a single survey in both Spanish and English on the Microsoft Forms platform. On April 18, 2020, we published a direct link to the survey on various social networks and various other media both print and digital to publicize the request for participants in the study. The mean response time for the survey ranged between 15 and 20 min, without a time limit.

To comply with the recommendations of the Ethics Committee for Research and Teaching at the University of A Coruña and the Declaration of Helsinki (AMM, 2017), we asked participants to confirm that they were over 18. They were informed of the voluntary, anonymous, confidential nature of their participation, and they were asked to give their informed consent to participate.

Once we had achieved a sufficiently large sample, and given the beginning of loosening lockdown measures in some countries, we closed access to the survey on May 19, 2020 and began data analysis using the SPSS statistical package.

Data Analysis

Predictor equations for stress during COVID-19 confinement were produced using logistical regression, following the forward stepwise regression procedure based on the Wald statistic. Three logistical regressions were performed using sociodemographic variables, confinement conditions, and work-related variables as predictors. The three cases included perceived stress (No = 0 or Yes = 1) as the criterion variable, referring to the mean in the Perceived Stress factor of the PSS-14 in the sample. The fit of the models was assessed using Nagelkerke's R^2 (Nagelkerke, 1991) and the percentage of correctly classified cases.

RESULTS

Sociodemographic Variables and Perceived Stress During Confinement

Considering gender, civil status, the level of education, and income levels, we produced a *sociodemographic model* in order to make estimations about the mean level of perceived stress during confinement (no stress = 0/stress = 1). The categorical variables in the regression equation were coded as described in Table 1.

TABLE 1 | Frequencies and parameter coding (1) for the sociodemographic variables included in the regression equation.

		Frequency	Parameter coding*		
			(1)	(2)	(3)
Gender	Male	400	1		
	Female	1,607	0		
Civil status	Married or stable partnership	1,225	1	0	0
	Separated or divorced	134	0	1	0
	Single	619	0	0	1
	Widowed	29	0	0	0

*Presence/absence of category.

The final explanatory model of stress would allow the correct classification of 60.3% of the sample ($\chi^2 = 128.964$; $p = 0.000$), with better sensitivity in estimating above-average stress (63.3%) than below-average stress (57.1%; see **Table 2**).

The analysis of the final step suggested the inclusion of three sociodemographic models: gender, age, and income, with the remaining sociodemographic variables included initially – educational level and civil status – not providing

better information for the prediction of stress in confinement.

The stepwise regression process showed that *age* was the sociodemographic variable that most explained the perception of stress in confinement ($W = 57.419$; $p < 0.001$), with *gender* making a reasonable contribution to this perception ($W = 36.494$; $p < 0.001$). *Income level* would also explain perceived stress during confinement, with lower explanatory power ($W = 7.398$; $p < 0.01$; see **Table 3**).

Although the percentage of variance explained was low (Nagelkerke's $R^2 = 0.083$), looking at the parameter coding, we can interpret it as the perception of stress being higher in women than men, with the lowest stress in older people and those with higher reported incomes (see **Table 3**).

TABLE 2 | Omnibus tests on the sociodemographic model coefficients.

		χ^2	df	Sig.
Step 1	Step	83.305	1	0.000
	Block	83.305	1	0.000
	Model	83.305	1	0.000
Step 2	Step	38.189	1	0.000
	Block	121.493	2	0.000
	Model	121.493	2	0.000
Step 3	Step	7.470	1	0.006
	Block	128.964	3	0.000
	Model	128.964	3	0.000

TABLE 3 | Variables in the equation.

	B	SE	Wald	df	p	Exp(B)
Step 1^a						
Age	-0.200	0.022	80.362	1	0.000	0.818
Constant	0.784	0.099	63.250	1	0.000	2.190
Step 2^b						
Gender (1)	-0.721	0.119	36.967	1	0.000	0.486
Age	-0.201	0.023	79.120	1	0.000	0.818
Constant	0.926	0.103	81.551	1	0.000	2.525
Step 3^c						
Income level	-0.124	0.046	7.398	1	0.007	0.883
Gender (1)	-0.717	0.119	36.494	1	0.000	0.488
Age	-0.181	0.024	57.419	1	0.000	0.835
Constant	1.303	0.174	56.065	1	0.000	3.682

^aVariable added in step 1: age.

^bVariable added in step 2: gender.

^cVariable added in step 3: income level.

Confinement Conditions and Perceived Stress

In order to estimate the mean level of stress perceived by the population during confinement (no stress = 0/stress = 1), we included the length of time confined, the situation in the home, and the type of residence in the *confinement conditions model*. The categorical variables in this regression equation were coded as shown in **Table 4**.

The final explanatory model for the perceived level of stress allowed the correct classification of 55% of the sample ($\chi^2 = 30.662$; $p = 0.000$; see **Table 5**) with better sensibility when estimating above-average stress (58.8%) than below-average stress (51.3%).

TABLE 5 | Omnibus tests for the confinement conditions model coefficients.

		χ^2	df	Sig.
Step 1	Step	8.290	1	0.004
	Block	8.290	1	0.004
	Model	8.290	1	0.004
Step 2	Step	10.040	2	0.007
	Block	18.329	3	0.000
	Model	18.329	3	0.000
Step 3	Step	12.333	4	0.015
	Block	30.662	7	0.000
	Model	30.662	7	0.000

TABLE 4 | Frequencies and parameter coding (1) for the categorical variables related to the confinement conditions included in the regression equation.

			Parameter coding ^a			
			(1)	(2)	(3)	(4)
Confined with...	Alone/without children	317	1	0	0	0
	With partner/without children	354	0	1	0	0
	Single parent/with children	244	0	0	1	0
	Two parents/with children	854	0	0	0	1
	With parents	117	0	0	0	0
Type of residence	Rural	335	1	0		
	Residential/Suburban	366	0	1		
	Urban	1,185	0	0		

^aPresence/absence of category.

The stepwise regression procedure showed that the *length of confinement* ($W = 8.815$; $p < 0.01$), the *type of residence* ($W = 10.017$; $p < 0.01$), and the *confinement situation* (*Confined with*; $W = 12.209$; $p < 0.05$) contributed to explaining the perception of stress in the population (see **Table 6**).

Although the variance explained was low (Nagelkerke's $R^2 = 0.022$), perceived stress would be lower in those confined with a partner, without children, and in residential or suburban areas (see **Table 6**). As expected, perceived stress would tend to be higher the longer the confinement (see **Table 6**).

Work Situation and Stress of Confinement

Considering people's work situation before confinement, during confinement, and their work-related expectations for after confinement, we produced a logistical regression model to assess the mean level of perceived stress (no stress = 0/ stress = 1). The categorical variables for this *work situation model* were coded as shown in **Table 7**.

The final explanatory model would allow the correct classification of 58.1% of the sample ($\chi^2 = 43.602$; $p = 0.000$) with better sensitivity when assessing below-average stress (66.1%; see **Table 8**).

Analysis of the final step for the explanation of perceived stress suggests that the post-confinement work-related expectations ($W = 24.6060$; $p < 0.001$) and people's normal pre-confinement work situations ($W = 11.593$; $p < 0.05$) would contribute to their perceptions of stress. From these parameters, the work situation during confinement appears not to provide more information for the prediction of mean stress in the confined population.

Although the percentage of variance explained was low (Nagelkerke's $R^2 = 0.037$), looking at the parameter coding, we can interpret that perceived stress is higher the worse the post-confinement work-related expectations, and that the stress reported by those with full-time jobs is lower than the stress reported by those in other circumstances of work (see **Table 9**).

TABLE 6 | Variables in the equation.

			E.T.	Wald	df	Sig.	Exp (B)
Step 1 ^a	Weeks confined	0.174	0.061	8.246	1	0.004	1.190
	Constant	-0.466	0.168	7.696	1	0.006	0.627
	Weeks confined	0.176	0.061	8.351	1	0.004	1.192
Step 2 ^b	Type of residence			9.949	2	0.007	
	Type of residence (1)	-0.033	0.124	0.071	1	0.790	0.967
	Type of residence (2)	-0.378	0.121	9.746	1	0.002	0.686
	Constant	-0.392	0.173	5.133	1	0.023	0.675
	Weeks confined	0.182	0.061	8.815	1	0.003	1.200
	Confined with			12.209	4	0.016	
	Confined with (1)	-0.375	0.220	2.910	1	0.088	0.687
Step 3 ^c	Confined with (2)	-0.634	0.219	8.409	1	0.004	0.531
	Confined with (3)	-0.336	0.229	2.157	1	0.142	0.715
	Confined with (4)	-0.253	0.201	1.580	1	0.209	0.776
	Type of residence			10.017	2	0.007	
	Type of residence (1)	-0.078	0.125	0.389	1	0.533	0.925
	Type of residence (2)	-0.385	0.122	10.009	1	0.002	0.680
	Constant	-0.059	0.247	0.057	1	0.811	0.943

^aVariables added in step 1: weeks confined.

^bVariables added in step 2: type of residence.

^cVariables added in step 3: confined with.

TABLE 7 | Frequencies and parameter (1) coding for the categorical variables related to the work situation included in the regression equation.

		Frequency	Parameter coding ^a			
			(1)	(2)	(3)	(4)
Usual work situation	Full-time	1,059	1	0	0	0
	Part-time/occasional/self-employed	336	0	1	0	0
	Homemaker	18	0	0	1	0
	Pensioner/retired	10	0	0	0	1
	Not working/studying	107	0	0	0	0
Work situation during confinement	Remote working and attending work	114	1	0	0	0
	Remote working	687	0	1	0	0
	Attending work	306	0	0	1	0
	Temporary suspension	334	0	0	0	1
	Lost job	89	0	0	0	0

*Presence/absence of category.

DISCUSSION

The results of this study may contribute to the recognition of factors underlying the stress of confined populations and may potentially inform possible future decisions in similar situations.

In line with the work by Brooks et al. (2020), the sociodemographic models demonstrate better explanatory power for stress in confinement than other models. Specifically, age (Taylor et al., 2008; Kang et al., 2020; Ozamiz-Etxebarria et al., 2020; Qiu et al., 2020; Shanahan et al., 2020; Wang et al., 2020b) and gender (Taylor et al., 2008; González-Sanguino et al., 2020; Kang et al., 2020; Pappa et al., 2020; Qiu et al., 2020; Wang et al., 2020a,b) seem to be the factors that best explain the perception of stress in confinement. The results also link low income and financial instability with the higher rates of stress and anxiety (Brooks et al., 2020; González-Sanguino et al., 2020; Lozano-Vargas, 2020; Shanahan et al., 2020; Wang et al., 2020a). The perception of confinement stress is higher among women than among men and decreases with age and with higher reported income.

Once age, gender, and income are considered, neither the level of education nor civil status provide better information in the explanation of stress in confinement (Hawryluck et al., 2004; Brooks et al., 2020; Lozano-Vargas, 2020; Wang et al., 2020a). Although one might expect that the level of education might make it easier for someone to properly interpret the information we are exposed to throughout confinement, the fact is that, in this study, we did not find differences in perceived stress according to this variable. It may be useful to explore potential differences in coping methods and in control of the stress response.

TABLE 8 | Omnibus tests for the workplace situation model coefficients.

		χ^2	df	Sig.
Step 1	Step	31.820	1	0.000
	Block	31.820	1	0.000
	Model	31.820	1	0.000
Step 2	Step	11.782	4	0.019
	Block	43.602	5	0.000
	Model	43.602	5	0.000

TABLE 9 | Variables in the equation.

		B	E.T.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Work expectations	-0.533	0.095	31.130	1	0.000	0.587
	Constant	0.838	0.164	25.960	1	0.000	2.311
Step 2 ^b	Work expectations	-0.480	0.097	24.660	1	0.000	0.619
	Usual work			11.593	4	0.021	
	Usual work (1)	-0.612	0.214	8.207	1	0.004	0.542
	Usual work (2)	-0.347	0.231	2.251	1	0.134	0.707
	Usual work (3)	-0.103	0.531	0.038	1	0.846	0.902
	Usual work (4)	-0.489	0.669	0.535	1	0.465	0.613
	Constant	1.257	0.248	25.616	1	0.000	3.515

^aVariables added in step 1: work expectations.

^bVariables added in step 2: usual work.

Although with more variance to explain than in the sociodemographic model, people's expectations about post-confinement work together with their pre-confinement work situation may to a large extent be estimators of emotional well-being – low perceived stress – in confined populations. In this regard, and as we hypothesized, perceived stress seems to be higher as people believe that their work situations will worsen post-confinement. Positive expectations were a protective factor against stress in confinement, enhancing the well-being of confined populations by strengthening self-efficacy and reducing behaviors associated with frustration and pessimism (Dubow et al., 2001; Besser and Shackelford, 2007; Bakioğlu et al., 2020; Molero et al., 2020; Salas-Nicás et al., 2020).

In line with results from previous studies, which reported part-time workers reporting more stress than full-time workers (DiGiovanni et al., 2004; Mimoun et al., 2020), those with full-time jobs may demonstrate less perceived stress during the periods of confinement. Those who work part-time, occasionally, or are self-employed would tend to have greater difficulties dealing with confinement because of the instability of the job market and/or lower incomes. Once the less negative work-related expectations associated with more stable pre-confinement work situations are considered, the work situation during confinement does not provide more information to the prediction of people's stress (Ma et al., 2020; Mimoun et al., 2020; Shanahan et al., 2020).

Although the variance explained by the model using confinement conditions in the home is low, our results suggest an increase in the rates of stress according to the length of confinement (Hawryluck et al., 2004; Marjanovic et al., 2007; Reynolds et al., 2008; Brooks et al., 2020; Taylor et al., 2020) and indicate a profile of reduced stress in stable couples without children (Sprang and Silman, 2013; APA, 2020; Esteves et al., 2020; Ma et al., 2020) confined in residential or suburban areas (Özdin and Bayrak Özdin, 2020; Recchi et al., 2020; Tadesse et al., 2020).

The difficulty of couples with children in accessing their support networks during the current confinement due to COVID-19 (Ma et al., 2020) may contribute to the levels of reported stress, and suburban or residential areas may combine the best qualities of urban and rural areas, contributing to a

smaller stress response to confinement (Özdin and Bayrak Özdin, 2020; Recchi et al., 2020; Tadesse et al., 2020). associated with confinement in residential areas would not have the negative characteristics associated with confinement in rural areas, as residential areas are relatively closer to more urban areas, they are associated with greater economic prosperity, with better connections to public services, and better healthcare conditions in the fight against the pandemic (Cao et al., 2020; Guessoum et al., 2020; Shigemura et al., 2020).

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at doi: 10.5281/zenodo.4020364.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of University of A Coruña. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

AV and IP conceived the presented idea. SR developed the theory and performed the computations. AV verified the analytical methods and supervised the project. IP encouraged TV and RG-S to investigate stress in COVID-19 and supervised the findings of this work. TV wrote the manuscript with support from RG-S, FD, and IP who fabricated the first sample. SR and AV helped to supervise the project and conceived the original idea. VT, RG-S, and FD developed the theoretical formalism. SR and IP performed the analytic calculations and the numerical simulations. All authors provided critical feedback, discussed the result, and also carried out the experiment. All authors contributed to the article and approved the submitted version.

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Fear of the Unknown: Does Fear of Terrorism Differ From Fear of Contracting COVID-19?

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The aim of the study was to explore whether living under constant security threat would result in better coping and higher resilience when exposed to an unknown threat such as the COVID-19 pandemic. Thus, fear of COVID-19 and fear of terrorism as well as the associations with coping strategies and resilience were examined among Israelis living in conflict zones as well as Israelis living in the center, where exposure to security incidents is rare. Six hundred and fifteen Israeli adults (260 men and 356 women) were interviewed via the internet while Israel was under mandatory first lockdown. Fear of COVID-19 was found to be higher than fear of terrorism among both groups. Those living in the conflict zones and those living in the central Israel. In contradiction to our assumption, we found that those who were living in a conflict zone did not exhibit higher levels of resilience and did not cope better when exposed to a new threat—even though they may be more skilled at handling prolonged exposure to a threat such as terrorism. A regression analysis indicated that the best predictor of both fear of COVID-19 and of terrorism is financial concerns—more than geographical area.

Keywords: COVID-19, terrorism, fear, cope, resilience

INTRODUCTION

Since the beginning of the twenty first century, many countries around the globe have had to cope with different epidemics and viral outbreaks (for review see: Brooks et al., 2020). COVID-19 is considered the largest pandemic in the twenty first century (Singhal, 2020). The global impact of COVID-19 and the public health threat it represents are the most serious seen in a respiratory virus since the 1918 H1N1 influenza pandemic (Ferguson et al., 2020). Despite the ongoing development of vaccines, the pandemic is not yet over. Many countries have been experiencing multiple waves of COVID-19 outbreaks.

A powerful effect of exposure to COVID-19, particularly in the first stage, was the sense of fear due to the uncertain nature of the threat. This following intensive reports in all forms of media concerning high rates of morbidity and mortality, side by side with the lack of knowledge and concern of an insufficient medical response, as well as threats that the healthcare system would collapse. Public anxieties and concerns were and continue to be high, along with an apparent wave of fear and worry in society (Lin, 2020). Research has shown that COVID-19 is perceived as a new, unknown, and out-of-control hazard and source of intense fear for the entire global population (Ahorsu et al., 2020; Rajkumar, 2020). People have reported fear of infection, death, loss of a family member, and contact with people who may be infected (Brooks et al., 2020; Fardin, 2020; Mertens et al., 2020), as well as career and financial loss (Trzebiński et al., 2020). These reports may seem

quite similar to the effect of terrorism and security threats. Hence, the current study is the first, as far as we know, to examine and compare the fear associated with security threats and fear of COVID-19. The main aim of the study was to examine whether Israelis habituated to living in conflict areas and being exposed to security threats experience a new type of threat, in the form of COVID-19, as more frightening than the familiar threat of terrorism incidents.

Threat of Terrorism vs. the Threat of COVID-19

Terrorism and COVID-19 share common elements. They affect the social fabric of life by creating a sense of fear and interfering with normal daily life routines. Both have psychological, physical, and financial effects. Similar to the effects described above due to exposure to COVID-19, the impact of terrorism is not restricted to the individual, but rather extends to entire communities (Perry and Alvi, 2011).

High levels of individual and public fear and distress were found following exposure to security and terrorism events (e.g., Haner et al., 2019). Fear and worry about terrorism attacks have been found to prompt several behavioral adjustments to individuals' daily life in order to minimize the risk of falling victim to a future attack, even if they themselves had not been directly victimized (Eisenman et al., 2009; Denovan et al., 2017).

At the same time, the source of each of these threats is quite different. Terrorism is a geopolitical threat, man-made acts that are uniquely motivated by ideology aimed at achieving political objectives. It is designed to harm random victims, cause damage and death, and plant seeds of fear and chaos far beyond its immediate victims and among a wider public (Perry and Alvi, 2011; Romanov et al., 2012). Thus, fear of terrorism may be linked to geographical location (Benzion et al., 2009; Besser and Neria, 2012).

Another difference is the visibility of the enemy. While in the case of terrorism the enemy is normally known, when dealing with a pandemic it is almost impossible to pinpoint a person or body agent that intentionally caused the spread of the virus. As such, COVID-19 is an invisible health threat as opposed to a visible enemy.

Regardless of the dissimilarities and discrepancies of these stressors, it appears that high levels of individual and public fear and distress were found following exposure to security and terror events (e.g., Haner et al., 2019) as well as fear of getting infected from COVID-19 (Lin, 2020). Various studies indicate processes of habituation following lengthy exposure to threatening and stressful situations (Bensimon, 2012; Stein et al., 2018; Laufer and Shechory Bitton, 2020). Studies that examined populations living in conflict areas, including Israel, and exposed to lengthy security threats, reported a lower sense of fear and distress than situations of exposure to a one-time event (Itzhaky et al., 2017; Shechory Bitton and Laufer, 2018; Shechory Bitton and Silawi, 2019). Fear and worry about terror attacks have been found to prompt several behavioral adaptations in individuals' daily lives in order to minimize the risk of falling victim to a future

attack, even if they themselves had not been directly victimized (Eisenman et al., 2009; Denovan et al., 2017).

The Situation in Israel

Israelis, who have considerable experience dealing with life under a constant security threat, are now faced with a new reality in which they are required to deal with an unfamiliar situation, dealing with an epidemic that is a threat to their health and to the health of their family, when uncertainty and lack of knowledge concerning the virus and its effects were at their height (Shechory Bitton and Laufer, 2021). Although there have been several global epidemics in recent decades, Israel was hardly affected by them. In fact, it could be argued that the last epidemic with which Israel had to cope was polio in the 1950s (Swartz, 2008). Since then, Israeli society has mostly had to contend with terrorism and the threat of terrorism has occupied a central place in the Israeli collective experience (Herzenstein et al., 2015). However, exposure to COVID-19 has affected Israeli society (Shrira et al., 2020).

Accustomed as it is to coping with terrorism and security threats, Israel is now facing a health threat caused by an invisible enemy. As such, this unique situation in Israel enables us to examine whether the development of resilience in the context of terrorism, following prolonged exposure, also affects resilience in the context of dealing with a pandemic. Thus, we examined the differences between two kinds of fear: of terrorism and of the pandemic, and we also examined whether fear of the pandemic and coping with the pandemic differ between those residing in areas of Israel confronted with a daily threat of terrorism and war and those residing in central Israel who are not exposed to fear of terrorism and war on a daily basis.

In contrast to the new COVID-19 threat extending to Israel's entire population, coping with terror events in Israel is geographically dependent. While inhabitants of border areas must deal with belligerent incidents on a daily basis, in central Israel there is almost no exposure to such events. Over the years, those living in areas of conflict have been exposed to attacks, both directly as well as indirectly through the injury or death of friends (Laufer et al., 2009; Shechory Bitton, 2013).

Resilience and Coping Strategies

Resilience and coping constitute a major component of people's ability to cope with stressful events (Connor and Davidson, 2003; Besser et al., 2015; Hu et al., 2015). A growing body of research shows that resilience, indicated either by a low rate of post-traumatic stress symptoms or distress, is the most common reaction to traumatic events (e.g., Bonanno et al., 2012; Stein et al., 2018). Resilience can be defined as the ability to cope successfully with stressful and traumatic events and retain a sense of equilibrium (Bonanno, 2004; Straud et al., 2018).

In fact, resilience in the face of adversity is the capacity to move ahead under adverse circumstances, a human response that leads to better health, both mentally and physically. Resilient people were found to enjoy better physical and mental health, lower levels of depression, anxiety, sleep disorders, and PTSD, compared to people who are less resilient (Hu et al., 2015; Straud et al., 2018; Finklestein et al., 2020).

In the current study, we follow Connor and Davidson (2003) definition of resilience as a personal characteristic that embodies the personal qualities as well as an individual's past life experiences and current life circumstances enabling one to thrive in the face of adversity.

Resilience has also been associated with coping strategies in the context of various adverse events (Reich et al., 2010). Lazarus and Folkman (1984, 1991) suggested two major forms of coping: problem-focused (dealing with stress sources and taking proactive steps to change them) and emotion-focused (serving to reduce the emotional stress resulting from such situations) (see also Folkman, 2013). Mostly, greater use of emotion-focused coping is highly correlated with high levels of psychological distress (e.g., Carver and Scheier, 1993; Gilbar et al., 2010; Rodrigues and Renshaw, 2010). In contrast, use of problem-focused strategies has been negatively correlated with distress and indicates good mental health (Taft et al., 2007; Gilbar et al., 2010) and higher levels of resilience (Li and Nishikawa, 2012; Thompson et al., 2018).

Several studies conducted during the ongoing coronavirus pandemic, found that resilient people and individuals who use positive, active, or problem-focused coping, worry less and have fewer symptoms of anxiety and depression than people who do not (Barzilay et al., 2020; Haven et al., 2020; Yu et al., 2020). However, the findings are not unequivocal. Other studies have identified a "coping-panic cycle" in which the more one uses coping (whether emotion-focused or problem-focused), the more one experiences distress during this pandemic (Huang et al., 2020; Man et al., 2020).

When examining the role of coping with exposure to terrorism and security threats, findings show that both coping strategies can be positively correlated with pathogenic (e.g., distress and fear, PTS symptoms) as well as with salutogenic factors (e.g., Shechory Bitton and Laufer, 2017). Some findings even emphasize the importance of emotion-focused strategies *in situations* perceived as uncontrollable or in the absence of a viable solution (e.g., exposure to terrorism and security threats) (May et al., 2011; Besser and Neria, 2012; Braun-Lewensohn and Mosseri Rubin, 2014).

According to the goodness of fit hypothesis, the effectiveness of different coping strategies depends on the appraised controllability of the event. Problem-focused strategies are proposed to be adaptive *in situations* perceived as controllable and maladaptive *in situations* perceived as uncontrollable. In contrast, high levels of emotion-focused coping are proposed to have positive effects on adaptation in uncontrollable situations (Conway and Terry, 1992). In these cases, it may even be better to use emotion-focused coping, since this strategy may reduce the negative psychological effects of the event without confronting it directly (Zeidner, 2006; Shechory Bitton and Cohen-Louck, 2021).

The Current Study

The current study was conducted during the peak of the first COVID-19 lockdown in Israel, when uncertainty and lack of knowledge concerning the virus and its effects were at their height. On March 17, 2020, the Israeli government officially

imposed a lockdown. At the time of data collection (March 30 to April 8, 2020), Israel's borders were closed and the government had instructed residents to remain at home while imposing limitations on the public and private sectors. Many people were forced to stop working, with no knowledge of when and even whether they would be returning to their jobs. The stay-at-home order was implemented rigorously, resulting in increasing unemployment in many areas of the economy, with the national unemployment rate rising from 3.4 to 27% in April 2020. Thus, Israeli society was confronted with a new and unfamiliar threat.

The main aim of the study was to examine whether Israelis habituated to living in conflict areas and exposed to security threats experience a new threat type, in the form of COVID-19, as more frightening than the familiar threat of terrorism incidents. That is, whether a previous habituation process of living in a conflict zone, will be manifested in a higher level of resilience and coping abilities with the new threat of COVID-19. As such, the study aimed to examine the levels of fear, resilience, and coping ability of two Israeli groups, those living in conflict areas who were previously found to have higher levels of habituation to fear due to terrorism (e.g., Stein et al., 2018) and those living in central Israel, where exposure to security incidents is rare. Thus, fear of COVID-19 and fear of terrorism as well as the associations with coping strategies and resilience were examined.

Previous findings suggested that gender differences are a dominant indicator of the response to stressful situations, with higher symptomatology among women compared to men (e.g., Laufer et al., 2019; Shechory Bitton and Cohen-Louck, 2021). Thus, gender differences were also examined.

Based on the literature review we hypothesized that those who were living in a conflict zone would exhibit lower levels of fears and higher levels of resilience and would cope better when exposed to the new pandemic threat. In addition, we hypothesized that lower level of resiliency and maladaptive coping strategy (emotion-focused coping more than problem-focused coping) would predict higher levels of fear of both threats.

METHOD

Participants

The participants in this study numbered 615 individuals: 260 males (42.3%) and 355 females (57.7%). Two hundred and fifty-one of the participants were living in conflict areas (40.8%) and 364 in central Israel (59.2%), with no gender differences by area ($Z = 1.85, p = 0.065$). The mean age of the participants was 47.54 ($SD = 14.50$, range 19–88), with no difference by area [$F_{(1, 500)} = 1.61, p = 0.206, \eta^2 = 0.003$], by gender [$F_{(1, 500)} = 1.81, p = 0.179, \eta^2 = 0.004$], or by the interaction of area with gender [$F_{(1, 500)} = 0.58, p = 0.445, \eta^2 = 0.001$].

Most of the sample from both groups were married and parents of children (75.4 and 84.7%, respectively). Overall, the number of children per family ranged from 0 to 11 ($M = 2.61, SD = 1.62$). Significant differences were found by area [$F_{(1, 573)} = 16.56, p < 0.001, \eta^2 = 0.003$], but no difference by gender [$F_{(1, 573)} = 0.27, p = 0.601, \eta^2 = 0.001$] or by the interaction of area with gender [$F_{(1, 573)} = 1.32, p = 0.251, \eta^2 = 0.002$]. Families

in conflict areas had more children ($M = 2.92$, $SD = 1.72$) than families in central Israel ($M = 2.39$, $SD = 1.51$).

Most of the participants ($N = 401$, 65.2%) had an academic education, to a greater extent in central Israel ($N = 257$, 70.6%) than in conflict areas ($N = 144$, 57.4%) ($Z = 3.39$, $p < 0.001$), and to a greater extent among females ($N = 252$, 71.0%) than males ($N = 149$, 57.3%) ($Z = 3.52$, $p < 0.001$). A quarter of the participants ($N = 155$, 25.2%) continued to commute to work at the time, while all others worked from home ($N = 187$, 30.4%) or did not work ($N = 273$, 44.4%). Continuing to go to work did not differ by area ($Z = 1.27$, $p = 0.203$), but was higher among males ($N = 92$, 35.4%) than females ($N = 63$, 17.7%) ($Z = 4.98$, $p < 0.001$). Most participants who were living in central Israel ($N = 201$, 62.8%) were secular, while most participants in conflict areas ($N = 113$, 56.8%) were non-secular ($Z = 4.37$, $p < 0.001$). No gender differences were found by religiosity ($Z = 1.56$, $p = 0.119$). In addition, only 8 participants (1.3%) reported that they had direct contact with someone who had become infected with COVID-19 at the time of collecting the data.

No differences were found between the groups in their response to the question: How concerned are you about your financial situation due to the COVID-19 crisis? Concern about one's financial situation due to COVID-19 differed only by gender [$F_{(1, 611)} = 6.64$, $p = 0.010$, $\eta^2 = 0.011$], with females reporting greater concern ($M = 2.85$, $SE = 0.07$) than males ($M = 2.58$, $SE = 0.08$).

Measurements

Personal Data

In order to record demographic variables, respondents were asked to provide information about their gender, age, marital status, level of education, religiosity, and place of residence. In addition, questions were asked focusing on the lockdown due to COVID-19: Did you/ a family member contract COVID-19? (yes or no); Did you continue working during the lockdown? (yes or no). Also, one question was addressed the financial situation: How concerned are you about your financial situation due to COVID-19? (on a 5-point scale: 1 = not at all to 5 = very much).

Fear of Terrorism and Fear of Contracting COVID-19

The respondents were asked to answer 5 questions that examined their level of fear of being attacked by terrorists or of contracting the COVID-19 virus, as well as their level of fear that their family members would be affected, on a 5-point scale (1 = not at all to 5 = very much): (1) To what degree are you afraid that your health will be affected due to contracting COVID-19?; (2) To what degree are you afraid that your family members' health will be affected due to contracting COVID-19?; (3) To what degree are you afraid at present of being hurt in a terrorist incident?; (4) To what degree are you afraid at present that someone in your family will be hurt in a terrorist incident? In addition, the respondents were asked to answer the question: Compared to your fear of contracting COVID-19, how afraid are you at present of being hurt in a terrorist incident? The response options were: 1. More afraid of contracting the COVID-19 virus; 2. More afraid of being hurt in a terrorist incident; 3. Equally afraid; 4. Not afraid of being hurt by either of them.

Coping strategies were measured using the COPE scales (Carver et al., 1989). The COPE scales examine two major coping strategies: problem-focused (15 items) and emotion-focused (15 items). Participants were asked to rate the extent to which they used each coping option to deal with stressful situations (e.g., exposure to COVID-19), on a 4-point scale (0 = not at all; 3 = a great deal) (data were transformed into a 1–4 scale). Higher mean scores on each dimension indicate more frequent use of that coping style. Cronbach's alpha was 0.83 for problem-focused and 0.68 for emotion-focused coping. The scale has been used extensively in Hebrew (e.g., Shechory Bitton, 2014).

Coping Strategies

Coping strategies were examined via use of the Coping Orientation to Problems Experienced scale (COPE scale; Carver et al., 1989). This scale assesses problem-focused strategies (15 items) and emotion-focused strategies (15 items). Participants were asked to rate the extent to which they used each coping option to deal with stressful situations on a scale ranging from 0 (not at all) to 4 (a great deal). Data were transformed into a 1–4 scale. The scale has been used extensively in Hebrew, showing good predictive validity and internal consistency (e.g., Shechory Bitton, 2014). In the current study, Cronbach's α for problem-focused coping was 0.82, and 0.68 for emotion-focused coping.

Resilience was measured using the Connor-Davidson Resilience Scale (CD-RISC; Connor and Davidson, 2003). It consists of 25 statements (e.g., able to adapt when changes occur; have close and secure relationships; belief that one can deal with whatever comes; and have control of one's life). Each statement is rated by respondents for their extent of agreement with it (0 = not at all to 4 = true nearly all the time). Total CD-RISC scores representative of resilience were utilized for this study ($\alpha = 0.89$). The scale has been used in Hebrew (Finklestein et al., 2020).

Procedure

The study was a cross-sectional survey study, based on respondent self-reports through an online survey. Considering the feasibility of electronic questionnaires, a professional online questionnaire powered through an online survey platform was used to complete the paperless survey. Inclusion criteria were: adult Israeli citizens (over 18 years old), Jewish, living in a conflict area (southern or northern Israeli border, or the West Bank—Judea and Samaria), or living in central Israel (mainly the Tel-Aviv district). Participants were recruited over 8 days between March 31 and April 8, 2020. As mentioned in the introduction, the study was conducted during the peak of the first COVID-19 lockdown in Israel, when uncertainty and lack of knowledge concerning the virus and its effects were at their height. At that time, the Israeli government had issued a directive for residents to isolate themselves at home and minimize face-to-face interactions. All respondents provided informed consent. The questionnaire stated that participation is anonymous and confidential. The participants were informed that their answers would serve only for research purposes and that they could stop answering at any point. Then, they were required to complete the questionnaires anonymously. The raw data was then transferred into a database. The study was approved according to the

ethical standards of the Institutional Review Board (IRB) of Ariel University.

Data Analysis

Data were analyzed with SPSS version 27. Background variables were described with means and standard deviations, as well as frequencies and percentages. The background variables were compared by geographical area and gender using analyses of variance and Chi-squares. The research variables were described with means and standard deviations, and compared by geographical area and gender using analyses of variance. Significant interactions were interpreted with estimated marginal means, using Bonferroni adjustments for multiple comparisons.

Differences between fear of COVID-19 and of terrorism, and between fear for oneself vs. one's family, were calculated with a $2 \times 2 \times 2 \times 2$ repeated measures analysis of variance (theme of fear—COVID-19/terrorism, subject of fear—self/family, geographical area—conflict area/central Israel, and gender—male/female). Theme of fear and subject of fear served as within subjects variables, and hence the repeated measures analysis of variance. Geographical area and gender served as between subjects variables. Significant interactions were interpreted with estimated marginal means, using Bonferroni adjustments for multiple comparisons. Pearson correlations were calculated among the research variables. Multiple hierarchical regressions were calculated for fear of COVID-19 and terrorism, using background variables and financial concerns in the first step, and coping strategies and resilience in the second.

RESULTS

Fear of Terrorism and Fear of COVID-19

First, a total $2 \times 2 \times 2 \times 2$ repeated measures analysis of variance was calculated (type of fear—COVID-19/terrorism, subject of fear—self/family, geographical area—conflict area/central Israel, gender—male/female). Results showed that COVID-19 related fear was higher than terrorism related fear, that fear for family was higher than fear for oneself, that women showed higher levels of fear than men, and that overall fear was higher in conflict areas than in central Israel. That is, a significant difference was found for type of fear [$F_{(1, 611)} = 352.07, p < 0.001, \eta^2 = 0.366$], with COVID-19 related fear ($M = 3.04, SE = 0.04$) higher than terrorism-related fear ($M = 2.15, SE = 0.05$). Another significant difference was found for the subject of fear [$F_{(1, 611)} = 567.58, p < 0.001, \eta^2 = 0.482$], with fear for family ($M = 2.92, SE = 0.04$) higher than fear for oneself ($M = 2.27, SE = 0.04$). A small significant effect was found for gender [$F_{(1, 611)} = 9.45, p = 0.002, \eta^2 = 0.015$], with women ($M = 2.71, SE = 0.05$) showing more fear overall than men ($M = 2.48, SE = 0.06$). In addition, a small significant effect was found for geographical area [$F_{(1, 611)} = 4.62, p = 0.032, \eta^2 = 0.008$], with participants from conflict areas ($M = 2.68, SE = 0.06$) showing higher fear overall than participants from central Israel ($M = 2.51, SE = 0.05$).

Further analyses for fear of COVID-19 (Table 1) revealed only one difference, with women showing higher fear for family than men. In other words, fear of COVID-19 with regard to oneself did not differ by geographical area, gender, or their interaction.

Fear of COVID-19 with regard to one's family differed by gender, with women showing higher fear ($M = 3.56, SE = 0.06$) than men ($M = 3.36, SE = 0.07$), and did not differ by geographical area or by its interaction with gender.

Fear of terrorism regarding oneself was higher in conflict areas and among women, than in central Israel and among men (respectively). That is to say, fear of terrorism with regard to oneself differed by geographical area, with participants from conflict areas ($M = 2.01, SE = 0.07$) showing more fear than participants from central Israel ($M = 1.83, SE = 0.06$). It was also higher among women ($M = 2.15, SE = 0.06$) than men ($M = 1.70, SE = 0.07$). Analysis of the significant interaction for fear of terrorism regarding oneself revealed that women from both geographical areas had the highest means for fear of terrorism with regard to oneself, whereas men in central Israel had the lowest mean score. More specifically, women reported higher fear of terrorism with regard to themselves than did men in central Israel ($p < 0.001$), but no gender difference was found in conflict areas ($p = 0.054$). Further, men in conflict areas reported higher fear than in central Israel ($p = 0.008$), but no area difference was found among women ($p = 0.988$).

Quite similarly, fear of terrorism with regard to one's family was higher in conflict areas and among women, than in central Israel and among men (respectively). That is, participants from conflict areas ($M = 2.56, SE = 0.08$) showed higher fear than participants from central Israel ($M = 2.20, SE = 0.07$). In addition, scores were higher among women ($M = 2.51, SE = 0.07$) than men ($M = 2.26, SE = 0.08$). Analysis of the significant interaction for fear of terrorism regarding the family revealed that participants from conflict areas and women from central Israel had higher means for fear of terrorism with regard to their family, than did men in central Israel. More specifically, women reported higher fear of terrorism with regard to their family than did men in central Israel ($p < 0.001$), but no gender difference was found in conflict areas ($p = 0.856$). Further, men in conflict areas reported higher fear than in central Israel ($p < 0.001$), but no area difference was found among women ($p = 0.298$).

Comparing fear of COVID-19 to fear of terrorism with regard to oneself, showed that women were more concerned of terrorism than men, and that fear of terrorism was higher in conflict areas than in central Israel, but no differences were found for fear of COVID-19. That is, two significant interactions were found: fear by gender [$F_{(1, 611)} = 16.04, p < 0.001, \eta^2 = 0.026$] and fear by geographical area [$F_{(1, 611)} = 4.49, p = 0.034, \eta^2 = 0.007$]. Interpretation of the first interaction with gender revealed that women were more concerned of terrorism than were men [$M = 2.14, SE = 0.06$ vs. $M = 1.69, SE = 0.07, F_{(1, 611)} = 26.32, p < 0.001, \eta^2 = 0.041$], while no significant gender difference was found for fear of COVID-19 [women: $M = 2.64, SE = 0.06$ vs. men: $M = 2.60, SE = 0.07, F_{(1, 611)} = 0.23, p = 0.633, \eta^2 = 0.001$].

Interpretation of the second interaction with geographical area revealed that fear of terrorism was higher in conflict areas than in central Israel [$M = 2.01, SE = 0.07$ vs. $M = 1.82, SE = 0.05, F_{(1, 611)} = 5.18, p = 0.023, \eta^2 = 0.008$], while no significant area difference was found for fear of COVID-19 [conflict area: $M = 2.61, SE = 0.07$ vs. central Israel: $M = 2.63, SE = 0.06, F_{(1, 611)} = 0.02, p =$

TABLE 1 | Distribution of the fear variables by area and gender ($N = 615$).

	Conflict area			Central Israel			Difference		
	Male ($n = 95$)	Female ($n = 156$)	Total	Male ($n = 165$)	Female ($n = 199$)	Total	Area	Gender	Area \times gender
Fear for self—COVID-19	2.64 (1.15)	2.58 (1.17)	2.61 (1.16)	2.54 (1.14)	2.71 (1.11)	2.63 (1.13)	$F_{(1,611)} = 0.02$ ($p = 0.893$) ($\eta^2 = 0.001$)	$F_{(1,611)} = 0.31$ ($p = 0.575$) ($\eta^2 = 0.001$)	$F_{(1,611)} = 1.38$ ($p = 0.240$) ($\eta^2 = 0.002$)
Fear for family—COVID-19	3.47 (1.08)	3.58 (1.07)	3.53 (1.08)	3.26 (1.15)	3.53 (1.12)	3.41 (1.14)	$F_{(1,611)} = 2.03$ ($p = 0.155$) ($\eta^2 = 0.003$)	$F_{(1,611)} = 4.24$ ($p = 0.004$) ($\eta^2 = 0.007$)	$F_{(1,611)} = 0.83$ ($p = 0.363$) ($\eta^2 = 0.001$)
Fear for self—terror	1.88 (1.02)	2.15 (1.17)	2.05 (1.12)	1.52 (0.87)	2.15 (1.12)	1.86 (1.06)	$F_{(1,611)} = 4.19$ ($p = 0.041$) ($\eta^2 = 0.007$)	$F_{(1,611)} = 25.29$ ($p < 0.001$) ($\eta^2 = 0.040$)	$F_{(1,611)} = 4.11$ ($p = 0.043$) ($\eta^2 = 0.007$)
Fear for family—terror	2.55 (1.31)	2.58 (1.34)	2.57 (1.33)	1.96 (1.14)	2.44 (1.25)	2.22 (1.22)	$F_{(1,611)} = 11.86$ ($p < 0.001$) ($\eta^2 = 0.019$)	$F_{(1,611)} = 5.73$ ($p = 0.017$) ($\eta^2 = 0.009$)	$F_{(1,611)} = 4.47$ ($p = 0.035$) ($\eta^2 = 0.007$)

Bold values indicated difference are significant.

0.881, $\eta^2 = 0.001$]. Further, the discrepancy between the two types of fear, with fear of COVID-19 being higher, was greater in central Israel ($\eta^2 = 0.212$) than in conflict areas ($\eta^2 = 0.088$).

Comparing fear of COVID-19 and fear of terrorism with regard to one's family, showed that fear of terrorism was higher in conflict areas than in central Israel, but no differences were found for fear of COVID-19. That is, no significant interaction was found for fear by gender [$F_{(1,611)} = 0.47$, $p = 0.495$, $\eta^2 = 0.001$], but a significant interaction was found for fear by geographical area [$F_{(1,611)} = 5.10$, $p = 0.024$, $\eta^2 = 0.008$]. Its interpretation revealed that fear of terrorism with regard to one's family was higher in conflict areas than in central Israel [$M = 2.56$, $SE = 0.08$ vs. $M = 2.20$, $SE = 0.07$, $F_{(1,611)} = 11.86$, $p = 0.001$, $\eta^2 = 0.019$], while no significant area difference was found for fear of COVID-19 with regard to one's family [conflict area: $M = 3.52$, $SE = 0.07$ vs. central Israel: $M = 3.40$, $SE = 0.06$, $F_{(1,611)} = 1.63$, $p = 0.203$, $\eta^2 = 0.003$]. Further, the discrepancy between the two types of fear with regard to one's family, with fear of COVID-19 being higher, was greater in central Israel ($\eta^2 = 0.340$) than in conflict areas ($\eta^2 = 0.177$).

Table 2 presents group differences in coping and resilience by area and gender.

As evident from **Table 2**, no differences were found between the respondents in coping strategies and resilience by place of residence. Nevertheless, differences related to the respondent's gender were found. Problem-focused coping was higher among women ($M = 1.45$, $SD = 0.053$) than among men ($M = 1.17$, $SD = 0.56$). A significant interaction showed that this gender-based difference was greater in central Israel [$F_{(1,611)} = 39.88$, $p < 0.001$, $\eta^2 = 0.061$] than in conflict areas [$F_{(1,611)} = 5.27$, $p = 0.022$, $\eta^2 = 0.009$]. Similar gender differences were found for emotion-focused coping, with women ($M = 1.09$, $SD = 0.35$) having higher scores than men ($M = 0.90$, $SD = 0.36$). In addition, a significant gender-based difference was found in the resilience variable, with men ($M = 68.98$, $SD = 13.41$) scoring higher than women ($M = 66.57$, $SD = 12.83$).

Pearson Correlations and Multiple Hierarchical Regressions

Means, standard deviations, and Pearson correlations among the research variables are presented in **Table 3**. Results show that among all types of fear and concern, fear for one's family regarding COVID-19 was highest and fear for oneself regarding terrorism was lowest. Significant relationships were found between the research variables. All types of fear and concern were positively interrelated, and in most cases were positively related with both types of coping strategies. Resilience was negatively and weakly associated with fear for oneself regarding COVID-19, and was positively associated with problem-focused coping.

Of the demographic variables, age was negatively associated with fear of COVID-19 with regard to one's family ($r = -0.24$, $p < 0.001$), fear of terrorism with regard to oneself ($r = -0.12$, $p = 0.008$), and fear of terrorism with regard to one's family ($r = -0.13$, $p = 0.002$). Overall, fear was higher among participants whose education level was lower than academic [fear of COVID-19 with regard to oneself: $M = 2.87$, $SD = 1.25$ vs. $M = 2.49$, $SD = 1.05$, $t(375.56) = 3.77$, $p < 0.001$; fear of COVID-19 with regard to one's family: $M = 3.61$, $SD = 1.15$ vs. $M = 3.38$, $SD = 1.10$, $t(612) = 2.48$, $p = 0.013$; fear of terrorism with regard to oneself: $M = 2.09$, $SD = 1.25$ vs. $M = 1.86$, $SD = 0.98$, $t(355.63) = 2.39$, $p = 0.017$; and fear of terrorism with regard to one's family: $M = 2.59$, $SD = 1.37$ vs. $M = 2.24$, $SD = 1.21$, $t(389.90) = 3.10$, $p = 0.002$].

Thus, the first step in the regression models included area (1-conflict area, 0-central Israel), gender (1-male, 0-female), age, education level (1-academic, 0-non-academic), and financial concerns. Coping strategies and resilience were entered in the second step. The results are presented in **Table 4**.

Results show that all four models are significant, explaining 14–22% of the variance in fear of COVID-19 and terrorism. Lower levels of education and higher levels of financial concerns were associated with higher levels of all types of fear. In addition to these variables, relationships were different by type of fear.

TABLE 2 | Distribution of coping and resilience by area and gender ($N = 615$).

	Central Israel		Conflict Area		Difference		
	Male <i>M (SD)</i>	Female <i>M (SD)</i>	Male <i>M (SD)</i>	Female <i>M (SD)</i>	Area	Gender	Area \times gender
Coping—problem-focused (0–3)	1.14 (0.55)	1.50 (0.52)	1.22 (0.57)	1.38 (0.53)	$F_{(1,611)} = 0.32$ ($p = 0.574$) ($\eta^2 = 0.001$)	$F_{(1,611)} = 33.13$ ($p < 0.001$) ($\eta^2 = 0.051$)	$F_{(1,611)} = 4.79$ ($p = 0.029$) ($\eta^2 = 0.008$)
Coping—emotion-focused (0–3)	0.92 (0.37)	1.10 (0.36)	0.87 (0.35)	1.09 (0.34)	$F_{(1,611)} = 1.45$ ($p = 0.229$) ($\eta^2 = 0.002$)	$F_{(1,611)} = 43.75$ ($p < 0.001$) ($\eta^2 = 0.067$)	$F_{(1,611)} = 0.60$ ($p = 0.438$) ($\eta^2 = 0.001$)
Resilience—total score (0–100)	68.11 (13.69)	65.95 (12.04)	70.48 (12.87)	67.36 (13.76)	$F_{(1,607)} = 2.97$ ($p = 0.085$) ($\eta^2 = 0.005$)	$F_{(1,607)} = 5.79$ ($p = 0.016$) ($\eta^2 = 0.009$)	$F_{(1,607)} = 0.19$ ($p = 0.663$) ($\eta^2 = 0.001$)

Bold values indicated difference are significant.

TABLE 3 | Means, standard deviations, and intercorrelations for the research variables ($N = 615$).

	<i>M (SD)</i>	2.	3.	4.	5.	6.	7.	8.
1. Fear for one's self—COVID-19 (1–5)	2.62 (1.14)	0.66***	0.39***	0.36***	0.37***	0.23***	0.20***	–0.09*
2. Fear for one's family—COVID-19 (1–5)	3.46 (1.12)		0.36***	0.43***	0.34***	0.24***	0.25***	–0.04
3. Fear for one's self—terrorism (1–5)	1.94 (1.09)			0.80***	0.32***	0.16***	0.17***	–0.06
4. Fear for one's family—terrorism (1–5)	2.36 (1.28)				0.31***	0.07	0.15***	–0.04
5. Financial concerns (1–5)	2.74 (1.24)					0.19***	0.24***	–0.07
6. Coping: problem-focused (0–3)	1.33 (0.56)						0.55***	0.14***
7. Coping: emotion-focused (0–3)	1.01 (0.37)							–0.01
8. Resilience: total (0–100)	67.58 (13.12)							

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Fear of COVID-19 with regard to oneself was higher with greater use of problem-focused coping and lower resilience, in addition to lower education and higher financial concerns. Fear of COVID-19 with regard to one's family was higher with younger age, lower education, and higher financial concerns, as well as with greater use of problem- and emotion-focused coping. Fear of terrorism with regard to oneself was higher among women than men, and higher with lower education and greater financial concerns. It was unrelated to coping strategies and resilience. Fear of terrorism with regard to one's family was higher among females than males, higher in conflict areas, higher with younger age, and higher with lower education and greater financial concerns. It was unrelated to coping strategies and resilience.

DISCUSSION

The aim of the study was to explore whether living under constant security threat will result in better coping and higher

resilience when exposed to an unknown threat such as COVID-19. Thus, we examined differences between fear of COVID-19 and fear of terrorism as well as associations with coping strategies and with resilience among those living in conflict zones compared to those living in the center, where exposure to security incidents is rare.

Contrary to our assumption, those who were living in a conflict zone did not exhibit lower levels of fear. Fear of COVID-19 was found to be much higher than fear of terrorism among both groups. In addition, those who were living in a conflict zone did not exhibit higher levels of resilience and did not cope better when exposed to a new threat—even though they may be more skilled at handling prolonged exposure to a threat such as terrorism. It seems that living under a continuous uncontrollable threat did not translate into enhanced ability to handle other life threats, nor did it lower that ability.

A possible explanation may be related to the nature of the new threat. Fear of COVID-19 and fear of terrorist attacks

TABLE 4 | Multiple hierarchical regressions for fear of COVID-19 and terrorism ($N = 615$).

	Fear of COVID-19 with regard to oneself		Fear of COVID-19 with regard to one's family		Fear of terrorism with regard to oneself		Fear of terrorism with regard to one's family	
	<i>B</i> (SE)	β	<i>B</i> (SE)	β	<i>B</i> (SE)	β	<i>B</i> (SE)	β
Step 1								
Gender	−0.04 (0.09)	−0.02	−0.13 (0.09)	−0.06	−0.44 (0.08)	−0.22***	−0.25 (0.10)	−0.12*
Area	−0.08 (0.09)	−0.04	0.05 (0.09)	0.02	0.10 (0.08)	0.05	0.26 (0.10)	0.13**
Age	0.01 (0.01)	0.03	−0.02 (0.01)	−0.20***	−0.01 (0.01)	−0.08	−0.01 (0.01)	−0.13**
Education	−0.28 (0.09)	−0.12**	−0.20 (0.09)	−0.08*	−0.22 (0.09)	−0.11*	−0.28 (0.11)	−0.13**
Financial concerns	0.33 (0.03)	0.36***	0.27 (0.03)	0.30***	0.25 (0.03)	0.31***	0.29 (0.04)	0.36***
Adj. R^2	0.18***		0.17***		0.16***		0.14***	
Step 2								
Gender	0.10 (0.09)	0.04	−0.01 (0.09)	−0.01	−0.39 (0.09)	−0.19***	−0.22 (0.10)	−0.11*
Area	−0.05 (0.09)	−0.02	0.08 (0.09)	0.03	0.11 (0.08)	0.06	0.27 (0.10)	0.13**
Age	0.01 (0.01)	0.04	−0.01 (0.01)	−0.18***	−0.01 (0.01)	−0.07	−0.01 (0.01)	−0.13*
Education	−0.34 (0.09)	−0.14***	−0.25 (0.09)	−0.11**	−0.24 (0.09)	−0.12**	−0.26 (0.11)	−0.13*
Financial concerns	0.28 (0.03)	0.31***	0.23 (0.03)	0.26***	0.23 (0.03)	0.28***	0.28 (0.04)	0.35***
Coping: problem-focused	0.42 (0.09)	0.21***	0.29 (0.09)	0.15**	0.14 (0.09)	0.08	−0.07 (0.11)	−0.04
Coping: emotion-focused	0.10 (0.14)	0.03	0.27 (0.14)	0.09*	0.07 (0.14)	0.03	0.25 (0.16)	0.09
Resilience	−0.01 (0.01)	−0.09*	−0.01 (0.01)	−0.04	−0.01 (0.01)	−0.03	−0.01 (0.01)	−0.02
Adj. R^2	0.22***		0.21***		0.17***		0.14***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

have similar roots. Both these events threaten to tear down the social fabric of life by creating a sense of fear and interfering with normal daily life routines (Cohen-Louck and Levy, 2021). However, whereas terrorism and security incidents are relatively well-known threats, COVID-19 poses a new type of stressor for Israeli society. The pandemic threat posed a new situation for which people cannot rely on their previous experience.

We assume that the findings are affected by the period during which the study was conducted. As mentioned, the data was collected at the beginning of the pandemic, during the peak of the first COVID-19 lockdown in Israel, when uncertainty and lack of knowledge concerning the virus and its effects were at their height. In times of public danger such as natural disasters and health emergencies, access to up to date information makes individuals and groups more resilient and less worried (Longstaff and Yang, 2008). Previous findings on public and individual fears indicates that perception of fear depends not only on the gravity of being a victim, but also on people's subjective perception of the likelihood of being a victim and of controlling whether they will be victimized (Warr, 1987; Jackson, 2011). Being in an uncertain situation may explain why higher levels of COVID-19 fear were found among Israeli citizens, although none of the participants had contracted the virus and only 8 participants (1.3%) reported having had direct contact with someone who had become infected with COVID-19 at the time of collecting the data.

Other possible explanation may be related to the finding raised by the regression analysis. The best predictor of both fear of COVID-19 and of terrorism is worry due to the

financial situation, beyond geographic area. In Israel, the most significant effect of the coronavirus was the need to stop working and to remain at home during the lockdown, with no knowledge of when and even whether workers would return to their jobs. At least in the first stage of the pandemic, most government efforts were directed at preventing the pandemic from spreading and less attention was given to COVID-19's financial implications (Shechory Bitton and Laufer, 2021). A similar situation was found in other countries, indicating that worrying about unemployment and financial loss were found to be associated with psychological maladjustment (Guo et al., 2020; Song et al., 2020; Trzebiński et al., 2020). Endangering economic stability was also found to be a salient aspect of terrorism. Economic loss and financial worry were found to be a major predictor of increased trauma-related symptoms following continuous exposure to security events (e.g., Stein et al., 2018). It seems that financial fear is a source of distress, which lowers the overall ability to confront other stressors such as the pandemic and terrorism.

These findings can be explained by the Conservation of Resources (COR) theory (Hobfoll, 1989), conceptualized as a bridge between environmental and cognitive viewpoints of adaptation to stress. The COR theory predicts that resource loss is a principal component of the stress process. According to Hobfoll (2001), environmental circumstances often threaten or generate a depletion of people's resources, threatening their status, position, economic stability, loved ones, etc. Consequently, loss of many resources due to trauma or crisis impairs the individual's adaptive abilities (Hobfoll and Lilly, 1993).

An interesting finding may support the significant impact of economic concerns on the well-being of those exposed to prolonged stressful situations. A small significant effect was found for geographical area, with participants from conflict areas showing higher fear overall than participants from central Israel. However, These findings should be addressed, as they are surprising and are incongruent with former studies showing a habituation process to an ongoing threat among similar populations exposed to ongoing security and terrorism events (e.g., missile attacks) (e.g., Shechory Bitton and Laufer, 2017; Shechory Bitton and Silawi, 2019).

The second hypothesis was partially supported by the findings. Resilience were negatively associated with higher levels of fear of COVID-19. In addition, use of problem-focused coping and of emotion-focused coping were both positively associated with higher levels of fear of COVID-19. However, fear of terrorism was unrelated to coping strategies and resilience. In the current study, participants were asked to rate the extent to which they used each coping option to deal with stressful situations such as exposure to COVID-19. Thus, we believe that in their responses—they addressed the threat of the new threat.

This result can be explained by the “coping-panic cycle” hypothesis in which the more coping there is (whether emotion-focused or problem-focused), the more pandemic-related fear and distress (Huang et al., 2020; Man et al., 2020). According to this hypothesis, higher use of different forms of coping is mainly a manifestation of elevated stress and distress in the context of COVID-19 which, as a pandemic, is both a new and a relatively uncontrollable threat. That is, the more one is distressed, the more he or she will use different types of coping.

Several theorists (e.g., Lazarus and Folkman, 1984; Zeidner and Saklofske, 1996) highlighted the importance of matching the coping effort with the controllability of the situation. Consequently, when the personal risk is perceived to be high, the coping ability may be undermined, thus affecting the overall levels of fear (Tzur Bitan et al., 2020) and the individual's perceived coping potential, as well as the psychological resources needed to overcome a potential threat (Taylor and Stanton, 2007). The COVID-19 pandemic certainly fits the definition of an event perceived as uncontrollable or lacking a viable solution (Shechory Bitton and Laufer, 2021). It is logical for participants to use emotional (e.g., concerns about health, especially for one's family and one's financial situation) in conjunction with practical coping strategies (e.g., attempts to protect themselves as well as their family). As mentioned before, the beginning of the pandemic was characterized by a general sense of confusion, resulting from the dramatic changes required to cope with the virus (Reizer et al., 2020). At that point, the media was saturated with information describing individual hardships, the extremely high infection rate, and the relatively high mortality. Presumably, this is why coping strategies in the present study were associated with a higher level of fear.

The same argument may also apply for explaining the association between lower resilience and higher levels of fear for oneself due to COVID-19. Resilience defined as the ability to cope successfully with stressful and traumatic events (Bonanno,

2004; Straud et al., 2018), an ability that has been associated with coping strategies (Reich et al., 2010). Growing research continues to find evidence in support of the notion that positive emotions have the ability to widen the range of potential coping strategies during times of stress, consequently enhancing one's resilience against present and future adversity, and vice versa (e.g., Gloria and Steinhardt, 2016). Resilience as a personal characteristic embodies the personal qualities as well as an individual's past life experiences and current life circumstances enabling one to thrive in the face of adversity. In the present study, resilience was examined as a personality trait (Connor and Davidson, 2003). Hence, it is possible that this type of resilience is more relevant for stressors that threaten the self.

Finally, in line with previous findings (e.g., Laufer et al., 2019; Qiu et al., 2020; Wang et al., 2020; Shechory Bitton and Cohen-Louck, 2021), women were found to display more fear than men. They also used more coping strategies and had less resilience compared to men. These findings are in line with other findings (for review see: Tamres et al., 2002; Hu et al., 2015). Hence, the tendency of women to be more threatened by a stressor, especially a life threatening unmanageable one such as terror and pandemic, is consistent. It may be that, as the panic-coping hypothesis posits, women use more coping techniques since they feel more stressed.

Overall, the results of this study indicate that individuals who are accustomed to reacting to continuous uncontrollable life threats such as terror and missiles are not more capable of managing other life threatening stressors and they are at risk of being overwhelmed by a new stressor. These results need further examination regarding differences and similarities between stressors and reactions to stressors in order to enhance our understanding of the ability to “generalize” from one experience to another. An unanswered question resulting from the current study is whether a process of habituation will emerge in time following exposure to COVID-19.

Perhaps precisely since the study was conducted at the very beginning of the pandemic, when uncertainty was very high, and although the participants were not directly affected by the virus, the reaction was similar to that found in other one-time or short time incidents, even without direct (objective) exposure. For instance, in studies conducted after 9/11, high levels of fear and distress (subjective exposure) were found, unrelated to people's objective exposure (Bonanno et al., 2006). At the time these lines are being written, many months after the study was conducted, the COVID-19 pandemic has not yet ended. Prolonged exposure to situations of tension and stress require those exposed to find practical solutions, despite feelings of fear (Shechory Bitton and Laufer, 2017). There is room for further studies that will address the ramifications of the prolonged exposure to the COVID-19 pandemic and check whether a process of habituation occurred over time, which moderated the fear levels. Integrating some other core aspects into existing explanations could help uncover some of the dynamics and mechanisms underpinning important current day phenomena.

Some potential limitations should be noted. We relied on convenience sampling by using an online survey. This may limit

the study's ability to reach all strata of the Israeli population. In addition, a cross-sectional design does not allow for causal inferences. Additional longitudinal studies, such as cohort studies or nested case-control studies, are essential for future research (e.g., Gao et al., 2020). Furthermore, self-report measures were used, and some had a single item. Finally, no measures of the consequences of both fears were included in the current study, and these are recommended for future analyses. It should also be noted that in the current study fear is a measure of distress resulting from the situation, however when dealing with terrorism or a new virus fear may be a sign of adjustment to the situation, helping one to sustain and survive.

Despite its limitations, this research has a novel contribution and entails several important implications. One of the paper's strengths is that it addresses two issues that are relevant and significant for extensive parts of the world (not only Israel): dealing with terrorism and dealing with the COVID-19 crisis. The study was conducted at the beginning of the crisis (when there was a high sense of uncertainty, and accordingly of fear). As far as known, this is the first empirical study to explore whether experience with continuous exposure to stressful situations (security threats and terrorism) can help cope with a new exceptional source of stress ("invisible enemy"). The findings can help understand processes of resilience and of coping with stressful situations. The findings show that fear is not simply a measure of the outcome of exposure to stress or a threatening

situation. Identifying levels of fear among different populations and especially their relationship to specific sociodemographic variables such as geographical location, level of education, financial situation, and gender, could assist in locating potential risk groups.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved according to the ethical standards of the Institutional Review Board (IRB) of Ariel University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MS and AL contributed to conception and design of the study, manuscript writing, and approved the submitted version. MS led questionnaire development and organized the database. All authors contributed to the article and approved the submitted version.

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Systematic Review and Meta-Analysis of Fear of COVID-19

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Background: Due to lack of preparedness of health systems, fast spread of the new virus, high mortality rates, and lack of a definite treatment, the outbreak of Coronavirus disease (COVID-19) led to high levels of fear and anxiety in different populations. In addition, isolation, mental disorders, and limitations in social interactions as a result of lockdown and travel ban increased the fear of the new coronavirus.

Methods: International databases, including Scopus, PubMed, Web of Science, and Google scholar, were searched without any time limitation, and all observational studies published in English reporting the mean of fear of COVID-19 based on the Fear of COVID-19 scale (FCV-19S) were included in the analysis. Methodological quality was assessed using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Random effects model, subgroup analysis, and meta-regression analysis were used to analyze the data. Heterogeneity across studies was examined using Cochran's Q test and I^2 statistic. All the statistical analyses were conducted using R software v4.0.3.

Results: A total of 44 articles with a sample size of 52,462 were reviewed. A pooled mean of 18.57 was found for fear of COVID-19. The mean of fear of COVID-19 was higher in women than in men (20.67 vs. 18.21). The highest and lowest means of fear of COVID-19 had been found in Asia (18.36) and Australia (17.43) based on continent, and in hospital staff (19.51) and college students (17.95) based on target population, respectively. In addition, the highest and lowest means of fear of COVID-19 were related to items #1 and #3 of the scale, respectively. According to the results of meta-regression analysis, there was no significant association between the mean of fear of COVID-19 and sample size and participants' age. In addition, publication error was not significant ($P = 0.721$).

Conclusion: The mean of fear of COVID-19 was high around the world; therefore, it seems necessary to pay more attention to the negative effects of the COVID-19 pandemic on mental health.

Keywords: fear, COVID-19, systematic review, meta-analysis, fear of COVID-19

INTRODUCTION

The Coronavirus disease (COVID-19) pandemic was first reported in Hubei, China, in December 2019. So far, it has affected about six million people and has led to the death of more than 360,000 people around the world mostly due to severe acute respiratory illness (Ashamalla et al., 2020). Given the lack of an effective treatment for COVID-19, different countries around the world focused their efforts on reducing the risk of transmission through implementing public health measures, such as social distancing, self-isolation, and regular hand washing. In addition, unprecedented measures, such as controlling borders, contact tracing, and lockdown were taken (Ahorsu et al., 2020a; Alyami et al., 2020). These measures led to widespread fear so that in some countries people started to stockpile staple foods, toilet paper, and even guns (Bakioğlu et al., 2020; Skoda et al., 2020). As the prevalence of COVID-19 increased, people started to isolate themselves, limit their social interactions, and avoid others for fear of getting the virus (Abuhammad et al., 2020). Fear is an adaptive response to one's environment and a defense mechanism to increase the chance of one's survival; however, it can be maladaptive when it is not proportionate to the actual threat (Steimer, 2002).

During the Severe Acute Respiratory Syndrome (SARS) and Ebola outbreaks, public fear worsened the negative effects of the actual illness; therefore, one of the most important challenges in the face of outbreaks is to control social reactions (García-Reyna et al., 2020). In order to reduce possible psychological problems, researchers recommend that the level of fear, worry, and helplessness associated with COVID-19 should be examined, because high levels of stress may prevent one from making logical decisions to protect themselves (Ahorsu et al., 2020a). For example, some patients who need medical care may refuse to go to the hospital due to experiencing illogical levels of fear (WongLaura et al., 2020). Some patients may postpone their surgical treatment for fear of contracting the virus (Vanni et al., 2020). In some cases, fear of COVID-19 can lead to hypochondriasis, so that some people may misinterpret their bodily sensations and attribute them to COVID-19 (Coelho et al., 2020). Some people may also excessively use medications recommended in COVID-19 treatment guidelines, such as hydroxychloroquine (Banerjee, 2020). On the other hand, fear can act as a motivator of behavioral change in the face of COVID-19 (Harper et al., 2020; Pakpour and Griffiths, 2020). The experience of fear can increase risk perception and reinforce protective behaviors, such as washing of hands and keeping physical distance (Broche-Pérez et al., 2020). When people take a threat seriously, they can perform preventive measures more efficiently, and perception of threat as a motivator facilitates the prevention of COVID-19. Harper et al. found that fear of COVID-19 strongly predicted improved social distancing and hand washing and had an important role in adherence to public health measures related to COVID-19 (Harper et al., 2020).

The COVID-19 pandemic has led to fear and negative emotions; however, it has also had positive consequences, such as encouraging people to engage in ethical behavior (Jian et al., 2020). According to what was explained above, measuring fear of COVID-19 has an important role in understating the

implications of the pandemic for mental health and in designing interventions to reduce COVID-19 fear and anxiety. One of the most important instruments available to assess fear of COVID-19 is the Fear of COVID-19 Scale (FCV-19S) that has been translated to many languages. Studies from different parts of the world examining fear of COVID-19 have led to different results. Therefore, the goal of the present systematic review and meta-analysis is to estimate the pooled mean of fear of COVID-19 around the world.

METHODS

The present systematic review and meta-analysis aimed to estimate the pooled mean of fear of COVID-19 based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009).

Data Sources and Search Strategy

Search for articles was conducted in September 20, 2020, in databases of Web of science/ISI, PubMed, and Scopus using the following keywords: Wuhan Coronavirus, Sars-cov-2, 2019 Novel Coronavirus, COVID-19 Virus, Coronavirus Disease 2019 Virus, Wuhan Seafood Market Pneumonia Virus, Fear, and all possible combination to increase search sensitivity. In addition, references of the selected articles were reviewed to access more related articles.

Selection Criteria

All observational studies published in English examining the state of fear of COVID-19 using the FCV-19S were analyzed. This scale developed by Ahorsu et al. assesses fear of COVID-19 using seven items that are rated on a Likert-type scale ranging from 5 (totally agree) to 1 (totally disagree). Total score on this scale ranges from 7 to 35, and higher scores indicate stronger fear of COVID-19 (Ahorsu et al., 2020a). The inclusion criteria were as follows: participants aged at least 18 years and reporting the mean and standard deviation of fear of COVID-19 score. Articles with unavailable full texts, preprinted articles, and articles not reporting the fear of COVID-19 score were excluded from the analysis.

Data Collection

In the first step, two independent authors screened the articles and selected those having the aforementioned keywords in their titles or abstracts. Then, they extracted the article information and recorded it in a predesigned Excel sheet. This information included first author's name, publication year, mean age of patients, target population, mean and standard deviations of fear of COVID-19 (total score and score by gender). Because all the selected articles had been published in 2020, publication year was not included in the table presenting article information.

Quality Assessment

The two researchers independently evaluated the quality of the articles based on 10 items of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (title and abstract, study environment, objectives and hypotheses, sample size, inclusion criteria, statistical methods, descriptive

data, interpretation of findings, limitations, and funding). Higher scores indicate better methodological quality. In terms of methodological quality, articles were divided into three categories: poor (4 or below), moderate (4 to 7), and good (over 7) (Vandenbroucke et al., 2007).

Analysis

Random effects model was used to estimate the pooled raw mean of fear of COVID-19. A forest plot was used to visually depict heterogeneity across studies in which the mean of fear of COVID-19 with a 95% confidence interval and also the pooled raw mean of the selected studies are reported. Heterogeneity across studies was assessed using I^2 statistic and Cochran's Q test. I^2 percentages of 25%, 50%, and 75% show low, average, and high heterogeneity, respectively, and in Cochran's Q test, $P < 0.1$ indicates significant heterogeneity (Higgins et al., 2003). Source of heterogeneity across studies was examined using subgroup analysis by gender, continent (Asia/America/Europe/Australia/multi-countries), and target population (general population, college students, pregnant women, and medical staff).

The association of the mean of fear of COVID-19 with sample size and mean age of participants was assessed using meta-regression analysis. To ensure that the meta-regression

results were not affected by one or several articles, leave-one-out sensitivity analysis method was used that involved performing the analysis on the data by leaving out one study at a time. For studies reporting scores by drop out one study at a time and estimate the pooled raw mean of remained studies. In addition, the potential effect of small studies was assessed using a funnel plot based on Egger's regression test (Egger et al., 1997). It is worthwhile to note that all analyses were performed based on random effects model using R software, version 4.0.3, and that all statistical tests were two-tailed ones. In addition, the significance level for all tests except for examination of heterogeneity across studies was set at $P < 0.05$.

RESULTS

In the primary search, a total of 634 articles were found, of which 320 duplicate articles were excluded, and titles and abstracts of the remaining articles were reviewed. In addition, 270 articles focused on unrelated subjects were removed from the analysis. **Figure 1** shows the flowchart of selecting and screening articles based on the PRISMA guidelines.

A total of 44 articles with a sample size of 52,462 were included in the final analysis. As shown in **Table 1**, among the 44 articles, 33 reported the total score of fear of COVID-19, 8

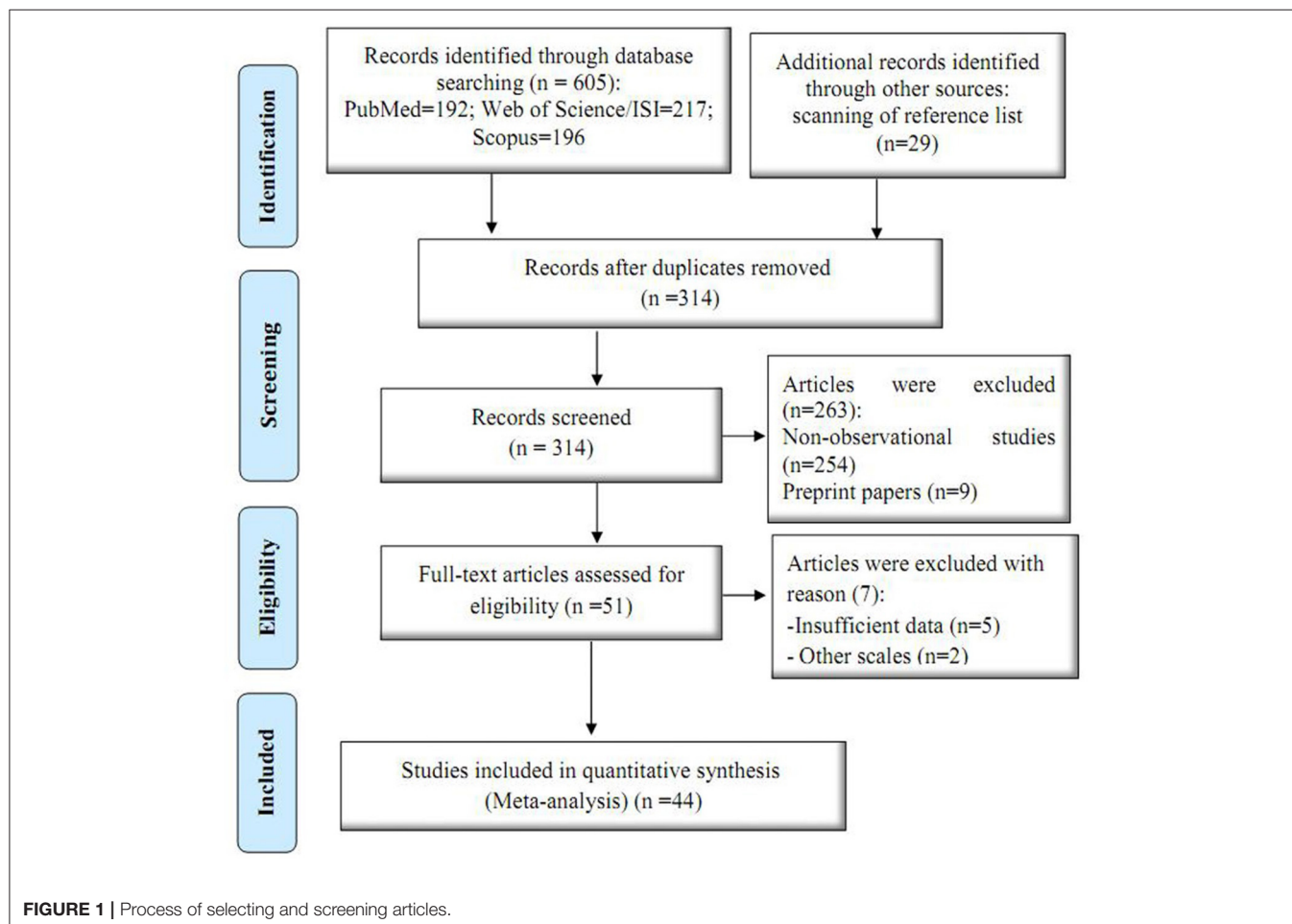


TABLE 1 | The characteristics of selected paper.

References	Sample size (M)			Age	Place	FCV-19S mean score			Target population
	Total	Male	Female			All	Male	Female	
Giordani et al. (2020)	7,430	1903	5527		Brazil	19.8 ± 5.3	-	-	General population
Winter et al. (2020)	1,397	-	-	-	New Zealand	15.6 ± 7.7	-	-	General population
	1,023	-	-	-	New Zealand	18.3 ± 7.9	-	-	General population
Lin et al. (2020)	1,078	628	450	26.2 ± 7.4	Iran	1,028 ± 4.45	-	-	General population
Haktanir et al. (2020)	668	187	481	29.3 ± 10.7	Turkey	-	16.99 ± 5.15	19.06 ± 5.42	General population
Seyed Hashemi et al. (2020)	651	245	406	33.5 ± 10.8	Iran	18.72 ± 5.81	-	-	General population
Saricali et al. (2020)	786	224	562	24 ± 7.8	Turkey	17.76 ± 6.01	-	-	General population
Saravanan et al. (2020)	433	278	155	21 ± 2.9	United Arab Emirates	16.6 ± 6.3	-	-	University students
Salehi et al. (2020)	222	0	222	29.1 ± 5.6	Iran	22.5 ± 5.9	-	-	Pregnant women
Rodríguez-Hidalgo et al. (2020)	640	179	461	21.6 ± 4	Spain	14.37 ± 5.38	-	-	University students
Nguyen et al. (2020a)	5,423	2,602	2,821	22 ± 2	Vietnam	16.7 ± 5.3	16.2 ± 5.6	17 ± 4.8	University students
Mertens et al. (2020)	439	132	307	-	Multiple countries	25.85 ± 5.91	25.05 ± 6.28	26.16 ± 5.73	General population
Rahman et al. (2020)	587	224	363	41.3 ± 12.5	Australia	18.4 ± 6.5	-	-	General population
Martínez-Lorca et al. (2020)	606	109	497	21.6 ± 3	Spain	16.79 ± 6.04	-	-	University students
Labrague and de Los Santos (2020)	261	69	192	30.95	Philippines	19.92 ± 6.15	-	-	Hospital staff
Konstantinov et al. (2020)	466	154	312	19 ± 2.7	Kazakhstan	22.1 ± 5.8	-	-	University students
Kaya et al. (2020)	1,012	185	827	28.3 ± 8.7	Turkey	19.1 ± 6.3	-	-	General population
Jaspal et al. (2020)	411	-	-	48.85 ± 15.38	United Kingdom	25.67 ± 7.55	-	-	General population
Gasparro et al. (2020)	735	195	240	44.8 ± 12.4	Italy	15.03 ± 5.45	-	-	Dentists
Cavalheiro and Sticca (2020)	354	163	191	34.9 ± 7.3	Brazil	15.76 ± 6.21	-	-	General population
Broche-Pérez et al. (2020)	772	203	569	34 ± 14.6	Cuba	-	17.9 ± 80.5	21.9 ± 6.9	General population
García-Reyna et al. (2020)	2,860	1,219	1,641	35.4 ± 8	Mexico	19.3 ± 6.9	-	-	Hospital staff
Abuhammad et al. (2020)	1,655	598	1,057	29.5 ± 7.7	Jordan	21.80 ± 6.43	-	-	General population
Ahorsu et al. (2020b)	413	256	157	57.7 ± 7.3	Iran	21.80 ± 6.43	-	-	General population
Ahorsu et al. (2020c)	580	290	290	-	Iran	15.90 ± 5.29	-	-	Pregnant women
Sakib et al. (2020)	8,550	4,790	3,760	26.5 ± 9	Bangladesh	-	20.29 ± 5.90	22.75 ± 5.65	General population
Reznik et al. (2020)	547	-	-	-	Russia	17.4 ± 4.7	-	-	University students
Reznik et al. (2020)	276	-	-	-	Belarus	16.6 ± 4.5	-	-	University students
Zolotov et al. (2020)	370	77	289	25.2 ± 3.1	Israel	14.95 ± 4.80	-	-	University students
Abad et al. (2020)	1,844	368	1,468	36.2	Brazil	18.1 ± 6.7	14.5 ± 0.3	18.9 ± 6.6	General population
Perz et al. (2020)	237	64	173	30.3 ± 10.2	USA	18.1 ± 7.1	-	-	University students
Yehudai et al. (2020)	291	49	242	24.5 ± 5.5	Israel + Russia	22 ± 6.3	-	-	University students
Masuyama et al. (2020)	629	302	327	12.9 ± 0.83	Japan	18.71 ± 5.65	-	-	University students
Hossain et al. (2020)	2,157	1,166	991	33.4 ± 14.6	Bangladesh	18.53 ± 5.01	18.07 ± 4.94	19.07 ± 5.04	General population
Isralowitz et al. (2020)	598	173	425	-	Multiple countries	21.2 ± 6.1	-	-	University students
Bakioğlu et al. (2020)	960	297	663	29.7 ± 9.6	Turkey	19.44 ± 6.07	16.82 ± 5.75	20.61 ± 5.85	General population
Alyami et al. (2020)	639	370	269	34.7 ± 11.8	Saudi Arabia	-	-	-	General population
Satici et al. (2020a)	1,304	387	917	29.4 ± 10.5	Turkey	-	-	-	General population
Bitan et al. (2020)	339	97	240	-	Israel	-	-	-	General population
Caycho-Rodríguez et al. (2020)	1,291	268	1,023	39.3 ± 15.7	Argentina	-	-	-	General population
Elemo et al. (2020)	307	249	58	30.9 ± 7.9	Ethiopia	-	-	-	General population
Huarcaya-Victoria et al. (2020)	832	286	546	38.3 ± 12.7	Peru	-	-	-	General population
Pang et al. (2020)	228	66	162	26	Malaysia	-	-	-	General population
Soraci et al. (2020)	249	20	229	34.5 ± 12.2	Italy	-	-	-	General population

FCV-19S, *The Fear of Coronavirus-19 Scale*.

reported this score by gender, and 17 reported the mean scores by item (Abuhammad et al., 2020; Alyami et al., 2020; Bitan et al., 2020; Cavaleiro and Sticca, 2020; Caycho-Rodríguez et al., 2020; Elemo et al., 2020; Giordani et al., 2020; Huarcaya-Victoria et al., 2020; Martínez-Lorca et al., 2020; Masuyama et al., 2020; Pang et al., 2020; Sakib et al., 2020; Satıcı et al., 2020a; Soraci et al., 2020; Winter et al., 2020; Zolotov et al., 2020). There were two groups of participants in the Winter et al. study; therefore, results were reported separately for each group. In eight studies, the mean of fear of COVID-19 was reported by gender (Abad et al., 2020; Bakioglu et al., 2020; Broche-Pérez et al., 2020; Haktanir et al., 2020; Hossain et al., 2020; Mertens et al., 2020; Nguyen et al., 2020a; Sakib et al., 2020). These studies had been conducted with the general population, college students, pregnant women, and medical staff. Detailed information on selection of articles

is provided in Table 1. In terms of methodological quality, eight studies had medium quality, and the remaining articles had excellent quality.

According to the level of heterogeneity across studies, random effects model was used to combine the studies ($P < 0.0001$; $Q = 8243.69$, $df = 32$, $P < 0.0001$, $\tau^2 = 7.9730$, and $I^2 = 99.6\%$). In the present study, the pooled mean of fear of COVID-19 was found to be 18.57 (95% CI: 17.60–19.54). In addition, the prediction interval for the pooled mean of fear of COVID-19 was found to be 12.72–24.42 (Figure 2). Among the selected studies, 17 reported the mean of fear of COVID-19 by item; the highest and lowest mean scores were related to items #1 (3.32) and #3 (1.78), respectively. It is worthwhile to note that the mean of fear of COVID-19 for all items was higher in Asian studies compared to those conducted in other continents. The

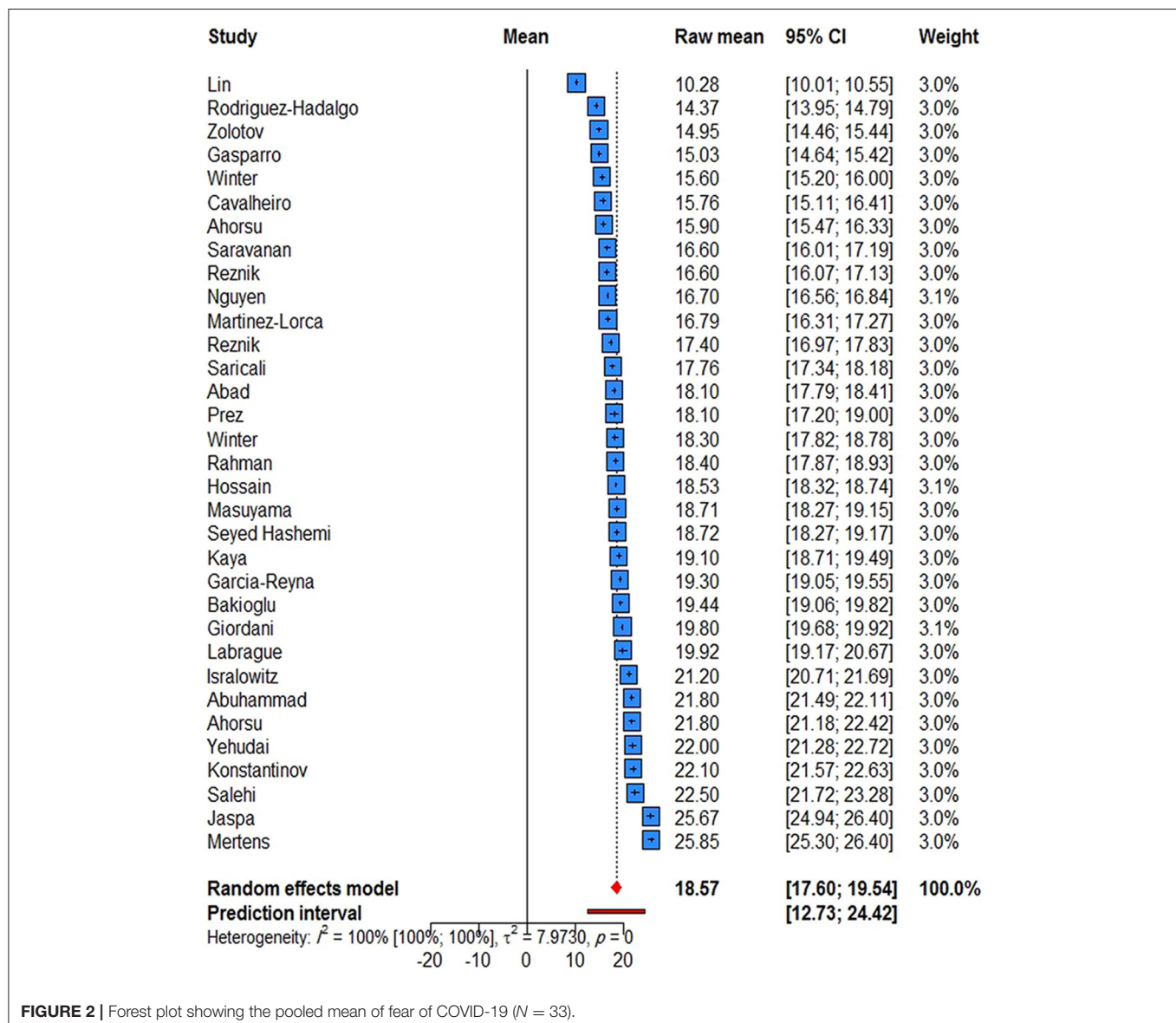


FIGURE 2 | Forest plot showing the pooled mean of fear of COVID-19 ($N = 33$).

lowest scores on items #1, #3, #5, and #6 were reported by the American studies, the lowest scores on items #4 and #7 were reported by Australian studies, and the lowest scores on item #2 were reported by European studies. In addition, the mean of fear of COVID-19 on all items except for items #1 and #4 was higher in the general population than in college students. The pooled mean of fear of COVID-19 by item is presented in **Table 2** (**Supplementary Figures 1–7**).

Subgroup Analysis

The pooled raw mean of fear of COVID-19 was examined using random effects model. According to the results of subgroup analysis, the highest and lowest pooled means of fear of COVID-19 were reported in the studies conducted in Asia (18.36, 95% CI: 16.88–19.84) and Australia (17.43, 95% CI: 15.51–19.34), respectively (**Supplementary Figure 8**). In addition, the pooled raw mean of fear of COVID-19 was higher in medical staff than in other groups (**Supplementary Figure 9**).

According to the results of subgroup difference test reported in **Table 3**, there was a significant difference in the mean of fear of COVID-19 in different continents ($P = 0.0347$), but there was no significant difference between different target populations ($P = 0.0773$). In addition, eight articles reported the mean of fear of COVID-19 by gender that was lower in men (18.21, 95% CI: 15.99–20.42) than in women (20.67, 95% CI: 18.62–22.73) (**Supplementary Figures 10, 11**). Moreover, the mean fear of COVID-19 was 17.68 and 19.70 in Asian men and women

and 16.15 and 20.39 in American men and women, respectively (**Supplementary Figures 12, 13**).

The results of meta-regression analysis showed that mean score of fear of COVID-19 increased with mean age, but the relationship was not statistically significant ($P = 0.797$) (**Figure 3** and **Table 4**).

Results of sensitivity analysis based on random effects model showed that none of the studies alone had a substantial impact on the pooled raw mean of fear of COVID-19 (**Supplementary Figure 14**). Results of Egger's regression test also indicated that publication bias was not statistically significant ($P = 0.721$) (**Supplementary Figure 15**).

Examination of the pooled mean by continent and target population showed that on all items, it was higher in the studies conducted in Asia compared to those conducted in other continents. In addition, the pooled mean of fear of COVID-19 on all items except for items #1 and #4 was higher in the general population than in college students (**Table 5**). Moreover, a significant difference was observed between studies conducted in different continents in terms of scores on item #2 of the scale ($P < 0.0001$), but there was no significant difference between different continents in terms of scores on other items. In addition, a significant difference was observed between different target populations in scores on items #6 and #7 ($P < 0.05$).

DISCUSSION

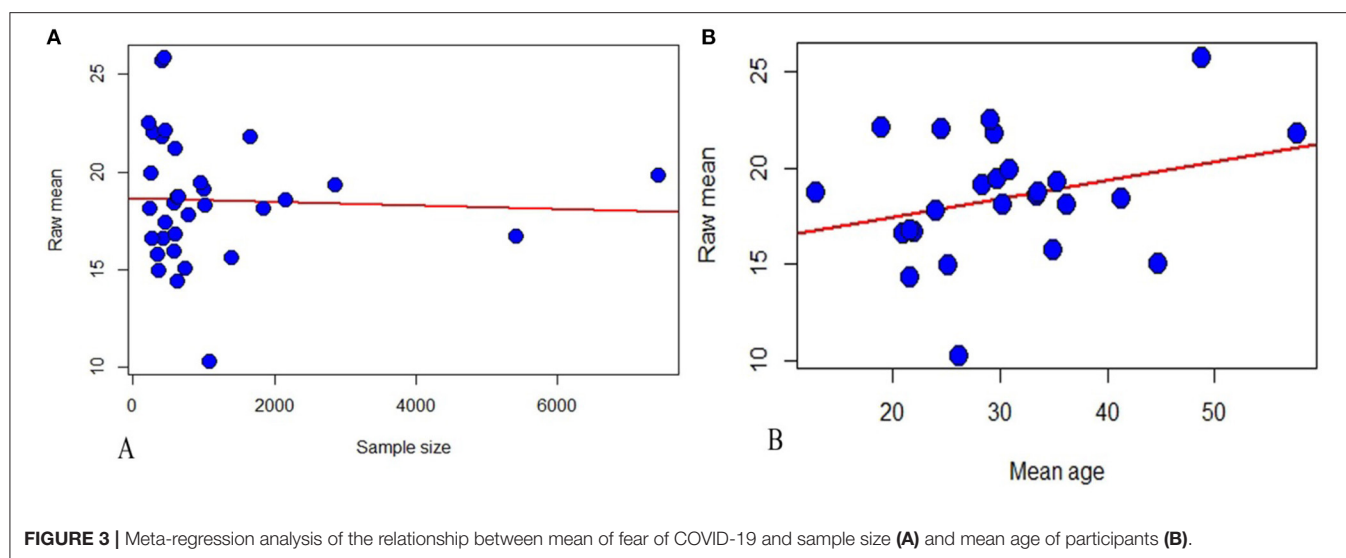
The present systematic review and meta-analysis aimed to estimate the pooled mean of fear of COVID-19. The results

TABLE 2 | Pooled mean of fear of COVID-19 by item.

No.	Item	Mean	95% CI
1	I am most afraid of coronavirus-19.	3.32	3.16–3.48
2	It makes me uncomfortable to think about coronavirus-19.	3.23	3.10–3.37
3	My hands become clammy when I think about coronavirus-19	1.78	1.57–2.00
4	I am afraid of losing my life because of coronavirus-19	2.64	2.37–2.88
5	When watching news and stories about coronavirus-19 on social media, I become nervous or anxious.	2.97	2.78–3.16
6	I cannot sleep because I'm worrying about getting coronavirus-19.	1.83	1.63–2.02
7	My heart races or palpitates when I think about getting coronavirus-19.	2.02	1.77–2.27

TABLE 3 | Subgroup analysis of the pooled mean of fear of COVID-19 by continent and target population.

Group	No. S	Pooled mean	Confidence level (95%)	Heterogeneity	Subgroup differences test			
				I^2 (%)	Q	df	P	
Continent	Asia	17	18.36	16.88–19.84	99.7	10.36	4	0.0347
	America	5	18.25	17.22–19.28	98.3			
	Europe	5	17.68	14.68–20.68	99.5			
	Australia	3	17.43	15.51–19.34	98			
	Multi countries	3	23.02	20.01–26.02	98.8			
Target group	General population	16	19.05	17.42–20.69	99.8	5.12	2	0.0773
	University student	12	17.95	16.37–19.18	99			
	Hospital staff	2	19.51	19.93–20.08	58			



showed that the participants in the reviewed studies had obtained 41% of the total score on the the FCV-19s. Fear of COVID-19 leads to stigmatization and social exclusion of patients and their families, and makes them vulnerable to adjustment problems, depression, irritability, anxiety, and anger (Abad et al., 2020; Satici et al., 2020b; Zhang et al., 2020). Therefore, it is important to pay attention to implications of COVID-19 for psychological health, because pandemics can lead to crisis in psychological, social, and economic domains (Xiang et al., 2020). Fear is not limited to the COVID-19 pandemic and has been observed in other outbreaks, including those of HIV and SARS (Ho et al., 2005). The pooled mean of fear of COVID-19 was higher in women than in men. This finding can be attributed to the fact that women are more delicate and vulnerable than men. In addition, Bakioğlu et al. (2020) found that it was more acceptable for women to express their fears of illness. On the other hand, it is more acceptable for men to be strong and brave. In addition, because men are less likely than women to become ill, they tend to be less afraid of COVID-19. The results of the present study showed that the highest and lowest fears of COVID-19 scores were in studies conducted in Asia and Australia, respectively. This finding can be attributed to the fact that before spreading to other countries, COVID-19 was reported in China as an Asian country; therefore, people in China and other Asian countries experienced higher levels of fear of the new virus. Overall, different rates of fear of COVID-19 in different countries can be attributed to contextual and cultural factors and different levels of access to medical services. Isolation as a result of the COVID-19 pandemic led to increased rates of mental problems, such as anxiety, anger, PTSD, confusion, and even suicide (Giordani et al., 2020; Haktanir et al., 2020; Mamun and Griffiths, 2020a). For example, a Bangladeshi man killed himself because he thought that he had the new virus, but the autopsy showed that he actually did not (Mamun and Griffiths, 2020b). Therefore, misconceptions about COVID-19 can lead to

TABLE 4 | Univariate meta-regression analysis.

Variable	Estimate	Standard error	P-value
Sample size	-0.0001	0.0004	0.7972
Mean age	0.0956	0.0613	0.1190

increased xenophobia and suicide ideation. The same pattern had been observed during the SARS outbreak in Asia (Hong Kong) (Cheung et al., 2008).

The pooled mean of fear of COVID-19 was higher in medical staff than in other target groups. This group became involved in fighting the new virus when health systems were not adequately prepared to respond to the pandemic (1). Long-term exposure to confirmed and also unrecognized COVID-19 patients, insufficient training on prevention and control of infectious diseases, and shortage of protective equipment were factors putting healthcare providers at higher risk of COVID-19 and, as a result, fear of the pandemic (Wang et al., 2020; Zhou et al., 2020). Nguyen et al. showed that the risk of testing positive for COVID-19 was three times higher in healthcare workers than in the general population (Nguyen et al., 2020b). Fear in healthcare providers is not limited to COVID-19 and has been reported during other outbreaks, including those of HIV (Montgomery and Lewis, 1995) and SARS (Ho et al., 2005). The highest and lowest pooled means were related to items #1 and #3 of the scale, respectively. This finding can be attributed to what the items assess. Item #1 directly assesses fear of COVID-19, while item #3 asks about symptoms of fear of COVID-19. One of the limitations of this study was the exclusion of preprint studies. Due to the large number of studies, it was not possible to review this type of articles in this meta-analysis and it is suggested that this type of articles be reviewed in future studies.

TABLE 5 | Subgroup analysis of the mean of different items of the FCV-19s by continent and target population.

Question	Group	Subgroup	No. S	Pooled mean	Confidence level (95%)	Subgroup differences test		
						Q	df	P
Q1	Continent	Asia	8	3.41	3.22–3.60	2.32	3	0.509
		America	4	2.98	2.38–3.57			
		Europe	2	3.17	2.65–3.69			
		Australia	2	3.34	2.79–3.89			
	Target	GP	14	3.15	3.15–3.48	0.01	1	0.931
		US	3	3.35	2.65–4.05			
Q2	Continent	Asia	8	3.35	3.24–3.47	28.6	3	<0.0001
		America	4	2.98	2.46–3.49			
		Europe	2	2.97	2.88–3.05			
		Australia	2	3.16	2.61–3.72			
	Target	GP	14	3.26	3.11–3.40	0.83	1	0.363
		US	3	3.11	2.84–3.38			
Q3	Continent	Asia	8	1.89	1.51–2.28	1.67	3	0.643
		America	4	1.59	1.21–1.97			
		Europe	2	1.62	1.39–1.86			
		Australia	2	1.65	1.49–1.81			
	Target	GP	14	1.83	1.60–2.07	2.46	1	0.117
		US	3	1.56	1.31–1.80			
Q4	Continent	Asia	8	2.80	2.43–3.16	5.09	3	0.166
		America	4	2.49	1.62–3.52			
		Europe	2	2.42	2.33–2.50			
		Australia	2	2.29	2.03–2.54			
	Target	GP	14	2.62	2.37–2.87	0.01	1	0.965
		US	3	2.65	1.35–3.95			
Q5	Continent	Asia	8	3.11	2.88–3.33	2.66	3	0.447
		America	4	2.65	2.05–3.25			
		Europe	2	2.95	2.86–3.04			
		Australia	2	2.98	2.35–3.61			
	Target	GP	14	2.99	2.78–3.20	0.91	1	0.339
		US	3	2.88	2.79–2.97			
Q6	Continent	Asia	8	1.91	1.57–2.25	1.31	3	0.720
		America	4	1.66	1.29–2.04			
		Europe	2	1.69	1.44–1.93			
		Australia	2	1.77	1.53–2.00			
	Target	GP	14	1.88	1.67–2.10	4.01	1	0.0453
		US	3	1.56	1.33–1.80			
Q7	Continent	Asia	8	2.12	1.70–2.54	4.96	3	0.175
		America	4	1.82	1.41–2.23			
		Europe	2	2.02	1.91–2.13			
		Australia	2	1.74	1.48–1.99			
	Target	GP	14	2.09	1.82–2.36	3.86	1	0.049
		US	3	1.70	1.43–1.98			

Nos, Number of studies; GP, General Population, US, University Students.

CONCLUSION

The excessive fear observed in previous outbreaks, including those of HIV and Ebola, has also been reported in the current COVID-19 pandemic and can be observed in the

future. Excessive fear can negatively impact one's life in personal (e.g., mental health problems) and social (panic shopping and xenophobia) domains, while a normal (logical) level of fear can help one pay more attention to government measures aimed at reducing the spread of

COVID-19 (33). The results of the present study showed that a moderate level of fear is required to reduce the risk of contracting COVID-19 and that fear of COVID-19 can be controlled and prevented from turning into excessive fear through providing effective training programs for different populations.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the Corresponding author.

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AUTHOR CONTRIBUTIONS

FL and RGG: data collection and manuscript preparation. RGG: manuscript preparation and study conceptualization. QL: study design. SS and RGG: search strategy. QL and FL: final revision and grammar editing. SD: statistical analysis.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.661078/full#supplementary-material>

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Explanatory Model of Perceived Stress in the General Population: A Cross-Sectional Study in Peru During the COVID-19 Context

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Background: The COVID-19 pandemic had negatively impact mental health worldwide. High prevalence of stress had been previously reported in populations during this context. Many theoretical frameworks had been proposed for explaining the stress process, we aim to proposed and explanatory model for the genesis of perceived stress in Peruvian general population.

Method: We conducted an online survey in Peruvian general population assessing sociodemographic variables and evaluating mental health conditions by using The Perceived Stress Scale (PSS-10), Positive Affect and Negative Affect Scale (PANAS), Generalized Anxiety Disorder scale (GAD-7), Patient Health Questionnaire (PHQ-9), and a numerical rating scale (NRS) for fear of COVID-19. Correlation analysis was conducted for the variables of interest. Two regression models were constructed to explore related factor to the dimensions of perceived stress. Finally, a structural regression model was performed with the independent variables.

Results: Data of 210 individuals was analyzed. Ages ranged from 15 to 74 years and 39% were women. Additionally, 65.2% of the participants had at least one mental health conditions (depression, anxiety, or stress symptoms). Perceived self-efficacy and positive affect (PA) were correlated, as perceived helplessness with anxious symptoms and negative affect (NA). Regression analysis showed that sex, anxiety symptoms, and NA explained perceived helplessness while positive and NA explained self-efficacy. The structural regression model analysis identified that fear of COVID-19 (composed of fear of infecting others and fear of contagion), predicted mental health conditions (i.e., depressive or anxiety symptoms); also, mental health conditions were predicted by PA and NA. Perceived helplessness and Perceived self-efficacy were interrelated and represented the perceived stress variable.

Conclusion: We proposed an explanatory model of perceived stress based on two correlated dimensions (self-efficacy and helplessness) in the Peruvian general population during the context of the COVID-19 pandemic, with two out of three individuals surveyed having at least one mental health condition.

Keywords: COVID-19, perceived stress, general population, Peru, structural equation modeling

INTRODUCTION

In the year 2020, the global social, economic, and health structures were redefined by the challenging context of a pandemic. Sequentially since March 2020, when the SARS-Cov-2 infection was declared the COVID-19 pandemic (Organization, 2020), governments around the globe set strict rules of social restrictions. By mid-April, most of the countries in the world were under some kind of confinement (Hale et al., 2021), representing a unique setting for behavior and psychology research (Bates et al., 2020).

In Peru, the first case of COVID-19 was diagnosed on March 8, 2020 and a national lockdown was installed as soon as March 16. Despite this early response, the disease spread around the country rapidly and reached the worst metrics for pandemic control worldwide by August (University, 2020). These outcomes were poorly predicted by epidemiological models (Pacheco-Barrios et al., 2020). Some potential related factors are socioeconomic inequities, high rate of informal business, difficulties to the access of supplies (Herrera Romero and Reys, 2020) and health services (Nevin et al., 2019), on the basis of a fragile and fragmented health care system (World Health Organization, 2003; Sánchez-Moreno, 2014). The governmental Peruvian response for mental health preservation during COVID-19 had been insufficient too and the technical guidelines proposed were logistically unrealistic in terms of implementation (Giraldo, 2020).

This situation as unprecedented, could be compared with other negative environmental contexts, such natural disasters in which mental health outcomes are impaired (Stough and North, 2018). In addition to mandatory social restrictions, other consequences of the pandemic as dealing with the disease as a patient, the fear of getting infected or to infect others, grieving with human losses, economic difficulties (i.e., unemployment, increase of debts, poor access to food, and primary-need supplies, etc.) and feeling uncertain about the future had been proposed as important stressors related to this context (Hagger et al., 2020).

Accordingly, systematic reviews about the impact of the COVID-19 pandemic in mental health reported high frequencies of depression (21.94–33.7%), anxiety (13.29–31.9%), and stress (13.29–29.6%) (Salari et al., 2020; Cénat et al., 2021). According to another meta-analysis the overall prevalence of psychological distress during COVID-19 pandemic rose to 41.1%, being higher in patients with suspicion of infection (99.6%) when compared to the general population (31.1%) (Wu et al., 2021). Additionally, according to a survey using the COVISTRESS questionnaire, assessed in 67 countries of the five continents, the self-reported symptoms of depression, anxiety and stress increased by 21.62, 16.71, and 21.8%, respectively (Ugbohue et al., 2020). In order to evaluate symptoms of mental health impairment, generic scales like the 9-item Patient Health Questionnaire (PHQ-9) (Levis et al., 2019) and the 7-item Generalized Anxiety Disorder (GAD-7) (Toussaint et al., 2020) had been broadly accepted for the appropriate screening measures. Many new scales design specifically for the current pandemic had been developed situation (Bernardo et al., 2020; Lee, 2020; Tavormina et al., 2020), however, their lack of validation in our context. Still, the generic scales are being used in the pandemic

context (Luan et al., 2020), and standardized a point for comparison with other populations.

According to Cohen's original theory of perceived stress, the stressor is not the potentially omnipresent life event that occurs to the individual, but rather "the cognitively mediated emotional response to the target event" (Cohen et al., 1983). Therefore, when evaluating perceived stress, we are scoring a global response that depends on various personal traits such as coping mechanisms, baseline psychopathological state or personality types. However, perceived stress is a complex concept that depends on factors such as the perception of how self-effective the person is in coping with demands from the external environment and the perception of helplessness as an internal response to negative emotions and lack of control facing stress (Liu et al., 2020). Different studies consider that the distinction between both dimensions represent separate components of the stress experience, so they should not be included in a single construct (Baik et al., 2019; Liu et al., 2020). Therefore, we consider that the perceived stress response can be understood only from these two separate variables.

The present study investigated the potential factors that explain the two dimensions of perceived stress of COVID-19 infection among the general Peruvian population. The following hypotheses were formulated based on the literature mentioned above (see **Figure 1**): H1: fear of COVID-19 is positively associated with mental health problems such as anxiety and depression; H2: PA is negatively associated with the presence of mental health problems such as anxiety and depression; H3: NA is positively associated with the presence of mental health problems such as anxiety and depression; H4: mental health problems are positively associated with the perceived helplessness component of stress; H5: NA is positively associated with the perceived helplessness component of stress; H6: NA is positively associated with the perceived self-efficacy component of stress; H7: PA is negatively associated with the perceived self-efficacy component of stress.

MATERIALS AND METHODS

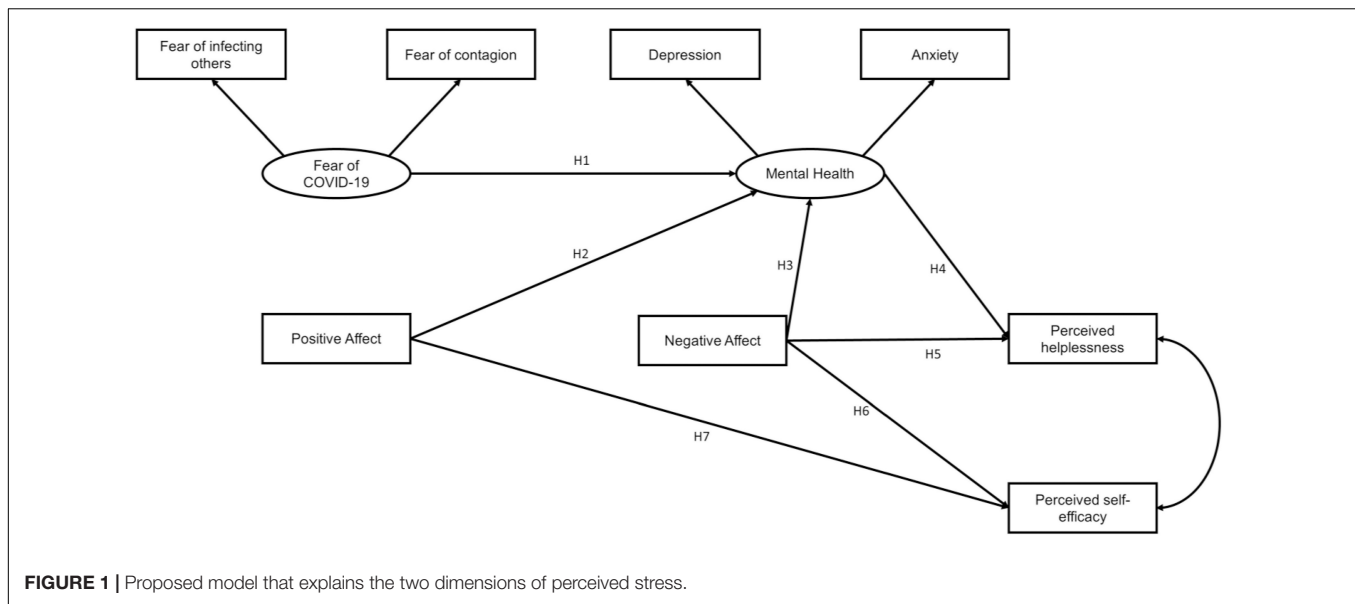
Study Design

This research is of an empirical nature since it aims to address an specific problem, to which a response is sought following a particular strategy (Ato and López-García, 2013). The strategy is associative, where the functional relationship between various variables (sociodemographic factors and psychological variables) is explored. The design of the study was explanatory since it seeks to identify a causal relationship between the variables.

Setting

This study was conducted online in the general population of Peru. Four main sources of stress during COVID-19 had been proposed (Biondi and Iannitelli, 2020), some examples according to our setting are described following:

- a) Pandemic-related: the advancement of disease propagation, the nature of the disease transmission



since air-borne epidemics had been related to higher stress outcomes (Luo et al., 2020), the absence of specific treatment, the lack of a vaccine and the uncertainty of dealing with a novel virus could be some examples.

- b) Information-related: as the misinformation and panic generated by the media (“Infodemics”) (The Lancet Infectious Diseases, 2020). In Peru, the massive spread of non-evidence-based treatments sometimes endorsed by governmental entities had an impact on general population decision of massive off-label self-medication and consequent shortage of drugs needed for the original prescriptions (Alvarez-Risco et al., 2020).
- c) Lockdown-related: Not only about social isolation but the prohibition of certain activities that were not of “primary need,” like social reunions, concerts, tourism, art exhibitions, etc. (Jurblum et al., 2020; Yamamoto et al., 2020). It was reported that during lockdown individuals perceived time as moving slower, and this perceptual change of having more free time was related to higher levels of stress and increased feeling of boredom (Droit-Volet et al., 2020).
- d) Additionally, in the context of a resource-limited country, other factors collide to increase stress and psychological burdening in the population. High rates of poverty, hunger, and delinquency, overcrowded households, had been reported to increase the risk of infection and negative outcomes in patients already infected (Shammi et al., 2020).

Participants

Non-probability sampling was used for convenience. The target population was made up of adults, over 18 years old, of both sexes, who agreed to answer the form voluntarily online and were able to answer the questions. No previous screening of mental health conditions was conducted, and we were unable to suggest potential resources for free tele-mental health support since those

were not a viable option in Peru during the time. The contact with the participants was asynchronous and at a single moment. According to the study’s aim and given the current situation, no exclusion criteria were considered since the pandemic has been affecting the general population regardless of any condition type or socio-cultural characteristic.

Online Survey

We designed an online survey using Google Forms. It was shared via social media (i.e., WhatsApp and Facebook) using a snowball sampling. The survey was anonymized and volunteer; participants also had the opportunity to leave the survey at any moment if willing.

Instruments

We constructed an online survey assessing psychological variables, and socio-demographic variables including age, sex, educational level, civil status, employment, exercise, and health status.

The Perceived Stress Scale

It is a self-reporting instrument assessing levels of perceived stress according to the thoughts and feelings of the last month (Cohen et al., 1983). It includes 10 items scored by a 5-point Likert scale with higher scores indicating higher levels of stress. The Perceived Stress Scale (PSS-10) consists of two dimensions: Perceived helplessness (6 items) and Perceived Self-Efficacy (4 items). Additionally, there is evidence of internal structure for the model of two correlated dimensions, invariance between men and women and, optimal internal consistency values (Liu et al., 2020). We defined moderate and severe stress symptoms using a cut-off of 14 and higher (Seedhom et al., 2019).

Positive Affect and Negative Affect Scale (PANAS)

This instrument is a 20-item scale that assesses mood with two factors, positive affect (PA) and negative affect (NA)

(Watson et al., 1988). The two general or higher dimensions are the NA and the PA dimensions containing 10 items each. Higher scores on each of the subscales suggest a high presence of positive or negative emotions, using ordinal categories (Extremely, Fairly, Moderately, Slightly, or Not at all). The test was self-administered.

Generalized Anxiety Disorder Scale

It is a self-report instrument that evaluates the physical and cognitive symptoms of anxiety over a 2-week period (Spitzer et al., 2006). This scale is one-dimensional, and it is composed of 7 items on a 4-point scale (0 = not at all; 3 = almost every day). The total score can vary from 0 to 21; likewise, its categories go from slight anxiety to severe anxiety (Bártolo et al., 2017). The GAD-7 was validated in the Peruvian context and presents evidence of a good fit for a one-dimensional model and has optimal internal consistency values (Zhong et al., 2015). We used a cut-off of 10 and above for moderate anxious symptoms (Plummer et al., 2016).

Patient Health Questionnaire

The Depression Module of the PHQ-9 is useful for the diagnosis of depressive disorders (Kroenke et al., 2001). It consists of 9 items on a 4-point scale (never on an almost daily). It evaluates the depressive symptomatology present in the last 2 weeks based on the criteria established in the DSM-5. The score can vary from 0 to 27, and the severity categories range from minimal to moderately severe and severe. The PHQ-9 has been validated in Peru, has a one-dimensional structure, and is invariant according to sex, age, and educational level. Also, it presents optimal levels of internal consistency (Villarreal-Zegarra et al., 2019). We used a cut-off of 10 and above to consider moderate depressive symptoms (Manea et al., 2015).

Fear of COVID-19

We included two independent questions to assess fear of COVID-19: (a) on a scale of 0–10, how much fear do you feel about getting infected? and (b) on a scale of 0–10, how much fear do you feel about infecting your family? Both questions were scored using a numerical rating scale (NRS). NRS had been used in similar previous studies and it has adequate psychometric properties while reporting valid and reliable information, when only numerical data is required without giving more qualitative detail (Fitzpatrick et al., 2020b; Lu et al., 2020).

Data Analysis

First, the sociodemographic characteristics of the participants and the prevalence of mental health problems were analyzed. Additionally, we calculated the reliability coefficient alpha (α) of all the mental health questionnaires used. Second, was performed using the Spearman correlation coefficient between the variables of interest (fear of contagion, anxiety, NA, positive affection, and perceived stress) since it does not require a normal distribution. Cohort points were proposed for a small ($r_s > 0.20$), moderate ($r_s > 0.50$), and large ($r_s > 0.80$) effect (Ferguson, n.d.). Third, two regression models were constructed to understand the factors that could explain both dimensions of perceived stress. More

specifically, the first regression model only included controlled variables (sex, age, civil status, education level, work, exercise, and health status) to explain perceived helplessness and perceived self-efficacy. The second regression model (based on the first) added the independent variables of Fear of contagion, Fear of infecting others, anxious symptoms, depressive symptoms, NA, and PA. Finally, a structural regression model was performed with the independent variables. It was used as an estimator of robust maximum likelihood (Holtmann et al., 2016). The structural regression model was evaluated in two steps. The first step was to evaluate different goodness-of-fit indexes: root mean square error of approximation (RMSEA), standardized root mean-square (SRMR), comparative fit index (CFI), and Tucker Lewis Index (TLI). The cut-off points of CFI and TLI > 0.95 , and RMSEA and SRMR < 0.08 were considered (Xia and Yang, 2019). The second step was to evaluate the amount of variance explained by perceived stress (output variables) through the coefficient of determination (R^2). All analysis was performance in R Studio and STATA.

Ethical Aspects

The study was approved by the ethics committee of Norbert Wiener University Ethics Committee (Exp. N° 104-2020). In addition, the study was anonymous and voluntary, so it does not pose a risk to participants.

RESULTS

Data were collected from 222 individuals. Twelve participants were removed from the database, for presenting Mahalanobis distance values that exceeded the critical acceptable value, being considered multivariate outliers. Finally, the sample was composed of 210 participants. The age range was from 15 to 74 years, of which 39% ($n = 82$) were women. A 66.2% of the participants had a university education and 43.3% came from a nuclear family. Additionally, 65.2% of the participants had symptoms of at least one of the mental health conditions studied ($n = 137$; depression, anxiety or stress symptoms). The summary of the sociodemographic characteristics of the sample is found in **Table 1**.

The reliability coefficients of all the mental health questionnaires were appropriate. We identified that the dimensions of perceived stress are moderately related to other variables. Perceived self-efficacy and positive affection are related ($r_s = 0.57$); while perceived helplessness is related to anxious symptoms ($r_s = 0.64$) and NA ($r_s = 0.69$). Furthermore, both dimensions of perceived stress are identified as being related to each other ($r_s = 0.57$). In **Table 2** the correlations between all the variables used can be identified, all the correlation values were significant ($p < 0.05$).

Regression models showed that sex ($\beta = -1.64$; $p = 0.001$), anxiety symptoms ($\beta = 0.38$; $p < 0.001$), and NA ($\beta = 0.33$; $p < 0.001$) were the variables that most explained the perceived helplessness. While PA ($\beta = 0.23$; $p < 0.001$) and NA ($\beta = -0.12$; $p = 0.012$) were the variables that most explained the perceived self-efficacy (see **Table 3**).

TABLE 1 | Sociodemographic characteristics of the participants ($n = 210$).

Variable	Categories	n (%)
Sex	Woman	128 (61.0)
	Male	82 (39.0)
Civil status	Single	156 (74.3)
	Married/cohabiting	40 (19.0)
	Separated/divorced	14 (6.7)
	Elementary/high school	25 (11.9)
Educational level	Technical education	30 (14.3)
	University education	139 (66.2)
	Graduate education	16 (7.6)
Work	Employed	143 (68.1)
	Unemployed	67 (31.9)
Exercise	Yes	116 (55.2)
	No	94 (44.8)
Health status	Self-reported disease	48 (22.9)
	Healthy	162 (77.1)
Anxiety	Yes	38 (18.1)
	No	172 (81.9)
Depression	Yes	41 (19.5)
	No	169 (80.5)
Stress	Yes	135 (64.3)
	No	75 (35.7)

Exercise was defined as: Do you do intense physical activity at least once a week? depression was defined as a scored of 10 or higher in the PHQ-9 test; anxiety was defined as a scored of 10 or higher in the GAD-7 test, stress was defined as a score 14 or higher in the PSS-10 test.

Model 2 was able to explain a greater amount of variance compared to model 1, both for perceived helplessness (57%) and perceived self-efficacy (33%). Therefore, the model that includes the sociodemographic and psychological variables (model 2) manages to explain more variability, compared to the model only of sociodemographic variables (model 1).

The model presented have adequate indexes of the goodness-of-fit ($X^2 = 26.4$; $gl = 15$; $CFI = 0.983$; $TLI = 0.969$; $SRMR = 0.088$; $RMSEA[90\% CI] = 0.063[0.017-0.101]$). It is identified that fear of COVID-19 composed of fear of infecting others and fear of

contagion, predicts the emergence of mental health problems (i.e., anxiety and depression symptoms); while mental health problems are predicted by PA and NA (see **Figure 2**). Perceived helplessness is predicted by mental health problems and NA. Perceived self-efficacy is predicted by NA and PA. Finally, Perceived helplessness and Perceived self-efficacy are related to each other, as they are part of the perceived stress variable. The model can predict 59% of the Perceived helplessness variance ($R^2 = 0.59$) and 35% of the Perceived self-efficacy variance ($R^2 = 0.35$).

DISCUSSION

The Main Findings

Knowing the factors that explain perceived stress will allow us to understand one of the most important elements in the development of mental health problems, since stress is a nonspecific component that leads to more complex conditions such as anxiety, depression, and post-traumatic stress (Patel et al., 2018). Therefore, it is essential to understand how perceived stress is generated, since high prevalence of mental health problems have been reported during the pandemic (Wu et al., 2021). The present study proposed an exploratory model to identify the relevant factors associated with the perception of stress during the context of the COVID-19 pandemic. The seven hypotheses formulated in the proposed model were supported by the evidence presented. Specifically, higher levels of NA and mental health problems (i.e., anxiety and depression symptoms) explained perceived helplessness, while higher levels of PA and lower levels of NA explained perceived self-efficacy. While the fear of COVID-19, NA and PA were factors that explained the presence of mental health problems such as anxiety and depression.

Comparison With Other Studies

Fear of contagion has been reported as a major stressor in unknown infectious outbreaks, especially during the context of pandemics (Fitzpatrick et al., 2020b). Therefore, it is justified that it is the variable that initiates the proposed model (see **Figure 2**).

TABLE 2 | Spearman correlation analysis ($n = 210$).

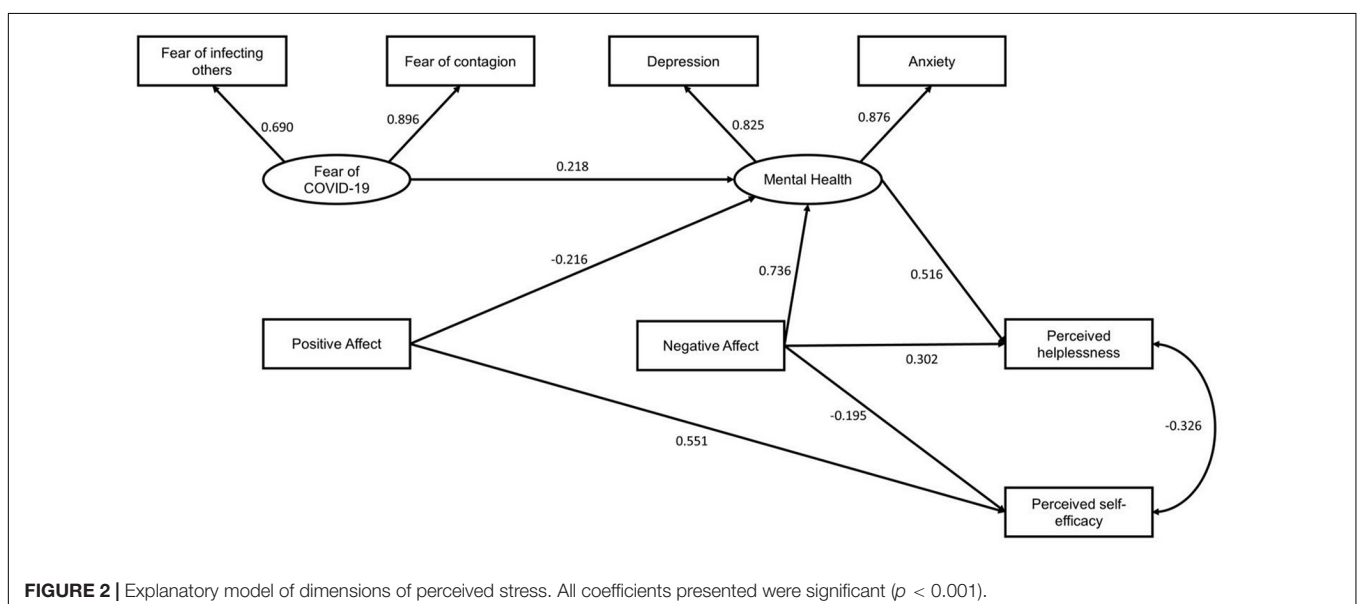
	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	α
1. Fear of contagion	5.7	2.79	1.00								—
2. Fear of infecting others	7.66	2.87	0.58*	1.00							—
3. Anxious symptoms	12.5	4.4	0.36	0.34	1.00						0.88
4. Negative affect	18.3	6.52	0.25	0.28	0.64*	1.00					0.90
5. Positive affect	26.6	8.82	-0.03	-0.02	-0.16	0.00	1.00				0.93
6. Perceived helplessness	15.1	5.62	0.29	0.29	0.64*	0.69*	-0.06	1.00			0.89
7. Perceived self-efficacy	12.9	3.77	-0.07	-0.06	-0.26	-0.23	0.57*	-0.04	1.00		0.85
8. Depressive symptoms	14.8	5.2	0.27	0.26	0.71*	0.66*	-0.22	0.60*	-0.24	1.00	0.90

M , mean; SD , standard deviation; α , reliability coefficient alpha; *moderate correlation. Fear of contagion by Numeric Rating Scale (NRS) of the question: How afraid are you of getting infected with COVID? Fear of infecting by NRS of the question: How afraid are you of infecting others? Anxiety symptoms by 7-item Generalized Anxiety Disorder (GAD-7); negative and positive affect measured by the Positive Affect and Negative Affect Scale (PANAS); perceived helplessness and Perceived self-efficacy were measured by the 10-item Perceived Stress Scale (PSS-10). Depressive symptoms measured by the Patient Health Questionnaire (PHQ-9).

TABLE 3 | Lineal regression models that explain the dimensions of perceived stress ($n = 210$).

	Perceived helplessness		Perceived self-efficacy	
	Model 1 ^a β (95% CI)	Model 2 ^b β (95% CI)	Model 1 ^a β (95% CI)	Model 2 ^b β (95% CI)
Sex				
Woman	Ref.	Ref.	Ref.	Ref.
Male	-2.41 (-3.85 to -0.97)***	-1.64 (-2.71 to -0.58)**	0.93 (-0.08 to 1.94)	0.04 (-0.84 to 0.93)
Age	-0.06 (-0.14 to 0.01)	-0.01 (-0.06 to 0.05)	0.04 (-0.01 to 0.09)	0.02 (-0.02 to 0.07)
Civil status				
Single	Ref.	Ref.	Ref.	Ref.
Married/cohabiting	-1.01 (-3.39 to 1.36)	-0.99 (-2.72 to 0.74)	0.05 (-1.62 to 1.71)	0.02 (-1.43 to 1.47)
Separated/divorced	-2.5 (-6.07 to 1.06)	-1.72 (-4.33 to 0.90)	-1.7 (-4.20 to 0.80)	-1.13 (-3.31 to 1.05)
Educational level	-0.38 (-1.31 to 0.56)	-0.15 (-0.85 to 0.56)	1.03 (0.38 to 1.69)**	0.46 (-0.13 to 1.05)
Work				
Employment	Ref.	Ref.	Ref.	Ref.
Unemployment	1.79 (0.20 to 3.38)*	0.29 (-0.91 to 1.50)	-1.18 (-2.29 to -0.06)*	-0.32 (-1.33 to 0.69)
Exercise				
Yes	Ref.	Ref.	Ref.	Ref.
No	0.18 (-1.27 to 1.64)	-0.49 (-1.55 to 0.58)	-0.48 (-1.5 to 0.54)	0.15 (-0.73 to 1.04)
Health status				
Healthy	Ref.	Ref.	Ref.	Ref.
Self-reported disease	2.62 (0.91 to 4.34)	0.64 (-0.62 to 1.91)	0.58 (-0.62 to 1.78)	0.64 (-0.42 to 1.7)
Psychological variables				
Fear of contagion		0.15 (-0.09 to 0.39)		-0.04 (-0.24 to 0.16)
Fear of infecting others		-0.09 (-0.34 to 0.15)		0.03 (-0.17 to 0.23)
Anxious symptoms		0.38 (0.19 to 0.58)***		-0.03 (-0.19 to 0.14)
Depressive symptoms		0.10 (-0.06 to 0.27)		0.05 (-0.09 to 0.19)
Positive affect		0.02 (-0.05 to 0.08)		0.23 (0.17 to 0.28)***
Negative affect		0.33 (0.21 to 0.44)***		-0.12 (-0.22 to -0.03)*
F-value (p -value)	6.29 (<0.001)	21.01 (<0.001)	3.50 (<0.001)	8.51 (<0.001)
R^2 (adjusted R^2)	0.20 (0.17)	0.60 (0.57)	0.12 (0.09)	0.38 (0.33)

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. Values in bold are the variables of interest. ^aAdjusted model by sex, age, civil status, education level, work, exercise, and health status. ^bAdjusted model by sex, age, civil status, education level, work, exercise, health status, fear of contagion, fear of infecting others, anxious symptoms, depressive symptoms, negative affect, and positive affect. 95% CI = 95% confidence interval.



However, even though there is evidence between the relationship between fear and stress (Shin and Liberzon, 2010; Maeng and Milad, 2015), according to the proposed model, fear does not directly influence stress, but it is indirectly mediated by the presence of mental health problems, PA or NA.

Our study identified that fear of COVID-19, NA, and PA were factors that explained the presence of mental health problems such as anxiety and depression. Previous studies carried out during the context of the pandemic in the general population also identify a positive relationship between fear of COVID-19 and the presence of mental health problems such as anxiety, depression, and post-traumatic stress (Fitzpatrick et al., 2020a; Huarcaya-Victoria et al., 2020). Since fear is a precursor and a main trigger of the stress response (Onozuka and Yen, 2008), several longitudinal studies have identified that the presence of constant fear states can trigger emotional problems such as anxiety and depression (Lonigan et al., 2003).

Although in our study it was found that the relationship between fear of contagion and of being infected was small, it is plausible to consider that fear is the first step of a stress response, although by itself it would not explain the presence of perceived stress. On the other hand, other studies have already shown a positive relationship between NA and the presence of mental health problems such as anxiety and depression (Watson et al., 1988), a situation that has been exacerbated during the pandemic. Likewise, studies have been identified that find an inverse relationship between PA and the presence of these mental health problems (Everaert et al., 2020). A Spanish study proposes that PA and NA are mediators of anxiety, anger-hostility, depression, and joy (Pérez-Fuentes and Molero Jurado, 2020). This would imply a circular relationship between PA and NA with mental health problems, that is, if PAs increase, the levels of mental health problems will decrease, which implies a reduction in NA. The complexity of these relationships is beyond the scope of the study; however, it is important to be able to consider the circularity of these relationships for later studies.

Our study identifies that higher levels of NA and mental health problems (i.e., anxiety and depression) predict higher levels of perceived helplessness. Other studies have also identified a positive relationship between helplessness and the presence of depressive and anxious symptoms. A study carried out in victims of violence found that helplessness is related to the appearance of depressive symptoms (Salcioglu et al., 2017), while another study carried out in patients with myocardial infarction, found that learned hopelessness is related to the presence of depressive symptoms (Smallheer et al., 2018). In addition, during the COVID-19 context, an investigation carried out in the general population identified a positive relationship between NA and the presence of mental health problems such as anxiety and depression (Pérez-Fuentes and Molero Jurado, 2020). These investigations carried out before and during the pandemic support what was found in our study. On the other hand, negative affectivity has been identified as a common factor between anxiety, depression, and helplessness (Camuñas et al., 2019), so its position as a mediator between mental health problems and helplessness is logical. This justifies the approach presented in our study, where it

is pointed out that NA mediates mental health problems and helplessness (Figure 2).

The present investigation reported that PA has a direct relationship with self-efficacy, while the latter is inversely related to NA. Other studies have identified this same relationship in people recovering from substance abuse, where it was identified that self-efficacy and NA have an inverse relationship (May et al., 2015). On the other hand, other studies carried out in patients with chronic diseases have found a positive relationship between PA and self-efficacy (Dunkley et al., 2017; Krok and Zarzycka, 2020; Smith et al., 2020). The available evidence suggests that self-efficacy increases the perception of having sufficient personal resources to cope with stressful situations, such as the context of the COVID-19 pandemic (Yıldırım and Güler, 2020).

Public Health Implications

These findings represent a theoretical contribution to public health, under a critical analysis, these results allow reflection, providing a better understanding of the variables analyzed. Identifying fear and negative emotions as the main trigger for the development of mental disorders such as anxiety and depression proves the hypotheses raised and contributes to the existing literature.

The fear of COVID-19 throughout this period of pandemic has been characterized as being sustainable over time, it is no longer an acute reaction, in which the body responds in an adaptive way, to a stressful event, it is a chronic response, which is maintained over time, producing in the person an adaptation to damage and an allostatic load (Fofana et al., 2020; Raza et al., 2020). Consequently, fear being an emotion mediated by worrisome thoughts of uncertainty (Brosschot et al., 2006), threat or harm will generate emotional, cognitive, and behavioral consequences in the population, thus affecting not only mental health, but also health physical. Recognizing the importance of the role that emotions, whether positive or negative, play in population health will help decision makers and health workers to establish actions to promote the care and protection of mental health and reduce levels of perceived stress.

Likewise, understanding how perceived stress develops in its various forms of coping, during the context of the COVID-19 pandemic could serve as an indicator to promote preventive medicine as a public policy, and through it counteract a health reality affected by corruption, neglect and administrative inefficiency, which currently characterize health administration and management in the Peruvian population (García, 2019).

From these results, it is necessary to generate new study hypotheses, through longitudinal research proposals on the control of basic emotions, with quasi-experimental designs, to compare the efficacy of interventions, construction of instruments for the early detection of maladaptive behaviors in children and adolescents, validation of diagnostic programs and methods.

Finally, understanding that population health is comprehensive, prioritizing it will contribute to the reduction of poverty, optimizing the best conditions and quality of life for the population.

Limitations and Strengths

Our study applies advance statistical methods using structural equation modeling, which allows for the analysis of different variables simultaneously. However, it is not free of limitations. First, a small sample of participants collected with a non-probabilistic strategy, so there may be difficulties in extrapolating the results to other contexts. Second, although we have data on perceived anxiety, depression, or stress, this does not substitute for clinical evaluations carried out by psychiatrists or psychologists, which could indicate if they have a clinical disorder. Third, at the time of data collection, we did not have validated instruments in our context on the fear of COVID-19, considering its usefulness in the analysis (Huaracaya-Victoria et al., 2020). Fourth, we conducted our survey via online. Several limitations had been associated with online surveys including not having a moderator for clarification or followed up question, increased sample bias which reduces representativeness, and difficulties for detecting response fraud (Ball, 2019). Also, the cross-sectional design prevents us from establishing causality, although the analysis proposes potential directions among the studied variables, these must be confirmed using longitudinal analysis.

CONCLUSION

The present study proposed a model to understand perceived stress based on two correlated dimensions (self-efficacy and helplessness) in the Peruvian general population during the context of the COVID-19 pandemic. This exploratory model will allow for a better understanding of the role of fear of COVID-19, mental health problems, NA, and PA with the presence of perceived stress. Also, a high prevalence of mental health

problems was identified, with an estimated 65.2% of participants having symptoms of at least one of the mental health conditions studied (depression, anxiety, or stress).

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found at Figshare (<https://doi.org/10.6084/m9.figshare.14497923>).

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Norbert Wiener University Ethics Committee. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

AB-C: conceptualization, data gathering, descriptive data analysis, redaction, and supervision. AN-F: literature search, descriptive data analysis, manuscript writing, and English redaction formatting. DV-Z: conceptualization, regression data analysis, SEM analysis, redaction, figure drafting, and supervision. All authors contributed to the article and approved the submitted version.

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COVID-19 Pandemic Worry and Vaccination Intention: The Mediating Role of the Health Belief Model Components

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Given the negative consequences of the ongoing COVID-19 pandemic on public health, this study aimed at investigating: (1) the differences between adults with and without chronic illness in buying behavior, vaccination intention, pandemic worry, and the health belief model (HBM) components; (2) the HBM components as mediators of the relationship between pandemic worry and vaccination intention. The sample consisted of 864 adults (66.6% females, $M_{age} = 47.61$, $SD = 9.23$), of which 20.5% reported having a chronic illness. Associations between pandemic worry, vaccination intention, and HBM were ascertained using correlation and mediation analyses. Individuals with chronic illness reported a higher level of pandemic worry, higher levels of perceived threat, greater benefits from vaccination, had lower self-efficacy and bought more medicine and sanitary/hygienic products. No significant differences were observed regarding vaccination intention, barriers against vaccination, and changes in food buying behavior. We found that the relationship between pandemic worry and vaccination intention was partially mediated by the perceived threat of disease and the benefits of vaccination. Pandemic worry predicted vaccination intention directly but also through the contribution of the perceived threat of disease and the benefits of vaccination. These findings suggest that presenting evidence of COVID-19 vaccine efficacy and the benefits of having the vaccine (especially for vulnerable groups, such as chronic illness patients) will encourage the population to follow vaccination recommendations.

Keywords: COVID-19, pandemic worry, vaccination intention, health belief model, chronic illness

INTRODUCTION

Vaccination is one of the central preoccupations during the current COVID-19 pandemic, as it strikes the world rapidly and pandemic worry spreads around the globe (World Health Organization, 2020). The increasing infection and mortality rates, especially in vulnerable populations, such as chronic illness patients, revealed a preoccupation for treatment optimization, especially for a vaccine with high uptake in the population (Centers for Disease Control and Prevention, 2020b). The high interest in vaccination is argued by the impact of the ongoing COVID-19 pandemic in various areas relevant for the current discussion: economy, psychological

functioning, and psychosocial consequences (Bashir et al., 2020; Norouzi et al., 2020).

Vaccination intention was intensively studied considering the continuous rising of the Anti-vaxxers movement in the last years and the increasing number of people refusing vaccination lately (Greenberg et al., 2019). The literature investigated factors that can influence the decision to vaccinate for various diseases. The following factors were positively associated with vaccination intention: pandemic worry and perceived threat of disease (Ashbaugh et al., 2013; Liao et al., 2013), a habit for seasonal influenza vaccination (Schmid et al., 2017), confidence in the safety of the vaccine and the information provided by the authorities, social comparisons with people who want to receive the vaccine (Podlesek et al., 2011), old age, a very high level of education, also a very low level of education (Bonfiglioli et al., 2013), being part of social categories exposed to risk infection (Bish et al., 2011).

Most studies regarding vaccination intention are based upon two prevalent theoretical frameworks: Theory of Planned Behavior (Gallagher and Povey, 2006) and health belief model (HBM; Cummings et al., 1979). These models explained almost 60% of the variance in young women's vaccination intentions against Human Papillomavirus (HPV) (Bennett et al., 2012). The HBM is one of the models used most extensively in health behavior research (Skinner et al., 2015). The original model has four components: (1) perceived susceptibility of disease (i.e., the perceived probability of contracting the disease/infection); (2) perceived severity (i.e., how bad are the consequences of the disease); (3) perceived benefits of preventive actions or treatment; (4) perceived barriers in carrying out the recommendations regarding preventive actions (Janz and Becker, 1984). Later on, other components were added (e.g., demographics, perceived control, self-efficacy) (DiClemente and Peterson, 1994). It has been successfully used as a framework to predict vaccination intentions for seasonal influenza in children (He et al., 2015) and young adults (Fall et al., 2018).

The HBM component connected to intention throughout multiple studies is the perceived threat of disease, which refers to the perceived risk of potential illness and its consequences on individual health (Liao et al., 2013). Pandemic worry is an emotional response regarding the disease (Ro et al., 2017), and it includes the perception of potential risk for infection, the risk for the family to become infected, the perceived severity of the disease, and the consequences on one's health (Goulia et al., 2010). It is closely related to risk perception and people's preventive behavior in a pandemic crisis (Goulia et al., 2010), and that is why it was considered relevant for this paper's scope.

Just as in previous major health crises, the population engaged in safety and preventive measures recommended or reinforced by their governments (Liu et al., 2020) and different shopping patterns that unbalanced store supplies (Sim et al., 2020). Given all these efforts to adapt, behavioral science contributes by exploring psychosocial responses connected with health behaviors.

Chronic diseases or illnesses are long-term diseases that affect the life and daily functioning of the person for at least one year and require continuous or periodic medical management

(Centers for Disease Control and Prevention, 2020a). There are several types of chronic diseases, depending on the affected system (e.g., cardiovascular, respiratory, neurological, digestive). This study considered cardiovascular disease, respiratory disease, diabetes, and two psychiatric disorders (anxiety and depression). People with chronic illnesses (i.e., cardiovascular, respiratory, diabetes, and cancer) are more prone to develop severe COVID-19 related symptoms and have an increased mortality rate than the general healthy population (Jordan et al., 2020). As such, for maintaining social balance, it is essential to explore people's reactions in the first stages of the COVID-19 pandemic, thus helping to establish a correct pattern of action in future situations like this.

The present study subscribes to the HBM to explain the vaccination intention. This model is already used to explain the relationship between pandemic worry and vaccination intention during the H1N1 pandemic. The perceived threat of disease, benefits, and barriers of vaccinations mediated the association (Scherr et al., 2016).

As such, this paper has two objectives: (1) to explore the differences between adults with and without chronic illness in buying behavior, vaccination intention, pandemic worry, and the HBM components; (2) to examine the HBM components as mediators of the relationship between pandemic worry and vaccination intention. For the first objective, we expect people with chronic illness to buy more supplies, to have greater pandemic worry levels, and to have a greater intention to vaccinate when compared with people without chronic illness. Regarding the HBM components, we expect them to have higher levels of threat perception and benefits from vaccination, but lower levels of barriers and self-efficacy, due to the perceived sense of vulnerability a chronic illness installs.

MATERIALS AND METHODS

Participants and Design

This cross-sectional design study is based on a convenience sample of 864 Romanian community adults (66.6% females), with ages ranging between 31 and 65 ($M = 47.61$, $SD = 9.23$). 20.5% reported having a chronic illness (e.g., cardiovascular disease, respiratory disorder, diabetes). The study included Romanian adults living in Romania during the COVID-19 state of emergency, able to give informed consent. We used the following exclusion criteria: adults under 30 years old, previous or current diagnosis of COVID-19.

Measures

Vaccination intention was measured with one item: "Do you intend to get vaccinated when offered a vaccine against COVID-19 infection?" The answers were coded from 1 to 3, as follows: 1 (*no*), 2 (*maybe*), and 3 (*yes*).

Pandemic Worry. The worry frequency and severity regarding the COVID-19 pandemic were measured using an adapted version of the Dispositional Pandemic Worry Scale (Scherr et al., 2016), initially conceived for the H1N1 flu pandemic of 2009–2010. Answers were rated on a 6-point Likert scale, from 1 (*not*

at all) to 6 (*very much*). All items were scored directly. Items 1–4 addressed the worrying frequency, while items 5–8 addressed the worry severity. For this scale, the Cronbach α index of internal consistency was very good, $\alpha = 0.92$.

The HBM Components. The perceived threat of disease, benefits, barriers, and self-efficacy regarding vaccination are the four main components of the HBM model investigated in this research. The perceived threat of disease was assessed with a 4-item scale adapted after Champion (1999) instruments which measured HBM components. The Cronbach alpha index was $\alpha = 0.77$. The benefits of vaccination were evaluated with a 5-item scale adapted from Champion. For this scale, the Cronbach alpha index was $\alpha = 0.87$. Barriers to vaccination were examined with a 10-item scale adapted from the same source. The Cronbach Alpha index for the barriers scale was $\alpha = 0.81$. Self-efficacy regarding COVID-19 infection was analyzed with a 5-item scale adapted from Champion et al. (2005) instrument regarding self-efficacy for mammography. The Cronbach alpha index for this scale is $\alpha = 0.76$. All the answers to HBM components were scored on a 5-point Likert scale, from 1 (*highly unlikely*) to 5 (*most likely*), and all the items were scored directly.

Changes in buying behavior were investigated using three questions regarding the amount of food, medication, and hygienic-sanitary items the participants purchased since the declaration of the COVID-19 pandemic. The answers were scored on a 10-point scale, ranging from 1 (*I buy as usual*) to 10 (*I buy ten times more than the usual amount*).

Socio-demographic data were obtained through a questionnaire inquiring about gender, age, education level, and chronic illness.

Procedure

The questionnaires were shared in online and social media environments during the state of emergency declared by the Romanian government. The Google Form questionnaire was available from March until May 2020. The participants read and agreed to an informed consent that provided information regarding the aims of the study, procedures, confidentiality (GDPR), and the possibility of withdrawing from the study at any moment, without consequences. Also, they could contact the researchers via e-mail for additional information. The study was conducted following the Declaration of Helsinki.

Data Analysis

All the data analyses were performed using the statistical software JAMOVI, version 1.1.9. We reported the main descriptive statistics (mean, standard deviation, frequencies, Pearson chi-square values of group differences). We used skewness and kurtosis indicators with values between -1.96 and $+1.96$ to establish the normality of the data distribution (George and Mallery, 2010). For examining the differences between participants without chronic illness (group 1) and participants with chronic illness (group 2), we used Welch's *t*-test on normally distributed variables and Mann-Whitney *U* test for non-normally distributed data. A positive mean difference reflected higher scores reported by group 1, and a negative mean difference was indicative of higher scores reported by group 2. Cohen's *d*

coefficient was used (Cohen, 1988) to depict the magnitude of the effect size in the mean difference.

We used principal component analysis to investigate the factor structure of the adapted measures to determine if the items cluster into one or more factors that explained as much as possible of the overall variance (Sava, 2011). We conducted the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin index of sampling adequacy to see whether the data is suitable for structure detection. A significant value for the first test and a value closer to 1 for the second test were considered acceptable in terms of usefulness of factor analysis. Also, we reported the cumulative variance explained by the items and the factor loadings.

Applying a general linear mediation model (i.e., GLM mediation model), we tested the mediation role of HBM components (i.e., perceived threat, benefits, barriers, and self-efficacy) on the relationship between pandemic worry and vaccination intention. We examined the direct, indirect, and total effects of pandemic worry and HBM components on vaccination intention. We used the jAMM module, which applies the maximum likelihood estimation method, an optimal procedure for parameter estimations. Using the Delta method, which extends the approximations from the central limit theorem (Deng et al., 2018), we calculated the confidence intervals.

RESULTS

Socio-Demographic Information and Descriptive Statistics

The sample's socio-demographic characteristics are in **Supplementary Table 1**. The main descriptive statistics and the correlations between the variables are depicted in **Table 1**. The skewness and kurtosis indicators had acceptable values, ranging between $(-1.96$ and $1.96)$ for all variables, except for medicine buying. Vaccination intention had significant correlations with all the studied variables, except for education level and self-efficacy. The strongest correlations were with benefits ($r = 0.68$, $p < 0.001$) and barriers to vaccination ($r = -0.60$, $p < 0.001$), in the expected direction. Pandemic worry correlated with all the variables, except for barriers to vaccination. The strongest association was with the perceived threat of disease ($r = 0.49$, $p < 0.001$). **Supplementary Table 2** presents the frequencies for vaccination intention and changes in buying food, medicine, and sanitary/hygienic supplies.

Exploratory Factor Analyses for the Adapted Measures

All the adapted instruments had skewness and kurtosis indicators within acceptable range and the main assumptions for exploratory factor analysis were met. The results revealed that the items explained between 53.9 and 80.5% of the scales' total variance, with high loadings of most items, thus providing evidence of the internal reliability of the measures. For details, consult **Supplementary Table 3**.

TABLE 1 | Descriptive statistics and correlations between study variables.

	1	2	3	4	5	6	7	8	9	10	11
1	–										
2	0.21***	–									
3	0.33***	0.49***	–								
4	0.68***	0.28***	0.37***	–							
5	–0.60***	0.02	–0.17***	–0.47***	–						
6	0.001	–0.22***	–0.25***	0.06	0.01	–					
7	0.08*	0.30***	0.22***	0.12***	0.03	–0.10**	–				
8	0.07*	0.35***	0.26***	0.09**	0.03	–0.16***	0.57***	–			
9	0.12***	0.35***	0.26***	0.14***	0.08*	–0.09**	0.55***	0.59***	–		
10	0.08*	0.11**	0.01	0.07*	0.01	0.009	–0.04	0.01	0.06	–	
11	0.03	–0.08*	0.04	0.04	–0.07*	0.02	0.05	–0.01	0.05	–0.09**	–
Mean	2.23	17.00	9.68	16.1	20.9	18.7	2.66	2.08	3.01	47.61	–
SD	0.75	8.69	3.47	5.79	7.51	4.12	1.85	1.77	2.20	9.23	–
Skewness	–0.40	1.25	0.35	–0.32	0.85	–0.44	1.34	2.13	1.27	0.44	–0.44
Kurtosis	–1.13	1.25	–0.43	–0.77	0.54	0.08	1.64	4.42	1.10	–0.59	–0.73

1, vaccination intention; 2, pandemic worry; 3, perceived threat; 4, benefits; 5, barriers; 6, self-efficacy; 7, food buying; 8, medicine buying; 9, hygienic/sanitary buying; 10, age; 11, education.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Differences Among Adults With and Without Chronic Illness

Participants with chronic illness reported a higher level of pandemic worry [$t(249) = -6.33$, $p < 0.001$, $d = -0.58$], higher levels of perceived threat [$t(259) = -0.95$, $p < 0.01$, $d = -0.27$], greater benefits from vaccination [$t(286) = -1.07$, $p = 0.02$, $d = -0.18$] and lower self-efficacy [$t(280) = 2.44$, $p = 0.01$, $d = 0.20$]. Regarding changes in buying behavior, people with chronic illness bought more medicine ($U = 52152$, $p < 0.001$, $d = 0.14$) and sanitary/hygienic products [$t(247) = -2.60$, $p = 0.01$, $d = -0.24$]. No significant differences were observed regarding vaccination intention, barriers against vaccination, and changes in food buying behavior. All the results are presented in Table 2.

The Health Belief Model Components as Mediators of the Relationship Between Pandemic Worry and Vaccination Intention

The total effect of pandemic worry on vaccination intention was significant [$\beta = 0.21$, $p < 0.001$, 95% CI (0.01,0.02)]. The direct effect of pandemic worry on vaccination intention was significant [$\beta = 0.06$, $p = 0.04$, 95% CI (0.001,0.009)] but smaller than the total effect, indicating partial mediation effects. As presented in Table 3, the perceived threat of disease and benefits of vaccination were mediators of the relationship, as the indirect effects and the components' regression coefficients were significant. Barriers against vaccination and self-efficacy did not mediate the relationship between pandemic worry and vaccination intention. The path diagram of the GLM mediation model, with the β coefficients, is displayed in Figure 1. To check whether the non-significant results are due to a lack of statistical power, we performed *post hoc* power analysis using

the software Quantpsy.org (Preacher and Coffman, 2006). For $\alpha = 0.05$, at a sample size of $N = 864$ and $df = 3$, we obtained a statistical power of 0.94, indicating high power. As such, it is unlikely that the non-significant findings can be attributed to small sample size.

DISCUSSION

Amid the ongoing COVID-19 pandemic, preventive measures, vaccination, and pandemic worry are topical due to their importance for public policymaking. That is the reason why, in the current study, we aimed to investigate two significant aspects related to these concepts: (1) the differences between adults with and without chronic illness in buying behavior, vaccination intention, pandemic worry, and the HBM components; (2) the HBM components as mediators of the relationship between pandemic worry and vaccination intention.

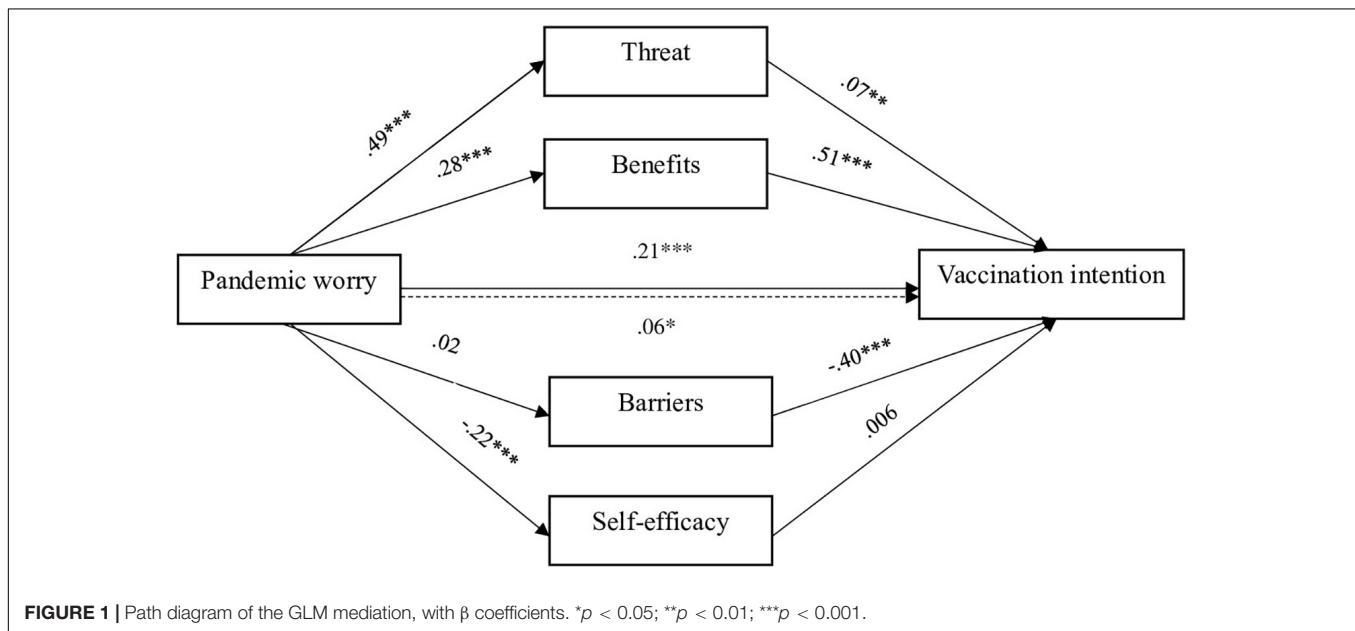
TABLE 2 | Group differences between participants without chronic illness and with chronic illness.

	Test value	df	Mean difference	SE	p-value	d
Vaccination intention	–1.59	287	–0.09	0.06	0.11	–0.12
Pandemic worry	–6.33	249	–4.91	0.77	<0.001	–0.58
Perceived threat	–3.13	259	–0.95	0.30	<0.01	–0.27
Benefits	–2.28	286	–1.07	0.47	0.02	–0.18
Barriers	0.001	294	0.001	0.60	0.99	0.00
Self-efficacy	2.44	280	0.83	0.34	0.01	0.20
Food supplies	–1.67	253	–0.28	0.16	0.09	–0.15
Medicine supplies	52152	–	–5.70e-5	0	<0.001	0.14
Sanitary supplies	–2.60	247	–0.52	0.20	0.01	–0.24

TABLE 3 | Direct, indirect, and total effects of the GLM mediation.

Type	Effect	Estimate	SE	95% C.I. ^a		β	z	p
				Lower	Upper			
Indirect	Panworry \Rightarrow Threat \Rightarrow Intenvaccin	0.003	0.001	0.001	0.005	0.03	2.76	0.006
	Panworry \Rightarrow Benefits \Rightarrow Intenvaccin	0.01	0.001	0.008	0.01	0.14	8.03	<0.001
	Panworry \Rightarrow Barrier \Rightarrow Intenvaccin	-0.001	0.001	-0.002	0.001	-0.01	-0.8	0.42
	Panworry \Rightarrow Self-efficacy \Rightarrow Intenvaccin	-0.001	0.001	-0.001	0.001	-0.001	-0.26	0.79
Component	Panworry \Rightarrow Threat	0.19	0.01	0.17	0.21	0.49	16.56	<0.001
	Threat \Rightarrow Intenvaccin	0.01	0.005	0.004	0.02	0.07	2.8	0.005
	Panworry \Rightarrow Benefits	0.19	0.02	0.14	0.23	0.28	8.76	<0.001
	Benefits \Rightarrow Intenvaccin	0.06	0.003	0.05	0.06	0.51	20.09	<0.001
	Panworry \Rightarrow Barrier	0.02	0.02	-0.03	0.08	0.02	0.8	0.42
	Barrier \Rightarrow Intenvaccin	-0.03	0.002	-0.04	-0.03	-0.4	-16.57	<0.001
	Panworry \Rightarrow Self-efficacy	-0.1	0.01	-0.13	-0.07	-0.22	-6.64	<0.001
	Self-efficacy \Rightarrow Intenvaccin	0.001	0.004	-0.007	0.009	0.006	0.26	0.79
	Panworry \Rightarrow Intenvaccin	0.004	0.002	0.001	0.009	0.06	2.02	0.04
	Total	0.01	0.002	0.01	0.02	0.21	6.33	<0.001

^aConfidence intervals computed with method: Standard (Delta method).



Regarding the first objective, data showed that participants with chronic illness displayed higher levels of pandemic worry, higher levels of the perceived threat, and reported greater benefits from vaccination than healthy participants. This result is expected considering that participants are exposed to informational sources (e.g., television, newspapers, brochures) that highlight the liability of chronic illness patients when faced with COVID-19. Thus, this installs a sense of vulnerability in front of a potential infection. According to this data, even if the first group reported greater benefits from vaccination, this perception was not associated with a greater intention to vaccinate. This finding has negative implications for the success of a future vaccination campaign, as intention predicts behavior (Sheeran, 2002). Additionally, vaccination

uptake is suboptimal in many countries, including Romania (Habersaat et al., 2020).

Regarding changes in shopping behavior, people with chronic illness bought more medicine and sanitary/hygienic products than people without chronic illness. Their normal functioning depends on the continuation of treatment for heart disease or diabetes. As such, they are expected to buy larger supplies of medicines during times of health crisis. This result is consistent with the previous one, reflecting the vulnerability of patients with chronic illness. There was no significant difference concerning food buying. Overall, participants bought 2.66 times more food during the state of emergency. A recent review highlighted that the psychological causes for panic buying are related to the people's perceived threat of the crisis and scarcity of supplies,

people's fear of the unknown and uncertainty, coping styles, and the social influence of others (Yuen et al., 2020). According to neuroscience, gathering enormous amounts of food is how evolution has taught us to manage periods of resource shortage. Therefore, it is deeply rooted in our brains to have extra supplies in times of crisis. Buying more sanitary hygienic products during pandemics (e.g., hand sanitizer, toilet paper) is an attempt to avoid diseases and is motivated by safety concerns and disgust regarding germs (Taylor, 2019).

A primary objective of this study was to assess a particular set of latent psychological constructs that could lead to a better understanding of why those differences between healthy individuals and those diagnosed with a chronic illness can lead to distinct behavioral responses. In this research, there was no significant difference in vaccination intention between the two groups. In contrast, an online survey conducted by the global market research and public opinion specialist (IPSOS), Romanians diagnosed with a chronic illness had an overall greater openness to vaccination (8% declared that they are already immunized, and 57% declared that they are willing to get vaccinated) (IPSOS, 2021). One explanation stems from the fact that the two surveys were conducted in different moments of the pandemic. During the first state of emergency, the present research was done when no vaccine was available and little was known about the SARS-COV-2 virus, while the IPSOS survey was conducted in 2021 after the vaccine started to be available for older adults. Attitudes toward vaccination can change throughout a public health crisis (Fridman et al., 2021). Most likely, subsequent scientific information about vaccination benefits and the pro-vaccination national campaign have encouraged vaccination behavior in people with chronic illness.

Given the shifts mentioned above in attitudes toward vaccination, relatively stable psychological characteristics and behavioral outcomes can represent a valuable baseline for vaccination campaigns and strategies. The primary reasons for deferring vaccination are due to concerns about side effects and safety of the COVID-19 vaccine, lack of trust in the government, and concern that COVID-19 vaccines are developed too quickly (Nguyen et al., 2021), low confidence in the COVID-19 vaccine and the health service response during the pandemic, worse perception of government measures, perception of the information provided as inconsistent and contradictory (Soares et al., 2021).

According to a recent systematic review of vaccine acceptance rates (Sallam, 2021) targeting 33 different countries, more research is needed to identify the mechanisms underlying vaccine hesitancy because low rates of COVID-19 vaccine acceptance were reported worldwide which can eventually represent a general public health issue. The present data shows that the relationship is partially mediated by two components of the HBM model: the perceived threat of disease and the benefits of vaccination. Pandemic worry predicted vaccination intention directly but also through the contribution of the perceived threat of disease and the benefits of vaccination. The result is consistent with previous studies on influenza vaccination and the HBM theoretical framework on predicting COVID-19 health-related

behaviors. For example, Liao et al. found in their study that vaccination intention mediated the effect of pandemic worry on vaccination decisions. Also, the perceived threat of disease, benefits, and vaccination barriers mediated the relationship between pandemic worry and vaccination intention during the H1N1 pandemic (Scherr et al., 2016).

This result has potential practical implications for healthcare specialists and policymakers, as it brings to their attention factors that help promote vaccination acceptance and prevent future COVID-19 outbreaks. From a distal perspective, the result pinpoints ways of communicating public messages regarding vaccination. For example, highlighting the disease's proper impact will prevent people from experiencing unhealthy levels of worry. Presenting evidence of COVID-19 vaccine efficacy and the benefits of having the vaccine (especially for vulnerable groups, such as chronic illness patients) will encourage the population to follow vaccination recommendations and reduce the risk of getting the infection.

One potential issue is whether people must experience a higher level of pandemic worry to impact their vaccination intention. After all, we want people to get vaccinated without experiencing high levels of worry or anxiety. And then, the critical question becomes how we can maintain low levels of pandemic worry and an adequate level of the perceived threat that would still prompt people to vaccinate. Having an adequate level of the perceived threat and highlighting the benefits of COVID-29 vaccination could be enough to engage people in future vaccination behaviors? This topic is worth more exploration.

Knowing that vaccine efficacy and adverse event concerns of the HBM constructs are considered to be significant predictors of COVID-19 vaccination intent (Lin et al., 2020), we conclude that taken together, the findings of the present study provide helpful insight regarding guidance for individually tailored interventions that can use HBM components to raise the level of vaccination intention in a constructive and specific manner.

Notwithstanding the contributions of this research, a limitation of the results derives from the study's cross-sectional nature, which does not allow for timeline inferences. Longitudinal studies could reveal a better understanding of the investigated phenomena and reinforce potential causal relationships between pandemic worry, the HBM components, and vaccination intention. It is reasonable to assume a temporal order between pandemic worry on the one hand and benefits and barriers to vaccination on the other hand. The assumption is limited without a longitudinal design for pandemic worry and the perceived threat of COVID-19, respectively COVID-19 self-efficacy. The sampling procedure does not allow for the generalization of results. Due to the online data collection, only Internet users could participate, excluding more vulnerable participants with lower academic or financial levels. All the measures used in this study were self-report, and there is the possibility of biased results due to common method variance or social desirability.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: <https://data.mendeley.com/datasets/m7jrfgnwzs/1>.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics board of the University of Bucharest (notice no. 27/11.06.2021). The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

CI and DI contributed to the conception, the design of the study, and its implementation, and wrote the first draft of the manuscript. EA and DC wrote sections of the manuscript and reviewed the manuscript. All authors read and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.674018/full#supplementary-material>

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Impact of the COVID-19 Pandemic on the Mental Health of College Students: A Systematic Review and Meta-Analysis

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Background: The coronavirus disease (COVID-19) pandemic has been spreading and brought unprecedented psychological pressure on people across the entire globe since December 2019.

Objectives: To synthesize the existing evidence of the prevalence of mental health status during the epidemic and provide the basis for mental health education.

Materials and methods: The literature search was conducted in nine databases from December 2019 to October 2020. The risk of bias for each study was assessed, and the random-effects meta-analysis was used to estimate the prevalence of specific mental health problems. The review protocol was registered in PROSPERO with the registration number CRD42020208619.

Results: About 27 studies were included in the analysis with a total of 706,415 participants combined, and 14 mental health problems were gathered. Meta-analysis showed that the prevalence of depression was 39% (95% CI: 27–51%) and that of anxiety was 36% (95% CI: 26–46%). Subgroup analysis indicated that the prevalence of depression and anxiety varied among nations and due to the survey date. The prevalence of depression (60%, 95% CI: 46–74%) and anxiety (60%, 95% CI: 46–74%) in non-Chinese college students was higher than those in Chinese college students (26%, 95% CI: 21–30% and 20%, 95% CI: 14–26%). The proportion of depression (54%, 95% CI: 40–67%) and anxiety (37%, 95% CI: 26–48%) was higher after March 1 than before it (21%, 95% CI: 16–25% and 19%, 95% CI: 13–25%).

Conclusions: The meta-analysis results presented that the prevalence of depression (39%) or anxiety (36%) among college students greatly increased during the COVID-19 pandemic. In addition, the mental health of college students is affected by the nations and the survey date. It was necessary to take measures to reduce mental health risks during the pandemic.

Keywords: COVID-19, mental health, college students, depression, anxiety, meta-analysis

INTRODUCTION

The coronavirus disease (COVID-19) rapidly spread to other areas in China and other countries (Hajivalili et al., 2020; World Health Organization, 2020) since its outbreak in Wuhan, China. The COVID-19 has triggered a global health crisis and is a major public health emergency of international concern (PHEIC) all over the world, which not only threatens the lives of people but also affects their mental health (World Health Organization, 2005, 2020; Zhong et al., 2021). During the pandemic, some people have experienced relatively higher emotional irregularities (e.g., panic, excessive anxiety, irritability, and other psychological reactions) while some people suffered from cognitive imbalances; as a result, their attention and memory may be influenced by repeated stimulation of a large amount of information. Some of them may have changed their behaviors considerably while some have expressed somatic reactions, such as insomnia, stomach pain, and diarrhea (Amerio et al., 2020; Chan and Kuan, 2020; Ren et al., 2020; Yedemie, 2020; Zhao et al., 2020; Zhong et al., 2021). Apropos physiological and psychological responses are normal reactions in dealing with public health emergencies, which are conducive to adapting to the environment. However, overreactions can increase the psychological burden and be hazardous to physical and mental health (Rosenbaum, 2010; Fergusson et al., 2014).

A study, including 992 respondents in China, found that 69% of the respondents were in the high-risk or medium-risk in seven psychological dimensions (mental status, knowledge of stress management, behavioral patterns, risk perception, academic stress, family relationships, and peer relationships) (Chen B. et al., 2020). A mental health survey, including 505 Bangladeshi college students during COVID-19, showed that 28.5% of the respondents were with stress, 33.3% with anxiety, and 46.92% with depression (Khan et al., 2020). The emerging mental health issues are often accompanied by abnormal behaviors. For instance, a study on Turkish university students showed that 90% of 3,040 respondents reported an increase in handwashing due to the outbreak, and 50% respondents reported that they wanted to wear protective gloves for everything they did (Akdeniz et al., 2020). At present, the mental health problems of college students during the COVID-19 pandemic have attracted the attention of relevant researchers. The current research has shown that during the pandemic, the mental health of college students has been affected to some extent, and the number of students with negative emotions and psychological problems has increased (Khan et al., 2020), revealing the possible mental health impact of COVID-19 on them. Hence, we hypothesized that (Hajivalili et al., 2020) COVID-19 would have adverse effects on the mental health of college students (World Health Organization, 2020). The prevalence of these mental health issues would be affected by nations, gender, and the survey date, etc.

Mental health instruments used by the institutes in COVID-19 related research were different, and the results varied therein; meanwhile, the reported prevalence in different nations and periods varied as well. A systematic analysis of the impact of COVID-19 on mental health of college students can obtain a more validated conclusion to assist psychological health

education and mental rehabilitation of students during the pandemic. This study aimed to analyze the association between the COVID-19 epidemic and the mental health of college students with systematic review and meta-analysis and to provide the synthetic prevalence of mental health problems in college students.

METHODS

Registration

Our study protocol was registered on the International Prospective Register of Systematic Reviews¹ with registration number CRD42020208619. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) were followed (Moher et al., 2010).

Data Sources and Search Strategies

The searches were conducted in nine electronic databases (PsycINFO, MEDLINE, Scopus, PubMed, EMBASE, CINAHL, ERIC, CNKI, World Health Organization Collaborating Centres Database, and Portal) with the search strategies that combined the search terms: (2019 novel coronavirus-infected pneumonia or 2019 novel coronavirus or 2019 novel coronavirus pneumonia or COVID-19 pneumonia or COVID-19 or 2019-nCoV) and (undergraduate or academican or university student or college student or higher education students) and (mental health or mental disorder or mental wellbeing or psychological health or psychology distress or mental illness or mental disorder or mental health problem or emotional health or emotion regulation or cognitive reappraisal or expressive suppression or subjective wellbeing or life satisfaction or depression or anxiety), search in December 2019 and October 2020. In addition, we have searched the literature included in the references, which was subject related and included by systematic reviews so as to supplement, obtain relevant literature, and ensure the recall ratio.

Eligibility Criteria

Eligible studies must meet the following inclusion criteria; original studies on mental health among current college students (college students in this study specifically referred to those who are in the stage of receiving higher education, without including students who have temporary absences from school, dropping out of school, etc.) in the COVID-19 pandemic; observational studies that measured the behaviors of college students in the COVID-19 pandemic; studies that assessed the mental health status of college students using validated mental health assessment tools with good reliability and validity, such as self-rating depression scale (SDS), patient health questionnaire-9 (PHQ-9) and generalized anxiety disorder (GAD-7), whose positive rate was determined by the scoring standard of each evaluation tool. We excluded review studies and randomized controlled trials, case reports, studies with methodological bias, unified data repeated publication, sampling locations not reported, and conflicting results after a full text reading. There were no restrictions regarding language.

¹<https://www.crd.york.ac.uk/PROSPERO/>

Literature Screening and Data Extraction

The literature was screened and then the data were extracted by two investigators, respectively (YL and AW). The results were cross-checked. Any disagreements were resolved by the consultations with the third independent reviewer (HH).

The content from data extraction included (i) basic information of the studies (e.g., first author, publication time, research nation, sample size, and mental health problems of the survey), (ii) basic characteristics of the participants in the studies (e.g., age, gender, major, and education level), (iii) tools for evaluating mental health, (iv) outcome indicators (e.g., depression, anxiety, and other psychological problems), (v) key elements of bias risk evaluation (e.g., inclusion criteria of the research sample, whether the research identifies confounding factors, whether the research controls confounding factors, and data analysis methods).

Assessment of Risk of Bias

We assessed the qualities of the studies with Joanna Briggs Institute (JBI) checklist for each study design (Rebecca et al., 2019). The checklist consists of eight evaluation items, which were used to evaluate the literature quality and methodological quality of studies. The evaluation of each item was divided into four categories (yes, no, unclear, and not applicable), and the judgment was based on the degree of conformity of the items. The overall evaluation of the included articles was obtained by synthesizing the evaluation of eight items (include, exclude, and seek further info) (Moola et al., 2020). The evaluation of the quality of included studies was independently evaluated by two researchers. In case of disagreements, they were resolved through discussions or negotiations with a third party.

Data Synthesis and Statistics

Stata, version 15.1 (StataCorp.), was utilized to collect data and to perform relevant analyses in this meta-analysis (Gebrie et al., 2019; Adane et al., 2020). Each numerical value of the result was presented with a 95% confidence interval (95% CI). Publication bias was measured through Egger's and Begg's tests; $p < 0.05$ was considered a significant publication bias. In addition, a sensitivity analysis was performed to test the result stability, using Stata 15.1 software.

Q test and I-square statistics were utilized to test the heterogeneity across the included studies. A fixed-effects model was used when the heterogeneity was no significant between studies (I-square $< 40\%$, $P < 0.1$) for meta-analysis; otherwise, a random-effects model was used if the heterogeneity was significant (I-square $\geq 40\%$, $P < 0.1$) for meta-analysis (Huggings and Sally, 2008), and subgroup analysis or sensitivity analysis was performed to explore heterogeneity (Zhao et al., 2017). According to the research characteristics of the included studies and the potential factors that affect the mental health of college students, we conducted a subgroup analysis based on the survey nations (China or non-China), gender (male or female), education level (undergraduate or graduate), major (medical or non-medical), and survey date (before or after March 1).

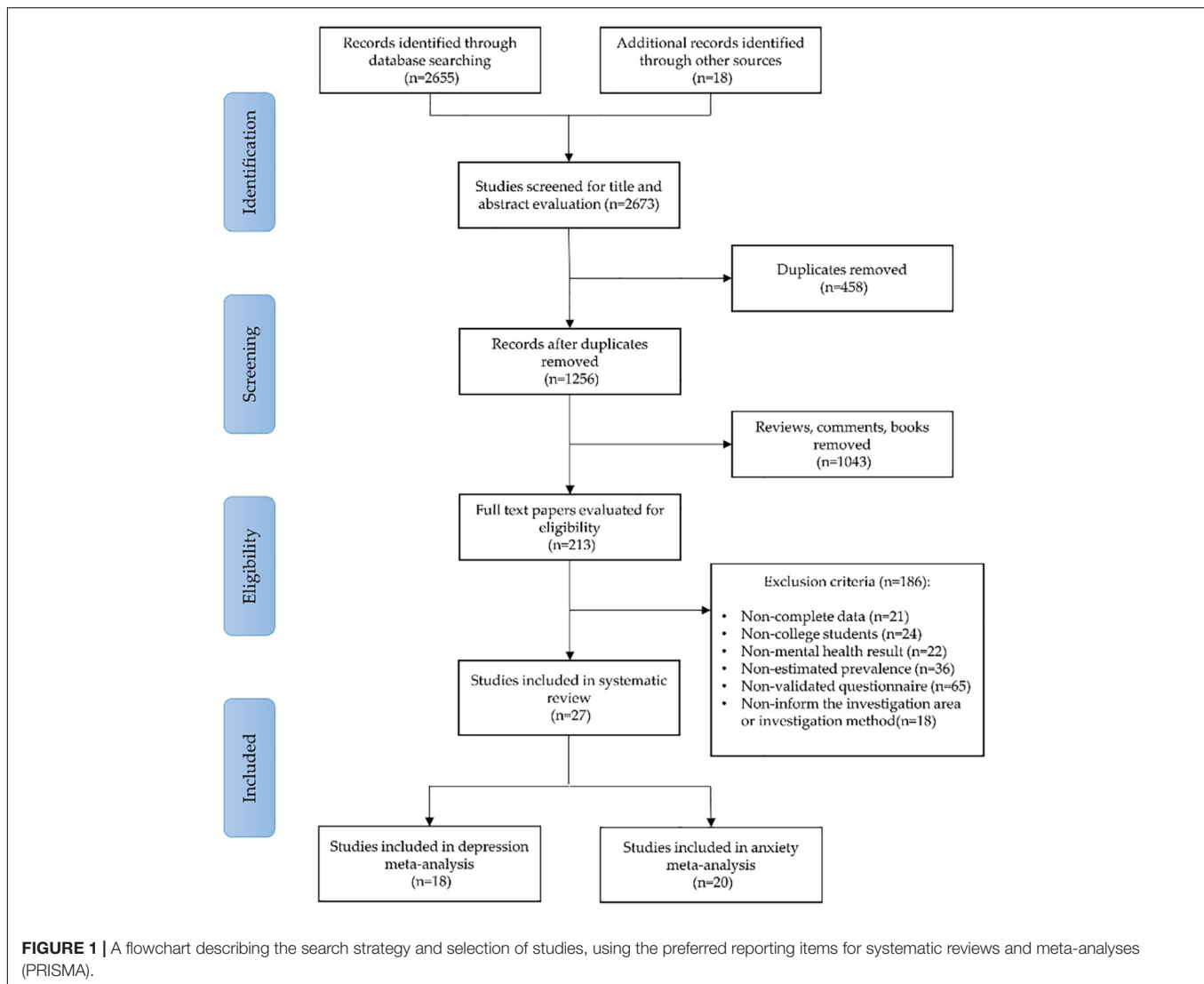
RESULTS

A total of 2,673 studies were obtained through a preliminary search. A total of 959 repeated articles were eliminated, 458 short papers were eliminated, 1,043 articles were eliminated after reading their titles and abstracts, and 186 articles were excluded after reading the full text. Eventually, a total of 27 articles were included in the meta-analysis (Huggings and Sally, 2008; Zhao et al., 2017; Bo et al., 2020; Cao et al., 2020; Chang et al., 2020; Chen R.N. et al., 2020; Dratva et al., 2020; Díaz-Jiménez et al., 2020; Fawaz and Samaha, 2020; Gilbert et al., 2020; Husky et al., 2020; Islam et al., 2020; Jia et al., 2020; Jiang et al., 2020; Mechili et al., 2020; Naser et al., 2020; Rudenstine et al., 2020; Tang et al., 2020; Wang and Zhao, 2020; Wang K. et al., 2020; Wang X. et al., 2020; Wang Z.H. et al., 2020; Wu et al., 2020; Xiao et al., 2020; Xinli et al., 2020; Yao et al., 2020; Zhan et al., 2020). The number of subjects who participated in the quantitative analysis was 706,415 college students. The search process and the selection phases are illustrated in the Flow Diagram, following the PRISMA protocol (Figure 1).

Characteristics of the Studies and Methodological Quality

The characteristics of the 27 studies included in this review are shown in Table 1. Regarding the distribution of survey nations included in the studies, 15 studies surveyed Chinese nations, 11 studies surveyed non-Chinese nations, 1 study investigated three nations (China, Japan, and South Korea). Except for the four studies that did not report the investigation time, the earliest investigation time was January 31, 2020, and the latest investigation time was May 4, 2020. A total of 706,415 participants were included in 27 studies. The study that has the minimum number of participants has 84 participants, while the study that has the maximum number of participants has 320,000 participants. Except for a study of 477 people that did not report gender, there were 284,478 men, 421,433 women, and 27 others. Among the included studies, six studies did not report the age of the participants, and the rest of the studies had survey subjects over 17 years old. Concerning the educational level, 18 studies distinguished whether the survey subjects were undergraduates or graduate students, and 9 studies did not report it. Regarding the majors, 6 studies indicated the participants' majors, and 21 studies did not report. The included 27 studies reported a total of 14 types of mental health issues or symptoms, of which anxiety (21 studies) and depression (19 studies) were the most reported ones, while none of the other psychological problems were reported by more than four studies.

Based on the JBI critical appraisal checklist for analytical cross-sectional studies, all of the articles have no methodological defect and significant risk of bias and meet the requirements of inclusion (Table 1). The "Methods of Exposure Factor Prediction," "Measurement Methods of Outcome Indexes," and "Diagnosis of Diseases" of the 27 included articles all adopted valid, reliable, and objectively consistent methods. Fifteen articles clearly defined the sample inclusion criteria, 19 articles



identified and controlled confounding factors, and 17 articles had appropriate and sufficient analysis methods. However, among the included articles, only five articles clearly described the research participants, and the remaining 22 had unreported content in the description of the research participants.

Meta-Analysis of Depression Prevalence

Among the 19 studies on the depression of college students during the pandemic, one (Chen R.N. et al., 2020) study only reported the overall trend of the depression of participants and did not report the exact occurrence of symptoms, so this report was not included in the meta-analysis. A total of 18 studies were integrated into the meta-analysis, covering a total of 63,317 respondents. Depending on the meta-analysis (Figure 2), the prevalence of depression among college students during the pandemic was 39% (95% CI: 27–51%). The heterogeneity among the 18 studies was relatively large ($I^2 = 99.9\%$, $P < 0.01$). According to the result of the random-effects model, we found

that the reasons for the heterogeneity may be complicated, and we believe that further research is indispensable.

No evidence of publication bias among the studies was observed using Begg's test and Egger's test (Begg's, $P > |z| = 0.705$; Egger's, $P > |t| = 0.47$; 95% CI -0.3 to 1.4).

Subgroup Analysis

Subgroup analysis was operated in terms of the survey nation, gender, educational level, major, and survey date. Table 2 shows that non-Chinese college students (60%, 95% CI: 46–74%) have higher prevalence of depression compared with Chinese college students (26%, 95% CI: 21–30%), and the surveys conducted after March 1 (54%, 95% CI: 40–67%) have higher prevalence of depression compared with the surveys operated before March 1 (21%, 95% CI: 16–25%). In our research, we found that the prevalence of depression was closed for men and women, for undergraduate and graduate students, and for medical and non-medical majors.

TABLE 1 | Characteristics of the studies and methodological quality.

Number	Author location	Survey time	Sample male/female	Age ¹	Educational level	Majors	Instrument	Main outcomes	JBI evaluation results
1	Chen R.N. et al., 2020 China	Feb. 13th–Feb. 22nd	323489 130516/192973	19–22	Undergraduate	NM	PHQ-9, RESEs	B, D, L, H	Include
2	Cao et al., 2020 China	NM	7143 2168/4975	NM	Undergraduate	NM	GAD-7	A	Include
3	Wang and Zhao, 2020 China	Feb. 10th–Feb. 17th	3611 1454/2157	18–24	Undergraduate	Arts Sciences	SAS	A, F, I, N	Include
4	Jia et al., 2020 China	Feb. 23rd–Apr. 2nd	217 90/127	18–27	Undergraduate Postgraduate	NM	PHQ-9, GAD-7	A, D	Include
5	Husky et al., 2020 French	NM	291 72/219	19.07 ± 1,7	NM	Social Sciences ² Health Sciences	GAD-7	A, E	Include
6	Mechili et al., 2020 United States	Mar.30th–Apr. 9th	863 98/765	NM	Graduate student	NM	PHQ-9	D	Include
7	Xiao et al., 2020 China	Feb. 4th–Feb. 12th	933 279/654	Over 17	Undergraduate Postgraduate	NM	PHQ-9, GAD-7	A, D	Include
8	Naser et al., 2020 Jordan	Mar. 22nd–Mar.28th	1165 538/627	NM	Undergraduate Postgraduate	NM	PHQ-9, GAD-7	A, D	Include
9	Xinli et al., 2020 China	Feb. 12th–Feb. 17th	2038 755/1283	20.56 ± 1.9	NM	NM	PHQ-9, PTGI, PCL Z-SAS	A, D, G, J	Include
10	Tang et al., 2020 China	Feb. 20th–Feb. 27th	2485 960/1525	19.81 ± 1.55	Undergraduate	NM	PHQ-9, PCL-C	D, G	Include
11	Wang Z.H. et al., 2020 China	Jan. 31st–Feb. 5th	44447 20217/24230	21.0 ± 2.4	Undergraduate Postgraduate	NM	PHQ-9 SAS	A, D	Include
12	Gilbert et al., 2020 United States	Apr. 24th–Jun. 5th	477 NM	20.7	NM	NM	GAD-2, PHQ-2	A, D, K	Include
13	Zhao et al. Bo et al., 2020 South Korea ,China,Japan	Mar. 23rd–Apr.20th	821 305/516	23.08 ± 4.78	Undergraduate Postgraduate	NM	PHQ-9	A	Include
14	Wang X. et al., 2020 United States	May. 4th–May.19th	2031 779/1252	22.88 ± 5.22	Undergraduate Postgraduate	NM	PHQ-9 GAD-7	A, D, H	Include
15	Díaz-Jiménez et al., 2020 Spain	May. 1st – May. 24th	365 36/329	23.22 ± 6.16	Undergraduate Other	NM	DASS-21 (Spanish)	A	Include
16	Islam et al., 2020 Bangladesh	May. 6th–May. 12th	476 320/156	Over 17	NM	NM	PHQ-9 GAD-7	A, D	Include
17	Rudenstine et al., 2020 United States	Apr. 8th–May. 2nd	1821 493/1301	26.17	Undergraduate Postgraduate	NM	PHQ-9, GAD-7	A, D	Include
18	Fawaz and Samaha, 2020 Lebanese	Apr. 20th–Apr. 27th	520 201/319	21.03 ± 2.66	Undergraduate	NM	DASS-21	A, D	Include
19	Dratva et al., 2020 Swiss	Apr. 3rd–Apr. 14th	2429 753/1676	26.40 ± 5.40	Undergraduate Postgraduate	NM	GAD-7	A	Include
20	Chang et al., 2020 China	Jan. 31st–Feb. 3rd	3881 1434/2447	Over 18	NM	NM	PHQ-9, GAD-7	A, D	Include
21	Wang K. et al., 2020 China	Feb. 13th–Feb.16th	430 139/291	18–25	NM	Medical Specialty Non-Medical Specialty	SAS, SDS	A, D	Include
22	Jiang et al., 2020 China	Feb. 27th–Feb. 29th	399 162/237	NM	NM	Medical Specialty	PHQ-9, GAD-7	A, D	Include

(Continued)

TABLE 1 | Continued

Number	Author location	Survey time	Sample male/female	Age ¹	Educational level	Majors	Instrument	Main outcomes	JBI evaluation results
23	Zhan et al., 2020 China	Mar. 17th–Mar. 19th	266 76/190	NM	Undergraduate Postgraduate	Medical Specialty	DASS (China)	A, D	Include
24	Yao et al., 2020 China	Feb.27th–Feb. 28th	84 52/32	19.9 ± 2.21	Undergraduate	Non- Medical Specialty	PHQ-9, GAD-7	A, D	Include
25	Wu et al., 2020 China	Feb. 16th–Feb. 20th	1196 402/794	Over 17	Undergraduate	NM	SAS	A, D	Include
26	Zolotov et al., 2020 Israeli	NM	370 77/289*	25.2 ± 3.1	NM	NM	FCV-19s	F	Include
27	Xueguo et al., 2020 China	NM	304167 122102/182065	NM	NM	NM	IES-6	E, G, O, P	Include

¹Age was expressed as a mean ± standard deviation ($M \pm SD$) or range.

²Social sciences included social sciences, technology and law and economics.

NM: not mentioned; PHQ-9: patient health questionnaire-9; RESEs: regulatory emotional self-efficacy scale; GAD-7: generalized anxiety disorder-7; SAS: self-rating anxiety scale; PCL: PTSD checklist; PTGI: posttraumatic Growth Inventory; Z-SAS: Zung Self-Rating Anxiety Scale; PCL-C: PTSD Check List-Civilian Version GAD-2: Generalized Anxiety Disorder 2; PHQ-2: Patient Health Questionnaire-2; SDS: self-rating depression scale; DASS: depression anxiety stress scale; DASS (Spanish): depression anxiety stress scale in Spanish; DASS (China): depression anxiety stress scale in China; FCV-19s: fear of COVID-19 scale; IES-6: impact of events scale 6; A: anxiety; B: regulatory emotional self-efficacy; C: self-perceived mental health; D: depression; E: stress; F: fear; G: PTSD; H: suicide; I: panic; J: posttraumatic growth; K: psychological distress; L: regulatory emotional self-efficacy; M: somatic symptom; N: tired; O: sleeplessness; P: self-perceived mental health.

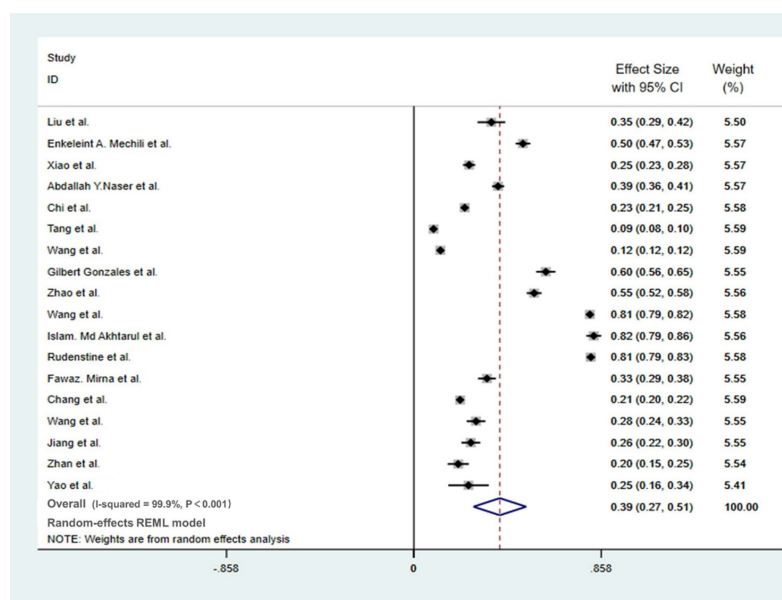


FIGURE 2 | Meta-analysis of depression in college students during the COVID-19 pandemic.

Meta-Analysis of Anxiety Prevalence

Among the 21 studies on the depression of college students during the pandemic, one (Husky et al., 2020) study only reported the overall trend of anxiety of the respondents while did not report the specific occurrence of symptoms, so this report was not included in the meta-analysis. A total of 20 studies were included in the meta-analysis, with 73,912 participants. The meta-analysis showed (Figure 3) that the prevalence of depression among college students during the pandemic was 36% [95% CI (26%, 46%)]; the results showed that the heterogeneity among the 20 studies was relatively large ($I^2 = 99.9\%$, $P < 0.01$),

According to the result of the random-effects model, we found that the reasons for the heterogeneity may be complex; we believe that further investigation is needed.

No evidence of publication bias among the studies was observed using Begg's tests and Egger's tests (Begg's, $P > |z| = 0.871$; Egger's, $P > |t| = 0.308$; 95% CI: -0.36 to 12).

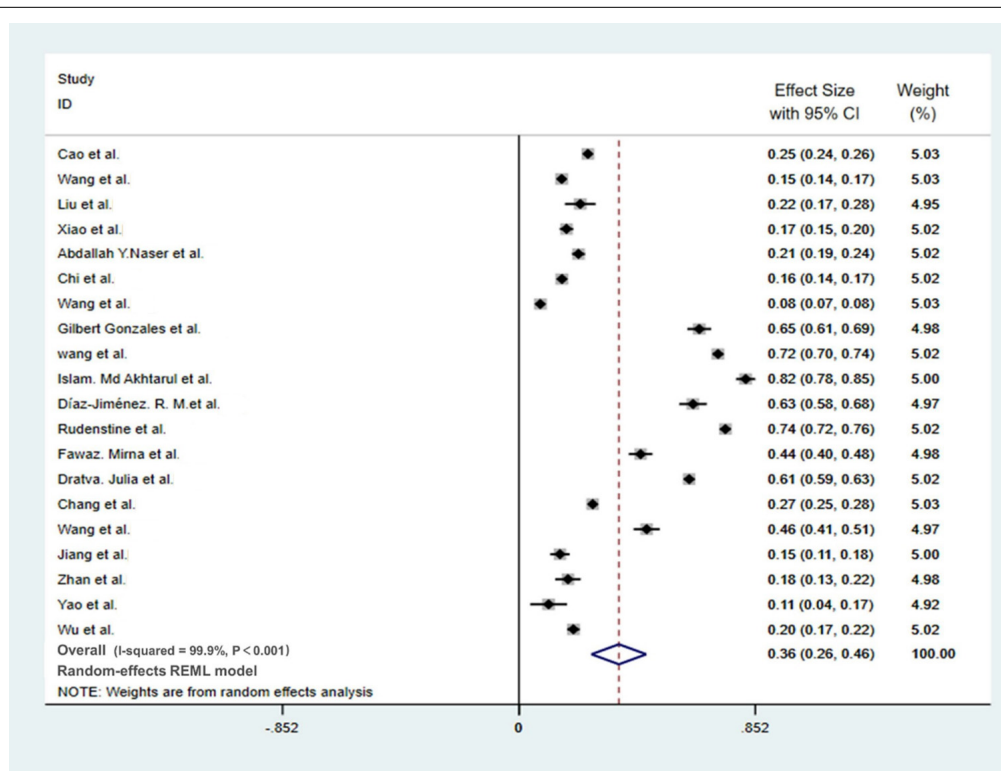
Subgroup Analysis

Subgroup analysis was operated in terms of the survey nation, gender, educational level, major, and survey time. During the outbreak period, the prevalence of anxiety shown by non-Chinese

TABLE 2 | Subgroup analysis of depression in college students during the COVID-19 pandemic.

Subgroup	Researches (Num)	Heterogeneity		Model	Meta-analysis
		I-square	P		Effect Size (95% CI)
Survey nation					
China nations	10	98.8%	<0.05	REM	0.26 (0.21–0.30)
Non-China nations	8	99.5%	<0.05	REM	0.60 (0.46–0.74)
Gender					
Male	5	72.6%	<0.05	REM	0.22 (0.17–0.28)
Female	5	84.3%	<0.05	REM	0.25 (0.19–0.32)
Educational level					
Undergraduate	7	99.1%	<0.05	REM	0.23 (0.16–0.30)
Postgraduate	5	96.4%	<0.05	REM	0.22 (0.14–0.31)
Major					
Medicine	5	87.6%	<0.05	REM	0.24 (0.19–0.30)
Non- Medicine	2	78.4%	<0.05	REM	0.18 (0.06–0.31)
Survey Date					
By Mar. 1st	8	98.7%	<0.05	REM	0.21 (0.16–0.25)
After Mar. 1st	10	99.5%	<0.05	REM	0.54 (0.40–0.67)

REM, random-effects model.

**FIGURE 3 |** Meta-analysis of anxiety in college students during the COVID-19 pandemic.

college students (60%, 95% CI: 46–74%) was significantly higher compared with that of Chinese college students (20%, 95% CI: 14–26%), and the prevalence of anxiety of the subgroups who completed the survey after March 1 (37%, 95% CI: 26–48%) was higher than that of the subgroups who completed the survey before March 1 (19%, 95% CI: 13–25%). However, there are no

significant differences among the gender subgroups, educational level subgroups, and major subgroups (Table 3).

Sensitivity Analysis

For the purpose of verifying the robustness of the meta-analysis, we conducted a sensitivity analysis by excluding the articles one

TABLE 3 | Subgroup analysis of anxiety in college students during the COVID-19 pandemic.

Subgroup	Researches (Num)	Heterogeneity		Model	Meta-analysis
		I-square	P		effect size (95% CI)
Survey nation					
China nations	12	99.5%	<0.05	REM	0.20 (0.14–0.26)
Non-China nations	8	99.6%	<0.05	REM	0.60 (0.46–0.74)
Gender					
Male	7	99.2%	<0.05	REM	0.27 (0.12–0.42)
Female	8	99.1%	<0.05	REM	0.33 (0.22–0.43)
Educational level					
Undergraduate	10	99.6%	<0.05	REM	0.23 (0.16–0.30)
Postgraduate	5	96.3%	<0.05	REM	0.17 (0.09–0.25)
Major					
Medicine	5	18.9%	0.294	REM	0.17 (0.15–0.19)
Non- Medicine	3	46.9%	0.152	REM	0.16 (0.12–0.20)
Survey time					
By Mar. 1st	9	99.4%	<0.05	REM	0.19 (0.13–0.25)
After Mar. 1st	8	99.9	<0.05	REM	0.37 (0.26–0.48)

REM, random-effects model.

by one in each step and then obtained the meta-analysis results of the remaining studies. During sensitivity analysis, the included studies were excluded one by one; we got almost the same results, which show that the studies on depression and anxiety both had good stability (**Table 4**).

Publication Bias

The funnel plot was applied to evaluate the publication bias of depression and anxiety research, respectively. Funnel plots assessing the risk of publication bias showed symmetric distribution, indicating a lack of publication bias (**Figure 4**).

Other Mental Health Issues or Symptoms

In addition to depression and anxiety, another 12 types of psychological issues or symptoms (including stress, posttraumatic stress disorder, suicidal tendencies, fear, panic, posttraumatic growth, psychological distress, regulatory emotional self-efficacy, somatic symptoms, tiredness, sleeplessness, and self-perceived mental health) were reported (**Table 5**). Concerning the investigations of the stress of college students during the pandemic, 3 studies were involved, and a total of 305,244 participants were surveyed, of which 56,239 participants showed positive results. In the 3 studies on college students, stress disorder during the period of the outbreak (308,690 students surveyed); there were 99,961 students showing positive and 23,299 interviewed participants reporting that they had or currently have “suicidal” thoughts (2 studies, 325,520 students were interviewed).

DISCUSSION

The public was not psychologically prepared for the pandemic due to the nature of suddenness, severity, and negativity of the emergency. In order to control the spread of the pandemic,

many restricted local prevention policies (restricted going out, restricted visiting relatives and friends, restricted gatherings, etc.) had been taken although they affected the normal lives of the people (Barnali and Tathagata, 2020; Quadros et al., 2020; Yanmengqian et al., 2020). With a steadily increasing number of confirmed cases and deaths of COVID-19, the infections of relatives around them, the spread of rumors, and the long-term social isolation have caused the public to experience different degrees of physical and psychological problems. This study found that depression and anxiety were the most reported psychological problems in the research on the impact of new coronary pneumonia on the mental health of college students. Meanwhile, excessive stress, posttraumatic stress disorder, psychological panic, posttraumatic growth disorder, psychological distress, emotional self-management disorder, suicidal tendency, insomnia, somatization, fatigue, and inadequate mental health status were considered to be potential mental health risks for college students.

This study showed that during the COVID-19 pandemic, the prevalence of depression among college students was 39% [95% CI (27%, 51%)]. According to WHO statistics, the global prevalence of depression in 2015 was 4.4% (World Health Organization, 2017). In addition, Global Burden of Disease Study 2017 (GBD-2017) (Kyu et al., 2018) revealed that there are significant differences in the prevalence of depression in different nations and different ethnic characteristics, but the prevalence of depression in most countries is less than 35%. College students are a special group that should not be ignored during the COVID-19 pandemic, whose mental health is affected by many factors; therefore, the prevalence of depressive symptoms in college students is not only higher than that in other groups but also has individual differences (Happell et al., 2020). The prevalence of depression in college students during the pandemic was analyzed by the regional subgroup, the gender subgroup, the educational level subgroup, the major subgroup, and the survey

TABLE 4 | Sensitivity analysis.

Excluding	Effect size	95% CI
Depression		
Liu et al.	0.39	0.27–0.51
Enkeleint A. Mechili et al.	0.38	0.26–0.50
Xiao et al.	0.40	0.28–0.52
Abdallah Y. Naser et al.	0.39	0.26–0.52
Chi et al.	0.40	0.27–0.53
Tang et al.	0.41	0.27–0.55
Wang et al.	0.40	0.26–0.54
Gilbert Gonzales et al.	0.38	0.26–0.50
Zhao et al.	0.38	0.26–0.50
Wang et al.	0.37	0.27–0.47
Islam. MdAkhtarul et a	0.36	0.24–0.48
Rudenstine et al	0.36	0.26–0.36
Fawaz. Mirna et al.	0.40	0.26–0.54
Chang et al.	0.40	0.27–0.53
Wang et al.	0.40	0.27–0.53
Jiang et al.	0.40	0.27–0.53
Zhan et al.	0.40	0.27–0.53
Yao et al.	0.40	0.28–0.52
Overall	0.39	0.27–0.51
Anxiety		
Cao et al.	0.36	0.25–0.47
Wang et al.	0.37	0.26–0.48
Liu et al.	0.36	0.26–0.46
Xiao et al.	0.37	0.27–0.47
Abdallah Y. Naser et al.	0.37	0.27–0.47
Chi et al.	0.37	0.26–0.48
Wang et al.	0.37	0.27–0.47
Gilbert Gonzales et al.	0.34	0.24–0.44
wang et al.	0.34	0.25–0.43
Islam. MdAkhtarul	0.33	0.24–0.42
Díaz-Jiménez. R. M.	0.34	0.24–0.44
Rudenstine et a	0.34	0.25–0.43
Fawaz. Mirna et al	0.36	0.25–0.47
Dratva. Julia et al	0.35	0.25–0.45
Chang et al.	0.36	0.25–0.47
Wang et al.	0.36	0.26–0.46
Jiang et al.	0.35	0.25–0.45
Zhan et al.	0.37	0.27–0.47
Yao et al.	0.37	0.27–0.47
Wu et al	0.37	0.27–0.47
Overall	0.36	0.26–0.46

date. The results showed that the prevalence of depression in college students during the pandemic was similar among the gender subgroup, the educational level subgroup, and the major subgroups, but the difference was found in the subgroup analysis of the survey areas and the survey date; that is, the prevalence of depression in non-Chinese areas (60%) was greater than in China (26%), and the rate of depression completed after March 1 (54%) was greater than that of those completed before March 1 (21%). A meta-analysis of 39 studies from 1997 to 2015 showed that the pooled prevalence of depression in Chinese college students for

depression reached 23.8% (Lei et al., 2016), which was lower than that reported in our study (26%). In the study of the occurrence of depressive symptoms in college students in non-Chinese nations, studies have shown that the prevalence of depressive symptoms in college students in non-Chinese nations is 49.7%, while the prevalence of depressive disorders is 16.7% (Newhart et al., 2019). In 2016, a mental health survey of 67,308 undergraduate students in the United States conducted by the American University Health Association showed that 13.4% of the students were depressed (Liu et al., 2019), and, meanwhile, the prevalence of depression in non-Chinese college students in this study (60%) was higher than 49.7 or 13.4%. Although there are differences in the prevalence of depression among students in different nations, the results showed that the prevalence of depression among college students has increased during the pandemic.

Concerning anxiety, the results of this study show that the prevalence of it among college students during the pandemic was 36% [95% CI (26%, 46%)], which was higher than the global prevalence of anxiety (3.6%) in 2015 according to WHO statistics (World Health Organization, 2017). Anxiety and depression have a high comorbidity rate and have some common symptoms, including fatigue, irritability, difficulty concentrating, and sleep disorders, suggesting that the two have some common psychopathological bases (Kalmbach et al., 2017; Tang et al., 2018). A survey involving 7,402,045 people across 24 countries found that 45.7% of depression patients are also suffering from anxiety disorder (Kessler et al., 2015); 60–70% of patients with generalized anxiety disorder have had an episode of depression in their lifetime (Adams et al., 2016). As a result, depression and anxiety not only bring more pain to the patient but also make the treatment more difficult. Similarly (Rebar et al., 2017), the degree of anxiety differs greatly based on nations and individuals (Suran et al., 2016). The subgroup analysis of this study shows that the prevalence of anxiety among college students during the pandemic has relatively smaller differences in gender subgroups, educational level subgroups, and major subgroups, while it has large differences in regional subgroups and survey date subgroups. The prevalence of anxiety among college students in non-China regions was (60%) higher than that of students in China (20%), and the prevalence of anxiety after March 1 (37%) was higher than that of students surveyed before March 1 (19%). Anxiety prevalence was higher in different regions and at different survey dates during the pandemic than during normal periods (Tang et al., 2018; Aljawawdeh and Alghazo, 2019; Melissa et al., 2019; Saba et al., 2020).

In public health emergencies, the public psychological reactions related to the epidemic situation are often influenced by region and temporal distributions. A recent study has shown that the prevalence of mental disorders in Chinese public was relatively low in the early stages of the COVID-19 pandemic. In addition, the mental state of people was affected by geographical and temporal distributions (Ren et al., 2020). The results of this study showed that there were obvious regional differences and survey date differences in the mental health status of college students during the pandemic. In China, except for the staff fighting against the pandemic, almost everyone experienced self-isolation, which meant that people had to stay at home due to

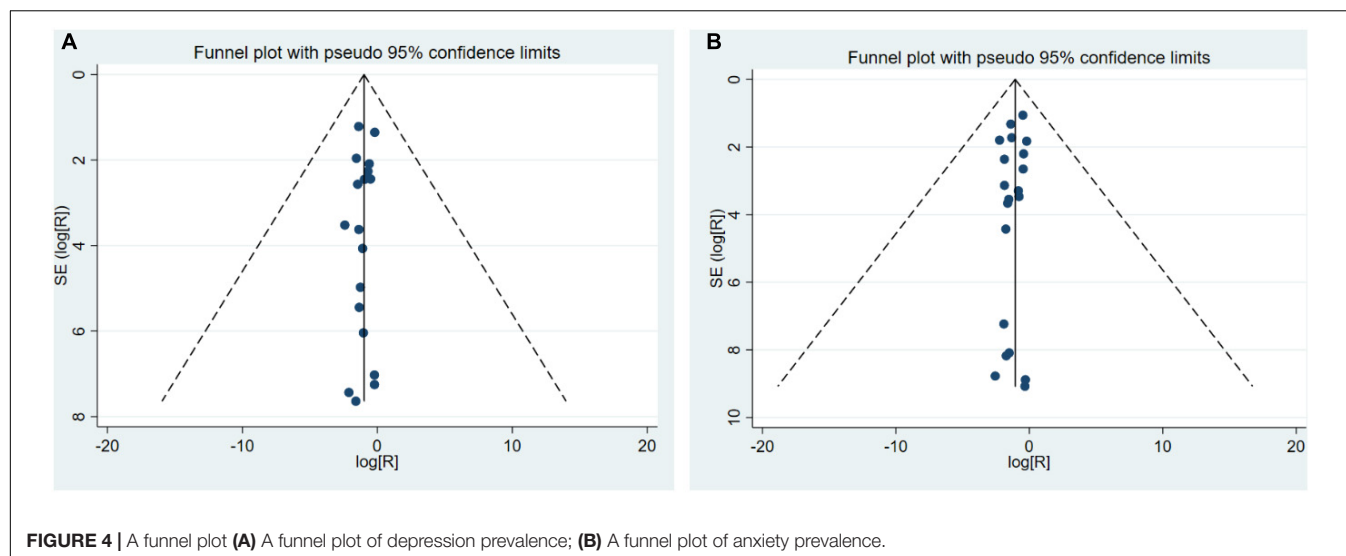


TABLE 5 | A list of investigation of psychological problems.

Psychological problems	Researches	Participants	Patients	Analytical method	Effect size
Depression	19	386,806	37,714	¹ Meta-analysis	39% (95% CI: 27–51%)
Anxiety	21	74,203	13,746	² Meta-analysis	36% (95% CI: 26–46%)
Stress	4	305,244	56,239	NMA	6.39–21.65%
PTSD	3	308,690	99,961	NMA	2.70–32.74%
Suicide	2	325,520	23,299	NMA	7.09–18.02%
Fear	2	3,981	452	NMA	12.52%
Panic	1	3,611	737	NMA	20.41%
PTG	1	2,038	1,363	NMA	66.88%
PD	1	477	290	NMA	60.80%
RESE	1	323,489	NM	NMA	³ None
Somatic Symptom	1	84	9	NMA	10.71%
Tired	1	3,611	731	NMA	20.24%
Sleeplessness	1	304,167	9,752	NMA	3.21%
Self-perceived Mental Health	1	304,167	1,565	NMA	0.51%

¹Meta-analysis was shown in Figure 2.

²Meta-analysis was shown in Figure 3.

³There was no effective effector.

NM, not mentioned; NMA, no merge analysis; PTSD, posttraumatic stress disorder; PTG, posttraumatic growth; PD, psychological distress; RESE, regulatory emotional self-efficacy.

strict lockdown and restriction policy. Strict quarantine policy allowed the pandemic in China to be well controlled, which increased the confidence of Chinese people in defeating the new crown pneumonia pandemic, thereby reducing the occurrence of psychological problems (Hien et al., 2020; Pan et al., 2020). Countries outside of China were relatively late in the outbreak of the pandemic, and insufficient attention was paid to the prevention of the pandemic at the beginning of the period. This increased the psychological pressure of local students, which would then cause a series of mental health problems. In addition, there are differences in the applicable populations of the mental health survey tools used in the research, or regional differences in the prevalence standards of mental health problems, which will increase the regional differences in mental health problems. In addition, as the epidemic spreads around the world, all

parts of the world are caught in panic, which has increased the psychological burden of college students and increased the prevalence of their psychological problems. Studies have shown that, when people face disasters, different experience times can have different psychological effects; and long-term “disaster” environments increase the risk of psychological problems with the epidemic, and the prevalence of psychological problems among college students has gradually increased.

This study showed that compared with the male students, the prevalence of depression and anxiety in the female students during the epidemic was higher, which may be caused by the different physiological structures and functions between the male and female students. Compared with the male students, the female students were less courageous, more dependent on others, and have stronger stress responses when confronted

with emergencies (Patel et al., 2007; Hyde et al., 2008; Rosenfield and Mouzon, 2013; Haugen et al., 2014). Subgroup analysis showed that medical students were more fragile than non-medical students to suffer anxiety and depression during the pandemic, which may be associated with their special major. There was a study reporting that the level of mental health status such as depression and anxiety among the university healthcare workers was steadily prevalent even after the lockdown period was lifted (Woon et al., 2020). Compared with workers in other professions, medical workers endured higher levels of burnout (Prosser et al., 1996; Tang et al., 2019). Burnout is significantly related to depression and anxiety and has a negative impact on the health of healthcare workers (Foster et al., 2019; Payne et al., 2020). However, few existing psychological studies have evaluated the mental health status of college students of different majors. Therefore, the results of this subgroup analysis need to be confirmed by further studies.

In the face of danger and strong stressor stimulation, psychological health of an individual is threatened and accompanied by panic behaviors. College students lack the ability and experience to self-regulate and self-rescue. It is inevitable that they are all under stress, which causes emotional pain and psychological fluctuations in some college students. Different students have different mental states and behavioral responses (depression, irritability, anxiety, insomnia, disappointment, and doubts, and some of them even show excessive worrying about health, repeated disinfection, repeated handwashing, drug abuse, etc.), and the state of being isolated at home makes students feel distrustful of their surroundings so that they have different levels of psychological problems such as interpersonal sensitivity, hostility, and paranoia (Goebel and Mills, 2000; Fergusson et al., 2014; Kouichi et al., 2019). College students also have to face many problems with their studies, graduations, and employment, and are a high-risk group of psychological problems (Andrews et al., 2018). During the COVID-19 epidemic, there were some changes in the mental status of college students, including the occurrence of some psychological problems (Lei et al., 2020). This study summarizes the negative changes in the mental state of college students during COVID-19 and indicated the mental health problems and potential mental health risks college students had the most during the COVID-19 period. This synergy was conducive to the spiritual comfort and mental health maintenance of college students during the pandemic prevention period and provided directions for psychological counseling for students after the social isolation or local control.

The COVID-19 pneumonia is highly contagious (Andrews et al., 2018), and its transmission route is respiratory-based. The homology with severe acute respiratory syndrome (SARS) virus is more than 85%, and the characteristics of the disease are unknown. It causes great psychological stresses to the population (Jia et al., 2020; Zhang, 2020). Therefore, during the special major public health crisis of COVID-19, in addition to COVID-19 preventions, more attention should be paid to the mental health of college students. Based on the results of this research, schools should pay attention to the psychological conditions of college students during and after the COVID-19 pandemic

situation, should pay attention to improving the psychological qualities of college students, should alleviate the helplessness of students, and should promptly target college students with psychological disorders. In addition, some online psychotherapy methods such as telemedicine and self-help mindfulness therapy may be considered to alleviate the mental health problems of college students during the COVID-19 pandemic. College students may gain benefits from online telemedicine to improve wellness and boost coping strategy such as empathic listening, psychoeducation, or supportive therapy (Hatta, 2020). Some studies have shown that self-help mindfulness therapy can improve psychological distress, positive mental health, and academic distress in college students, as well as what was expected to increase resilience and reduce depression anxiety and stress in other adults who need psychotherapy (Javedani et al., 2017; Levin et al., 2020). In addition, the society, colleges and universities, families, and students should take effective actions in time to prevent the occurrence of adverse psychology of college students during the COVID-19 pandemic. The actions include (1) complete mental health service, such as the television media publicity of mental health care or online telemedicine service; (2) timely and accurate disclosure of epidemic information to avoid public panic; (3) remote management of students to master the health dynamics and mental health status; and (4) increase of the communication with the family to encourage one another.

In order to create a mentally healthy and friendly environment for these college students, university departments and local governments should provide some professional counseling and supportive projects (Bao et al., 2020). In addition, due to the limitations of the number and quality of included studies, the above conclusions need to be verified by more high-quality studies. More research should be conducted to determine the symptoms of depression in other countries during the COVID-19 pandemic in the coming months to provide more general data. The results of this study can provide basic information for the development of mental health plans for college students and other groups.

LIMITATIONS

One of the limitations of this study is the differences in the assessment tools and the differences in the evaluation criterion the researchers selected according to the study location. Second, most studies were observational studies, and the patients were not randomly chosen. In addition, our ability to assess the qualities of study was limited by the fact that many studies failed to offer detailed information of selected subjects or valid data on important factors. Therefore, selection biases and confounding seem to be inevitable. Third, the heterogeneity of this study was obvious, and the great statistical heterogeneity is common in the single-rate meta-analysis because there are too many confounding factors that affect the results of the study, which needs to be analyzed further. Finally, because the sample size of

included literature is not large enough, the inability to perform meta-regression is another limitation of the study.

CONCLUSION

During the COVID-19 pandemic, college students had a variety of psychological problems, of which depression and anxiety were the main psychological problems. The prevalence of depression and anxiety reached 39% and 36%, respectively. The mental health problems in college students were influenced by nations and survey date. The prevalence of depression and anxiety in non-Chinese college students were 60% and 60%; in contrast, 26% and 20% in Chinese college students. The survey conducted after March 1st reported that depression and anxiety were 54% and 37% while survey before March 1st showed that they were 21% and 19%. In order to create a psychologically healthy environment for these college students, university departments, and local, and central governments should provide some professional depression counseling and supportive programs.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

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AUTHOR CONTRIBUTIONS

YL and HH: study concept and design. YL, YW, and NH: data acquisition, analysis, and interpretation. YL, HH, and AW: preparation of manuscript and figures. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.669119/full#supplementary-material>

Supplementary Figure 1 | Based on the JBI checklist quality evaluation chart.

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Infectious Disease Outbreak and Post-Traumatic Stress Symptoms: A Systematic Review and Meta-Analysis

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Background: As one of the most widely researched consequence of traumatic events, the prevalence of post-traumatic stress symptoms (PTSS) among people exposed to the trauma resulting from infectious disease outbreak varies greatly across studies. This review aimed at examining the pooled prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak, summarizing the possible causes of the inconsistencies in the current estimates.

Methods: Systematic searches of databases were conducted for literature published on PubMed, EMBASE, Web of Science, the Cochrane Library, PsycArticles, and Chinese National Knowledge Infrastructure (CNKI) until 14 October 2020. Statistical analyses were performed using R software (registration number: CRD42020182366).

Results: About 106 studies were included. The results showed that the pooled prevalence of PTSS among the general population exposed to the trauma resulting from infectious disease outbreak was 24.20% (95% CI: 18.54–30.53%), the pooled prevalence of PTSS among healthcare workers was 24.35% (95% CI: 18.38–34.51%), the pooled prevalence of PTSS among patients with infectious disease was 28.83% (95% CI: 18.53–44.86%), and the pooled prevalence of PTSS among suspected cases of infectious disease was 25.04% (95% CI: 18.05–34.73%). Mortality rate was a significant contributor to heterogeneity.

Conclusions: Evidence suggests that PTSS were very common among people exposed to the trauma resulting from infectious disease outbreak. Health policymakers should consider both short-term and long-term preventive strategy of PTSS.

Keywords: infectious disease outbreak, systematic review, meta-analysis, COVID-19, post-traumatic stress symptoms

BACKGROUND

Infectious disease poses a serious threat to public health. Over the past two decades, novel viruses continuing to emerge, the number of reported outbreaks of highly pathogenic or highly transmitted infectious diseases has increased, such as severe acute respiratory syndrome (SARS) in 2003, 2009 influenza A (H1N1) in 2009, and Ebola virus disease (Ebola) in 2014

(Houlihan and Whitworth, 2019). At the end of 2019, a new type of infectious disease emerged, which is known as coronavirus disease 2019 (COVID-19). As of December 10, 2020, over 66.2 million cases of COVID-19 and about 1.5 million deaths have been reported to the WHO (WHO, 2020). The outbreak of infectious disease can spread rapidly, causing enormous losses to individual health, national economy, and social well-being (Steele et al., 2016).

The psychological effects of infectious disease outbreak can be deleterious and far-reaching. Previous research indicates high prevalence rates of clinically relevant post-traumatic stress symptoms (PTSS) among people exposed to the trauma resulting from infectious disease outbreak (such as the outbreak of SARS; Gardner and Moallem, 2015). Patients with post-traumatic stress disorder (PTSD)-related symptoms live under the shadow of past trauma. According to the Diagnostic and Statistics of Mental Disorders, the fifth edition (DSM-5), the clinical features of PTSD include persistent intrusion symptoms, persistent avoidance of stimuli, negative alterations in cognition or mood, and marked alterations in arousal and reactivity, all of which are related to traumatic events (Association, 2013). PTSS could cause clinically significant distress or impairment in social, occupational, or other important areas of functioning (Greene et al., 2016). When an infectious disease breaks out, people may experience many types of psychological trauma, such as directly suffering from the symptoms and traumatic treatment, witness of suffering, and struggling and dying of patients (Fiorillo and Gorwood, 2020). Additionally, individuals may experience the fear of realistic or unrealistic of infection, social isolation, exclusion, and stigmatization, as patients, care and help providers, or even the general public (Kisely et al., 2020; Morganstein and Ursano, 2020). As one of the most widely researched consequence of traumatic events, the prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak varies greatly across studies (Lancee et al., 2008; Jung et al., 2020). In order to provide more reliable prevention, it is necessary to determine a more accurate estimation of the prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak and to explore the possible causes of the inconsistencies in the current estimates.

Currently, control of the epidemic of COVID-19 is still the dominant task of the whole world, millions of people are scared and even panic of the possible loss of health, life, and wealth (Dutheil et al., 2020). A few epidemic studies reported that experience and witness of the suffering related to COVID-19 resulted in a high prevalence of PTSD-related symptoms (Kisely et al., 2020; Rogers et al., 2020). Although it is too early to predict how many people worldwide will be infected with the virus, it is believed that the numbers of case and death will continue to increase in the following months. Some psychologists draw attention toward PTSD as the second tsunami

of the COVID-19 pandemic (Dutheil et al., 2020). For taking effective measures to reduce the psychological sequelae caused by COVID-19 across the world, understanding how infectious disease outbreak cause PTSD and who might be vulnerable are essential. This review aimed at examining the pooled prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak (including infectious diseases over the past 20 years and COVID-19), summarizing the possible causes of the inconsistencies in the current estimates, and examining potentially vulnerable populations, try to provide a reference for COVID-19 and possible outbreak of infectious diseases in the future.

MATERIALS AND METHODS

This review was reported in accordance with the PRISMA guideline and the Meta-analyses Of Observational Studies in Epidemiology (MOOSE) guidelines (Stroup et al., 2000; Moher et al., 2009). The protocol of this review is registered in the International Prospective Register of Systematic Reviews (registration number: CRD42020182366). See **Supplementary Material** for the details.

Search Strategy

PubMed, EMBASE, Web of Science, the Cochrane Library, PsycArticle, and Chinese National Knowledge Infrastructure (CNKI) were independently searched by two reviewers (DQ and YLL), with no restrictions on date or language of publication up until 25 April 2020, and an update search was conducted on 14 October 2020. The following search terms were used: “Infectious disease” (including “infection,” “infectious,” “infectious disease,” “public health emergency,” “public health event,” “SARS,” “Severe Acute Respiratory Syndrome,” “H1N1,” “flu,” “influenza,” “Ebola,” “MERS,” “Middle East Respiratory Syndrome Coronavirus,” “coronavirus,” and “COVID-19”); “Post-traumatic stress disorder” (including “Posttraumatic stress disorder,” “posttraumatic syndrome,” “PTSD,” “stress disorder,” “post-traumatic,” and “post traumatic syndrome”). See **Supplementary Table 1** for a full search strategy.

Study Selection

Studies were included if they meet the following criteria: (1) the study was observational study; (2) information about the prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak; (3) the full article was written in English or Chinese; and (4) these outbreaks were SARS, H1N1, H7N9, MERS, Ebola virus disease, Zika virus disease, and COVID-19. Studies were excluded if: (1) the report was a review, comments, meta-analysis, or protocol; (2) the participants with comorbid symptoms or chronic disease (such as mental illness, cancer, etc.); and (3) the report was duplicate results.

Data Extraction

Two reviewers (DQ and YLL) checked the titles, abstracts, and full texts of the initial search results independently. Data were extracted on first author, year of publication, country or area, type of disease, population, survey period, sample size, response

Abbreviations: COVID-19, coronavirus disease 2019; SARS, severe acute respiratory syndrome; MERS-CoV, Middle East respiratory syndrome; Ebola, Ebola virus disease; PTSD, post-traumatic stress disorder; DSM-5, Diagnostic and Statistics of Mental Disorders, the fifth edition; H1N1, 2009 influenza A(H1N1); H7N9, H7N9 avian influenza.

rate, percentage of male participants, average age of participants, instruments used to identify PTSS, prevalence of PTSS, and quality score of the included studies. Any discrepancies that emerged in these procedures were discussed and resolved by involving a third reviewer (SYX).

Quality Assessment

Two independent reviewers (JH and FYOY) used the established guidelines, the Loney criteria, to evaluate the methodological quality of the included studies, which has been widely used to evaluate observational studies (Loney et al., 1998; Sanderson et al., 2007). The included papers were scored according to eight criteria, such as definition of participants, study design, sampling method, response rate, sample size, and appropriateness of measurement and analysis. The scores range from 0 to 8, with a score of 0–3 as low quality, 4–6 as moderate, and 7–8 as high (Qiu et al., 2020). See **Supplementary Table 3** for details on the quality assessment.

Statistical Analyses

When data were available for three or more studies, the prevalence was combined. When there were 10 or more studies, the quantitative subgroup analysis was conducted. All the statistical analyses were performed using the “meta” (4.12-0) and “metafor” package (2.4-0) of R version 4.0.0. Between-study heterogeneity was evaluated by Cochran’s Q -test and quantified by the I^2 statistic, with values 50% or more indicating possible heterogeneity (Higgins et al., 2003; Ades et al., 2005). The pooled prevalence of PTSS was combined using the Logit transformation method or Log transformation method by a random effects model if significant heterogeneity was observed across studies (when $p < 0.05$, $I^2 > 50\%$). If more than one dataset was reported for the same group of participants, the outcomes that were assessed at the baseline were used. In order to compare the prevalence from different studies, the subgroup meta-analysis was conducted. Because the subgroup analyses should be interpreted with caution (Jike et al., 2018), we planned *a priori* to limit our subgroup analyses to a small number of baseline characteristics including area, sample size, type of disease, mortality rate of disease, survey time after the outbreak, gender, age, assessment tool, and quality score. The difference between subgroups was examined using the Cochran’s Q chi-square tests. Mixed-model meta-regression analyses were performed by using the Freeman–Tukey double arcsine method to explore potential moderators on the heterogeneity. Publication bias was investigated by Egger’s test. To evaluate the consistency of the results, sensitivity analysis was performed by removing each study individually. All the statistical tests were two-sided, with a significance threshold of $p < 0.05$.

RESULTS

Literature Search

As shown in **Figure 1**, a total of 6,612 references were identified. Among them, 2,953 duplicates were removed. By screening titles and abstracts, 3,019 irrelevant articles were excluded. A total of 288 potentially relevant full-text articles were independently assessed based on the selection criteria. Further, 182 studies were

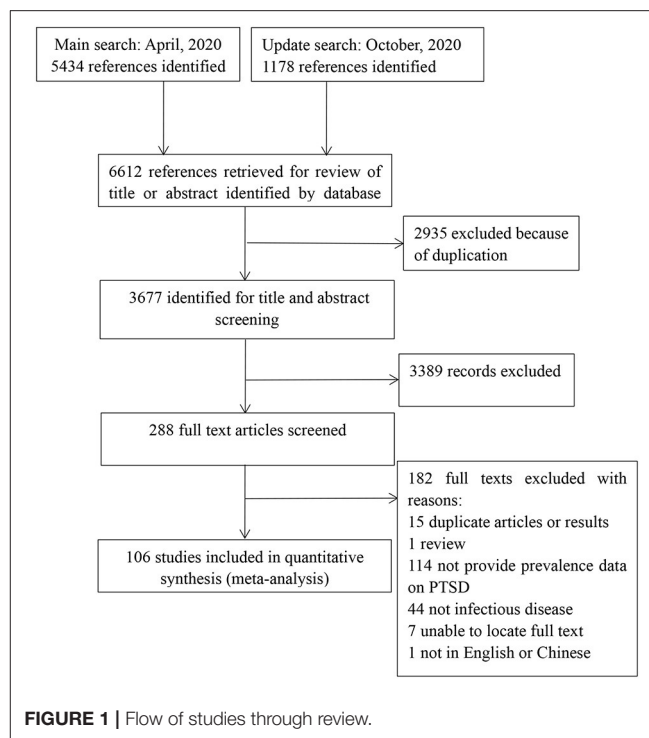


FIGURE 1 | Flow of studies through review.

excluded because of the following reasons: duplicate articles or results ($n = 15$), review ($n = 1$), did not provide data on PTSS ($n = 114$), not infectious disease ($n = 44$), unable to locate full text ($n = 7$), and not in English or Chinese ($n = 1$). Finally, 106 eligible studies were included in this review. See **Figure 1** for the details.

Study Characteristics

One hundred and six papers met the inclusion criteria. Of the included studies, 78 were of COVID-19 (Alkhamees et al., 2020; Barbato and Thomas, 2020; Blekas et al., 2020; Bo et al., 2020; Caillet et al., 2020; Cai X. et al., 2020; Cai Z. et al., 2020; Cardel et al., 2020; Castelli et al., 2020; Chang and Park, 2020; Chen B. et al., 2020; Chen et al., 2020; Chew et al., 2020; Chi et al., 2020; Civantos et al., 2020a,b; Cortes-Alvarez et al., 2020; Di Tella et al., 2020; Dobson et al., 2020; El-Zoghby et al., 2020; Fekih-Romdhane et al., 2020; Forte et al., 2020; Giusti et al., 2020; Gonzalez Ramirez et al., 2020; Gonzalez-Sanguino et al., 2020; Guo et al., 2020; Hao et al., 2020; Huang et al., 2020; Karatzias et al., 2020; Lahav, 2020; Lai et al., 2020; Lange et al., 2020; Le et al., 2020; Leng, 2020; Leng et al., 2020; Li, 2020; Liang L. et al., 2020; Liang S. W. et al., 2020; Li et al., 2020a,b; Li G. et al., 2020; Lijun et al., 2020; Liu C. H. et al., 2020; Liu D. et al., 2020; Liu N. et al., 2020; Liu Y. et al., 2020; Li X. C. et al., 2020; Li X. et al., 2020; Luceno-Moreno et al., 2020; Ma et al., 2020; Nie et al., 2020; Qi et al., 2020; Riello et al., 2020; Rodriguez-Rey et al., 2020; Rossi et al., 2020a,b; Seyahi et al., 2020; Sherman et al., 2020; Si et al., 2020; Song et al., 2020; Tan et al., 2020; Tang et al., 2020; Tee et al., 2020; Traunmuller et al., 2020; Varshney et al., 2020; Wang et al., 2020; Wesemann et al., 2020; Xie et al., 2020; Yin et al., 2020; Yuan et al., 2020; Zhang and Ma, 2020a,b; Zhang C. et al., 2020; Zhang et al., 2020; Zhao et al., 2020; Zhou et al., 2020) (Alkhamees

et al., 2020; Barbato and Thomas, 2020; Blekas et al., 2020; Bo et al., 2020; Caillet et al., 2020; Cai X. et al., 2020; Cai Z. et al., 2020; Cardel et al., 2020; Castelli et al., 2020; Chang and Park, 2020; Chen B. et al., 2020; Chen et al., 2020; Chew et al., 2020; Chi et al., 2020; Civantos et al., 2020a,b; Cortes-Alvarez et al., 2020; Di Tella et al., 2020; Dobson et al., 2020; El-Zoghby et al., 2020; Fekih-Romdhane et al., 2020; Forte et al., 2020; Giusti et al., 2020; Gonzalez Ramirez et al., 2020; Gonzalez-Sanguino et al., 2020; Guo et al., 2020; Karatzias et al., 2020; Lahav, 2020; Lange et al., 2020; Le et al., 2020; Leng, 2020; Leng et al., 2020; Li, 2020; Liang S. W. et al., 2020; Li et al., 2020a,b; Li G. et al., 2020; Lijun et al., 2020; Liu C. H. et al., 2020; Liu D. et al., 2020; Liu Y. et al., 2020; Li X. C. et al., 2020; Li X. et al., 2020; Luceno-Moreno et al., 2020; Ma et al., 2020; Nie et al., 2020; Qi et al., 2020; Riello et al., 2020; Rodriguez-Rey et al., 2020; Rossi et al., 2020a,b; Seyahi et al., 2020; Sherman et al., 2020; Si et al., 2020; Song et al., 2020; Tan et al., 2020; Tee et al., 2020; Traunmuller et al., 2020; Varshney et al., 2020; Wesemann et al., 2020; Xie et al., 2020; Yuan et al., 2020; Zhang and Ma, 2020a,b; Zhang C. et al., 2020; Zhang et al., 2020; Zhao et al., 2020; Zhou et al., 2020), two of Middle East Respiratory Syndrome (MERS) (Lee et al., 2018; Jung et al., 2020), one of Ebola virus disease (Jalloh et al., 2018), one of H7N9 (Tang et al., 2017), two of H1N1 (Xu et al., 2011; Luyt et al., 2012), and the remaining 22 of SARS (Chan and Huak, 2004; Fang et al., 2004; Hawryluck et al., 2004; Sin and Huak, 2004; Chen et al., 2005; Tie-ying et al., 2005; Wu et al., 2005, 2009; Yong et al., 2005; Hongsheng et al., 2006; Kwek et al., 2006; Lee et al., 2006; Maunder et al., 2006; Zhongguo et al., 2006; Laiqi et al., 2007; Lin et al., 2007; Su et al., 2007; Lancee et al., 2008; Reynolds et al., 2008; Hong et al., 2009; Mak et al., 2010; Sim et al., 2010). Six papers were in Chinese, and the remainder in English. Of these, 93 were cross-sectional studies, nine were longitudinal designs, and four were case control studies. Most of the included studies were from Asia, such as China, Singapore, and South Korea. See **Table 1** for the details. From the 106 papers, five (4.72%) studies were rated as high quality, 93 (87.73%) were rated as moderate, and eight (7.55%) were rated as low quality. Details of the methodological quality assessments of all 106 studies are showed in **Supplementary Table 3**.

Pooled Prevalence of Post-traumatic Stress Symptoms Among the General Population

There were 51 studies reported the prevalence of PTSS among the general population. The forest plot in **Figure 2** depicts the details. A total of 78,459 people exposed to the trauma resulting from an epidemic of infectious disease were identified in the 51 articles, of which 25,826 were reported with PTSS. The random effects model was used to determine the pooled prevalence ($I^2 = 99.70\%$, $p < 0.001$), the pooled prevalence of PTSS among people exposed to the trauma resulting from infectious disease outbreak was 24.20%, with a 95% CI of 18.54–30.53%.

The details of subgroup analyses are presented in **Table 2**. There were no significant differences in the prevalence of PTSS between age and gender ($Q = 0.08$ and 0.16 , $p > 0.05$). Significant difference in the prevalence of PTSS between different

types of disease was observed, the pooled prevalence of PTSS among people influenced by COVID-19 was higher than that for people influenced by SARS, Ebola and H1N1 (26.75 vs. 16.42 vs. 15.99 vs. 2.03%; $Q = 117.12$, $p < 0.05$). In addition, a higher mortality rate is associated with a lower prevalence of PTSS (24.39 vs. 15.99%; $Q = 8.26$, $p < 0.05$). The pooled prevalence of PTSS among people in the Eastern Mediterranean region was higher than people in the Western Pacific region, the Southeast Asia region, the America region, the European region, and the Africa region (37.74 vs. 33.23 vs. 29.25 vs. 24.00 vs. 20.78 vs. 15.99%; $Q = 114.16$, $p < 0.05$). Furthermore, there were significant differences in the prevalence of PTSS between different survey time after the outbreak; closer survey time to the point of infectious disease outbreak was associated with a higher prevalence of PTSS (25.96 vs. 5.95%; $Q = 7.49$, $p < 0.05$). There were significant differences in the prevalence of PTSS between studies used different assessment tools (24.44 vs. 14.00%; $Q = 12.18$, $p < 0.05$). In addition, significant difference in the prevalence of PTSS between studies with different quality scores was observed, articles with the highest quality scores showed a high prevalence (12.57 vs. 12.41 vs. 25.86%; $Q = 19.00$, $p < 0.05$). A multivariate meta-regression was carried out to explore the origin of heterogeneity accounted for by the variables, such as type of disease and survey time after the outbreak. However, no significant contributor was found. See **Table 5** for the details.

The results of the Egger's test showed that publication bias was not found in this study ($t = -2.425$, $p = 0.208$). When each study was excluded one by one, the recalculated combined results did not change significantly. The pooled prevalence of PTSS ranged from 23.29% (95% CI: 17.91–29.70%) to 25.13% (95% CI: 19.43–31.85%), and the I^2 statistic varied from 99.70% to 99.80%. The results indicate that no individual study significantly influenced the overall results.

Pooled Prevalence of Post-traumatic Stress Symptoms Among the Healthcare Workers

A total of 41 studies reported the prevalence of PTSS among the healthcare workers. The forest plot in **Figure 3** depicts the details. A total of 38,250 healthcare workers exposed to the trauma resulting from an epidemic of infectious disease were identified in the 41 articles, of which 9,071 were reported with PTSS. The random effects model was used to determine the pooled prevalence ($I^2 = 99.40\%$, $p < 0.001$), the pooled prevalence of PTSS among healthcare workers exposed to the trauma resulting from infectious disease outbreak was 24.35%, with a 95% CI of 18.38–31.51%.

The details of subgroup analyses are presented in **Table 3**. There were no significant differences in the prevalence of PTSS between age, gender, mortality rate of disease, sample size, and quality score ($Q = 0.21$, 0.19 , 3.78 , 2.54 , and 4.65 , $p > 0.05$). Significant difference in the prevalence of PTSS between different types of disease was observed, and the pooled prevalence of PTSS among people influenced by MERS was higher than that for the people influenced by COVID-19, H7N9, and SARS (52.77 vs. 29.64 vs. 20.59 vs. 11.80%; $Q = 351.95$, $p < 0.05$). In addition,

TABLE 1 | Study characteristics of the included studies.

References	Study design	Type of disease	Population	Event/N	Survey time after the outbreak (month)	Mean age	Percentage of male participants (%)	Response rate (%)	Assessment tool	Quality score
Chan and Huak (2004) Singapore	CS	SARS	Healthcare workers	127/661	2	/	/	67.0	IES (≥ 30)	6
Fang et al. (2004) China	CS	SARS	SARS patients	28/286	4	33.4 \pm 11.3	47.2	100.0	CIDI	7
Hawryluck et al. (2004) Japan, Canada	CS	SARS	Healthcare workers	35/129	/	/	/	/	IES-R (≥ 20)	4
Sin and Huak (2004) Singapore	CS	SARS	Healthcare workers	6/47	/	/	/	85.4	IES-R (≥ 30)	6
Chen et al. (2005) China	CS	SARS	Healthcare workers	14/128	2	27.2 \pm 3.6	0.0	100.0	IES (≥ 35)	5
Wu et al. (2005) Hong Kong	CS	SARS	SARS patients	11/195	1		43.1	41.0	IES-R	3
Tie-ying et al. (2005) China	CS	SARS	SARS patients /Healthcare workers/ General population	2/4 5/128 2/30	9	/	0.0/ 21.1/33.3	/	PCL-C	4
Yong et al. (2005) China	CS	SARS	SARS patients/ General population	65/114 29/93	3	36.9 \pm 13.9 34.9 \pm 12.3	45.6/ 38.7	100.0/100.0	IES-R (≥ 20)	5
Zhongguo et al. (2006) China	CS	SARS	SARS patients	65/117	3	36.9 \pm 13.9	44.4	100.0	IES-R (≥ 19)	5
Kwek et al. (2006) Singapore	CS	SARS	SARS patients	26/63	3	34.8 \pm 10.4	20.6	40.0	IES (≥ 26)	6
Hongsheng et al. (2006) China	F	SARS	SARS patients	31/67	3	25.3 \pm 8.5	36.8	88.1	CCMD- III	5
Lee et al. (2006) Hong Kong	CS	SARS	General population	13/146	2	/	/	/	IES-R (≥ 26)	4
Maunder et al. (2006) Toronto, Canada	CS	SARS	Healthcare workers	96/769	13	43 \pm 9.5	/	39.0	IES (≥ 26)	5
Lin et al. (2007) Taiwan	CS	SARS	Healthcare workers	16/92	6	34.0	8.7	100.0	DTS-C (≥ 40)	6
Laiqi et al. (2007) China	CS	SARS	Healthcare workers	5/56	12	/	/	/	CCMD- III	3
Su et al. (2007) China	F	SARS	Healthcare workers	29/102	3	43.0 \pm 9.5	0.0	/	DTS-C (≥ 23)	5
Lancee et al. (2008) Japan	CS	SARS	Healthcare workers	2/139	24	45.0	13.0	/	DSM-IV	4
Reynolds et al. (2008) Canada	CS	SARS	General population	148/1057	3	49.2 \pm 15.7	37.0	55.3	IES-R (≥ 20)	7
Wu et al. (2009) China	CS	SARS	Healthcare workers	55/549	36	/	23.5	83.0	IES-R (≥ 20)	7
Hong et al. (2009) China	F	SARS	SARS patients	28/70	2	38.5 \pm 12.3	32.9	81.4	CCMD-III	5
Mak et al. (2010) Hong Kong	F	SARS	SARS patients	23/90	30	41.1 \pm 12.1	37.8	96.8	DSM-IV	6
Sim et al. (2010) Singapore	CS	SARS	General population	107/415	3	36.6 \pm 13.9	59.3	78.0	IES-R	5
Xu et al. (2011) China	CS	H1N1	General population	22/1082	7	20.2	56.3	100.0	PCL-C	4
Luyt et al. (2012) France	CC	H1N1	H1N1 patients	16/40	4	39.0	48.7	100.0	IES (≥ 26)	5

(Continued)

TABLE 1 | Continued

References	Study design	Type of disease	Population	Event/N	Survey time after the outbreak (month)	Mean age	Percentage of male participants (%)	Response rate (%)	Assessment tool	Quality score
Tang et al. (2017) China	CS	H7N9	Healthcare workers	21/102	20	/	33.3	/	PCL-C	3
Jalloh et al. (2018) Sierra Leone	CS	Ebola	General population	570/3,564	12	35.0 ± 15.0	50.0	98.0	IES-6	6
Lee et al. (2018) South Korea	F	MERS	Healthcare workers	183/359	2	/	18.1	19.9	IES-R (≥25)	4
Jung et al. (2020) South Korea	CS	MERS	Healthcare workers	84/147	/	/	0.0	49.0	IES-R (≥18)	5
Castelli et al. (2020) Italy	CS	COVID-19	General population	265/1,321	3	35.1 ± 14.0	31.0%	/	PCL-C	3
Zhang C. et al. (2020) China	CS	COVID-19	High school students	222/1,025	3	15.5 ± 1.8	51.5	87.4	IES-R (≥30)	7
Tee et al. (2020) Philippines	CS	COVID-19	General population	316/1,879	3	34.5 ± 13.4	31.0	75.4	IES-R (≥24)	5
Si et al. (2020) China	CS	COVID-19	Healthcare workers	347/863	1	/	29.3	76.0	IES-6 (≥10)	6
Rodriguez-Rey et al. (2020) Spain	CS	COVID-19	General population	1559/3,055	2	32.1 ± 12.9	29.3	/	IES-R (≥24)	5
Nie et al. (2020) China	CS	COVID-19	Healthcare workers	194/263	0.5	/	23.3	96.3	IES-R (≥20)	5
Liang S. W. et al. (2020) China	CS	COVID-19	College students	1822/4,164	1	/	52.0	/	IES-6	6
Li G. et al. (2020) China	CC	COVID-19	Healthcare workers	1382/4,369	0.5	/	0.0	82.2	IES-R (≥34)	7
Giusti et al. (2020) Italy	CS	COVID-19	Healthcare workers	121/330	3	44.6 ± 13.5	37.4	71.2	IES-6 (≥9)	6
Chen B. et al. (2020) China	CS	COVID-19	Healthcare workers / general population	900/1,493	1	/	55.3	93.3	IES-R (≥20)	6
Caillet et al. (2020) France	F	COVID-19	ICU Caregivers	52/208	3	/	25.0	/	IES-R	5
Barbato and Thomas (2020) Italy	CS	COVID-19	General population	33/148	3	41.4 ± 7.1	24.0	40.0	IES-R (≥33)	5
Alkhamees et al. (2020) Saudi Arabia	CS	COVID-19	General population	467/1,160	3	/	36.1	/	IES-R (≥24)	4
Zhou et al. (2020) China	CC	COVID-19	General population	23/859	1	32.7	0.0	/	IES-R (≥33)	5
Zhao et al. (2020) China	CS	COVID-19	General population	29/515	0.25	/	33.6	/	PCL-5	3
Zhang et al. (2020) Taiwan	CS	COVID-19	General population	377/560	1	25.8 ± 2.7	0.0	93.3	: IES-R (≥26)	4
Yin et al. (2020) China	CS	COVID-19	Healthcare workers	15/371	0.5	35.3 ± 9.4	38.5	/	PCL-5 (≥33)	4
Wesemann et al. (2020) Germany	CS	COVID-19	General population	23/60	2	59.0 ± 17.8	53.7	/	PCL-5	3
Wang et al. (2020) China	F	COVID-19	General population	98/1,210	0.25	/	32.7	92.7	IES-R (≥24)	4
Varshney et al. (2020) India	CS	COVID-19	General population	217/653	3	41.8	75.2	/	IES-R (≥24)	4
Traunmuller et al. (2020) Austria	CS	COVID-19	General population	2,377/4,126	3	38.6 ± 13.3	26.0	/	IES-R (≥24)	5
Tang et al. (2020) China	CS	COVID-19	General population	67/2,485	1	19.8	38.3	69.3	PCL-C (≥38)	6

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TABLE 1 | Continued

References	Study design	Type of disease	Population	Event/N	Survey time after the outbreak (month)	Mean age	Percentage of male participants (%)	Response rate (%)	Assessment tool	Quality score
Tan et al. (2020) China	CS	COVID-19	General population	126/673	1	38.8 ± 7.4	74.4	50.8	IES-R (≥18)	5
Song et al. (2020) China	F	COVID-19	Healthcare workers	1,353/14,825	1	34.0 ± 8.2	35.7	/	PCL-C (≥38)	5
Sherman et al. (2020) America	CS	COVID-19	General population	29/591	4	35.9 ± 8.2	22.5	35.3	PCL-5 (≥33)	6
Seyahi et al. (2020) Germany	CS	COVID-19	Hospital workers/ teachers	219/535 132/917	3	42.0/31.0/35.0	46.0/51.0/39.0	42.8/22.3/41.7	IES-R (≥33)	6
Rossi et al. (2020a) Italy	CS	COVID-19	General population	6,604/18,147	3	38.0 ± 23.0	20.5	/	GPS-PTSS	4
Rossi et al. (2020b) Italy	CS	COVID-19	Healthcare workers	681/1,379	3	39.0 ± 16.0	22.8	49.3	GPS-PTSD	6
Riello et al. (2020) Italy	CS	COVID-19	Healthcare workers	433/1,071	4	/	24.6	53.0	IES-R (≥26)	6
Qi et al. (2020) China	CS	COVID-19	COVID-19 patients	5/41	1	40.1 ± 10.1	41.9	52.4	PCL-5 (≥50)	5
Ma et al. (2020) China	CS	COVID-19	General population	164/728	3	32.9 ± 10.4	29.8	72.8	IES-R (≥26)	6
Luceno-Moreno et al. (2020) Spain	CS	COVID-19	Healthcare workers	160/1,422	3	43.8 ± 10.2	13.6	75.3	IES-R (≥20)	6
Liu N. et al. (2020) China	CS	COVID-19	General population	20/285	0.25	/	45.6	95.0	PCL-5 (≥33)	4
Liu D. et al. (2020) China	CS	COVID-19	COVID-19 patients	84/675	2	/	47.0	90.0	PCL-5	6
Liu C. H. et al. (2020) America	CS	COVID-19	General population	285/898	2	24.5	14.1	/	PCL-C (≥38)	5
Li et al. (2020b) China	F	COVID-19	College students	160/1,442	0.5	/	/	71.2	IES-R (≥24)	7
Li et al. (2020a) China	CS	COVID-19	Healthcare workers	640/3,637	0.5	34.4 ± 9.6	37.0	/	IES-R (≥24)	3
Li X. C. et al. (2020) China	CS	COVID-19	Healthcare workers	220/356	0.25	31.3	13.8	98.6	PCL-5	6
Li X. et al. (2020) China	CS	COVID-19	General population	271/398	3	/	50.5	70.2	IES-7	5
Li (2020) China	CS	COVID-19	General population	744/1,109	3	/	56.0	/	IES-R (≥20)	5
Leng et al. (2020) China	CS	COVID-19	Healthcare workers	5/90	2	/	27.8	83.3	PCL-C (≥50)	6
Le et al. (2020) Vietnam	CS	COVID-19	General population	386/1,423	3	35.0	33.4	/	IES-R (≥24)	5
Lange et al. (2020) France	CS	COVID-19	Healthcare workers	23/135	3	47.9 ± 11.4	40.9	31.1	IES-R	5
Lai et al. (2020) China	CS	COVID-19	Healthcare workers	1,017/1,257	0.25	/	23.3	68.7	IES-R (≥26)	6
Lahav (2020) Israel	CS	COVID-19	General population	112/976	3	44.3 ± 14.2	18.4	77.3	PCL-5 (≥33)	5
Karatzias et al. (2020) Ireland	CS	COVID-19	General population	184/1,041	3	/	48.2	/	ITQ	6
Cardel et al. (2020) America	CS	COVID-19	General population	92/250	3	/	15.0	/	IES-6	4
Guo et al. (2020) China	CS	COVID-19	General population	1,944/2,441	0.25	/	47.6	/	PCL-C-2	5

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TABLE 1 | Continued

References	Study design	Type of disease	Population	Event/N	Survey time after the outbreak (month)	Mean age	Percentage of male participants (%)	Response rate (%)	Assessment tool	Quality score
Gonzalez-Sanguino et al. (2020) Spain	CS	COVID-19	General population	550/3,480	2	/	25.0	/	PCL-C	3
Gonzalez Ramirez et al. (2020) Mexico	CS	COVID-19	General population	1,160/3,932	3	33.0	25.5	/	IES-R	4
Forte et al. (2020) Italy	CS	COVID-19	General population	635/2,291	2	30.0 ± 11.5	25.4	/	IES-R (≥33)	5
Fekih-Romdhane et al. (2020) Tunisia	CS	COVID-19	General population	199/603	3	29.2 ± 10.4	26.0	/	IES-R (≥33)	4
El-Zoghby et al. (2020) Egypt	CS	COVID-19	General population	387/510	3	/	34.1	/	IES-R (≥24)	5
Dobson et al. (2020) Australia	CS	COVID-19	Healthcare workers	93/320	3	/	18.4	/	IES-R (≥26)	6
Di Tella et al. (2020) Italy	CS	COVID-19	Healthcare workers	38/145	2	42.9 ± 11.2	27.6	/	PCL-5	3
Cortes-Alvarez et al. (2020) Mexico	CS	COVID-19	General population	555/1,105	3	/	37.9	/	IES-R	6
Civantos et al. (2020b) America	CS	COVID-19	Healthcare workers	210/349	3	/	60.7	/	IES-R (≥26)	6
Civantos et al. (2020a) Brazil	CS	COVID-19	Healthcare workers	43/163	4	/	74.2	23.3	IES-R (≥26)	5
Chi et al. (2020) China	CS	COVID-19	College students	627/2,038	0.75	20.5 ± 1.9	37.0	81.5	PCL-C	5
Chew et al. (2020) Asia-Pacific region	CS	COVID-19	Healthcare workers	91/1,146	3	31.7 ± 7.8	34.9	88.2	IES-R (≥24)	6
Chang and Park (2020) South Korea	CS	COVID-19	COVID-19 patients	13/64	2	54.7 ± 16.6	43.7	58.7	PCL-5 (≥33)	5
Cai Z. et al. (2020) China	CS	COVID-19	Healthcare workers	184/709	0.25	/	3.5	/	IES-R	5
Cai X. et al. (2020) China	CS	COVID-19	COVID-19 patients	39/126	1	45.7 ± 14.0	47.6	100.0	PTSD-SS	4
Bo et al. (2020) China	CS	COVID-19	COVID-19 patients	689/714	2	50.2 ± 12.9	49.1	97.8	PCL-C (≥50)	5
Blekas et al. (2020) Greek	CS	COVID-19	Healthcare workers	45/270	3	37.6 ± 11.9	21.9	/	PSDI-8	4
Zhang and Ma (2020b) China	CS	COVID-19	General population	20/263	0.25	37.7 ± 14.0	40.3	65.7	IES-R	5
Zhang et al. (2020) China	CS	COVID-19	Suspected COVID-19 patients	13/93	1	38.7 ± 13.6	54.8	100.0	PCL-5 (≥33)	6
Lijun et al. (2020) China	CS	COVID-19	Suspected COVID-19 patients	87/306	2	34.8 ± 8.3	7.8	/	PCL-5 (≥38)	4
Yuan et al. (2020) China	CS	COVID-19	Suspected COVID-19 patients	39/126	1	45.7 ± 14.0	47.6	/	PTSD-SS	4
Xie et al. (2020)	CS	COVID-19	General population	72/333	1	31.0 ± 10.1	39.9	93.8	PCL-C (≥40)	4
Liu Y. et al. (2020) China	CS	COVID-19	General population	453/584	1	35.3 ± 8.9	33.0	90.9	PCL-C (≥40)	6
Liu X. et al. (2020) China	CS	COVID-19	Healthcare workers	20/221	2	/	1.0	99.0	PCL-C (≥40)	6
Leng (2020) China	CS	COVID-19	Healthcare workers	24/72	0.25	/	11.1	92.7	IES-R (≥26)	4

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TABLE 1 | Continued

References	Study design	Type of disease	Population	Event/N	Survey time after the outbreak (month)	Mean age	Percentage of male participants (%)	Response rate (%)	Assessment tool	Quality score
Chen et al. (2020) China	CS	COVID-19	Healthcare workers	23/109	1	/	11.9	/	PCL-C (≥ 38)	6
Hao et al. (2020) China	CC	COVID-19	General population	15/109	1	/	32.9/ 37.6	11.3/81.3	IES-R (≥ 24)	5
Liang L. et al. (2020) China	CS	COVID-19	General population	84/584	0.5	/	38.1	95.7	PCL-C (≥ 38)	6
Li et al. (2020) China	CS	COVID-19	Healthcare workers	104/205	0.75	/	14.6	99.9	PCL-C (≥ 38)	5
Huang et al. (2020) China	CS	COVID-19	Healthcare workers	63/230	0.5	32.6 \pm 6.2	18.7	93.5	PTSD-SS (≥ 55)	6

CS, cross-sectional study; CC, case-control study; F, follow-up study; COVID-19, coronavirus disease 2019; SARS, severe acute respiratory syndrome; MERS-CoV, Middle East respiratory syndrome; Ebola, Ebola virus disease; DSM-5, Diagnostic and Statistics of Mental Disorders, the fifth edition; H1N1, 2009 influenza A(H1N1); H7N9, H7N9 avian influenza; IES-R, The Impact of Event Scale-Revised; IES-6, The Impact of Event Scale-6; PCL-C, The amended self-reported Posttraumatic Stress Disorder (PTSD) Checklist-Civilian Version; PTSD-SS, post-traumatic stress disorder self-rating scale; PCL-5, the post-traumatic stress disorder checklist-5; ITQ, The International Trauma Questionnaire; PSDI-8, post-traumatic stress disorder-8 inventory.

a higher mortality rate is associated with a higher prevalence of PTSS (23.19 vs. 42.04%; $Q = 3.78$, $p < 0.05$). The pooled prevalence of PTSS among people in the European region was higher than people in the America region, the Western Pacific region, and the Southeast Asia region (34.47 vs. 29.10 vs. 21.70 vs. 7.94%; $Q = 70.59$, $p < 0.05$). Furthermore, there were significant differences in the prevalence of PTSS between different survey time after the outbreak, and closer survey time to the point of infectious disease outbreak is associated with a higher prevalence of PTSS (29.04 vs. 10.42%; $Q = 10.09$, $p < 0.05$). There were significant differences in the prevalence of PTSS between studies used different assessment tools (24.87 vs. 8.93%; $Q = 5.84$, $p < 0.05$). A multivariate meta-regression was carried out to explore the origin of heterogeneity accounted for by the variables including type of disease, mortality rate, survey time after the outbreak, age, gender, quality score, and sample size. The results of meta-regression showed that mortality rate of disease was a significant contributor to heterogeneity (accounted for 16.81% of the heterogeneity). See Table 5 for the details.

The results of the Egger's test showed that publication bias was not found in this study ($t = 0.728$, $p = 0.470$). When each study was excluded one by one, the recalculated combined results did not change significantly. The pooled prevalence of PTSS ranged from 23.22% (95% CI: 17.69–29.84%) to 25.62% (95% CI: 19.68–32.62%), and the I^2 statistic varied from 99.20 to 99.40%. The results indicate that no individual study significantly influenced the overall results.

Pooled Prevalence of Post-traumatic Stress Symptoms Among Patients With Infectious Disease

A total of 15 studies reported the prevalence of PTSS among the patients. The forest plot in Figure 4 depicts the details. A total of 2,666 patients with infectious disease were identified in the 15 articles, of which 1,125 were reported with PTSS. The random effects model was used to determine the pooled prevalence ($I^2 =$

98.60%, $p < 0.001$), and the pooled prevalence of PTSS among patients with infectious disease was 28.83%, with a 95% CI of 18.53–44.86%.

The details of subgroup analyses are presented in Table 4. There were no significant differences in the prevalence of PTSS between age, gender, type of disease, region, survey time after outbreak, diagnosis tool, sample size, and quality score ($p > 0.05$). A significant difference in the prevalence of PTSS between studies with different quality scores was observed (5.64 vs. 35.45 vs. 9.79%; $Q = 31.65$, $p < 0.05$). A multivariate meta-regression was carried out to explore the origin of heterogeneity accounted for by the variables, such as type of disease and survey time after the outbreak. However, no significant contributor was found. See Table 5 for the details.

The results of the Egger's test showed that publication bias was not found in this study ($t = -6.138$, $p = 3.553$). When each study was excluded one by one, the recalculated combined results did not change significantly. The pooled prevalence of PTSS ranged from 23.22% (95% CI: 17.69–29.84%) to 32.23% (95% CI: 20.75–50.05%), and the I^2 statistic varied from 95.40 to 98.7%. The results indicate that no individual study significantly influenced the overall results.

Pooled Prevalence of Post-traumatic Stress Symptoms Among the Suspected Cases of Infectious Disease

A total of three studies reported the prevalence of PTSS among the suspected cases. The forest plot in Figure 5 depicts the details. A total of 525 suspected cases of infectious disease exposed to the trauma resulting from an epidemic of infectious disease were identified in the three articles, of which 139 were reported with PTSS. The random effects model was used to determine the pooled prevalence ($I^2 = 74.50\%$, $p < 0.001$), the pooled prevalence of PTSS among suspected cases exposed to the trauma

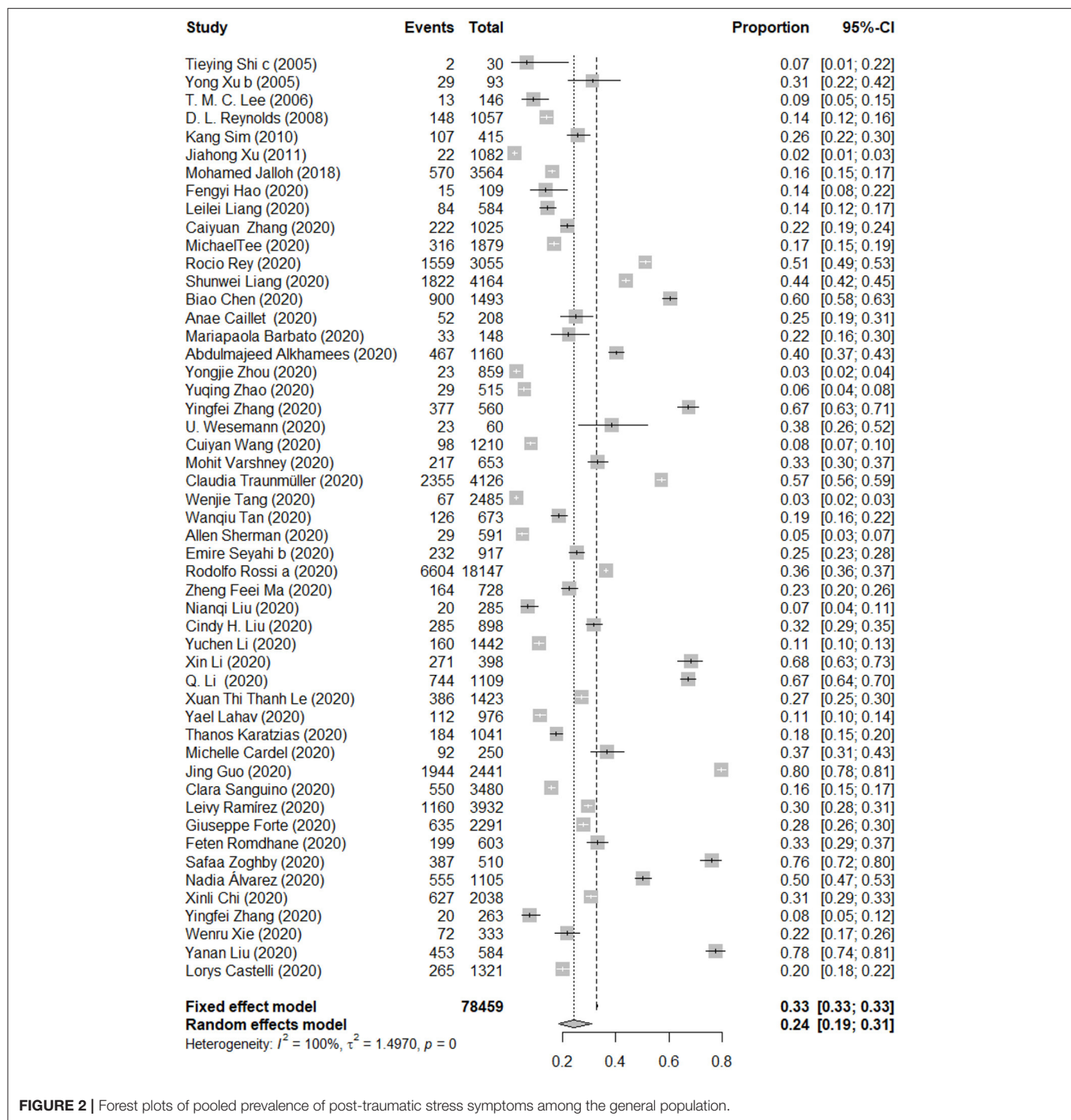


FIGURE 2 | Forest plots of pooled prevalence of post-traumatic stress symptoms among the general population.

resulting from infectious disease outbreak was 25.04%, with a 95% CI of 18.05–34.73%.

DISCUSSION

Key Findings

This review has highlighted the importance of considering the psychological impacts of people exposed to the trauma resulting

from infectious disease outbreak. The results showed that the pooled prevalence of PTSS among the general population was 24.20% (95% CI: 18.54–30.53%), the pooled prevalence of PTSS among the healthcare workers was 24.35% (95% CI: 18.38–31.51%), the pooled prevalence of PTSS among patients with infectious disease was 28.83% (95% CI: 18.53–44.86%), and the pooled prevalence of PTSS among the suspected cases of infectious disease was 25.04% (95% CI: 18.05–34.73%), and

TABLE 2 | Subgroup analysis for the general population.

Subgroup	Studies	Pooled prevalence % (95%CI)	I^2 (%)	Test of difference within each subgroup	
				Q	P
Mean age				0.08	0.962
0–30	4	18.97 (4.52–53.64)	99.70		
31–45	25	23.17 (16.08–36.71)	91.20		
>45	2	22.57 (10.67–43.23)	99.70		
Percentage of male participants (%)				0.16	0.921
0–33	18	23.52 (16.17–32.90)	98.70		
34–66	28	26.08 (17.44–37.09)	98.50		
67–100	2	25.33 (16.57–36.67)	/		
Type of disease				117.12	<0.001
SARS	5	16.42 (9.93–25.95)	92.60		
H1N1	1	2.03 (1.34–3.07)	/		
Ebola	1	15.99 (14.83–17.23)	/		
COVID-19	44	26.75 (20.33–34.32)	99.80		
Lithality rate				8.26	0.004
0–20%	50	24.39 (18.60–31.28)	99.70		
>20%	1	15.99 (14.83–17.23)	/		
WHO region				114.16	<0.001
Western Pacific	28	20.78 (13.26–31.04)	99.70		
Americas	6	24.00 (12.73–40.61)	99.40		
European	11	29.25 (22.30–37.33)	99.50		
Southeast Asia	1	33.23 (16.34–35.52)	/		
Eastern Mediterranean	4	37.74 (16.62–64.82)	99.40		
Africa	1	15.99 (14.83–17.23)	/		
Survey time after outbreak (month)				7.49	0.006
0–6	48	25.96 (20.06–32.89)	99.70		
≥7	3	5.95 (1.91–17.07)	95.40		
Diagnosis assessment				12.18	<0.001
Screening tools	50	24.44 (18.65–31.35)	99.80		
Diagnostic tools	1	14.00 (12.04–16.23)	/		
Sample size				2.66	0.102
≤300	10	17.17 (11.05–25.17)	99.80		
>300	41	26.20 (19.33–34.77)	92.70		
Quality score				19.00	<0.001
0–3	3	12.57 (6.73–22.26)	98.30		
4–6	46	12.41 (10.54–14.66)	99.80		
7–8	2	25.86 (19.52–33.40)	57.80		

several factors including type of disease, mortality rate of disease, region, survey time after outbreak, assessment tool, sample size, and quality score were associated with PTSS. Mortality rate of disease was a significant moderator for heterogeneity. Further research is needed to identify effective strategies for preventing and treating PTSS among people exposed to the trauma resulting from infectious disease outbreak.

Comparison With the Literature

The pooled prevalence of PTSS among different population exposed to the trauma resulting from infectious disease outbreak in this study ranged from 24.20 to 28.83%, which was higher than flood survivors (15.74%) and hurricane survivors (Liu

et al., 2017; Wang et al., 2019), but similar to earthquake survivors (Dai et al., 2016) and civilian war survivors (23.66–26.00%) (Morina et al., 2018). Compared with infectious diseases, some natural disasters, such as flood and hurricane, can be predicted, whereas earthquakes and infectious disease were often happened suddenly and without a warning and pose a huge threat to health and property of people in a short period of time (Dai et al., 2016). Therefore, earthquakes might have caused more damage to mental health of people. Relative to natural disasters, wars often last longer, and survivors directly exposed to trauma continuously (Morina et al., 2018). Furthermore, the pooled prevalence of PTSS among patients with infectious disease was much higher than healthcare workers, the general

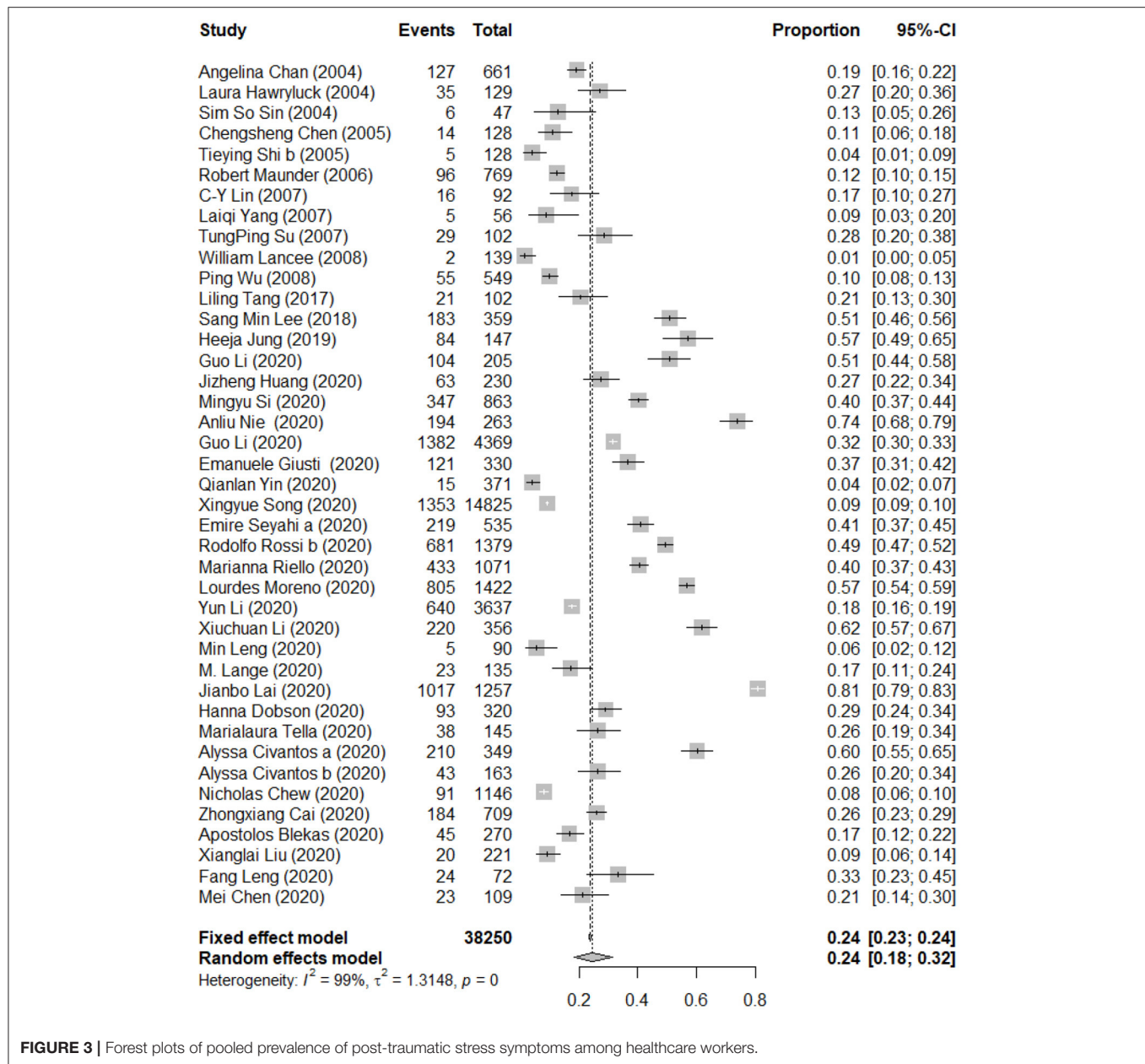


FIGURE 3 | Forest plots of pooled prevalence of post-traumatic stress symptoms among healthcare workers.

population, and suspected cases of infectious diseases, which were consistent with previous studies (Neria et al., 2008). The possible reason is that patients with infectious disease experience higher level of severity of disaster exposure. Patients often directly suffer from the symptoms and traumatic treatment (such as dyspnea, respiratory failure, alteration of conscious states, and tracheotomy), and after being cured, they were more vulnerable to social discrimination than other groups (Neria et al., 2008).

The pooled prevalence of PTSS in different types of diseases was different, and different mortality rates of those infectious diseases also affect the prevalence of PTSS. Among the healthcare workers, mortality rate of infectious diseases was a significant moderator for heterogeneity, higher mortality rate was associated with a higher prevalence of PTSS. Previous studies have shown

that when the mortality rate of infectious diseases is high, the impact on mental health of people may be greater (Spoorthy et al., 2020). Therefore, we think the mortality rate of these infectious diseases should be considered when formulating psychological interventions for people influenced by infectious diseases. In addition, the pooled prevalence of PTSS is relatively high in Europe and the Americas, but relatively low in Asia and Africa. The possible reason is that the epidemic situation is more serious in the first two places (WHO, 2020). In addition, the pooled prevalence of PTSS assessed in different time points was different. PTSS among the general population and the healthcare workers were higher in the immediate aftermath of the infectious disease outbreak (0–6 months), which was in line with other studies (Heron-Delaney et al., 2013; Dai et al., 2016; Righy et al., 2019;

TABLE 3 | Subgroup analysis for healthcare workers.

Subgroup	Studies	Pooled prevalence % (95%CI)	I^2 (%)	Test of difference within each subgroup	
				Q	P
Mean age				0.21	0.900
0–30	2	18.22 (9.20–32.88)	99.30		
31–45	14	19.80 (11.36–32.24)	99.60		
>45	1	17.04 (11.59–24.34)	/		
Percentage of male participants (%)				1.19	0.551
0–33	27	28.01 (19.72–38.29)	99.30		
34–66	8	19.15 (9.78–34.10)	99.60		
67–100	1	26.38 (20.19–33.67)	/		
Type of disease				351.95	<0.001
SARS	11	11.80 (7.59–17.91)	77.53		
H7N9	1	20.59 (13.83–25.93)	/		
MERS	2	52.77 (48.41–57.08)	0.00		
COVID-19	27	29.64 (21.68–39.04)	95.50		
Lithality rate				3.78	0.049
0–20%	38	23.19 (17.21–30.49)	99.40		
>20%	3	42.04 (24.57–61.77)	94.60		
WHO region				70.59	<0.001
Western Pacific	27	21.70 (14.45–31.25)	94.00		
Americas	5	29.10 (17.30–44.60)	98.00		
European	8	34.47 (25.22–45.08)	98.60		
Southeast Asia	1	7.94 (6.51–9.52)	42.70		
Survey time after outbreak (month)				10.09	0.001
0–6	30	29.04 (21.65–37.73)	99.50		
≥7	8	10.42 (5.81–18.00)	93.60		
Diagnosis assessment				5.84	0.015
Screening tools	40	24.87 (18.75–32.20)	99.40		
Diagnostic tools	1	8.93 (3.77–19.72)	/		
Sample size				2.74	0.098
≤300	21	19.40 (12.93–28.06)	96.20		
>300	20	30.19 (20.81–41.58)	99.70		
Quality score				4.65	0.097
0–3	4	17.87 (16.70–19.10)	76.00		
4–6	35	25.57 (18.61–34.05)	98.60		
7–8	2	18.64 (7.83–38.19)	80.50		

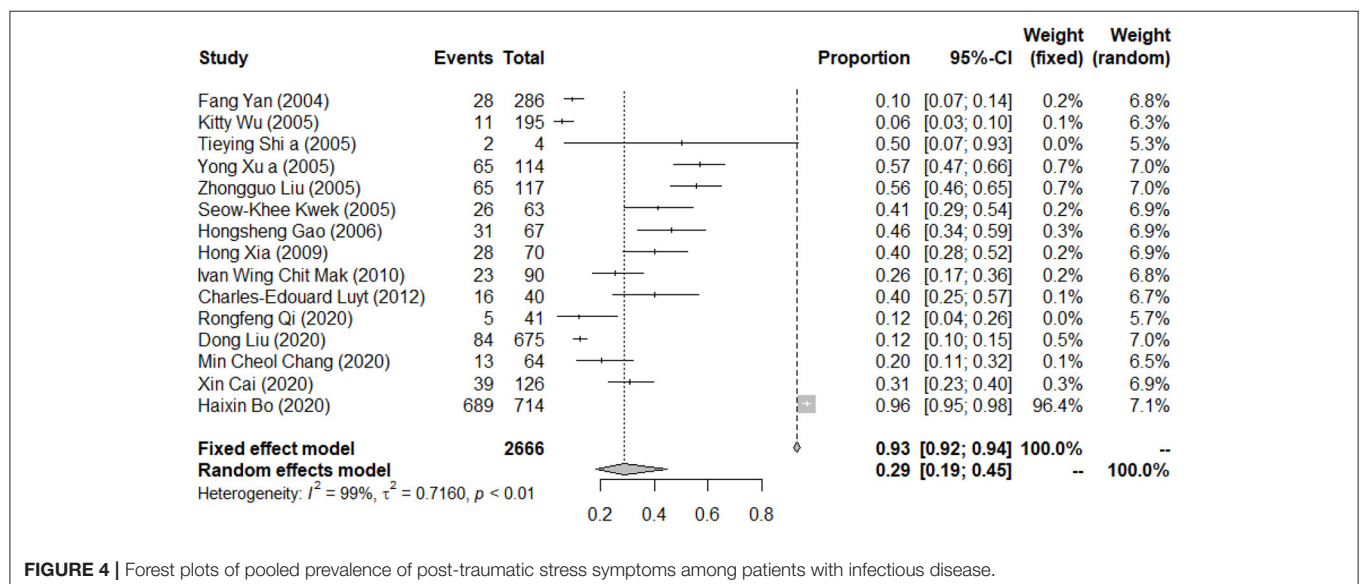
**FIGURE 4 |** Forest plots of pooled prevalence of post-traumatic stress symptoms among patients with infectious disease.

TABLE 4 | Subgroup analysis for patients with infectious disease.

Subgroup	Studies	Pooled prevalence % (95%CI)	I^2 (%)	Test of difference within each subgroup	
				Q	P
Mean age				2.67	0.263
0–30	1	46.27 (35.75–59.89)	/		
31–45	8	31.55 (21.56–46.17)	93.50		
>45	3	40.04 (14.69–99.99)	98.20		
Percentage of male participants (%)				3.53	0.060
0–33	4	42.90 (36.60–50.27)	0.00		
34–66	11	24.80 (14.31–42.96)	98.60		
67–100	/				
Type of disease				1.36	0.506
SARS	9	30.04 (20.17–44.76)	94.50		
H1N1	1	40.00 (27.37–58.46)	/		
COVID-19	5	25.13 (8.34–75.69)	99.30		
WHO region				1.33	0.249
Western Pacific	14	28.15 (17.74–44.67)	99.70		
Americas	/				
European	1	30.33 (22.80–39.08)	99.50		
Southeast Asia	/				
Eastern Mediterranean	/				
Africa	/				
Survey time after outbreak (month)				0.04	0.840
0–6	13	28.16 (17.59–45.09)	98.80		
≥7	2	30.40 (17.09–54.07)	37.30		
Diagnosis assessment				0.09	0.758
Screening tools	11	26.28 (13.63–50.65)	98.70		
Diagnostic tools	4	14.00 (12.04–16.23)	94.50		
Sample size				0.69	0.407
≤300	13	29.29 (19.65–41.24)			
>300	2	66.47 (4.82–98.37)			
Quality score				31.65	<0.001
0–3	1	5.64 (3.18–10.02)	/		
4–6	13	35.45 (23.11–54.37)	98.50		
7–8	1	9.79 (6.89–13.02)	/		

Benfante et al., 2020). However, in patients with infectious disease, no significant difference was found, and the prevalence of PTSS among patients was still high even after 6 months. This difference in the prevalence estimates among different population may be explained by the fact that patients are exposed to greater trauma than other population, they need more time to recover (Xiao et al., 2020). Furthermore, we found that the pooled prevalence of PTSS among healthcare workers and the general population identified by screening tools was significantly higher than that identified by diagnostic tools, which was consistent with previous researches (Edmondson et al., 2013). It is reported that studies with poor methodological quality or small sample size generally yielded more extreme prevalence estimates (Mata et al., 2015), the current study showed similar results. However, after controlling for other factors, the results of meta-regression showed that the influence of methodological quality and sample size on the prevalence of PTSS is no longer significant. Hence, the

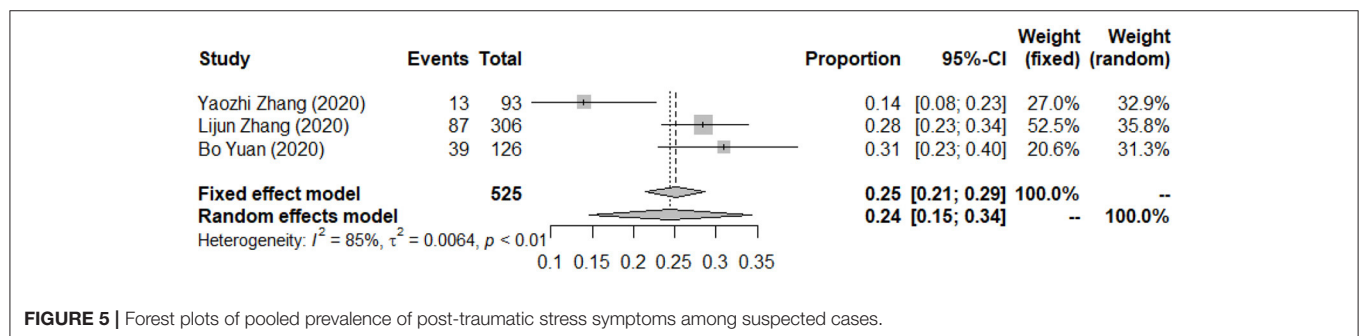
results for quality score and sample size in the subgroup analyses require further clarification.

Implications for the Future

Epidemiological studies have demonstrated a rather high prevalence of mental health problems among different population after an epidemic of infectious disease (Catalan et al., 2011; Tucci et al., 2017). While most of these mental health problems will fade out after the epidemic, symptoms of PTSD may last for a prolonged time and result in severe distress and disability (Vyas et al., 2016). In terms of applicability to COVID-19, evidence suggests that the symptoms of PTSD were very common and persist in patients with infectious disease even higher after 6 months (Hong et al., 2009). Thus, healthcare policies need to take into account both short-term and long-term preventive strategies of PTSD. The information available suggests that the prevalence of PTSS is

TABLE 5 | Meta-regression analysis for the included studies.

Group	β	95% CI		<i>P</i>	<i>R</i> ²
		Lower	Upper		
Healthcare workers					
					16.81%
Area (Western Pacific vs. others)	0.04	−0.14	0.24	0.634	
Mortality rate (0–20% vs. >20%)	0.63	0.13	1.14	0.012	
Type of disease (coronavirus infections ^a vs. others)	−0.16	−0.35	0.01	0.069	
Survey time after the outbreak (0–6 vs. >6 month)	−0.04	−0.24	0.14	0.638	
Quality score (0–3 vs. 4–6 vs.7–8)					
0–3 (reference)					
4–6	0.16	−0.07	0.40	0.169	
7–8	0.06	−0.33	0.46	0.747	
Sample size (0–300 vs. >300)	0.11	−0.03	0.26	0.126	
General population					
					9.65%
Area (Western Pacific vs. others)	0.02	−0.02	0.07	0.384	
Mortality rate (0–20% vs. >20%)	0.14	−0.56	0.85	0.682	
Type of disease (coronavirus infections vs. others)	−0.29	−0.99	0.41	0.416	
Survey time after the outbreak (0–6 vs. > 6 month)	−0.15	−0.67	0.36	0.551	
Quality score (0–3 vs. 4–6 vs.7–8)					
0–3 (reference)					
4–6	0.29	−0.04	0.62	0.090	
7–8	0.04	−0.41	0.51	0.837	
Sample size (0–300 vs. >300)	0.14	−0.02	0.32	0.098	
Patients with infectious disease^b					
					0.00%
Area (Western Pacific vs. others)	−0.02	−0.65	0.59	0.931	
Survey time after the outbreak (0–6 vs. >6, month)	−0.02	−0.24	0.66	0.361	
Quality score (0–3 vs. 4–6 vs.7–8)					
0–3 (reference)					
4–6	0.41	−0.19	1.02	0.183	
7–8	0.07	−0.73	0.88	0.854	
Sample size (0–300 vs. >300)	0.27	−0.52	0.47	0.907	

^a This group include SARS, MERS, and COVID-19.^b Type of disease dropped out from the model.

higher among patients with infectious disease, lower among suspected cases, related workers, and yet even lower in the general population. These three types of samples studied are likely to represent different levels of severity of disaster exposure, with different levels of the PTSS prevalence (Neria

et al., 2008). However, there is little doubt that there is a dose-response relationship between the degree of trauma and the mental health burden of disasters (Neria et al., 2008). This relation may not necessarily mean that the principal mental health burden of people exposed to the trauma resulting from

infectious disease outbreak is among those who were most directly affected by the disease (Galea and Resnick, 2005). It will be important to establish whether indirect exposure to a trauma during a COVID-19 pandemic was correlated with higher risk of PTSS. In addition, it is necessary to assess the relation between exposure to multiple traumas and risk of PTSS in the future. Additionally, the mortality rate of these infectious diseases should be considered when formulating psychological interventions for people influenced by infectious diseases. Lastly, we think a large multicenter prospective study using a single validated measure of PTSS and measuring possible confounding factors in randomly selected participants is needed in the future, which would provide a more accurate estimate of PTSS among people influenced by infectious diseases.

Limitations

First, although subgroup analyses and meta-regression analyses were conducted to control many moderating factors for the pooled prevalence of PTSS, heterogeneity was still retained in this review. It is reported that heterogeneity is difficult to avoid in meta-analysis of epidemiological surveys (Winsper et al., 2013), suggesting the need for caution when drawing inferences about estimates of PTSS in post-disaster research. In addition, the follow-up time varies greatly among the included longitudinal studies, which hinder comparability. Additionally, although our study included relevant studies across 30 countries, more than half of the eligible studies were from upper-high income countries. Prevalence studies were scarce for many countries, especially for low-income countries. Considering the inconsistency of the healthcare environment and socioeconomic status across the world, more prevalence studies in low-income countries are needed to understand the panorama of PTSS among people influenced by infectious diseases. Lastly, we noticed that most of the included studies were used screening tools to assess PTSS, only 5.71% of studies used diagnostic tools. It is possible that the pooled prevalence of PTSS caused by infectious diseases was overestimated in this review. Thus, we think ongoing surveillance is essential.

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CONCLUSION

Evidence suggests that PTSS were very common among people exposed to the trauma resulting from infectious disease outbreak, and the pooled prevalence among different population ranged from 24.20 to 28.83%. Several factors, including type of disease, mortality rate of disease, region, survey time after outbreak, assessment tool, sample size, and quality score, were associated with PTSS. Mortality rate of disease was a significant moderator for heterogeneity. Further research is needed to identify effective strategies for preventing and treating PTSS among people exposed to the trauma resulting from infectious diseases outbreak.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

DQ, SX, and YL contributed to the design of the study. DQ and YL screened the text. DQ and LL extracted and analyzed the data. JH and FO conducted the quality assessment. DQ wrote the first draft of the manuscript with input from SX. All authors approved the final manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.668784/full#supplementary-material>

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Do Positive Emotions Make You More Prosocial? Direct and Indirect Effects of an Intervention Program on Prosociality in Colombian Adolescents During Social Isolation Due to COVID-19

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The objectives of this study are to analyze the efficacy of the Virtual Hero Program during the social isolation due to COVID-19 to increase the positive emotions (joy, gratitude, serenity, personal satisfaction, and sympathy) and prosocial behavior of Colombian adolescents. Additionally, we will analyze whether the Hero program, by directly promoting positive emotional states in adolescents, can predispose them to take prosocial actions toward other people (via an indirect or mediated effect). The final sample of the study comprised 100 participants from the intervention group (M age = 13.94, SD = 0.97) and 111 from the control group (M age = 14.39, SD = 0.81). The participants were assigned to the groups using a cluster randomized trial. The positive emotions questionnaire and the Kindness and Generosity subscale of the Values in Action Inventory of Strengths were used to measure the variables. The results indicated that the program increased joy, gratitude, serenity and personal satisfaction but not sympathy of those who participated in the intervention. The promotion of these positive emotions predisposed the Colombian adolescents to act prosocially. Furthermore, the program was also effective in directly promoting prosocial behaviors in the adolescents during social isolation, as observed through a statistically significant difference in the pre- and post-test evaluations between the control and intervention groups. The structure of the intervention brought adolescents closer to social situations to which isolation had limited their access, promoting the importance of closeness and solidarity with others within the complexities of the social confinement context. This study is particularly relevant because interventions with proven effectiveness are necessary to counteract the trauma produced by social isolation in young people throughout the world.

Keywords: adolescents, COVID-19, intervention, prosocial behavior, positive emotion

INTRODUCTION

Beginnings of COVID-19 and Its Characteristics in Colombia

COVID-19, the disease caused by the new coronavirus called SARS-CoV-2, appeared for the first time in Wuhan, China, in late December 2019 (Kamps and Hoffmann, 2020) and generated a global health emergency due to its rapid spread and a lack of knowledge regarding effective treatments (World Health Organization, 2020). More precisely, in December 2019, reports emerged of cases of pneumonia of unknown cause in Wuhan, China, which culminated in the identification of a new coronavirus on January 12, 2020; the virus was named SARS-CoV-2, and the associated disease was named COVID-19 (Li et al., 2020). The virus spread rapidly throughout the world and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (World Health Organization, 2020). Many countries adopted unprecedented public health measures to curb its expansion (Mehta et al., 2020), although these measures were somewhat fruitless.

To date, there have been more than 130 million cases of COVID-19, and it has caused more than 2,900,000 deaths worldwide. The United States is the country with the highest number of cumulative cases of COVID-19, with more than 30,000,000 infected patients and 550,000 deaths. In Latin America, Colombia has more than 2,430,000 infections and almost 70,000 deaths (World Health Organization, 2021).

Colombia, like other Latin American countries, has been on alert and expectant about the world situation. The Colombian government issued a decree on March 18, 2020 (Dec. 457), that announced mandatory preventive social isolation for 19 days, with the intention of returning to normal activities in early April 2020. The Colombian Ministry of Education announced that on April 13, 2020, it would announce the actions to be taken in educational institutions. Due to the increase in the number of infections, the Colombian Ministry of National Education decided to extend the mid-year vacation until April 21. At the end of the holidays, the government announced the implementation of virtual education for the entire 2020 school year at the preschool, elementary and higher levels due to the health emergency generated by the pandemic (La Opinión, 2020). In this regard, the national government and the Ministry of National Education in Colombia included recommendations and measures developed by UNICEF (2021) to support the continuity of school activities by developing contingency plans around the closure of schools: i) distance learning; ii) emotional containment of vulnerable youth; iii) pedagogical actions for the prevention of COVID-19.

Negative Effects of COVID-19 on Adolescent Mental Health

As soon as the pandemic began in April 2020, Van Bavel et al. (2020) published an article aggregating a valuable body of material from the social sciences literature warning about the possible negative impact of the pandemic. These authors discussed research on the perception of an arising threat (e.g., fear of contagion, prejudice and discrimination toward possibly

infected people), the impact of the pandemic situation in the social context (e.g., social inequity, vulnerable populations), the pandemic as a stressor and coping strategies (e.g., physical and social distancing), among others (Van Bavel et al., 2020).

Social distancing, or quarantine, known as a universal non-pharmacological intervention, was considered the best strategy to avoid contagion by most countries worldwide. Since April 2020, almost four billion people in more than 80 nations have been affected by social isolation to prevent the spread of the virus. This measure affected social contact and generated some negative psychosocial effects (Venkatesh and Edirappuli, 2020). Research has shown that isolation gave rise to negative psychosocial and physical correlates in individuals (Pfefferbaum and North, 2020), significantly reduced in-person activities, limited productivity and affected the economy, and simultaneously increased unemployment and general unrest in the population (Hevia and Neumeyer, 2020). Adolescents were not excluded from the negative effects of this isolation (Espada et al., 2020; Stankovska et al., 2020), particularly because this stage of life is a sensitive period in which the need for interpersonal contact is vital (Orben et al., 2020). In this sense, spending long periods without attending school—a space not only for learning but also for socialization—can also be a mental health risk factor in adolescents (Ali et al., 2019). A study on the psychosocial effects of isolation due to COVID-19 in adolescents aged 12 to 18 years from China found that 44% showed depressive symptoms, 37% had anxious symptoms, and 31% had both. Another study developed by Duan et al. (2020) arrived at similar results. Similarly, one study found an increase in depression and anxiety and a decrease in life satisfaction based on measurements taken at two timepoints during isolation, indicating that adolescents are more concerned about government restrictions than about the virus or the disease (Magson et al., 2021). This same study also showed that discomfort was more pronounced in adolescent girls than boys (Magson et al., 2021). A recent review of the psychosocial effects of social isolation in children and adolescents indicated that for adolescents, the main presentations are irritation, nervousness, frustration and boredom (Imran et al., 2020).

It is important to highlight that the effects of social isolation depend on its duration. In this sense, a recent meta-analysis that included 24 studies found that prolonged periods of quarantine—more than 10 days—were associated with reduced mental health, with the major presenting symptoms of post-traumatic stress, avoidance behaviors and anger (Brooks et al., 2020). In addition, this research indicated that prolonged quarantine causes boredom, frustration and fear in the population (Brooks et al., 2020). Additionally, there are long-term or post-quarantine psychosocial effects, such as decreased financial income, stigmatization of people who were infected and even the presence of symptoms of post-traumatic stress. Such effects can seriously threaten the health of adolescents in nations with long periods of isolation, such as Colombia. In Colombia, strict compulsory isolation was extended from March 15 to August 30, 2020, and from September 1, 2020 to the present, and some specific activities were restricted; for example, in-class classes at public schools continue to be canceled, and the circulation of the

population remains restricted. For this reason, interventions that promote well-being and positive relationships with others in the context of a health emergency are of great importance to reduce the negative psychosocial effects of isolation. One possible way to reduce the psychosocial costs of social isolation is to increase levels of positive emotions and prosocial behavior to restore and improve adolescents' interpersonal networks.

Positive Emotion and Prosocial Behavior in Adolescents

Positive emotions are brief, multidimensional responses to changes that people detect in different circumstances of their lives; some of the most frequently studied are joy, gratitude, serenity, personal satisfaction, and sympathy (Fredrickson, 2013; Oros, 2014). Recent theories postulate that emotions can self-perpetuate systems that trigger behaviors that help people maintain or prolong their current states (Kuppens et al., 2010; Wichers, 2014). This can be explained by mood-maintenance theory, which indicates that positive emotions generate prosocial behaviors and, in turn, maintain or restore these emotions to their original levels (Isen and Simmonds, 1978). Prosocial behavior is understood as positive social acts to promote the well-being of others (Brief and Motowidlo, 1986). This construct is associated with important positive psychosocial correlates, such as higher self-esteem and improved interpersonal relationships (Laible et al., 2004; Padilla-Walker and Carlo, 2014).

The relationship between emotions and prosocial behavior is well-established (Hammond and Brownell, 2018). There are some experimental studies that show that promoting emotion in general increases the prosocial behavior of cooperation (i.e., working together for a common goal) (Rand, 2016; Levine et al., 2018; Kvarven et al., 2020) and decreases instrumental harm (Capraro et al., 2019). In fact, a recent metanalysis indicated that people who rely on their emotions more than reason to make decisions tend to be more cooperative (Kvarven et al., 2020). In addition, positive emotions play a central role in the development of prosociality (Hammond and Drummond, 2019) and moral standards (Hart and Matsuba, 2007; Tracy and Robins, 2007). One positive emotion is joy, which refers to a general state of fun and rejoicing (Lazarus, 2006) involving a positive affect and a positive cognitive evaluation of one's life (Veenhoven, 2010). Previous studies indicate that joy—or happiness—creates a domino effect, increasing positive emotional states and causing adolescents to act in a more prosocial way (Erreygers et al., 2019). Gratitude is another positive emotion of great social relevance that is experienced when a positive benefit is intentionally granted by another individual and is not achieved through one's own effort (Emmons et al., 2003). Thus, gratitude is a positive experience that implies a generalized tendency to recognize the commitment of others to one's own benefit and to respond to this with gratitude (McCullough et al., 2002). According to McCullough et al. (2002), it is likely that people with a higher level of gratitude more strongly perceive the social support they receive from others. You et al. (2020) found that gratitude directly predicted prosocial behavior in adolescents. In addition, serenity is a feeling of peace and trust that can be experienced

independently of external events and involves inner peace, even in the face of adverse events (Connors et al., 1999). Previous research has found that those who perceive themselves as more serene show higher levels of prosocial behaviors (Connors et al., 1999). Finally, sympathy constitutes the affective component of empathy and is the ability to tune into the emotions of others and the inclination to help (Oros, 2014). Padilla-Walker et al. (2015) found that sympathy mediates the relationship between friendship connections and prosocial behavior in adolescents. On the other hand, a recent investigation by García-Vázquez et al. (2020) evaluated the role of different positive emotions (forgiveness, gratitude and happiness) in predicting whether adolescents would engage in prosocial behaviors to stop bullying. The results indicated that the three emotions had a positive direct effect on the development of prosocial behaviors to stop bullying or help victims.

Given that the abovementioned studies show that the presence of positive emotions predisposes adolescents to engage in prosocial actions toward others, we thus propose in this study to promote the positive emotional states of adolescents with the intention of stimulating prosocial behaviors. Because adolescents are isolated by the pandemic situation, it seems appropriate to use technological interventions that allow us to reach their homes with the intention of mitigating psychological distress and promoting their well-being. Indeed, Van Bavel et al. (2020) suggest that online interactions could be a means by which to develop a sense of connection with others, thereby improving psychological well-being; this phenomenon is especially likely to occur if the technological tool is dynamic and synchronous (p. 466). In this way, the Hero Program can be useful to reduce the adverse psychosocial effects of isolation.

The Hero Program

The Hero Program was developed and tested by Mesurado et al. (2019b) and targets at Spanish-speaking adolescents between 12 and 15 years of age. It is a short, online program composed of five intervention sessions. The first session seeks to stimulate the recognition of emotions and empathy; the second session seeks to stimulate a specific positive emotion (gratitude); the third session aims to stimulate other types of positive emotions, such as joy and serenity; the fourth is aimed at promoting forgiveness; and the fifth stimulates empathy toward people who need help (prosocial behavior) (Mesurado et al., 2020). According to Mesurado et al. (2019b), the variables empathy, gratitude, positive emotions and forgiveness were chosen to be part of the program because they can be taught and because there is empirical evidence of their predictive effects on prosociality (Mesurado et al., 2019b). The program was created and tested in Latin American adolescents from Argentina and Uruguay (Mesurado et al., 2019b, 2020). Each intervention lasts ~40 min to an h. The program demonstrates high levels of acceptance among adolescents and is effective in the development of prosocial behaviors (Mesurado et al., 2019a,b, 2020). In addition, it was found to be effective for promoting empathy and positive emotions, and its effects are maintained for as long as three months after the end of the intervention (Mesurado et al., 2020). Consequently, Hero seems to be a promising program for

promoting positive adolescent development, mainly due to the frequent use of technology by young people, which may have increased due to isolation.

Given the importance of positive emotions and prosociality to the psychological well-being of adolescents, we plan to implement a virtual program—such as Hero—to help improve the emotional state of Colombian adolescents during a complex health and social situation, such as the social isolation generated by the pandemic. It is plausible that COVID-19, with its isolation measures, is the greatest collective trauma that most human beings have experienced (Rosenfeld et al., 2021). Research indicates that collective trauma from COVID-19 may foster generous behavior (Lotti, 2020), while other research indicates that such trauma may undermine prosocial tendencies and actions aimed at helping others (Brañas-Garza et al., 2020). Indeed, Lotti (2020) found that pandemic-related worry had a positive effect on donations. Conversely, Brañas-Garza et al. (2020) carried out an online experiment for 6 days at a time when the number of deaths due the pandemic in Spain rose extremely quickly; their results indicated that generosity decreased significantly during this period, especially in elderly participants. This may be because the increasing number of deaths and the fear of getting sick have caused a reduction in empathy and compassion (Cameron and Payne, 2011; Västfjäll et al., 2014).

Based on the above, the objectives of this study are to analyze the effectiveness of the Hero Program for improving positive emotions (joy, gratitude, serenity, personal satisfaction, and sympathy) and prosocial behavior in Colombian adolescents during social isolation due to COVID-19. Additionally, we will analyze whether the Hero program, by directly promoting positive emotional states in adolescents, can in turn predispose them to perform prosocial actions toward other people (i.e., its indirect or mediated effect).

Previous research has shown differences in emotional experiences between genders (Brebner, 2003; Chaplin and Aldao, 2013). With regard to prosocial behavior, the discussion is still open, especially in the case of cooperation: one meta-analysis found no gender differences (Balliet et al., 2011), while another found gender differences (Rand, 2017). In terms of altruistic behavior (i.e., prosocial behavior aimed at selflessly seeking the welfare of others), four meta-analyses have been performed, all of which agree that women tend to be more altruistic than men (Engel, 2011; Rand et al., 2016; Brañas-Garza et al., 2018; Xiao et al., 2019). Based on this background, we will control the gender of the participants in the analyses. Likewise, the age of the adolescents will be controlled because previous longitudinal studies have shown changes over time (Van der Graaff et al., 2018).

This paper makes at least three novel contributions to the current research developed using the Hero Program: (1) evaluating for the first time the effectiveness of the Hero Program in adolescents in situations of social and physical isolation, (2) applying the research for the first time in a new country in Latin America, Colombia, thus increasing the evidence of its efficacy in different cultural contexts, and (3) studying the mediating effect of positive emotions between the interventions and prosocial behavior, a feature not previously analyzed.

MATERIALS AND METHODS

Design

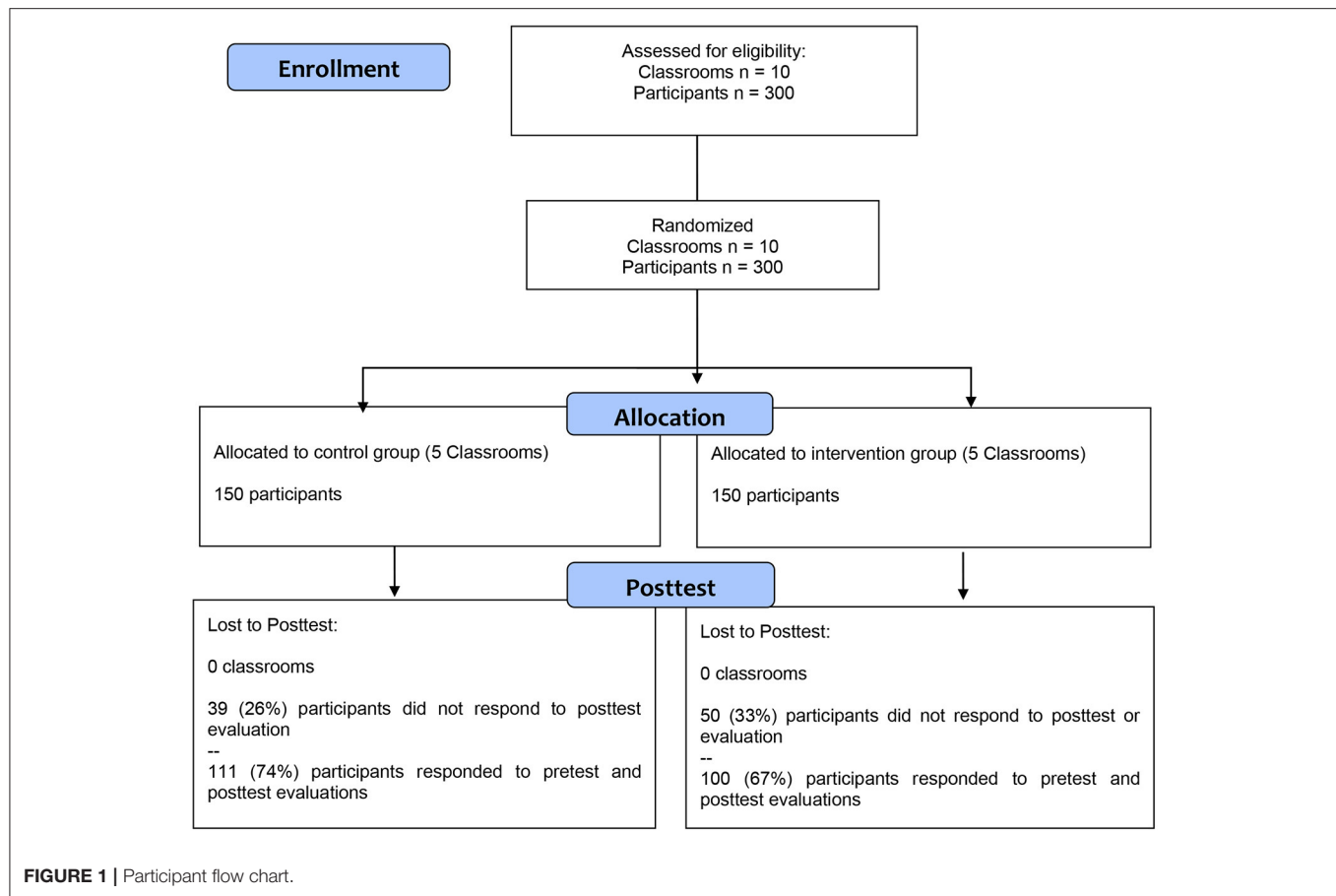
To analyze the effectiveness of the Hero program in Colombian adolescents, a pre-test and post-test research design with a control group was used. The allocation of participants to the intervention group and the control group waiting list was performed using a cluster randomized trial (Campbell et al., 2004). Students from three Colombian educational institutions participated; students from five courses were randomly included in the control group, and students from five other courses were included in the experimental group. The research protocol of this study was approved by the Comité Institucional de Evaluación of the Facultad de Ciencias Biomédicas of Universidad Austral [CIE N° P 20-058], and it was ratified by the ethics committee of the Ibero-American University Corporation.

Participants

The study comprised 300 participants of both genders between 12 and 15 years ($M_{\text{age}} = 14.09$, $SD = 1.09$) from the city of Cartagena de Indias, Colombia. Thirty-three percent of the participants in the intervention group and 26% of the participants in the control group left the study. **Figure 1** shows the flow diagram of the participants according to the guidelines of Consolidated Standards of Reporting Trials (CONSORT). The final sample of the study was composed of 100 participants from the intervention group ($M_{\text{age}} = 13.94$, $SD = 0.97$) and 111 from the control group ($M_{\text{age}} = 14.39$, $SD = 0.81$), and 42% of the sample were female. Regarding the educational level of the participants' fathers, as reported by the participants, 12.9% of the fathers completed primary education, 31.4% completed secondary education, 30% completed tertiary or university education and 25.7% of the adolescents said they were unaware of their fathers' maximum education level. Regarding their mothers, the adolescents reported that 10.5% of their mothers had completed primary education, 31% had completed secondary education, 42.4% had completed tertiary or university studies, and 16.2% of the adolescents reported not knowing their mothers' maximum education level.

Procedure

A researcher from the project who was based in the city of Cartagena de Indias, Colombia, contacted secondary schools in the city, and the selection was intentional. Subsequently, meetings were held with the directors of the schools, at which the research project was presented, and the characteristics of the virtual intervention program were shown. The directors who were interested in implementing the program with the students at their educational institutions allowed us to organize meetings with the secondary school coordinators (teachers who organize the activity of the teachers in charge of the subjects taught at the school) and the teachers in charge of teaching "Ethics and Values" and "Project and Life." At these meetings, the program description, the technical requirements for implementation and the possible intervention schedule were presented again. Finally, meetings were held with the parents or guardians of the students who would participate in the research project to provide them with the same information. At the end of the meeting, the



parents or guardians were given informed consent forms for review that guaranteed the protection of the data collected in the investigation, clarified that the participation of the adolescents was voluntary and stated that the adolescents must also provide their consent. The parents were given seven days to read the consent carefully, and those who were interested in having their children participate in the study were asked to return the signed form to the school. The research was implemented within the framework of activities developed in the “Ethics and Values” or “Project and Life” courses, depending on the institution. The adolescents in the intervention group virtually attended seven weekly meetings from their homes (a pre-test evaluation, five intervention sessions and a post-test evaluation), while those in the control group attended two meetings (pre-test and post-test evaluations). Each encounter lasted 45 min to one h. The meetings were held synchronously through the Google Meet platform, and each session was coordinated by a teacher from the educational institution and a researcher from the research team. The program was implemented from March 30 to July 30, 2020.

Instruments

Positive Emotions

Five types of positive emotions, joy, gratitude, serenity, personal satisfaction, and sympathy, were evaluated using the Argentine positive emotions questionnaire by Oñate and Mesurado (2021).

This questionnaire is an adaptation of the questionnaire of positive emotions for children by Oros (2014) for adolescents. The questionnaire consists of 23 statements; the adolescent must indicate the frequency with which he or she experiences these emotions using a response scale of 1 (never), 2 (sometimes) or 3 (always). To obtain the score, the responses to the items in each subscale must be averaged. Below example items for each subscale with their respective internal consistency index in the pre-test and post-test evaluation: joy, e.g., “I am very happy” (McDonald’s coefficient omega 0.72 and 0.80); gratitude; e.g., “I like to thank people” (McDonald’s coefficient omega 0.77 and 0.84); serenity, e.g., “Most days I feel at peace” (McDonald’s coefficient omega 0.81 and 0.82); personal satisfaction, e.g., “I feel that I am important” (McDonald’s coefficient omega 0.84 and 0.81); and sympathy, e.g., “I feel very bad if I see someone get hurt” (negative item, scored inversely) (McDonald’s coefficient omega 0.76 and 0.88).

Prosocial Behavior

To evaluate prosociality, the Kindness and Generosity subscale of the Values in Action Inventory of Strengths by Peterson and Seligman (2004) was used. This subscale was validated in Spanish by Mesurado et al. (2019c). The scale consists of nine statements (e.g., “I enjoy being kind to others”). Adolescents should indicate

the degree to which each of the statements represents them using a scale from 1 (not like me at all) to 5 (very much like me). To obtain the score, the answers given for each item must be averaged. McDonald's coefficient omega, which evaluates the internal consistency of the items, was 0.84 for the pre-test evaluation and 0.93 for the post-test evaluation.

At the end of the post-test evaluation, the adolescents in the intervention group were asked to indicate specific ways in which the program had impacted their daily lives. It was not mandatory for adolescents to complete this step. This question was asked with the intention of collecting qualitative information to show the impact of the program on adolescents and to better understand the statistical results.

Statistical Procedure

The statistical package SPSS 24 was used to calculate the mean and standard deviation of all the data obtained from the pre-test and post-test measurements of the control group and the intervention group. Moreover, SPSS 24 was used also to carried out chi-squared tests, ANOVA, and MANOVA for the preliminary analyses.

In addition, to analyze the objectives of the study, the statistical program MPLUS 8.5 by Muthén and Muthén (2017) was utilized. Five different models were analyzed using the analysis of covariance (ANCOVA) proposed by Valente and MacKinnon (2017), a statistical technique that has been used in previous research to evaluate the effectiveness of intervention programs (Luengo Kanacri et al., 2020). ANCOVA is conducive to analyzing the direct effect of interventions on the promotion of two variables using a pre-test and post-test design. It also allows the measurement effect of one of the variables for promoting another linked variable to be analyzed. Additionally, it analyzed whether the program promotes a specific type of positive emotion (namely, joy, gratitude, serenity, personal satisfaction, and sympathy) and examined via mediation analysis whether this in turn promotes the development of prosocial actions toward other people.

This technique allows adjustment by the pre-test of the mediating variable (in this case, positive emotion: joy, gratitude, serenity, personal satisfaction, and sympathy) and the outcome variable (in this case, prosociality). The pre-test evaluation of each positive emotion and prosociality were used in estimating the mediated effect of intervention on prosociality through positive emotions at the post-test evaluation, as suggested by Valente and MacKinnon (2017, p. 430). Specifically, in this article, five different models were run to analyze the effectiveness of the Hero Program for directly promoting five types of positive emotions (model 1: joy, model 2: gratitude, model 3: serenity, model 4: personal satisfaction, and model 5: sympathy) and prosocial behavior (see Figure 2). In all models, the influence of participant gender and age was controlled. Finally, the missing-at-random (MAR) method was used to impute the missing data in each of the models studied (Little et al., 2014).

RESULTS

Preliminary Analyses

Table 1 shows the descriptive data (mean and standard deviation) of each of the variables evaluated in the pre- and post-test evaluations of the participants in the control group and the intervention. The participants in the control group and the intervention group were compared in terms of gender, age, father's and mother's educational levels, and their baseline measurements of prosociality and positive emotions (i.e., pre-test evaluation). Three chi-squared tests were used to test for differences between the groups with respect to gender and father's and mother's educational levels. Two one-way ANOVAs were used to test age and prosociality differences, respectively. Finally, a MANOVA was used to test for differences between groups in positive emotions in the pre-test evaluation. The results indicated that the control and intervention groups were equivalent in terms of gender [$\chi^2(1) = 2.36, p = 0.12$], father's educational level [$\chi^2(2) = 0.70, p = 0.71$], mother's educational level [$\chi^2(2) = 3.20, p = 0.20$], prosociality [$F(1, 209) = 0.01, p = 1.0$], and positive emotions [Hotelling's trace $F(5, 204) = 1.62, p = 0.16$]. The participants in the control group were older than the participants in the intervention group, $F(1, 209) = 13.47, p < 0.001$. Consequently, age was used as a control variable.

Effects of the Intervention on the Change in Prosociality Scores Using the Positive Emotion Joy as a Mediator (Model 1)

The results indicate that the participants in the intervention group increased their joy ($b = 0.14, p < 0.01, 95\% \text{ CI } [0.04 \text{ to } 0.24]$; Cohen's $d = 0.35, \text{ CI } [0.07 \text{ to } 0.62]$) and their prosocial behavior toward others ($b = 0.36, p = 0.01, 95\% \text{ CI } [0.14 \text{ to } 0.60]$; Cohen's $d = 0.37, \text{ CI } [0.09 \text{ to } 0.64]$) when the intervention ended. Moreover, the findings indicate that the online intervention promoted prosocial behavior toward others through joy ($b = 0.08, p < 0.01, \text{ CI } [0.02 \text{ to } 0.14]$). These findings suggest that the Hero intervention promoted joy, which in turn increased prosocial behavior. These results show that joy partially mediated the effect of the Hero Program on increasing prosocial behavior. Finally, gender and age did not affect the changes in the joy and prosociality scores. This model explained 31% of the joy ($R^2 \text{ coefficient} = 0.31$) and 32% of the prosociality ($R^2 \text{ coefficient} = 0.32$) (Table 2).

Effects of the Intervention on the Change in Prosociality Scores Using the Positive Emotion Gratitude as a Mediator (Model 2)

The results indicate that the participants in the intervention group increased their gratitude ($b = 0.14, p < 0.01, 95\% \text{ CI } [0.04 \text{ to } 0.23]$; Cohen's $d = 0.35, \text{ CI } [0.07 \text{ to } 0.63]$), and their prosocial behavior ($b = 0.39, p = 0.001, 95\% \text{ CI } [0.17 \text{ to } 0.62]$; Cohen's $d = 0.41, \text{ CI } [0.13 \text{ to } 0.69]$) at the end of the intervention. Moreover, the finding indicates that the online intervention promoted prosocial behavior through gratitude ($b = 0.07, p < 0.05, \text{ CI } [0.02 \text{ to } 0.13]$). These findings suggest that the Hero intervention promoted gratitude, which in turn increased prosocial behavior.

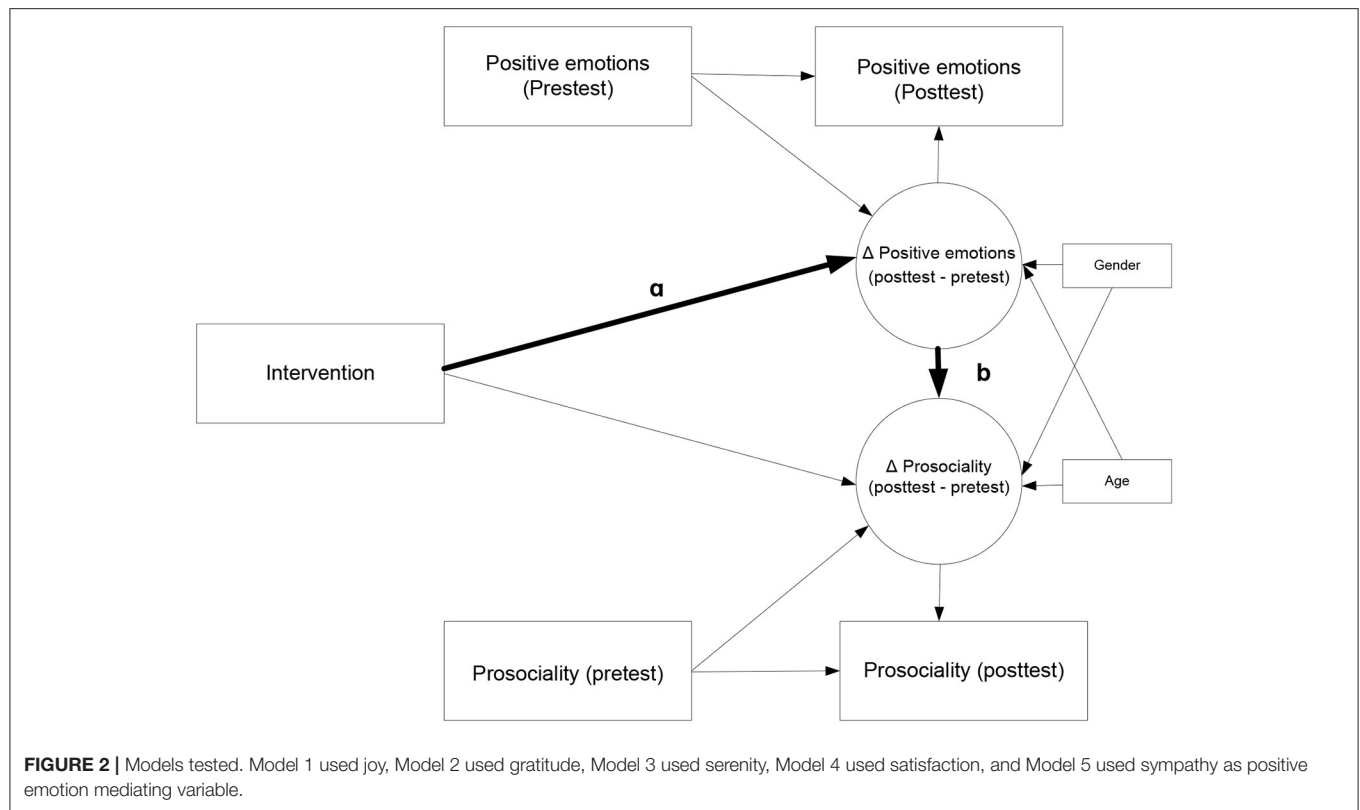


TABLE 1 | Means and standard deviations of positive emotions (joy, gratitude, serenity, personal satisfaction, and sympathy) and prosocial behavior in the pre-test and post-test evaluations.

Variables	Control Group				Intervention Group			
	Pre-test		Post-test		Pre-test		Post-test	
	M	SD	M	SD	M	SD	M	SD
Joy	2.70	0.42	2.66	0.45	2.66	0.38	2.79	0.31
Gratitude	2.76	0.32	2.71	0.37	2.78	0.31	2.84	0.32
Serenity	2.52	0.46	2.57	0.45	2.55	0.39	2.73	0.39
Personal satisfaction	2.63	0.56	2.60	0.57	2.71	0.44	2.78	0.40
Sympathy	2.39	0.52	2.54	0.51	2.30	0.55	2.60	0.46
PB toward strangers	3.21	0.76	3.52	0.84	3.21	0.68	3.93	0.92

These results show that gratitude partially mediated the effect of the Hero Program on increasing prosociality. Finally, gender and age did not affect the change in gratitude and prosociality scores. This model explained 31% of the gratitude (R^2 coefficient = 0.31) and 32% of the prosociality (R^2 coefficient = 0.32) (Table 2).

Effects of the Intervention on the Change in Prosociality Scores Using the Positive Emotion Serenity as a Mediator (Model 3)

The results indicate that the participants in the intervention group increased their serenity ($b = 0.14$, $p < 0.01$, 95%

CI [0.03 to 0.25]; Cohen's $d = 0.28$, CI [0.01 to 0.56]), and their prosocial behavior ($b = 0.41$, $p = 0.001$, 95% CI [0.17 to 0.65]; Cohen's $d = 0.43$, CI [0.15 to 0.71]) at the end of the intervention. Moreover, the finding indicates that the online intervention promoted prosocial behavior through serenity ($b = 0.05$, $p < 0.05$, CI [0.01 to 0.10]). These findings suggest that the Hero intervention promoted serenity, which in turn increased prosocial behavior. These results show that serenity partially mediated the effect of the Hero Program on increasing prosocial behavior. Finally, gender and age did not affect the changes in serenity and prosociality scores. This

TABLE 2 | Hero Program's effect on change scores (Δ) of positive emotions (joy, gratitude, serenity, personal satisfaction, and sympathy) and prosocial behavior.

	ΔJoy			ΔProsocial Behavior		
Model 1	b	SE	R ²	b	SE	R ²
Intervention	0.14**	0.05	0.31***	0.36**	0.12	0.32***
Gender	−0.01	0.05		−0.02	0.12	
Age	−0.01	0.02		0.04	0.05	
Pre-test scores	−0.56***	0.09		−0.60***	0.09	
Mediation				0.08**	0.03	
	ΔGratitude			ΔProsocial Behavior		
Model 2	b	SE	R ²	b	SE	R ²
Intervention	0.14**	0.05	0.31***	0.39***	0.12	0.32***
Gender	0.01	0.05		0.01	0.12	
Age	−0.01	0.05		0.05	0.05	
Pre-test scores	−0.66***	0.09		−0.60***	0.09	
Mediation				0.07*	0.03	
	ΔSerenity			ΔProsocial Behavior		
Model 3	b	SE	R ²	b	SE	R ²
Intervention	0.14**	0.06	0.35***	0.41***	0.12	0.31***
Gender	−0.07	0.06		−0.01	0.12	
Age	−0.01	0.03		0.04	0.12	
Pre-test scores	−0.66***	0.07		−0.62***	0.09	
Mediation				0.05*	0.02	
	ΔPersonal Satisfaction			ΔProsocial Behavior		
Model 4	b	SE	R ²	b	SE	R ²
Intervention	0.15*	0.07	0.28***	0.40***	0.12	0.34***
Gender	0.02	0.07		−0.03	0.12	
Age	0.01	0.06		0.03	0.05	
Pre-test scores	−0.53***	0.08		−0.60***	0.09	
Mediation				0.07*	0.03	
	ΔSympathy			ΔPB_E		
Model 5	b	SE	R ²	b	SE	R ²
Intervention	0.10	0.07	-	0.39***	0.12	0.34***
Gender	0.01	0.06		0.07	0.12	
Age	−0.01	0.03		0.05	0.05	
Pre-test scores	−0.69***	0.07		−0.58***	0.09	
Mediation				0.04	0.03	

Δ change scores of the variables indicated. The unstandardized *b*-coefficients were calculated, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

model explained 35% of the serenity (R^2 coefficient = 0.35) and 31% of the prosociality (R^2 coefficient = 0.31) (Table 2).

Effects of the Intervention on the Change in Prosociality Scores Using the Positive Emotion Personal Satisfaction as a Mediator (Model 4)

The results indicate that the participants in the intervention group increased their personal satisfaction ($b = 0.15$, $p = 0.02$,

95% CI [0.02 to 0.28]; Cohen's $d = 0.30$, CI [0.03 to 0.58]) and their prosocial behavior ($b = 0.40$, $p = 0.001$, 95% CI [0.18 to 0.64]; Cohen's $d = 0.41$, CI [0.13 to 0.69]) at the end of the intervention. Moreover, the finding indicates that the online intervention promoted prosocial behavior through personal satisfaction ($b = 0.07$, $p = 0.02$, CI [0.01 to 0.13]). These findings suggest that the Hero intervention promoted personal satisfaction, which in turn increased prosocial behavior. These results show that personal satisfaction partially mediated the effect of the Hero Program on increasing prosocial behavior. Finally, gender and age did not affect the changes in the personal satisfaction and prosociality scores. This model explained 28% of

the personal satisfaction (R^2 coefficient = 0.28) and 34% of the prosociality (R^2 coefficient = 0.34) (Table 2).

Effects of the Intervention on the Change Prosociality Scores Using the Positive Emotion Sympathy as a Mediator (Model 5)

The findings indicate that the participants in the intervention group increased their prosociality ($b = 0.39$, $p < 0.001$, 95% CI [0.17 to 0.62]; Cohen's $d = 0.41$, 95% CI [0.13 to 0.68]) but did not increase their sympathy level ($b = 0.10$, $p = 0.15$, 95% CI [-0.04 to 0.23]), at the end of the intervention. Moreover, the results show that the online intervention did not have an indirect effect on prosocial behavior through sympathy ($b = 0.04$, $p = 0.17$, 95% CI [-0.02 to 0.11]). However, the study could be inadequately designed to detect the effect of fostering sympathy vs. the pre-test evaluation due to insufficient statistical power. Finally, gender and age did not affect the changes in personal sympathy and prosociality scores. This model explained 34% of the prosociality (R^2 coefficient = 0.34) (Table 2).

DISCUSSION

With the appearance of the new disease COVID-19, the world population has experienced an outbreak of such magnitude that the health situation was decreed a pandemic. Colombia mandated confinement of its entire population to their homes from March 15 to August 30, 2020; in-person classes were suspended, and social gatherings were limited. Currently, isolation continues selectively, but schools, for the most part, have not resumed in-person attendance. This isolation has had negative psychological impacts on the adolescent population because their socialization depends on interactions with the peer group and because social behavior is a fundamental component of this stage of development (Hawryluck et al., 2004; Dong and Bouey, 2020; Riiser et al., 2020; Tang et al., 2020). In this sense, peer socialization is a context of utmost importance for the development of adolescents' identity and for their emotional and cognitive development, among other aspects. This social situation has prompted mental health professionals to focus on the emotional and behavioral consequences of social isolation measures (Idoiaga et al., 2020). To this end, it has become necessary to develop interventions that prevent the psychological consequences of isolation, which affect the social and emotional sphere of adolescents in general.

Several studies argue that both positive emotions and prosociality tend to prevent antisocial, violent or aggressive behaviors, improving social relationships in diverse and adverse situations (Romersi et al., 2011). Therefore, interventions that promote both positive emotionality and prosocial behavior in adolescents can contribute to comprehensive, healthy and positive development, promoting the social and emotional skills to counteract problems that can affect their interpersonal

relationships (Lam, 2012; Caprara et al., 2015; Mesurado et al., 2019b,d).

The objective of this study was to examine the effectiveness of the Hero Program for directly promoting positive emotions and prosocial behaviors in Colombian adolescents during isolation. Specifically, the program focused on stimulating five positive emotions: joy, gratitude, serenity, personal satisfaction, and sympathy. Additionally, the mediating effect of positive emotions in promoting prosociality was studied.

The effects of the program on the promotion of different types of positive emotions are discussed below, followed by a discussion of the mediating effect of each of the positive emotions on the promotion of prosociality. Finally, the direct effect of the program on the promotion of adolescent prosociality is discussed.

The results indicated that the Hero Program directly promoted joy; the adolescents who participated in the intervention showed a statistically significant increased this positive emotion and exhibited a general state of contentment and fun after the intervention. This was observed in the participants' statements that the program was "a lot of fun" and that they noticed that their "mood was better weeks after performing the exercises proposed by the program." The majority of the adolescents affirmed at the end of the process that the activity made them feel at ease and happy. Furthermore, the results indicate that the positive emotion joy, in turn, promoted prosocial behaviors toward other people; that is, the mediating effect of joy between the intervention program and prosociality was confirmed. In other words, the program promoted joy, which in turn promoted prosocial behaviors among the participating adolescents. It is possible that the positive emotional state of joy enabled greater openness to the needs of others, thus promoting prosociality. On the other hand, it is likely that joy made it possible to trust others, a fundamental pillar of social life and an expression of social relatedness to others (Caprara et al., 2013; Gerbino et al., 2016).

The results indicated that the program was effective for promoting the positive emotion of gratitude toward others among the adolescents who participated in the intervention. By carrying out the different activities proposed by the program, adolescents were able to experience the psychological benefits of expressing gratitude to others, as suggested by previous research (Emmons et al., 2003; Oros, 2014). The adolescents who participated in the Hero Program affirmed that the activities made them more aware of the help they receive from others. This was evidenced by the participants' statements that after the end of the intervention, "It has given me more of a desire to return favors," "I called my teacher and thanked him/her for his/her patience during the virtual classes," and "I was able to recognize the efforts of my parents during all these months" of isolation. Furthermore, our results indicated that the positive state of gratitude led the adolescents to be more prosocial toward others. That is, the mediating effect of gratitude on the promotion of prosociality was tested, and the results went in the same direction as previous research showing that a genuine feeling of gratitude promotes prosocial behaviors, since the grateful person seeks to

reward the actions of the benefactor (Emmons et al., 2003; Oros, 2014). It is likely that the adolescents who developed higher levels of gratitude in the context of the intervention were better able to perceive the social support provided by others (McCullough et al., 2002; You et al., 2020), which favored solidarity behavior.

The program also proved to be effective for promoting *serenity*, which encourages peace and relaxation. It is likely that the program's facilitation of serenity in the adolescents enabled them to better cope with the social isolation they were experiencing, distancing themselves from thoughts that can generate concern or anxiety. This point was exemplified in the statements of the Colombian adolescents who participated in the Hero Program: "I really liked the calming exercises; I felt relaxed"; "After doing the activities, I was very calm at home." Similarly, the results indicated that serenity in turn promoted prosocial actions toward others. The fact that the program promoted relaxation and tranquility may have fostered harmonious interpersonal relationships that favored the emergence of prosocial behaviors, despite the adverse events that the adolescents may have been experiencing.

Another positive emotion that favored the effects of the Hero Program in Colombian adolescents during isolation was the perception of *personal satisfaction*. It is evident that the program contributed to the process of valuing and promoting the self among the adolescents, encouraging them to recognize the merits of their actions (Diener and Larsen, 1993; Oros, 2014). Additionally, the strengthening of personal satisfaction in adolescents contributed to their development of prosocial behaviors. It is likely that the program facilitated greater self-acceptance and, therefore, greater acceptance of others (Diener and Larsen, 1993), thus favoring prosocial behavior.

Contrary to expectations, the results indicated that the program was not effective for promoting *sympathy* among the adolescents who participated in the intervention. Sympathy is understood as the affective component of empathy, which involves tuning into the emotions of the other or sharing the same emotional tone. It is likely that these findings can be explained by deeply rooted cultural patterns in Colombia, where the upbringing of children and adolescents aims to prioritize their emotions over those of others. This was reflected in the comments made by the adolescents at the end of the intervention, expressing their concern about being "invaded by the feelings of others" or parenting patterns that emphasized the need to "be strong and not get involved with what others feel." These expressions, while denoting a certain capacity for recognizing the emotions of others, indicate a position of distancing oneself from the emotions of others out of fear of experiencing emotional distress. This could also be linked to the social and political context in which Colombian adolescents live. This context arises from two aspects, the historical and the current: historically, it arises from more than six decades of structural and political violence, and currently, it relates to the extreme social isolation caused by the COVID-19 pandemic. Research carried out in the Colombian context reports that children and adolescents who have experienced violence in environments of social vulnerability show weaker relationships between sympathy and behaviors associated with collaboration and helping others (Gómez-Tabares and Narvaéz Marín, 2020). Additionally, Moffitt

(1993) states that it takes time for adolescents to accept the emotions they have toward others because they fear being ridiculed and not accepted by their peer group or by people who are not part of their immediate environment (Luengo Kanacri et al., 2020). Hence, it is likely that these adolescents interpret sympathy as a weakness of character that is not necessary for social life or the emergence of prosocial behavior. However, this interpretation should be made with care because there was a trend toward the Hero Program's promoting sympathy when compared to the pre-test evaluation. Consequently, another likely explanation is that the study failed to detect the effect of fostering sympathy vs. the pre-test evaluation due to insufficient statistical power.

Finally, the Hero Program proved to be effective for directly promoting prosocial behavior in the Colombian context of social isolation. This was observed through a statistically significant difference in the pre- and post-test evaluations between the control and intervention groups. The structure of the intervention brought adolescents closer to social situations to which isolation had limited their access (Alomo et al., 2020; Rodríguez-Morales et al., 2020), promoting the importance of closeness and solidarity with others within the complexity of social confinement (Ali et al., 2019; Espada et al., 2020; Stankovska et al., 2020). In this sense, the positive effect of the Hero Program may be linked to the fact that preventive social isolation—characterized by boredom, demotivation and irritability in young people (Imran et al., 2020)—was modified by the program's activities, which guided adolescents to be more open to the needs of others. This result is also confirmed by the participants' comments after the intervention, such as "I will try to help people more, especially in this difficult time of COVID"; "I think it is important to think about others and be able to help them... I truly liked that aspect of the program"; "I would be happy to help someone when they are sick." These results are consistent with previous research showing the effectiveness of the Hero Program for mitigating the adverse effects generated by isolation in other Latin American countries by promoting prosociality (Mesurado et al., 2020).

In summary, this study concludes that the Hero Program was effective for promoting four positive emotions (joy, gratitude, serenity and personal satisfaction) and that these emotions predispose Colombian adolescents to act prosocially. Additionally, the program was effective for directly promoting prosociality in adolescents during isolation. This study is particularly relevant because it is necessary to develop interventions with proven efficacy to counteract the trauma produced by social isolation in young people around the world.

Limitations of the Study and Future Directions

An important limitation of this study is that it did not include a follow-up evaluation of the measurements of positive emotions and prosociality to verify whether the effect of the program remains stable over time. Furthermore, given that we did not find an effect of the program on the promotion of sympathy, despite its effects on the other positive emotions evaluated and prosociality, it would be interesting for future studies to analyze

whether the Hero Program is effective in promoting the cognitive aspect of empathy, which is linked to taking perspective or understanding the emotional tone of others. Finally, it would be interesting in future studies to implement the program in other contexts of economic, social or cultural vulnerability to analyze its effectiveness in diverse contexts.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: <https://riu.austral.edu.ar/handle/123456789/885>.

ETHICS STATEMENT

The research protocol of this study was approved by the Comité Institucional de Evaluación of the Facultad de Ciencias Biomédicas of Universidad Austral [CIE N° P 20-058], and

it was ratified by the ethics committee of the Ibero-American University Corporation.

AUTHOR CONTRIBUTIONS

BM, SR, MT and CV made substantial contributions to the conception of the study, the acquisition, analysis, interpretation of the research data, and preparation of the manuscript for publication. All authors contributed to the article and approved the submitted version.

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The Influence of COVID-19 Pandemic on Physical Health–Psychological Health, Physical Activity, and Overall Well-Being: The Mediating Role of Emotional Regulation

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Background: Highly infectious respiratory disease COVID-19 emerged in Wuhan, China, and spread worldwide. Different measures have been adopted worldwide to contain the COVID-19, and these measures have various impacts on health-related quality of life (HRQoL). This study aimed to assess the impact of the COVID-19 pandemic (CP) and lockdown policy on physical health (PH)–psychological health (PsH), physical activity (PA), and overall well-being (OW) in the context of HRQoL, exploring the mediating role of emotional regulation (ER).

Method: The current study was conducted in two provincial cities of China. An online survey was conducted in both the cities to collect the data. After quantifying the data, a total of 2,200 respondents data were analyzed through appropriate statistical techniques.

Results: The study results indicate that CP was found significantly and negatively related to PH ($\beta = -0.157$, $t = 9.444$, $p < 0.001$). A significant relationship was found between CP and PsH ($\beta = 0.779$, $t = 45.013$, $p < 0.001$). The third prediction revealed a significant negative relationship between the CP and OW ($\beta = -0.080$, $t = 5.261$, $p < 0.001$). The CP and PA had a significant negative relationship ($\beta = -0.047$, $t = 3.351$, $p < 0.001$).

Conclusion: The PH, PsH, and OW of the Chinese people were affected due to the CP and lockdown measures. It is suggested that ER intervention reduces the negative psychological impacts for improving quality of life. ER can function one's sentiments in their social environment effectively for quality of life.

Keywords: COVID-19, lockdown, HRQoL, emotional regulation, physical health, psychological health, physical activity, overall well-being

INTRODUCTION

In early December 2019, in Wuhan, Hubei Province, China, a highly infectious respiratory disease, that is, Coronavirus (COVID-19) emerged and extended globally. On March 11, 2020, this newly emerged viral infection was declared a worldwide health emergency by World Health Organization (WHO) (Rogowska et al., 2020). According to the WHO, the COVID-19 has spread worldwide, and 213 countries are taking multiple measures to contain the COVID-19 by their governments. On January 23, 2020, the governments implemented various measures, such as the lockout of entire cities, travel warning regulation, and home medical observations to prevent and control the viral transmission (Anna, 2020). Because of the threats of COVID-19 pandemic (CP) to health care systems and society at large, and to reduce the incidence of novel infections and flatten the COVID-19 infection curve, a global mass home-confinement directive has been implemented in many countries, most of which entail social isolation and quarantine. Social isolation and quarantine can be the main stressors that can lead to emotional distress and other unpredicted mental health and psychological consequences (Hossain et al., 2020). Pandemics have different stages and come in waves with various severe impacts on human health and society. CP is also coming in waves in which the virus pathogen is becoming more dangerous, creating pressure on public health facilities worldwide. Many countries worldwide introduced different policies that include total lockdown, smart lockdown, health monitor system, and quarantine to contain the virus (Alwan et al., 2020). Public health experts review the CP-related lockdown policies (LPs) daily to ensure public safety (Al Zobbi et al., 2020; Plümper and Neumayer, 2020).

Studies have reported loneliness, anxiety, boredom, anger, denial, depression, insomnia, harmful substance use, despair, self-harm, and suicides in quarantined individuals (Li et al., 2020; Wang et al., 2020). Furthermore, COVID-19 physical symptoms (such as cough, hypoxia, and fever) along with side effects of recommended medicines (corticosteroids) may lead to more psychological distress and anxiety (Wang et al., 2020). Researchers reported that various psychiatric disorders could be found in individuals, for instance, anxiety disorders, self-blame, guilt, post-traumatic stress disorder, depressive disorders, delirium, somatic symptoms, panic disorder, psychosis, and even suicide (Goyal et al., 2020). Furthermore, our findings are similar in the context of emotional regulation (ER) with the studies of Li et al. (2021) and Cheng et al. (2006), which were carried out among the Chinese population and concluded that socio-behavioral restrictions are negatively associated with the health-related quality of life (HRQoL). There is also a negative impact on emotions on time spent under quarantine measures. It is consistent with previously published work on the mental health effects of the lockout of COVID-19 (Ozamiz-Etxebarria et al., 2020). Several studies reported adverse impacts, such as depression, loneliness, anxiety, and post-traumatic stress due to the CP. The suddenly declared pandemic has drastic negative effects on every segment of human society in the socio-psychological and physical paradigm. Muzi et al. (2021)

conducted a study on Italian adolescents and reported that the teenagers might have used social media disorder symptoms to express CP adverse effects. Teenagers during pandemic showed lower internalizing but higher other issues (such as excessive drinking and self-destructive behaviors) and more problematic social media usage than pre-pandemic samples.

COVID-19 Lockdown—Health and Well-Being

HRQoL, participation in physical activity (PA), and perceived mental stress among Chinese adults are significantly related to the CP. Physical inactivity and sedentary sitting time have been increased during home confinement among Chinese people. Long-term sitting has also proved to negatively impact well-being and quality of life (Qi et al., 2020). Lockdown policy (LP) implementation across China has generated many socio-psychological problems for the Chinese people in every segment of their lives. During the period of lockdown, people were confined to their homes to contain the pathogen. Domestic confinement has a long-lasting psychological and well-being effect. Chinese people were confronted by anger, boredom, and loneliness during home confinement, and psychological problems, such as depression, stress, and anxiety increased (Duan and Zhu, 2020). Mental health and quality of life among Chinese adults have been impacted negatively by the CP (Zhang and Ma, 2020). Home isolation has adverse socio-psychological effects on physical and mental health. Long-term isolation causes negative feelings, cognitive decline, and discomfort (Hawkley and Capitanio, 2015). The daily routine and lifestyle of Chinese citizens would inevitably be interrupted by restrictions on travel and outdoor leisure. Individuals were also less physically involved, more sedentary, and more depressed, which may pose severe protection and well-being risks (Chen et al., 2020). HRQoL has been affected due to the socio-psychological impacts of COVID-19 and caused a severe threat to global public health (Tsamakis et al., 2020). People with personality disorders may be particularly vulnerable to negative psychological impacts of the CP. ER skills appear to be a potential target for therapies targeted at reducing negative consequences (Velotti et al., 2021a,b).

COVID-19—Emotional Regulation for Health and Well-Being

Emotions refer to an event-focused affective state, an intricate pattern of the reaction involving elements of experience, actions, and physiology (Sander et al., 2013). The advent of the CP can exacerbate these two psychological aspects and make people feel endangered. People interpret risk cognitively and respond to it emotionally. Risk beliefs are often the source of negative emotions and psychological distress (Leppin and Aro, 2009). The social and emotional reaction to the epidemic of COVID-19 is multidimensional. Furthermore, it depends not just on external factors but also on personal and innate components (Brooks et al., 2020). Emotions and feelings play a vital role in response to the sudden phenomena and reshape our understanding about how to cope with the negative impacts of different situations on our socio-psychological and health-related QoL. Emotion

regulation is helpful in the maintenance of health behavior during the CP. Positive health behavior through ER is a catalyst for PA and psychological well-being (Julie, 2020). In empirical models of well-being, human growth, interpersonal processes, psychopathology, and decision making, emotions play a pivotal role (Ekman and Davidson, 1994; Saarni, 2008). Previous pandemics, such as Ebola, H1N1, and SARS evidence show that public emotional response is associated with risk perception (Yang, 2016). During the early stages of the COVID-19 outbreak in China, a nationwide survey found that ~27.9% of the participants had depression symptoms, and 31.6% had anxiety symptoms, which further leads to emotional sensitivity (Shi et al., 2020). ER is an effective way to maintain healthy behavior in particular circumstances. ER processes have long been known as a trans-diagnostic factor in various psychological problems (Sloan et al., 2017). ER theories indicate that the ability to control one's own emotions is necessary for psycho-social health (Gross and Munoz, 1995). Emotional stability requires explicit or implicit attempts to control the emotional perception, expression, length, and magnitude (Gross, 1998). A significant factor in raising or decreasing the risk of poor physical and PsH should be controlling feelings when people face the challenges of the pandemic (Low et al., 2020). PA is a catalyst for healthy living and plays a pivotal role in preventing different diseases (Saqib et al., 2020).

Statement of the Study

Significant adverse impacts have been observed due to the CP, which undermines the overall health and well-being. Preventive measures, such as home isolation during mandatory lockdown to contain the pathogen or the virus are used effectively to manage socio-economic life safely (Holmes et al., 2020). Regulation of emotion is significant in maintaining psychological and physical health (PH) during home isolation and lockdown during the pandemic period. People use emotions to add sense to their interactions and organize themselves and the people they communicate with (Duy and Yildiz, 2014). ER is also a vital principle that allows people to manage their emotional states and maintain healthy relationships with their environment (Gross, 2013). The CP created a fearful and panicked environment that has negative socio-psychological impacts on human lives. Management and regulation of emotions are the best ways to keep positive attitude and behavior toward a healthy quality of life. The pandemic created a crisis across the globe, and emotions are vital to human lives, which give direction to maintain socio-psychological and PH well-being. This study aimed to assess the impact of the CP and LP on PH–psychological health (PsH), PA, and overall well-being (OW) in the context of HRQoL, exploring the mediating role of ER. HRQoL through a mediating role of ER during CP explored PH, PsH, PA, and OW. Every person is experiencing COVID-19 in various ways and has different emotional reactions to manage OW. Regulation of emotions applies to people controlling their emotional perceptions and altering emotional expressions in the face of extreme or negative feelings, intentional behavioral improvement, and regulation of affective states (Leahy et al., 2011). It is especially true for those who have low self-control levels in maintaining their emotions

and have drawn attention to reliance on others to manage their negative emotions. For persons who tend to emotional control issues feeling lonely may be extremely motivating. Humans may be able to express themselves based on the information they are processing through emotions. The grand theory of Aristotle proposed that emotions were sentiments associated with happiness or suffering, such as wrath, joy, fear, love, hatred, desire, and confidence (Bound, 2018). ER to negate the negative emotions and prevent psychological issues is the best way among the masses during the CP (Velotti et al., 2021a,b). The relationship between different variables of the study has been shown in **Figure 1**. The ER strategies have significant impacts on PH and PsH. ER and physical health well-being have an essential association under particular circumstances. The CP is posing a unique circumstance globally, and people are facing numerous kinds of challenges in every segment of life. In the paradigm of COVID-19, examining the relationship between ER, PH, PsH, PA, and OW have vital implications for health and routine life functioning.

MATERIALS AND METHODS

Study Locale

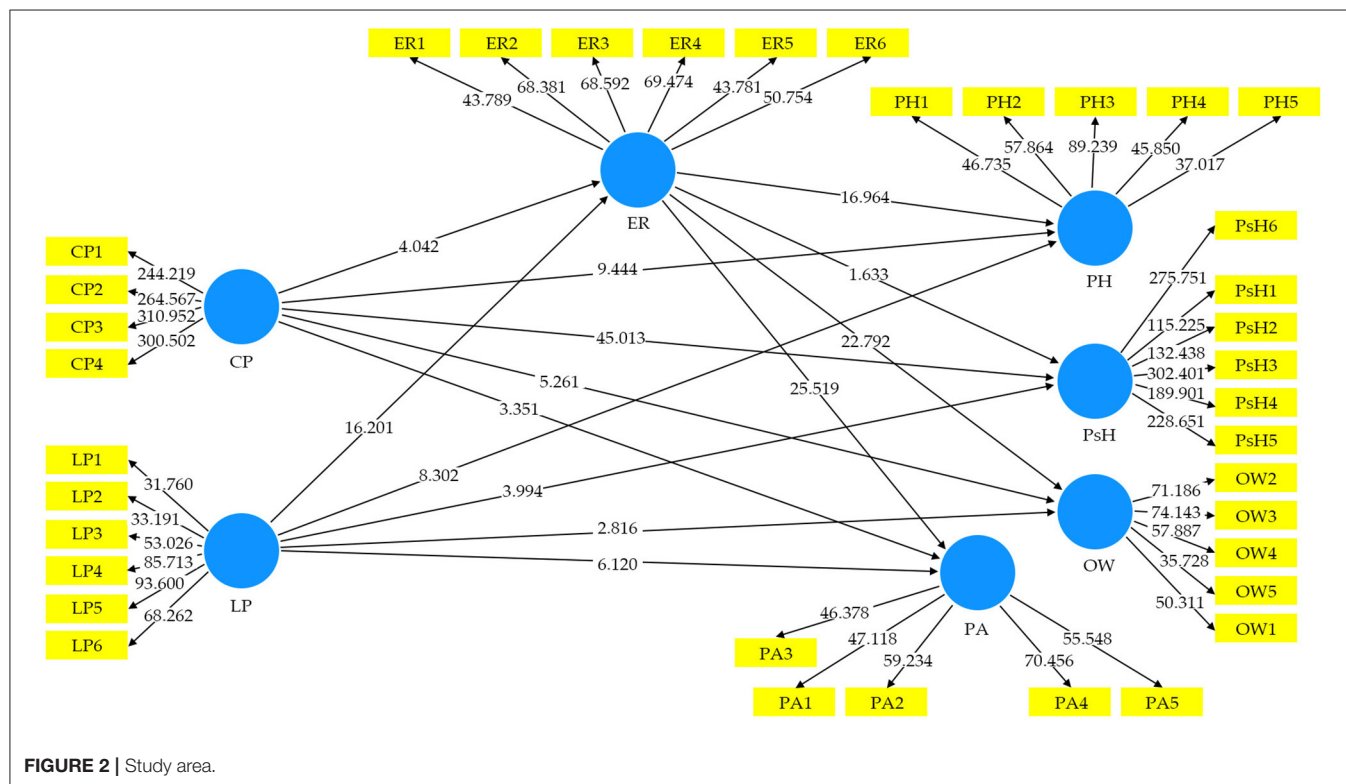
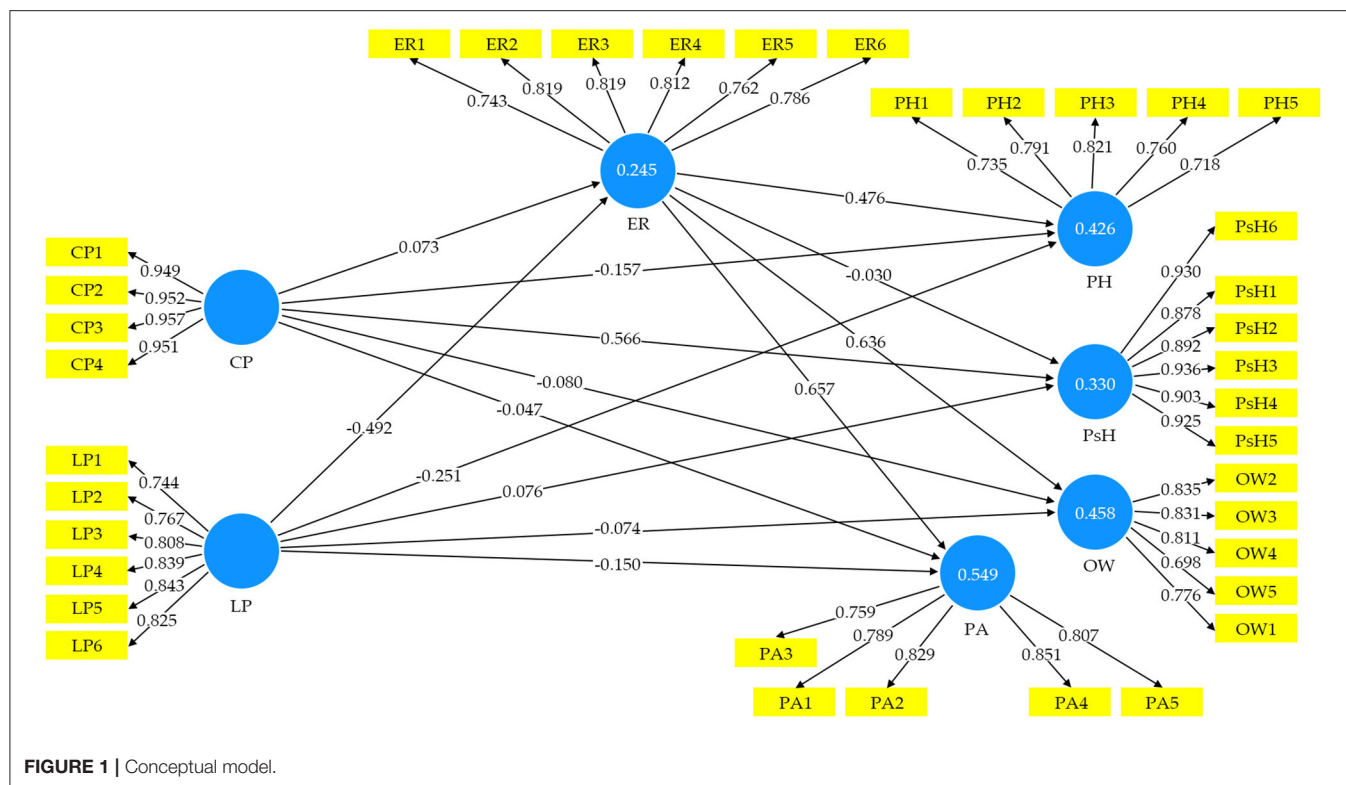
The present study was conducted in two cities of China; Wuhan, Hubei Province, and Suzhou, Jiangsu Province, as shown in **Figure 2**. The study upheld the standards of the World Medical Helsinki Policy. Therefore, the Ethical Committee of Soochow University, Suzhou, Jiangsu and Wuhan Sports University, Wuhan, Hubei, approved the study.

Participants

The current study population was Wuhan, Hubei Province, and Suzhou, Jiangsu Province city residents (+18) in the cities during the lockdown period. A convenience sampling method was used to collect the data by conducting an online survey in both the cities. A total of 2,280 respondents replied to the online survey questionnaire. After quantifying the data, a total of 2,200 respondents from Suzhou (1,034) and Wuhan (1,166) were included for the final data analysis. The answers of the 80 respondents were excluded because of incomplete information. According to the table statistics, most of the survey participants (~53.0%) lived in the Wuhan city, Hubei Province, where the first lockdown was implemented due to the severity of the CP and ~47.0% lived in Suzhou city, Jiangsu Province, during the lockdown period.

Instrument and Data Collection

The impacts of CP and LPs were assessed in the context of HRQoL in association with ER, PH, PsH, PA, and OW. An online questionnaire survey method was used to collect the primary data from the targeted population in both Wuhan and Suzhou cities. The survey method was used to collect the primary data in the current study. The questionnaire was developed after reviewing the variables related to previous research studies regarding SARS and influenza outbreaks (Rubin et al., 2010). The questionnaire was pre-tested in both cities (Wuhan and Suzhou) targeted population before conducting the final survey for data



collection. After pre-testing the questionnaire, some questions were amended and improved the wording of the comprehensive questionnaire for getting the best response rate from the study

participants. An online survey was conducted in both Wuhan, Hubei Province, and Suzhou, Jiangsu Province cities from July 9 to August 10, 2020, to evaluate the CP and LPs and the HRQoL.

TABLE 1 | Demographic characteristics of the survey participants.

City wise demographics	Category	Suzhou (N = 1,034)	Wuhan (N = 1,166)	Overall (N = 2,200)
Age (years)	18–24	316 (30.56%)	514 (44.08%)	830 (37.73%)
	25–34	172 (16.63%)	21 (1.80%)	193 (8.77%)
	35–44	253 (24.47%)	137 (11.75%)	390 (17.73%)
	45–54	199 (19.25%)	215 (18.44%)	414 (18.82%)
	55–64	77 (7.45%)	59 (5.06%)	136 (6.18%)
	65 or older	17 (1.64%)	220 (18.87%)	237 (10.77%)
Gender	Male	503 (48.65%)	583 (50.0%)	1,086 (49.36%)
	Female	524 (50.68%)	572 (49.05%)	1,096 (49.82%)
	Others	2 (0.19%)	3 (0.26%)	5 (0.23%)
	Prefer not to answer	5 (0.48%)	8 (0.69%)	13 (0.59%)
Marital status	Single (never married)	400 (38.68%)	518 (49.57%)	918 (41.73%)
	Married, or in a domestic partnership	595 (57.54%)	512 (43.91%)	1,107 (50.32%)
	Widowed	11 (1.06%)	97 (8.32%)	108 (4.91%)
	Divorced	22 (2.13%)	36 (3.09%)	58 (2.64%)
	Separated	6 (0.58%)	3 (0.26%)	9 (0.41%)
Education	Less than high school degree	137 (13.25%)	354 (30.36%)	491 (22.32%)
	High School	197 (19.05%)	13 (1.11%)	210 (9.54%)
	Associate degree	143 (13.83%)	180 (15.44%)	323 (14.68%)
	Bachelor's degree	167 (16.15%)	414 (35.51%)	581 (26.41%)
	Graduate degree	390 (37.72%)	205 (17.58%)	595 (27.04%)

The questionnaire was based on closed-ended 5-point Likert scale questions regarding the respondents' demographic information, CP, COVID-19 LP, ER, PH, PsH, participation in PA, and OW during the COVID-19 lockdown period. An informed consent received from all the study participants after informing about the purpose of the study. The researchers performed the quality check (accuracy, relevancy, and completeness) of the data collected anonymously. It was guaranteed to all study participants that data would be used only for research.

Conceptualization of Variables and Measurement

After reviewing the relevant literature and studies conducted by Sang et al. (2021) and Lin et al. (2020) in the socio-economic and CP perspective, the current study included living place (Suzhou, Wuhan); gender (male, female, others, and prefer not to answer); age (18–24, 25–34, 35–44, 45–54, 55–64, and 65 years or older); education (less than high school degree, high school degree, associate degree, bachelor's degree, and graduate degree); marital status (single-never married, married, or in a domestic partnership, widowed, divorced, and separated); and employment status (employed full time-including self-employed or homemaker, employed part-time-including self-employed or homemaker, unemployed, student, retired, and unable to work); and annual household income before taxes (Pre-COVID-19). The survey participants reported all the demographic variables used in the study. The CP affects everyday life, movements, trade, and business activities from local to global, which further impacts socio-economic lives of people (Haleem et al., 2020).

The CP and LP were used as independent variables in the current study. The CP was assessed by asking questions about risk perception and belief about the pandemic that emerged in

Wuhan. The questions were based upon the belief about that how the COVID-19 emerged (Due to climate change, the CP created fear and anxiety, the belief that the COVID-19 is a threat to humanity, and the importance have health and well-being as a top priority in everyone's life after COVID-19). As a result, the lockdown was initially imposed to contain the transmission of the pandemic. Under the lockdown measure, several interventions were introduced among the general population for physical health well-being protection. In the present study, questions were asked about the LP interventions (stay at home, social distancing, wearing a facemask, wash hands with sanitizer, quarantine and avoid the areas where the pandemic is severe).

ER is the mediator variable according to the study objective. The questions related to ER in the current study were based upon the coping strategy aspects. The study participants were asked to report the strategies or steps (getting comfort and understanding from someone, use the substance to make myself feel better, accept the reality of fact and learned to live with it safely, maintaining positive thinking, to do physical exercise to release stress and anxiety and look for creative ways to alter the problematic situation) which they used during the lockdown period to regulate the emotions for psychological, physical, and overall health well-being. Infectious disease outbreaks are one of the most daunting conditions to deal with emotionally. Physical and emotional well-being of individuals is jeopardized as they must plan for an uncertain event. Since there is no definite time limit for the conclusion of infectious disease outbreaks, people feel at risk all the time (Bavel et al., 2020).

The dependent variables in this study were PH, PsH, PA, and OW during the CP lockdown. The question statements under the Likert scale for each dependent variable is based on the PH (during the COVID-19: Have you maintained personal

hygiene for disease prevention? Have you been leading an active lifestyle during the COVID-19 lockdown? Did you have a healthy diet during the pandemic lockdown? During COVID-19, have you maintained physical fitness? and During COVID-19, did you have a normal sleep of 8 h?); PsH (During COVID-19 lockdown, have you experienced anxiety, bipolar disorder, insomnia, substance abuse or addiction, depression, and mental stress?); OW (During the CP, your PH remained stable, your PsH remained stable, your lifestyle remained active, your financial situation remained stable and your emotional health remained stable); and PA (use PA to cope with the health maintenance difficulties you faced, encourage others, including your family members, to do physical activities, PA levels during the lockdown period decrease, PA levels during the lockdown period increase and your PA levels during the lockdown period were almost the same). Thus, HRQoL is based on physical, psychological, and OW. Therefore, HRQoL is a multidimensional paradigm in public health and is based on various aspects, such as PH, PsH, and PA (Sitlinger and Zafar, 2018).

Statistical Analysis

For analyzing the collected data for this study, the Smart-PLS 3.2.9 and SPSS 23 software were used (Ringle et al., 2015). The statistical analysis was based on two parts; univariate and multivariate. Under the univariate analysis, the demographic information of the survey participants was analyzed. And under the multivariate analysis, the structural equation model (SEM) technique was applied to examine the relationship between the study variables. Two-step techniques were used under the SEM for analyzing the data. The first step was the measurement model for checking construct validity, reliability, and convergent validity (CV). In the second step, the structural model was developed to test the hypothesis (Anderson and Gerbing, 1992; Hair et al., 2017). A robust, scalable, and advanced method for creating a significant statistical model is the Smart-PLS research design. The function of the Smart PLS-SEM helps achieve the intended objective (Abbas et al., 2019). The SEM in this study is based on six observed variables, as shown in **Figure 1** (conceptual model), to assess the HRQoL. The CP and LP are the independent variables, while ER is considered a mediator variable. Furthermore, PH, PsH, PA, and OW are considered as dependent variables.

RESULTS

Univariate Analysis

Demographic Characteristics of the Survey Participants (N = 2,200)

Table 1 shows the demographic characteristics of the survey participants. The age statistics show that majority of the survey participants (~37.73%) belonged to the age group of 18–24 years, ~18.82% belonged to the age group of 45–54 years, ~17.73% belonged to the age group of 35–44 years, ~10.77% belonged to the age group of +65 years, and ~8.77% belonged to the age group of 25–34 years, while only ~6.18% belonged to the age group of 55–64 years. In the context of gender distribution, the majority of the survey participants (~49.82%)

were female, with a slight difference of ~49.36% being male, and only ~0.59% preferred not to answer about their gender identity. In comparison, only ~0.23% were others. Table statistics show that majority of the survey participants (~50.32%) were married or in a domestic partnership, ~41.73% were single (never married), ~4.91% were widowed, and ~2.64% were divorced. In comparison, only ~0.41% were separated. The educational background shows that the majority of the survey participants (27.04%) had a graduate degree, ~26.41% had a bachelor degree, ~22.32% had less than high school degree, ~14.68% had an associate degree, and ~9.54% had high school level education.

Multivariate Analysis

Assessment of the Measurement Model

We examined the internal consistency reliability, CV, and discriminant validity (see **Table 3**). Cronbach's alpha and composite reliability were utilized to evaluate the internal consistency of the measures used, which ranged from 0.823 to 0.966 and 0.876 to 0.975, respectively, thus surpassing the 0.70 cutoff in all the cases. For CV, the factor loadings of all the items and the average variance extracted (AVE) were conducted. CV was confirmed because loading of all the items was more than 0.6, and the AVE for all the constructs was more than 0.5 thresholds (Hair et al., 2017). All the mentioned results are presented in **Table 2** and **Figure 3**.

Discriminant Validity

There are various approaches to determine discriminant validity, such as Fornell Lacker and Hetro Trait–Mono Trait (HTMT). Fornell Lacker is the first criterion that needs to confirm for discriminant validity. According to this process, the value of the square root of AVE of one construct must be higher than the value of inter-correlations between the constructs. This is because a construct must represent more variance with its items than others in the model. As depicted in **Table 3**, the square roots of the AVE of all constructs are more significant than their corresponding inter-correlation values. Henseler et al. (2016) proposed the HTMT method regarding discriminant validity, which confirms discriminant validity between each pair of variables. **Table 4** shows that the HTMT values are below the threshold of 0.90.

Assessment of the Structural Equation Model

According to Chin (2010), the structural model represents the theoretical model to evaluate the inner path model with structural equations. For the evaluation of the SEM in this research, the essential criteria used were path coefficient (β), coefficient of determination (R^2) for an endogenous variable, effect size (f^2), prediction relevance (q^2), and multicollinearity (inner VIF) (Tenenhaus et al., 2005; Henseler et al., 2009; Götz et al., 2010). The threshold value and description for each benchmark are shown in **Table 5** of the SEM. **Table 5** presents the findings related to our direct hypotheses as well; in support of the first prediction, CP was significantly and negatively related to PH ($\beta = -0.157$, $t = 9.444$, $p < 0.001$, **Table 6**). Similarly, a significant relationship between second prediction CP and PsH was found ($\beta = 0.779$, $t = 45.013$, $p < 0.001$). For the third prediction

TABLE 2 | Construct validity and reliability ($N = 2,200$).

Constructs	Items	FL	CA	CR	AVE
COVID-19 pandemic	CP		0.966	0.975	0.907
	CP1	0.949			
	CP2	0.952			
	CP3	0.957			
	CP4	0.951			
Lockdown policy	LP		0.892	0.917	0.648
	LP1	0.744			
	LP2	0.767			
	LP3	0.808			
	LP4	0.839			
	LP5	0.843			
Emotion regulation	LP6	0.825			
	ER		0.880	0.909	0.625
	ER1	0.743			
	ER2	0.819			
	ER3	0.819			
	ER4	0.812			
Physical health	ER5	0.762			
	ER6	0.786			
	PH		0.823	0.876	0.587
	PH1	0.735			
	PH2	0.791			
	PH3	0.821			
Psychological health	PH4	0.760			
	PH5	0.718			
	PsH		0.959	0.967	0.830
	PsH1	0.878			
	PsH2	0.892			
	PsH3	0.936			
Physical activity	PsH4	0.903			
	PsH5	0.925			
	PsH6	0.930			
	PA		0.867	0.904	0.652
	PA1	0.789			
	PA2	0.829			
Overall well-being	PA3	0.759			
	PA4	0.851			
	PA5	0.807			
	OW		0.850	0.893	0.627
	OW1	0.776			
	OW2	0.835			
	OW3	0.831			
	OW4	0.811			
	OW5	0.698			

FL, Factor Loadings; CA, Cronbach's Alpha; CR, Composite Reliability; AVE, Average Variance Extracted; CP, COVID-19 Pandemic; LP, Lockdown Policy; ER, Emotional Regulation; PH, Physical Health; PsH, Psychological Health; PA, Physical Activity; OW, Overall Well-being.

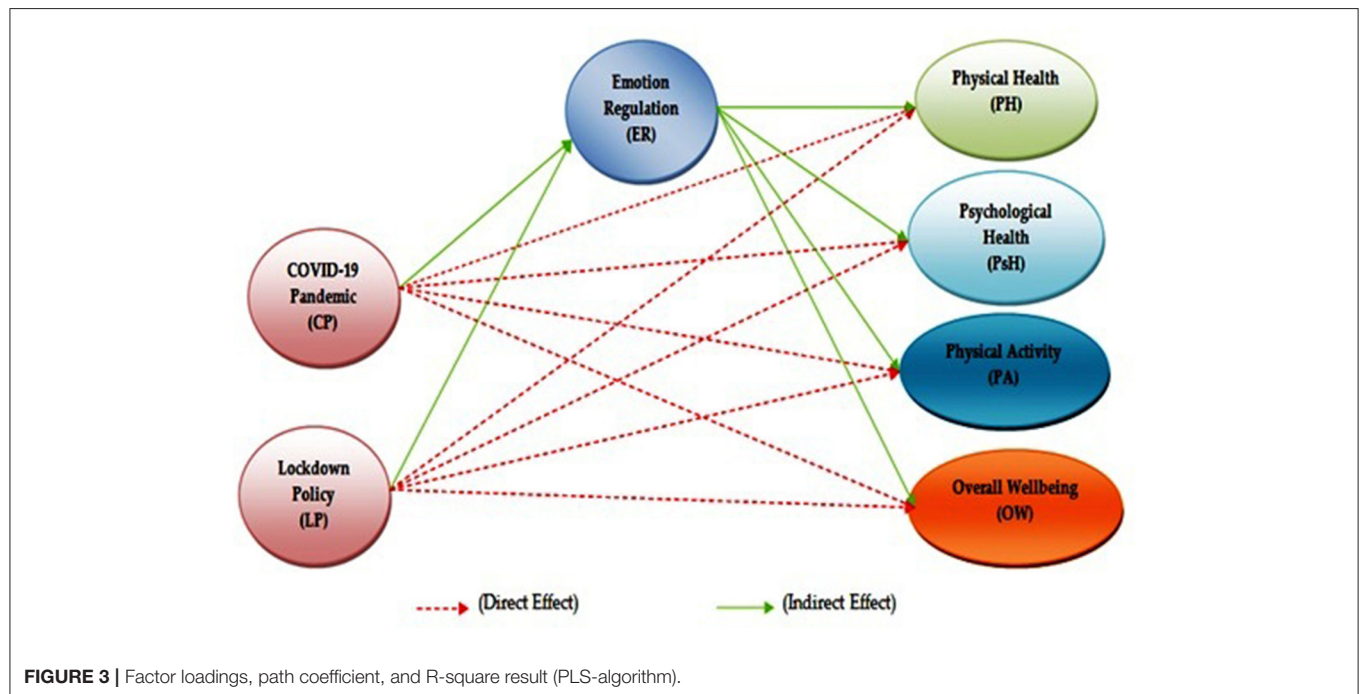
(H3), the statistical analysis revealed that there is a significant negative relationship between CP and OW ($\beta = -0.080$, $t = 5.261$, $p < 0.001$). The fourth hypothesis (H4), the statistical

analysis, revealed that there is a significant negative relationship between CP and PA ($\beta = -0.047$, $t = 3.351$, $p < 0.001$). Similarly, the other four paths, that is, LP and PH, LP and PsH, LP and

TABLE 3 | Discriminant validity: Fornell Larcker ($N = 2,200$).

Constructs	CP	ER	LP	OW	PA	PH	PsH
CP	0.952						
ER	0.057	0.791					
LP	0.032	-0.490	0.805				
OW	-0.046	0.668	-0.388	0.792			
PA	-0.014	0.727	-0.473	0.685	0.808		
PH	-0.138	0.591	-0.490	0.553	0.593	0.766	
PsH	0.567	-0.035	0.109	-0.138	-0.094	-0.122	0.911

CP, COVID-19 Pandemic; ER, Emotion Regulation; LP, Lockdown Policy; OW, Overall well-being; PA, Physical Activity; PH, Physical Health; PsH, Psychological Health.

**TABLE 4 |** Discriminant validity (HTMT method) ($N = 2,200$).

Items	CP	ER	LP	OW	PA	PH	PsH
CP							
ER	0.070						
LP	0.071	0.537					
OW	0.060	0.771	0.435				
PA	0.039	0.825	0.527	0.803			
PH	0.150	0.693	0.555	0.656	0.701		
PsH	0.586	0.052	0.118	0.155	0.105	0.133	

CP, COVID-19 Pandemic; ER, Emotion Regulation; LP, Lockdown Policy; OW, Overall Wellbeing; PA, Physical Activity; PH, Physical Health; PsH, Psychological Health.

OW, and LP and PA, were statistically significant with negative relationships as their p -values were <0.05 . Therefore, the H1 to H8 was supported, which is presented in Table 6 and Figure 4.

Furthermore, the mediating effect of EC among the mediating path, such as CP \rightarrow ER \rightarrow PH, CP \rightarrow ER \rightarrow OW, CP \rightarrow ER \rightarrow PA, LP \rightarrow ER \rightarrow PH, LP \rightarrow ER \rightarrow OW, and LP \rightarrow ER \rightarrow

PA were found statistically significant as the t -values were higher than 1.96 and the p -values were <0.05 . Besides the confidence interval results for those relationships, LL and UL were negative values (i.e., “0” not in between), which also confirmed the mediation effect. Furthermore, all the mediation effects were found to be of partial mediation as their direct relationships were

TABLE 5 | Assessment of structural equation model ($N = 2,200$).

<i>R</i> -square	Endogenous variables		<i>R</i> -square		<i>R</i> -square adjusted		Criteria
	ER		0.245		0.245		0.26: Substantial, 0.13: Moderate, 0.02: Weak, Hair et al., 2017
	OW		0.458		0.457		
	PA		0.549		0.549		
	PH		0.426		0.426		
	PsH		0.330		0.329		
Effect size (<i>F</i> -square)	Endogenous variables		CCR Q ² (=1-SSE/SSO)		CCC Q ² (=1-SSE/SSO)		Criteria
	ER		0.150		0.471		0.26: Substantial, 0.13: Medium effect, 0.02: Small effect Hair et al., 2017
	OW		0.277		0.437		
	PA		0.347		0.472		
	PH		0.243		0.378		
	PsH		0.271		0.756		
Collinearity (Inner VIF)	Exogenous variables	ER	OW	PA	PH	PsH	Criteria
	CP	0.007	0.012	0.005	0.042	0.475	A value larger than (0) indicates Predictive Relevance Hair et al., 2017
	ER		0.563	0.722	0.299	0.001	
	LP	0.321	0.008	0.038	0.083	0.007	
Predictive relevance (Q-square)	Exogenous variables	ER	OW	PA	PH	PsH	Criteria
	CP	1.001	1.008	1.008	1.008	1.008	VIF ≤ 5.0, Hair et al., 2017
	ER		1.325	1.325	1.325	1.325	
	LP	1.001	1.323	1.323	1.323	1.323	

ER, Emotion Regulation; OW, Overall Wellbeing; PA, Physical Activity; PH, Physical Health; PsH, Psychological Health; CP, COVID-19 Pandemic; LP, Lockdown Policy.

TABLE 6 | Path coefficient (direct effect) result ($N = 2,200$).

Hypotheses	Original sample (O)	Sample mean (M)	SD	T	P-values	Decision
CP -> PH	-0.157	-0.158	0.017	9.444	0.001	Significant
CP -> PsH	-0.779	-0.566	0.013	45.013	0.001	Significant
CP -> OW	-0.080	-0.080	0.015	5.261	0.001	Significant
CP -> PA	-0.047	-0.046	0.014	3.351	0.001	Significant
LP -> PH	-0.251	-0.250	0.030	8.302	0.001	Significant
LP -> PsH	-0.076	-0.077	0.019	3.994	0.001	Significant
LP -> OW	-0.074	-0.072	0.026	2.816	0.005	Significant
LP -> PA	-0.150	-0.151	0.025	6.120	0.001	Significant

CP, COVID-19 Pandemic; LP, Lockdown Policy; PH, Physical Health; PsH, Psychological Health; OW, Overall Wellbeing; PA, Physical Activity.

also significant. However, two mediation paths, such as CP -> ER -> PsH and LP -> ER -> PsH, revealed no significant mediation as their p -values were higher than 0.05 and zero “0” in between LL and UL. All the results are presented in **Table 7** and **Figure 4**.

DISCUSSION

In the current study, we tried to explore the mediating role of ER. Furthermore, we assessed the impact of the CP and LP on PH–PsH, PA, and OW in the context of HRQoL. The Chinese

government implemented strict measures for the safety of the Chinese people to contain the COVID-19 virus. Those measures have significant impacts on the HRQoL of the Chinese people.

The findings related to our first hypothesis confirmed our first prediction that CP was found significantly and negatively associated with PH. These findings are in line with the previous studies that reported the CP and the LPs negatively impacting the HRQoL during the COVID-19 epidemic in Morocco (Azizi et al., 2020). The CP affected PH by increasing inactive lifestyles, contributing to OW health-related

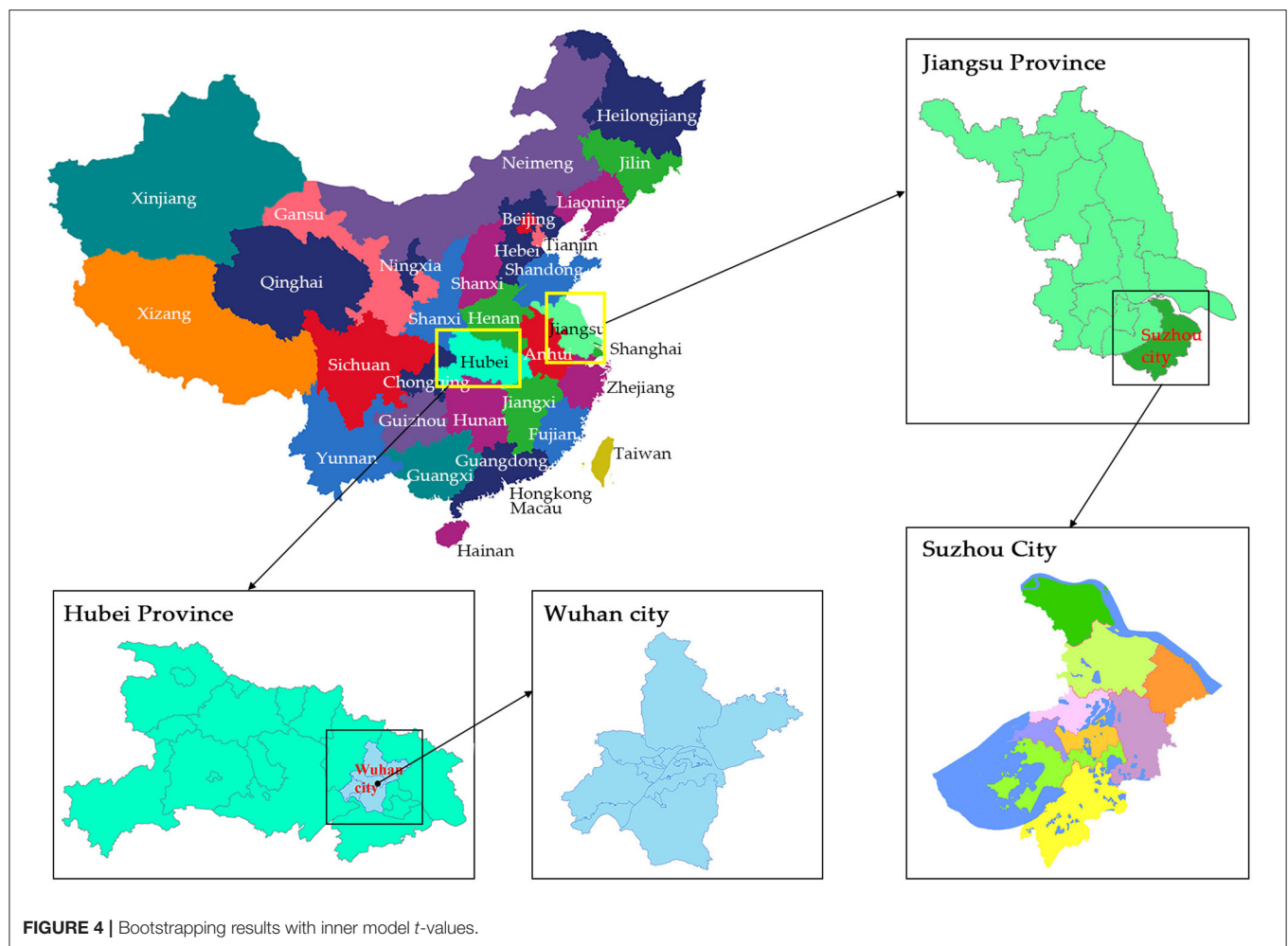


TABLE 7 | Mediation (indirect effect) result ($N = 2,200$).

Hypotheses	OS/Beta	LL	UL	T	P-values	Decision	Mediation
CP -> ER -> PH	-0.035	-0.054	-0.053	3.830	0.001	Significant	Partial
CP -> ER -> PsH	-0.002	-0.006	0.000	1.285	0.200	Not significant	No mediation
CP -> ER -> OW	-0.046	-0.026	-0.069	4.088	0.001	Significant	Partial
CP -> ER -> PA	-0.048	-0.026	-0.072	3.993	0.001	Significant	Partial
LP -> ER -> PH	-0.235	-0.279	-0.195	10.766	0.001	Significant	Partial
LP -> ER -> PsH	0.015	-0.002	0.034	1.631	0.104	Not significant	No mediation
LP -> ER -> OW	-0.313	-0.365	-0.265	12.368	0.001	Significant	Partial
LP -> ER -> PA	-0.323	-0.374	-0.274	12.639	0.001	Significant	Partial

CP, COVID-19 Pandemic; LP, Lockdown Policy; ER, Emotion Regulation; PH, Physical Health; PsH, Psychological Health; OW, Overall Wellbeing; PA, Physical Activity; LL, Lower Limit; UL, Upper Limit.

problems (Krok and Zarzycka, 2020). The mediating effect of ER among the mediating paths was statistically significant as the *t*-values are higher than 1.96 and the *p*-values are <0.05 . A study conducted in Mainland China reported that the effect of CP on emotional stability or the quality of life has negatively impacted China and many other parts of the world (Zhang and Ma, 2020). Our findings confirm that ER has a mediating effect because

both lower and upper limits are negative values. The home confinement policy implementation regarding the containment of the COVID-19 negatively impacted the HRQoL (Lipskaya-Velikovsky, 2021). Similar results have been reported by Özdin and Bayrak Özdin (2020) and Rajkumar (2020) and found that ER, as a coping strategy, significantly impacts eliminating depression and anxiety. Cognitive ER as a coping strategy

correlates with HRQoL (Dubey et al., 2020). ER strategies have a positive impact on psychological well-being (Extremera and Rey, 2014).

The closure of public spaces has negative impacts on the PA level. CP and LPs, directly and indirectly, impact socio-economic, psychological, and physical health well-being aspects of the human society (Sang et al., 2021). The statistical analysis of our study revealed a significant negative relationship between the CP and PA, which means PA level decreased among the targeted research population of our study. PA levels decreased from local to global levels across the world due to the CP lockdown. PA is a natural preventive measure against different non-communicable diseases and plays a vital role in maintaining the HRQoL (Dai and Menhas, 2020; Sánchez Castillo et al., 2020). The decreasing PA and inactive lifestyle were identified as vital issues during home confinement (Bentlage et al., 2020). PA levels decreased from local to global levels across the world due to the CP lockdown. Playgrounds, public parks, and recreational spaces closed due to implementing the COVID-19 LP to cutoff the transmission of the virus. In similar findings by López-Sánchez et al. (2020), it was reported that PA levels declined from about 60.6 to 48.9% among the Spanish population.

The PH, PsH, and OW of the Chinese people were affected due to the CP and lockdown measures. It is suggested that PA is the most suitable preventive measure against chronic anxiety. In the context of PsH, the COVID-19 outbreak increased the mental health issues of Wuhan residents reported by Bao et al. (2020), and a high rate of depression prevalence among young Chinese people has been found during the lockdown period (Huang and Zhao, 2020). General well-being, PH, and PsH are linked with PA. PA is also affected by the COVID-19 lockdown, negatively impacting the HRQoL. PA played a pivotal role in improving HRQoL, especially in the comorbidities reported by Hanke et al. (2020). In the context of PA related to our findings, similar results were reported in Greece and found adverse changes in PA due to the COVID-19 lockdown (Bourdais and Zacharakis, 2020). Our findings show that LP and PH, LP and PsH, LP and OW, and LP and PA also found statistically significant negative relationships as their *p*-values were <0.05. Similarly, a study conducted in Pakistan reported that the COVID-19 negatively influenced Pakistani students, further linked with high depression and mental anxiety (Salman et al., 2020). Likewise, a study conducted in Canada reported that outdoor and overall PA decreased due to the lockdown (Lesser and Nienhuis, 2020). In line with our findings, similar results have been reported by Narayanan et al. (2020) and found that the lifestyle of Indian people has been changed due to the COVID-19 lockdown measures, which further have negative impacts on HRQoL.

CONCLUSIONS

COVID-19 was declared as a global pandemic by the WHO after many cases across China were confirmed. Due to the severity of the COVID-19, many countries worldwide introduced different measures to contain the pathogen of the COVID-19,

such as lockdown of the whole country, smart lockdown, social distancing, and body temperature monitoring at home confinement. The preventive measures taken by different countries had an impact on the socio-economic perspectives to HRQoL (Azizi et al., 2020). Our results show that the CP and the LPs negatively impact the HRQoL among the Chinese population. Additionally, the mediating role of ER was found to significantly improve the HRQoL, such as CP → ER → PH, CP → ER → OW, CP → ER → PA, LP → ER → PH, LP → ER → OW, and LP → ER → PA. Stability and proper ER play a vital role in OW. PA is also important for OW, but due to the COVID-19 LPs across China, PA participation decreased. The mediating role of ER is critical for quality of life during the sudden emergence of an outbreak. ER can be defined as an individual's efforts to monitor and control their ecstatic response. It is suggested that ER intervention reduces the negative psychological impacts for improving quality of life. ER can function one's sentiments in their social environment effectively for quality of life.

STUDY LIMITATIONS

The study has several limitations. The cross-sectional study design is a major limitation of this study. Furthermore, to participate in the survey, the respondent must be 18 years old and literate. The convenience sampling technique was used under the non-probability sampling method according to the objective and nature of the study. The study results cannot be generalized to the whole population because it is hard to replicate the convenience sample results.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the data belongs to a multi-country ongoing project. Requests to access the datasets should be directed to the corresponding author RM.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Soochow University (SUDA2020061H01) and the Ethics Committee of Wuhan Sports University (2020004). The study was conducted according to the Declaration of Helsinki's guidelines. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JD is the principal investigator, while XS, YW, YC, and JH conducted an online survey and collected primary data. RM designed the study model, methodology, wrote the article, and did English editing. SK and MG guided psychological perspective. ZAS contributed to the discussion section with

RM while MNA analyzed the data. BS, SM, and WI designed pictures, while XX did the proofreading and approved the manuscript. All authors contributed to the article and approved the submitted version.

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Prevalence and Risk Factors of Home Quarantine Strategy Implementation Among Chinese Residents During the Coronavirus Disease 2019 Pandemic

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Background: Home quarantine is an important strategy to contain the mass spread of the coronavirus disease 2019 (COVID-19) pandemic. However, there are a dearth of studies on the prevalence and risk factors of home quarantine strategy implementation among residents. This study aims to assess the state of home quarantine strategy implementation among Chinese residents, which could provide a reference for quarantine policymakers around the world during the pandemic.

Method: We conducted a cross-sectional survey of 3,398 residents in China by adopting a convenience sampling strategy. We measured the prevalence and risk factors of home quarantine strategy implementation with the Center for Epidemiological Studies-Depression Scale (CES-D), 10-item Connor-Davidson Resilience Scale (CD-RISC 10), and Perceived Social Support Scale (PSSS). A multivariable model was used to determine the factors associated with home quarantine strategy implementation.

Results: A total of 2,936 (86.4%) respondents carried out home quarantine. There were some factors significantly associated with home quarantine strategy implementation among Chinese residents during the COVID-19 outbreak. Respondents who were male, lived in western and central China, were aware of the primary symptoms of COVID-19, were willing to accept recommendations on relevant protective measures, understood local quarantine measures, had better resilience, and had better social support were more likely to engage in home quarantine. Respondents who were married, were employed, were healthy, and had high depression scores were more likely to refuse to follow home quarantine guidance.

Conclusions: Gender, region, marital status, employment status, health status, awareness of the primary symptoms of COVID-19, willingness to accept recommendations on relevant protective measures, understanding of local quarantine

measures, depression, psychological resilience, and perceived social support were the main factors affecting the implementation of residents' home quarantine strategy. Health service policymakers should adopt relevant measures to improve the prevalence of home quarantine strategy implementation among residents during the pandemic.

Keywords: home quarantine strategy, Chinese residents, coronavirus disease 2019, prevalence, risk factors

BACKGROUND

Home quarantine is the separation and restriction of movement of people who have potentially been exposed to a contagious disease to limit disease spread (Wang et al., 2020). Particularly during the early stages of a novel infectious disease outbreak, quarantine can be applied to large numbers of people. Home quarantine is necessary and effective for preventing the spread of coronavirus disease 2019 (COVID-19) (Wang and Wang, 2020). China adopted the "Reduce travel and contact with others" policy as the core of the nationwide home quarantine strategy early in the COVID-19 outbreak (Bauch and Anand, 2020). With the global spread of the virus, many countries have issued similar home quarantine policies (Matias et al., 2020). Previous studies reported that the effects of home quarantine on the prevention and control of COVID-19 are specific and remarkable. A study conducted by McCloskey et al. (2020) demonstrated that implementing a home quarantine strategy is an effective alternative to reduce the global spread of COVID-19. Ferguson et al. (2020) indicated that home quarantine, social distancing of the entire population, and closure of schools and universities can reduce transmission of the virus. However, another study indicated that the key to the implementation of this strategy is that residents voluntarily comply with home quarantine requirements (Pan et al., 2020). In reality, some residents are still inattentive to the home quarantine strategy and do not comply with the requirements, which vastly reduces the effectiveness of containment strategies and indirectly contributes to the spread of the epidemic.

In an infectious disease pandemic, there are different motivations for residents' adherence to recommendations about social distancing (e.g., desire to protect self and others), and external circumstances or motivators (e.g., work/school conducted remotely) contribute to engagement in and adherence to preventative behaviors, such as social distancing (Guo et al., 2020). These motivations also likely interact with various sociodemographic variables, such as gender, age, socioeconomic and health status, and household size and composition (Guo et al., 2020). There are multiple factors influencing residents' willingness to comply with home quarantine according to previous studies (Webster et al., 2020). For instance, a potential factor is the objective condition of the individual based on income and employment status and the individual's state of health (Cava et al., 2005; Porten et al., 2006; Bodas and Peleg, 2020). Another factor is the subjective psychological status of residents, which reflects their subjective cognitive situation and degree of panic in this crisis (Cui et al., 2020). The third is the environmental factors of

residents, which include the government's response to the crisis and residents' satisfaction with the government's actions (Hsu et al., 2006; Desclaux et al., 2017).

Several studies conducted during the COVID-19 pandemic have explored the willingness of residents to comply with quarantine measures and the influencing factors. However, some studies considered only the impact of demographic and social characteristics and economic factors on residents and failed to fully consider the role of psychological status (Geldsetzer, 2020; Kamenidou et al., 2020). There were also studies that considered the role of mental health and risk perception but did not use professional scales to measure the psychological condition of the residents (Li et al., 2020; Roy et al., 2020; Atchison et al., 2021), such as the Center for Epidemiological Studies Depression Scale (CES-D), the 10-item Connor-Davidson Resilience Scale (CD-RISC 10), and the Perceived Social Support Scale (PSSS). Therefore, it is necessary to conduct research based on full consideration of the various potential factors and the use of specialized measurement tools.

Various models of health behavior change conceptualize motivation as a central predictor for the adoption and maintenance of preventative health behaviors. For example, the capability-opportunity-motivation-behavior (COM-B) model (Michie et al., 2011) posits that the interaction between individual capability (or having the necessary knowledge and skills) and opportunity (physical, social, and environmental support) directly influences motivation to engage in a behavior (reflective and automatic processes driving behavior), which leads to behavior change and maintenance. Self-determination theory (Ryan and Deci, 2000) suggests that there are two types of motivations that drive behavior change: intrinsic motivation, where the individual derives pleasure from the behavior, and extrinsic motivation, where external pressures facilitate adherence to behavior. However, few studies have focused on the influencing factors of home quarantine based on these theories and the influencing factors proposed by previous studies. Therefore, we investigated the willingness of residents to quarantine at home and explored the main factors, which has significance for the improvement and implementation of the home quarantine strategy in future global public health emergency response.

Given that the home quarantine strategy entails significant lifestyle changes for the general population and may potentially be required for months or years to come (Zhang et al., 2020), it is important to understand what facilitates or prevents adherence to these measures so that public health interventions can be developed in a timely manner. Because most countries have relaxed their social and physical distancing measures compared

TABLE 1 | Details of the Center for Epidemiological Studies-Depression Scale (CES-D), 10-item Connor-Davidson Resilience Scale (CD-RISC 10), and Perceived Social Support Scale (PSSS).

Scale	Items	Each item ranged	Construct	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach α	Application in Chinese population
Center for Epidemiologic Studies Depression Scale (CES-D)	20	0–3	Full scale	0.7	0.8	0.9	Chen et al., 2015;
			Depressed mood	0.7	0.7	0.9	Yang et al., 2015;
			Guilt and unworthiness	0.6	0.8	0.8	Wang et al.,
			Helplessness and hopelessness	0.6	0.8	0.8	2019a,b
			Psychomotor hysteresis	0.8	0.9	0.9	
			Loss of appetite	0.7	0.7	0.9	
			Sleep disorders	0.7	0.7	0.8	
10-item Connor-Davidson Resilience Scale (CD-RISC 10)	10	0–4	Full scale	0.8	0.7	0.8	Li et al., 2016;
			Change	0.8	0.7	0.7	Meng et al., 2019;
			Personal problems	0.8	0.6	0.7	Cheng et al., 2020
			Disease	0.7	0.7	0.8	
			Pressure	0.7	0.7	0.8	
			The feeling of failure and pain	0.7	0.7	0.8	
Perceived Social Support Scale (PSSS)	12	1–7	Full scale	0.8	0.8	0.8	Liu et al., 2016; Xu
			Family support	0.7	0.7	0.8	et al., 2019; Xiao
			Friends support	0.8	0.7	0.8	et al., 2020
			Other support	0.8	0.8	0.9	

to the measures taken in the early days of the epidemic, it is crucially important to determine the factors that might affect adherence to these preventive health behaviors in the long run.

METHODS

Ethics Statement

This study protocol was approved by the institutional review board of Tongji Medical College of Huazhong University of Science and Technology, Wuhan, China (IORG No: IORG0003571).

Study Participants

We conducted a cross-sectional survey in China from January 31 to February 29, 2020. We stratified the respondents mainly according to geographical area: the eastern, central, and western regions of China. We adopted a convenience sampling strategy to recruit participants. A total of 3,495 residents received the questionnaire. The response rate was 97.2%, and 3,398 complete questionnaires were employed for the results analysis.

Survey Tools

The questionnaire consisted of five sections: sociodemographic information of the respondents, COVID-19-related cognitive evaluation and protective behaviors, the Center for Epidemiological Studies-Depression Scale (CES-D), the 10-item Connor-Davidson Resilience Scale (CD-RISC 10), and the Perceived Social Support Scale (PSSS). **Table 1** presents the scales-items used, where they were adopted from, and validity and reliability measures.

Center for Epidemiologic Studies Depression Scale (CES-D)

The CES-D is a 20-item self-rating scale for the measurement of depressive symptoms (Adams et al., 2019). It was designed for use in the general population and has been successfully employed to assess depression in a variety of community samples. The categorical response variables for each item ranged from 0 (Rarely or none of the time) to 3 (Most or all of the time). Higher scores reflected lower levels of positive emotional well-being. The Cronbach's alpha coefficient of this scale was 0.9 in this study.

10-Item Connor-Davidson Resilience Scale (CD-RISC 10)

The CD-RISC 10 was developed by Campbell-Sills and Stein as a viable alternative to the original scale after a review of its efficacy revealed an unstable factor structure. The revised scale is a self-report measure with excellent psychometric properties and has generally been shown to be unidimensional in nature (Siddaway et al., 2017). The CD-RISC10 was used to measure the psychological resilience of residents (Cosco et al., 2016). This 10-item scale uses a response scale from 0 (never or not possible) to 4 (always or extremely possible) (Reid, 2016). The total score of the psychological resilience scale is the sum of the scores of the items and ranges from 0 to 40 points. Higher scores indicate higher psychological resilience (Cosco et al., 2016). The Cronbach's alpha coefficient of this scale was 0.8 in this study.

Perceived Social Support Scale (PSSS)

Another measure used was the perceived social support status among Chinese community dwellers during the COVID-19 pandemic. The Perceived Social Support Scale (PSSS) has 12 items in three dimensions: family support, friend support, and

significant other support (Kuru and Piyal, 2018). It has a three-factor structure, with each subscale comprising four items addressing practical help, emotional support, and availability to discuss problems and help in decision making. These 12 items were assessed on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total scores ranged from 12 to 84, with higher scores indicating better social support among residents. Scores of 12–36 indicate low social support; 37–60 indicate moderate social support; and 61–84 indicate high social support (Li et al., 2017). The Cronbach's alpha coefficient of this scale was 0.8 in this study.

Data Collection and Quality Control

The design of the questionnaire was based on a literature review, small group discussion, and simulated interviews (Li et al., 2019). We invited experts for group discussion to improve the professionalism of the questionnaire based on the Delphi method. In addition, we conducted a pilot study to ensure that the language of the questionnaire could be understood and accepted by most residents. Next, we leveraged WeChat (China's largest messaging platform with nearly 1 billion users, similar to WhatsApp in Western countries) to send a hyperlink of the online questionnaire, which was designed using "Survey Star (wjx.cn)," to participants. The researcher entered the data into the Internet database to ensure accuracy (Yu et al., 2019).

Data Analysis

The dependent variable is whether the home quarantine strategy was implemented. In the multivariable model, predictive variables included region, dwelling place, age, sex, marital status, education level, income level, physical condition, drinking habits, smoking status, chronic disease status, whether self or relative had been diagnosed with COVID-19, CES-D score, and CD-RISC 10 score (Mancilla-Galindo et al., 2020; Simpson et al., 2020).

Descriptive analysis was conducted to determine the characteristics of the participants, including the quantity and percentage. No clustering was observed in the respondents (correlation = 0.03, $p < 0.001$). We used stepwise multivariable logistic regression analysis to determine the predictors of home quarantine, i.e., level for selection and elimination: $p = 0.05$ and $p = 0.10$, respectively (Wang et al., 2020). We performed analyses by using SAS version 9.2 (SAS Institute, Cary, NC), and all tests were 2-sided with a significance level of 0.05 (Yu et al., 2018).

RESULTS

Table 2 reports the sociodemographic characteristics of the 3,398 respondents. The mean age was 27.6 years ($SD = 7.7$), and the majority of respondents were female (66.5%). Among the respondents, 585 (17.2%), 2,716 (69.0%), and 637 (18.8%) were from eastern, central, and western China, respectively. Most respondents (95.6%) were Han Chinese and single (68.9%). Approximately 62.0% of respondents were students, soldiers, or freelancers. More than half of the respondents (58.2%) lived in urban areas, and more than half of the respondents (53.7%) had a low mean monthly family income. Most respondents (86.2%)

TABLE 2 | Statistical description of study samples.

Variables	N (%)
Total	3 398 (100)
Gender	
Male	1,138 (33.5)
Female	2 260 (66.5)
Age group, y	
18–44	2,994 (88.1)
45–59	367 (10.8)
>60	37 (1.1)
Region	
Eastern China	585 (17.2)
Central China	2,716 (69.0)
Western China	637 (18.8)
Ethnicity	
Han Chinese	3,248 (95.6)
Minorities	150 (4.4)
Marital status	
Single/widow/divorced	2,340 (68.9)
Married	1,058 (31.1)
Place of residence	
Urban	1,976 (58.2)
Rural	1,422 (41.9)
Highest educational level	
Primary school or below	16 (0.5)
Junior middle school	79 (2.3)
Senior middle school	291 (8.6)
College degree or above	3,012 (88.6)
Employment status	
Employed	1,220 (35.9)
Retired	41 (1.2)
Unemployed	28 (0.8)
Others (students, soldiers, freelancers)	2109 (62.1)
Mean monthly family income	
Higher	203 (6.0)
Middle	1,369 (40.3)
Lower	1,826 (53.7)
Medical insurance status	
Present	2,941 (86.6)
Absent	457 (13.5)
Health status	
Good	2,930 (86.2)
Fair	439 (12.9)
Poor	29 (0.9)
Smoking status	
Current smoker	192 (5.7)
Ex-smoker	85 (2.5)
Non-smoker	3,121 (91.9)
Alcohol consumption status	
Current drinker	397 (11.7)
Ex-drinker	73 (2.2)
Abstainer	2,928 (86.2)
Chronic disease status	

(Continued)

TABLE 2 | Continued

Variables	N (%)
Present	289 (8.5)
Absent	3109 (91.5)
Home quarantine was carried out	
Yes	2,936 (86.4)
No	462 (13.6)
Patients and relatives diagnosed with COVID-19	
Yes	17 (0.5)
No	3,381 (99.5)
Awareness of primary symptoms of COVID-19	
Aware	3,010 (88.6)
Fair	346 (10.2)
Unaware	42 (1.2)
Level of concern for COVID-19	
Concerned	2,995 (88.1)
Moderate	356 (10.5)
Not concerned	47 (1.4)
Willingness to accept recommendations on relevant protective measures (such as wearing masks or not participating in gatherings)	
Willing	3,149 (92.7)
Fair	226 (6.7)
Unwilling	23 (0.7)
Understanding of local quarantine measures	
Understood	2,795 (82.3)
Fair	458 (13.5)
Not understood	145 (4.3)

had a good health status and medical insurance (86.6%). A total of 2,936 (86.4%) respondents carried out home quarantine. The CES-D, CD-RISC 10, and PSSS results across respondents and items showed that the average scores for community residents' social support were 28.4 ($SD = 10.6$), 27.1 ($SD = 8.0$), and 66.1 ($SD = 12.3$), respectively.

Table 3 shows the odds ratio (OR), confidence interval (CI), and significance (p) values from the multivariable analyses. Respondents who were male ($OR = 1.5$, 95% CI: 1.3 ~ 1.9), lived in western and central China ($OR = 1.6$, 95% CI: 1.2 ~ 2.0), were aware of the primary symptoms of COVID-19 ($OR = 1.7$, 95% CI: 1.3 ~ 2.1), were willing to accept recommendations on relevant protective measures ($OR = 1.1$, 95% CI: 1.0 ~ 1.2), understood local quarantine measures ($OR = 1.1$, 95% CI: 1.1 ~ 1.2), had better resilience ($OR = 1.4$, 95% CI: 1.1 ~ 2.0), and had better social support ($OR = 1.3$, 95% CI: 1.1 ~ 1.4) were more likely to implement home quarantine. Respondents who were married ($OR = 0.5$, 95% CI: 0.4 ~ 0.7), were employed ($OR = 0.8$, 95% CI: 0.7 ~ 0.9), were healthy ($OR = 0.8$, 95% CI: 0.7 ~ 0.9), and had high depression scores ($OR = 0.4$, 95% CI: 0.3 ~ 0.5) were more likely to refuse to implement home quarantine.

DISCUSSION

In the face of the outbreak and rapid spread of COVID-19, China actively adopted a series of effective non-pharmaceutical

intervention measures (West et al., 2020). In particular, China implemented the home quarantine strategy of "Reduce travel and contact with others" nationwide, which provided an important boost to COVID-19 prevention and control. This large population-based cross-sectional survey showed that most respondents (86.40%) carried out home quarantine, and whether residents complied with home quarantine had a significant relationship with their gender, region, marital status, employment status, health status, awareness of the primary symptoms of COVID-19, willingness to accept recommendations on relevant protective measures, understanding of local quarantine measures, depression status, resilience, and perceived social support.

Males were more likely to comply with home quarantine, and females were less likely to comply with the strategy. This may reflect the fact that women are more likely to do outside activities. Married residents were more likely to refuse to comply with home quarantine than single/divorced/widowed residents. This may be due to the fact that families can provide some support to individuals during an emergency, so residents with spouses are more confident about overcoming the crisis (Mediouni et al., 2020). This phenomenon also appeared for the region factor. Residents living in eastern China (where economic conditions are better than those in central and western China) had a more relaxed attitude toward the epidemic and were less inclined to implement the home quarantine strategy. One possible explanation is that residents living in eastern China experience better economic conditions, and the living standards are generally higher there than in the central and western regions. Affected by the economic level, residents in different regions showed different mental health responses in the face of the COVID-19 outbreak. However, better mental health may cause such people to lose their alertness to risk. This indicates that countries worldwide should improve the level of economic development and urbanization and simultaneously strengthen public awareness and implementation of policy (Chevance et al., 2020).

The health status of residents was also an important factor affecting the implementation of the home quarantine strategy. Residents with poor health were more likely to implement the home quarantine strategy than those with good health. This may be because residents in poorer health were suffering from psychological stress and were more alert to the risk of illness. Therefore, countries worldwide should actively carry out the detection of suspected patients and strengthen care for residents with poor health (Wang et al., 2020). The more residents knew about the underlying symptoms of COVID-19, the more likely they were to implement a home quarantine strategy. A better understanding of the underlying symptoms of COVID-19 reflected the greater concern of these residents for their own health. Similarly, the more residents understood local government strategies, the more willing they were to implement home quarantine, indicating that a government's policies can provide psychological support to the public. In the face of the COVID-19 outbreak, the government could take effective measures to treat confirmed cases and control the spread of the epidemic, and the public will be more confident in facing the

TABLE 3 | Results of the multivariable analyses for home quarantine among the Chinese residents.

Variables	Odds Ratio (OR)	95% Confidence Interval (CI)	Significance (P)
Gender (Reference: Female)	1.5	1.3 ~ 1.9	0.009
Region (Reference: Eastern China)	1.6	1.2 ~ 2.0	<0.001
Marital status (Reference: Single/widow/divorced)	0.5	0.4 ~ 0.7	0.005
Employment status (Reference: Others [students, soldiers, freelancers])	0.8	0.7 ~ 0.9	0.009
Health status (Reference: Poor)	0.8	0.7 ~ 0.9	0.006
Awareness of primary symptoms of COVID-19 (Reference: Unaware)	1.7	1.3 ~ 2.1	0.009
Willingness to accept recommendations on relevant protective measures (such as wearing masks or not participating in gatherings) (Reference: Unwilling)	1.1	1.1 ~ 1.2	0.004
Understanding of local quarantine measures (Reference: Not understood)	1.1	1.1 ~ 1.2	0.009
Depression condition	0.4	0.3 ~ 0.5	<0.001
Psychological resilience condition	1.4	1.1 ~ 2.0	<0.001
Perceived social support condition	1.3	1.1 ~ 1.4	<0.001

crisis (Reynolds et al., 2020). Thus, countries should respond to people's concerns in a timely manner and take measures to safeguard people's well-being and protect their physical and mental health (Shi et al., 2020). People who were more depressed and had lower levels of mental resilience and social support were more willing to implement the home quarantine strategy. This suggests that psychological factors play an important role in the implementation of this strategy. Some residents will have a poor psychological state in the face of emergencies, and they may better implement national policies. However, there are also some residents who are more optimistic and in a better psychological state, and these residents are more likely to reject national policies (Wang et al., 2020). Countries should actively carry out health education and policy popularization to encourage residents to maintain a good psychological state while improving the implementation of policies.

China is a growing developing country and has a large rural population (Tan et al., 2018). Although China has made great efforts to develop medical and health services and its emergency response to public health emergencies since the SARS epidemic in 2003, it still had to take strong measures and pay a heavy price to contain the spread of COVID-19 in the face of national transmission (Zheng, 2020). COVID-19 is currently raging around the world, making it the worst global pandemic of this century. In the face of the COVID-19 outbreak, how countries promote the implementation of the home quarantine strategy has become a very important international topic. Governments should pay close attention to the policy implementation and psychological status of residents while actively implementing home quarantine strategies. In the long run, countries should further improve their economies, urbanization, and resilience while actively treating confirmed cases, isolating vulnerable populations, strengthening health education, and improving residents' understanding of health emergency policies to weather future global epidemics.

This study has several limitations. In the questionnaire, some potential predictors of the implementation of the

home quarantine strategy among Chinese residents were not investigated, such as cultural factors. In addition, this is a cross-sectional study, which limits the establishment of temporal and causal relationships. However, this study has several advantages. First, this is the first national study on the prevalence and risk factors of home quarantine strategy implementation among residents. Second, with the popularization of smartphones and rapid development of communications tools, an Internet-based survey method could be employed. This study was conducted on an advanced interaction platform, and a higher response rate was obtained by chatting with the survey subjects. The academic contribution of this study is that it considered the potential factors that have been reported by previous studies to influence residents' willingness to implement the home quarantine strategy, especially the influence of psychological factors. In addition, standardized scales were used in the investigation, including the Center for Epidemiological Studies-Depression Scale (CES-D), 10-item Connor-Davidson resilience scale (CD-RISC 10), and Perceived Social Support Scale (PSSS), which enhanced the accuracy of the research conclusions.

Future research could explore more factors that may influence residents' willingness based on this study, such as culture, ethnicity, or religion. In addition, longitudinal studies should be conducted in the future to evaluate the relationship between various influencing factors and the prevalence and risk factors of home quarantine among residents. Countries worldwide are still facing the threat of COVID-19, and the implementation of home quarantine should be taken seriously by governments. Our findings indicate that attention and action are needed to promote home quarantine strategy enforcement. Therefore, global policymakers should take appropriate measures to improve the implementation of the home quarantine strategy among residents, including executing active treatment, strengthening health education, improving residents' awareness of health emergency policies in the short term, and improving the economic level, health, and resilience of the population in the long run.

CONCLUSIONS

The home quarantine strategy is an important strategy for dealing with COVID-19 and was first implemented in China and later promoted in many countries around the world. However, whether this policy can be widely implemented is related to the residents' material foundation, mental condition, and living environment. The investigation revealed that gender, region, marital status, employment status, health status, awareness of the primary symptoms of COVID-19, willingness to accept recommendations on relevant protective measures, understanding of local quarantine measures, depression, psychological resilience, and perceived social support were the important factors affecting the implementation of the home quarantine strategy. This study provides a solid reference for global home quarantine policymakers as well as lessons for dealing with future outbreaks.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

This study protocol was approved by the Institutional Review Board of Tongji Medical College of Huazhong

University of Science and Technology, Wuhan, China (IORG No: IORG0003571). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LL, XS, and YG conceived and designed the study. JF, ZLe, and KT participated in the acquisition of data. XZ and HC analyzed the data. JL and YW gave advice on methodology. LL and XS drafted the manuscript. ZLu and YG revised the manuscript. YG is the guarantor of this work and had full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis. All authors read and approved the final manuscript.

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The Relationship Between State Loneliness and Depression Among Youths During COVID-19 Lockdown: Coping Style as Mediator

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The coronavirus disease (COVID-19) pandemic has had a great impact on public mental health. However, loneliness during the lockdown related to depression and whether the relationship would be mediated by coping style or whether sex moderates loneliness and coping style are not clear. The study aimed to examine the mediating role of coping style in the relationship between state loneliness and depression as well as the moderating role of sex in the relationship between state loneliness and coping styles during the COVID-19 lockdown. Participants were 337 college students in China during the COVID-19 pandemic (January–February 2020). States of depression and anxiety, state loneliness, and coping styles with COVID-19 were measured. The results show that loneliness was an effective predictor of depression during self-quarantine. Moreover, coping style mediated the relationship between state loneliness and depression although sex did not moderate the relationship between state loneliness and coping style. Youths were inclined to use more positive coping strategies than negative coping strategies. Our results indicate less loneliness is an effective way to relieve depression, and coping strategies, especially the positive ones, are important for youths to prevent depression and loneliness during the lockdown of the COVID-19 pandemic.

Keywords: COVID-19, loneliness, depression, coping style, mediator

INTRODUCTION

A severe pandemic of infectious diseases suddenly broke out in Wuhan, Hubei Province, China, in December 2019, and it was named the novel coronavirus disease (COVID-19) by the World Health Organization later. The pandemic had a huge impact on people's mental health and caused problems, such as panic, anxiety, and depression. Moreover, an extended lockdown policy due to COVID-19 has had a huge effect on college students. College education not only puts emphasis on the training of students' academic skill, but also emphasizes the cultivation of students' practical ability. However, the extended lockdown has limited their social practice as well as social activities. In terms of age, they are adults, but not mature. In terms of social development, college students are sensitive, impulsive, dependent, and not good at dealing with frustrations. They are more likely to

experience emotional problems than people at other developmental stages, which is not profitable for them to go through the pandemic and adjust their lifestyles.

Depression

Depression is characterized by continuous low mood and anhedonia (De Fruyt et al., 2020). Researchers have focused on depression among college students for a long time and found that more than half of college students report moderate or severe depression (Cramer and Neyedley, 1998; Killeen, 1998; Alorani and Alrdaydeh, 2017). Besides this, stress is a situation in which the specific social environment threatens the physical and mental health of individuals (Grant et al., 2003). Such a situation may be a short-term environmental event or a long-term life event. The outbreak of a major pandemic is a typical public health emergency, which seriously threatens the safety of people. People often respond to stress usually with generation or aggravation of depression. Since 2000, China has experienced two major pandemic disasters: the SARS pandemic in 2003 and the H1N1 influenza virus in 2009. Tone (2004) found that depression under acute stress was different from normal depression with more harm. During SARS, 25.38% of medical college students were depressed (Liu et al., 2004). Ding et al. (2011) report that 34.88% of unquarantined college students suffered depression during the influenza (H1N1) outbreak. The depression of college students in the stressful social environment conforms to the general psychological characteristics of the postdisaster population. Hence, exploring the mechanism of depression and its interaction with other mental health variables is helpful to provide a scientific basis for psychological counselors to provide counseling services to college students during the COVID-19 pandemic.

What's more, anxiety is an innate, survival-oriented stress response of human beings in the face of environmental stress, and it usually occurs when an individual is faced with threats (Beck and Stanley, 1997). Anxiety and depression are common adverse emotional reactions in a stressful social environment, and they often coexist. Therefore, to explore the relationship between coping style, loneliness, and depression effectively, anxiety is added as a covariate.

Loneliness

Loneliness is a common negative emotion. Fitts et al. (2009) define it as an emotion when an individual experiences a discrepancy between expectation and what they currently perceive. When individuals are not satisfied with their interpersonal relationships, they feel lonely with the perceived gap between what they expected and the objective level in life. It is shown that (1) loneliness stems from dissatisfaction with relationships; (2) loneliness is a subjective feeling, and when someone is isolated, they do not necessarily feel lonely; and (3) loneliness is a negative emotional experience (Baumeister and Leary, 1995; Killeen, 1998).

According to the duration of loneliness, researchers divide it into two types: state and trait loneliness. The former is short term and caused by specific factors, and the latter is long term and related to personality factors. State loneliness can change as

the environment changes. For example, students may experience loneliness when they transfer to another school. Trait loneliness is chronic and caused by a prolonged perception of poor relationships. State loneliness is closely related to trait loneliness. Reconnection motivation indicates that, when individuals are disgusted with state loneliness, they are prompted to reconnect with others (Qualter et al., 2015). In short, loneliness affects the connection between individuals and people around them. Tung et al. (2019) report the severity of loneliness increases significantly after exposure to violent neighborhoods with high crime rates and being forced to stay at home for safety. Maharani et al. (2019) find that hearing impairment is positively correlated with loneliness with a longitudinal study. Adamczyk (2016) finds that support from family and significant others can alleviate loneliness among college students. These indicate that, when people's social behaviors are restricted and their social experiences are poor or when they encounter unpleasant events, they feel lonely. Therefore, it is particularly important to explore the loneliness of college students and its interaction with negative emotions, such as depression states caused by the restriction policy during the pandemic.

Coping Style

Coping style refers to a mode in which individuals adjust their cognition and behavior patterns to alleviate negative feelings when they are under stress (Compas and Boyer, 2001). It is divided into positive and negative coping (Lazarus and Folkman, 1984). When under stress, individuals using positive coping styles may deal with their negative emotions by adopting positive cognition and seeking help (Lazarus and Folkman, 1984). Positive coping styles include strategies such as "Talk to people and pour out your inner troubles" and "Ask for advice from friends, relatives or classmates," and these make individuals focus on solving problems and relieving their negative emotions, such as anxiety and depression. The negative coping style is defined as the negative adaptive adjustment by individuals when they realize that their interaction with the surrounding environment may bring some load to them or even exceed the resources they own (Lazarus, 2000). Negative coping styles include strategies such as "Try to take a break or vacation from your troubles for a while" and "Relieve by smoking, drinking, taking medicine, and eating," and these may not solve the problem properly, and these unresolved difficulties may further bring emotional distress to individuals.

The Present Study

Researchers have tried to explain the relationship between loneliness and depression from a theoretical perspective as well as an empirical perspective. The deficiency hypothesis of loneliness proposes that individuals with strong loneliness are not good at interpersonal interaction, leading to unsatisfied emotional needs and negative emotions, such as depression and anxiety (Yao et al., 2014). Moreover, social support theory proposes that intense loneliness is caused by the lack of social support, and long-term, high-intensity loneliness could further induce depression (Huang et al., 2019). Except for theoretical indication, previous empirical studies also demonstrate the association between depression

and loneliness. A recent meta-analysis summarizes 14 empirical studies and supports the intense positive relationship between loneliness and depression and reports that it is difficult for individuals with high loneliness to relieve depression. Students who live alone or have a bad relationship with people around report severe depression (Shao et al., 2020). Furthermore, studies show that loneliness stably predicts depression and can be an antecedent risk factor for depression (Qualter et al., 2010; Vanhalst et al., 2012; Matthews et al., 2016; Kraav et al., 2021).

The relationship between loneliness and coping style has also been explored before. One study found that teenagers with more loneliness were more likely to use negative coping styles (Van Buskirk and Duke, 1991). Apart from a positive correlation between negative coping and loneliness, a negative correlation between positive coping and loneliness has also been found (Zhao et al., 2017). Coping style also mediates the association between loneliness and other variables, such as self-esteem (Zhao et al., 2017) and adjustment (Quan et al., 2014). In short, a strong association between loneliness and coping style has been found. However, less is known about how the coping style is related to state loneliness caused by lockdown during the COVID-19 pandemic. In addition, researchers have found a strong link between coping style and depression. In a longitudinal study, adolescents who use a negative coping style were found to have more depressive symptoms after 2 years (Seiffge-Krenke and Klessinger, 2000). A negative coping style is positively associated with depression (Boerboom et al., 2014; Abdollahi et al., 2018) and is a main predictor of depression (Mahmoud et al., 2012). Individuals who use positive coping report less depression (Donatti et al., 2017). Hence, it is interesting to explore the relationship between coping style and depression under lockdown during the pandemic.

Furthermore, studies investigate the relationship between coping style, state loneliness, and depression. It is reported that loneliness could hinder the use of positive coping strategies, resulting in a higher probability of depression among Spanish college students (Liang et al., 2019). Only one study split coping styles into positive and negative strategies in teenagers and found coping styles, such as rumination and problem-solving, could both mediate the relationship between loneliness and depression (Zhang et al., 2019). However, whether positive and negative coping styles play a role in the relationship between state loneliness caused by social quarantine and constant high-level depression due to uncertainty during the pandemic in youths is rarely studied.

Moreover, studies consistently show that males are more likely to be lonely than females (Mahon et al., 2006; Ren et al., 2021) and did not recognize their loneliness (Cramer and Neyedley, 1998). Besides this, loneliness is proved to be a predictor of negative coping in females (Zhang et al., 2019). Therefore, sex differences might play a role in the association between loneliness and coping styles and, thus, affect depression.

The aim of our study was to explore the mediating effect of negative and positive coping styles on the relationship between state loneliness and depression as well as the moderating effect of sex on the association between loneliness and coping styles

during COVID-19 quarantine. Based on previous findings, we hypothesized that loneliness could be predictive of depression during COVID-19 quarantine with coping style as a mediator. Moreover, we hypothesized that sex could be a moderator in the relationship between state loneliness and coping style during COVID-19 quarantine (Figure 1).

MATERIALS AND METHODS

Participants

Participants in this study were recruited through social networks and were asked to fill out online questionnaires from February 14 to February 29, which was the peak of the COVID-19 pandemic and the strictest period of nationwide self-quarantine. A total of 337 questionnaires were collected. Participants from Guangdong Province accounted for 72.97%, and those from Hubei Province accounted for 10.51%. None of them were confirmed as COVID-19 cases. They were informed of the contents, purpose, and confidentiality principle. Informed consent was obtained, and then a unique code was given to participants. After eliminating 12 questionnaires that were missed, filled in incorrectly, or repeated, 325 valid questionnaires were finally obtained (effective rate: 96.44%). All participants were between the ages of 17–30 with a mean age of 20.65 (SD = 1.791), and 223 (68.62%) females were included. Participants were compensated with 15 RMB. The study was approved by the Ethics Committee of Shenzhen University.

Measures

Patient Health Questionnaire-9

We modified the Patient Health Questionnaire (PHQ-9) to measure depression during the lockdown of the COVID-19 pandemic. The questionnaire had nine items to measure the frequency of depression. The questionnaire was scored from 0 = “almost never” to 3 = “nearly every day.” Examples of the items are “Do you have little interest or pleasure in doing things during the lockdown of the COVID-19 pandemic?” and “Are you feeling down, depressed, irritable, or hopeless during the lockdown of the COVID-19 pandemic?” If scored less than 4, it

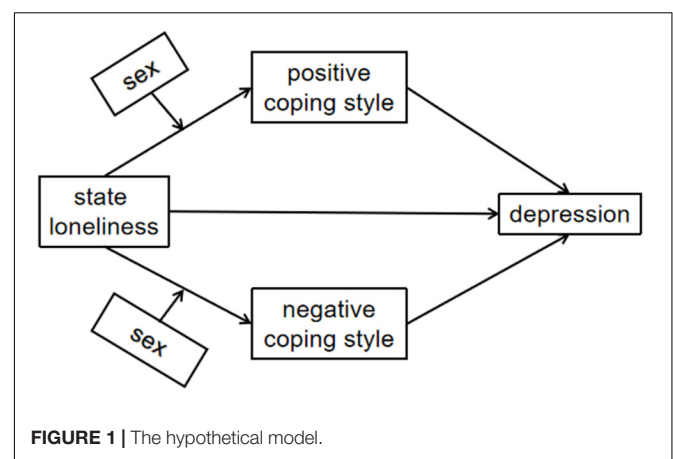


FIGURE 1 | The hypothetical model.

is treated as non-depressed; if scores ranged from 5 to 14, it is treated as mildly depressed; if scores ranged from 15 to 19, it is treated as moderately depressed, if scored above 20, it is treated as severely depressed. Cronbach's coefficient of the scale was 0.89, indicating a good reliability and validity.

State Anxiety Inventory

To control for the state of anxiety, we modified the State Anxiety Inventory (SAI) to measure college students' temporary state anxiety during the COVID-19 pandemic, which was compiled by Spielberger in 1980. Individuals were required to report their state of anxiety during the lockdown of the COVID-19 pandemic on a scale ranging from 1 = "none at all" to 4 = "very much." Examples of the items are "Do you presently worry over possible misfortunes during the lockdown of the COVID-19 pandemic?" and "Do you feel self-confident during the lockdown of the COVID-19 pandemic?" Range of scores is from 20 to 80 with higher scores representing more severe states of anxiety.

State Trait Loneliness Scale

We used the State Trait Loneliness Scale (STLS) to assess the short-term loneliness of college students. This scale was compiled based on the loneliness scale (UCLA) and was more convenient than UCLA. The scale had 12 items with a five-point Likert scale ranging from 1 = "in fully agreement" to 4 = "totally disagree." Examples of the items are "Are you short of companionship during the lockdown of the COVID-19 pandemic?" and "Do you feel your interests and ideas are different from those of people around you during the lockdown of that COVID-19 pandemic?" Higher scores indicate more intensity of state loneliness. Cronbach's coefficient of the scale was above 0.88, indicating a good reliability and validity.

Simplified Coping Style Questionnaire

We used the Simplified Coping Style Questionnaire to measure coping style among college students. The questionnaire fully combines China's cultural and population characteristics. It has 20 items with two dimensions: positive and negative coping styles. It is scored from 0 = "never use" to 3 = "frequently uses." Items from 1 to 12 are used to assess the positive coping styles (e.g., "Getting rid of difficulties through work and study or some other activities during the lockdown of the COVID-19 pandemic" and "Looking for different ways to solve the problem during the lockdown of the COVID-19 pandemic"). Items from 13 to 20 were used to assess negative coping styles (e.g., "Trying to forget what gets you in trouble" and "Getting through your negative feelings and just letting them go"). A high score showed that this method was used frequently. Cronbach's coefficient of the scale was 0.90.

Statistical Analysis

Statistical analysis was conducted by IBM SPSS Statistics (version 26.0). An independent *t*-test was used to analyze sex differences on state loneliness, coping style, and depression. The mediating role of coping style and the moderating role of sex were analyzed by PROCESS macro. We also controlled for sex and anxiety as covariates. The bootstrapping method produces 95%

bias corrected confidence intervals of these effects from 5,000 resamples of the data. Confidence intervals without zero indicate a significant effect.

RESULTS

Depression, Loneliness, and Coping Style of College Students Under the COVID-19 Pandemic

Descriptive statistics are presented in **Table 1**. Of the participants, 58.46% suffered depression; 20.31% suffered moderate or more serious depression. In terms of sex, 31.38% of males reported they suffered from depression, and 68.62% of females did so. There was a significant effect of sex on depression ($t = -2.18$, $p = 0.03$, $d = -0.26$). Sex difference was not found on loneliness ($t = -0.16$, $p = 0.88$, $d = -0.02$), state anxiety ($t = -0.77$, $p = 0.44$, $d = -0.09$), positive coping style ($t = -1.06$, $p = 0.29$, $d = -0.17$), or negative coping style ($t = -0.13$, $p = 0.9$, $d = -0.02$).

To explore the regional differences on loneliness, we divided college students into different regional groups (students in Wuhan City, students outside Wuhan City in Hubei Province, students outside Hubei Province). Results showed that there was no significant regional difference on state loneliness during the lockdown ($F = 2.48$, $p = 0.08$).

Correlation Between Loneliness, Depression, and Coping Style

Correlations for the measured variables, together with descriptive statistics are presented in **Table 1**.

There was a positive correlation between state loneliness and depression ($r = 0.44$, $p < 0.01$) and a negative correlation between state loneliness and positive coping style ($r = -0.35$, $p < 0.01$). Positive coping style was negatively predictive of depression ($r = -0.35$, $p < 0.01$). Meanwhile, negative coping style was negatively correlated with depression and loneliness ($r = -0.18$, $p < 0.01$, $r = -0.19$, $p < 0.01$). The correlation was not significant after controlling for anxiety.

Furthermore, we tested the predictive power of state loneliness on depression with linear regression. It was found that state

TABLE 1 | Descriptive statistics and correlations among key variables.

	Mean	SD	State loneliness	Positive coping	Negative coping	Depression
Age	20.65	1.791				
SAI	38.37	10.09				
State loneliness	28.44	6.80	1			
Positive coping	2.07	0.45	-0.35**	1		
Negative coping	1.77	0.48	-0.18**	-0.01	1	
Depression	6.11	4.71	0.44**	-0.35**	-0.19**	1

** $p < 0.01$. SAI, score of State Anxiety Inventory; SD, standard deviation.

loneliness could be an effective predictor of depression, and it accounted for 19% of the variation in depression ($\beta = 0.44$, $t = 8.69$, $p < 0.001$) with 95% CI: 0.233, 0.370.

The Mediating Role of Coping Style Between State Loneliness and Depression

We found that sex did not moderate the relationship between loneliness and positive coping (95%CI: -0.01 , 0.03), loneliness and negative coping (95%CI: -0.01 , 0.02), positive coping and depression (95%CI: -2.04 , 2.6), negative coping and depression (95%CI: -3.84 , 0.16), or loneliness and depression (95%CI: -0.25 , 0.16).

The results showed that state loneliness could predict positive coping style ($\beta = -0.02$, $t = -6.66$, $p < 0.001$). State loneliness could predict depression ($\beta = 0.23$, $t = 6.24$, $p < 0.001$), and positive coping could predict depression ($\beta = -2.51$, $t = -4.69$, $p < 0.001$). It was indicated that positive coping was a significant mediator in the path of state loneliness affecting depression (Table 2, Figure 2).

State loneliness could predict negative coping style ($\beta = -0.01$, $t = -0.003$, $p < 0.001$). State loneliness could predict depression ($\beta = 0.23$, $t = 6.24$, $p < 0.001$). Negative coping could predict depression ($\beta = -1.29$, $t = -2.69$, $p < 0.001$). It was indicated that the mediating effect of negative coping was significant in the path of state loneliness affecting depression

(Figure 2). After controlling for state anxiety scores and sex, our main results did not change.

A bootstrap method was used to explore effectiveness. The confidence interval of the results of the mediation test does not contain zero, further indicating the significance of the mediating of coping style. State loneliness affected the depression of youths with the total effects of 0.3 (95% CI: 0.23, 0.37), including the direct effect size of 0.23 (95% CI: 0.16, 0.3) and the indirect effect size through coping style of 0.07. At the same time, the indirectly mediating power of positive and negative coping were 0.06 (95% CI: 0.03, 0.1) and 0.01 (95% CI: 0.003, 0.035), respectively. Therefore, coping style mediated the relationship between state loneliness and depression during the lockdown, and the mediating effect accounted for 24.78% of the total effect.

DISCUSSION

This study was aimed to explore the relationships between loneliness, coping style, and depression and investigate the moderating role of sex between state loneliness and coping styles among youths under COVID-19 lockdown. We found that loneliness effectively predicted depression, and coping style played a mediating role, although sex did not moderate the relationship between state loneliness and coping styles. Sex only differed in depression, which was that females were more likely to be depressed during the lockdown. There were no sex differences in state loneliness and coping style. All results were not affected by the state of anxiety.

State loneliness during COVID-19 lockdown was positively predictive of depressive symptoms. This is consistent with previous studies (Lau and Kong, 1999; Cacioppo et al., 2010) as well as a recent meta-analysis (Erzen and Çikrikci, 2018). Lonely students could easily get into difficulties because of negative cognitive, and they were more likely to be depressed (Zawadzki et al., 2013). Adults experienced more loneliness during the quarantine, which can lead to poorer mental health (Creese et al., 2020). The previous study also revealed that depression was intensively correlated with loneliness in the elderly, which was produced when an individual was unable to form a good attachment to others (Peerenboom et al., 2015). Besides this, patients with cancer who experience more loneliness also have an increased risk of depression during COVID-19 (Gallagher et al., 2020). Adding to these, our results indicate that youths who are

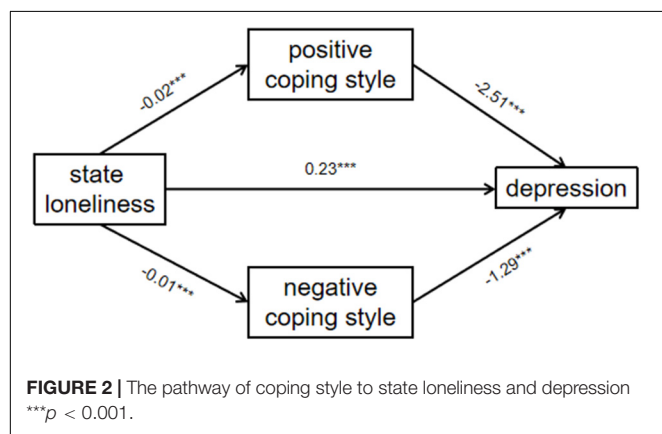


TABLE 2 | Regression analysis of state loneliness, positive coping style, and depression.

	Model 1 (Positive coping)			Model 2 (Negative coping)			Model 3 (Depression)		
	β	SE	t	β	SE	t	β	SE	t
State loneliness	-0.02^{**}	0.003	-6.66	-0.01^{**}	0.004	-3.29	0.23^{**}	0.04	6.24
Positive coping							-2.51	0.53	-4.69
Negative coping							-1.29^{**}	0.48	-2.69
R^2	0.12			0.03			0.25		
F	44.41			10.8			36.3		

** $p < 0.01$.

in lockdown at home may experience depressive symptoms as well as loneliness.

Coping style played a partial mediating role between relationships and loneliness. On one hand, loneliness could negatively predict positive coping style, and positive coping style could negatively predict depression. Individuals with low loneliness tend to use positive coping styles and avoid negative coping styles (Quan et al., 2014), and high loneliness would reduce proactive behavior and the desire to explore the environment (Bolger and Amarel, 2007). Moreover, social supports from family and friends were negative predictors of low loneliness (Salimi and Bozorgpour, 2012). Hence, our results suggest that college students with low loneliness may relate to family support and understanding of the lockdown policy under COVID-19, and they would be more likely to adopt positive coping styles to deal with negative emotions, such as depressive symptoms. On the other hand, negative coping styles also mediated the relationship between state loneliness and depressive symptoms during the lockdown. A previous study reports that loneliness was related to an increased use of passive coping strategies, which involve behaviors such as not dealing with problems and relate to maladaptive psychological outcomes (Vanhalst et al., 2012). Negative response styles, such as rumination, are also associated with depressive symptoms and mediate the effect of loneliness on depression (Zhang et al., 2019). Contrary to these results and our expectations, negative coping styles were negatively correlated with loneliness and depressive symptoms during the COVID-19 lockdown. This inconsistency may result from the negative coping strategies involved in our study being different from the previous negative response style or passive coping. For instance, strategies such as distracting from the problem or persuading oneself to accept the situation contain the component of cognitive reconstruction for the sake of actively solving the problem, which are different from passive coping or negative rumination responses in previous studies. Studies already show that distraction and cognitive reconstruction were effective in relieving negative emotions, including depression (Goldin et al., 2008; Cheng et al., 2009; Dörfel et al., 2014). Therefore, although these negative coping strategies may not directly resolve the stressors, it may distract youths from the pandemic and have some effect on alleviating the negative emotion under the COVID-19 lockdown. Together, our results imply that not positive coping would help youths to adapt to healthy mental states and effectively deal with the pandemic threats, but negative coping would help to relatively alleviate maladaptive emotions during the lockdown. It would be of great importance to improve college students' ability to actively deal with the stressful situation.

Sex did not moderate the relationship between loneliness and coping style during the lockdown. Previous research reports that compared with males, female adolescents with high loneliness were more likely to have a negative response style in general, which was calculated by the ratio of rumination to problem solving and distraction (Zhang et al., 2019). However, in our study, to identify the different role of positive and negative coping, we included more negative coping strategies than rumination and investigated the moderate effect of sex

on loneliness to negative and positive coping, respectively. Nonetheless, we did check the sex effect on the relationship between loneliness and overall coping style (i.e., ratio of negative to positive coping) and found no moderate effect of it. Together with the findings that sex differences are found in depressive symptoms but not loneliness or use of coping styles, we speculate that the homogeneous nationwide lockdown policy during the pandemic may result in non-discriminatory social contacts for both males and females, thus leading to the same level of loneliness in them, and promote the coordinative ability to use coping strategies to deal with stressful situation.

IMPLICATIONS

It is of great importance to improve people's mental health with COVID-19 pneumonia spreading globally, especially for college students with unbalanced physiological and psychological characteristics. Our research shows that coping style mediates the relationship between loneliness and depression, which suggests that a suitable coping style or strategy plays an important role in preventing and intervening in the depressed state among college students. First, given the lockdown situation during the pandemic and the evidence that more social connection predicts less depression (Jose and Lim, 2014), it would be helpful for college students to interact with friends through social media and communicate with the family frequently to meet their social needs and to reduce their solitude. Second, it would be beneficial if they could adjust the goal of interpersonal interaction through cognitive reappraisal. For instance, it may be inevitable to be socially restricted during the lockdown. Therefore, it would be good for college students to understand and support the lockdown policy and to hold a bright view of the pandemic, which may help to relieve negative emotions, such as loneliness and the state of depression.

LIMITATIONS

There were some limitations in our study. As we adopted a self-report approach in our cross-sectional study, it might be difficult to indicate the causality of the variables. Hence, it would be interesting to investigate the causality through longitudinal design in the future. Moreover, although regional differences on state loneliness during lockdown were not significant in our study, a future study may include more objective measurements on mental states during the COVID-19 pandemic, such as lockdown levels and pandemic threat, as indicated in a recent study (Zheng et al., 2020).

CONCLUSION

Our research explored the relationship among depression, state loneliness, and coping style and sex differences during the COVID-19 pandemic. State loneliness was a significant predictor of depression, and both positive and negative coping styles could partially mediate the relationship between state loneliness and

depression under the lockdown. Our findings shed light on public mental health intervention to youths.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Center for Brain Disorders and Cognitive Science. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

YZ and LH did the survey and data analyses. HA and YL designed the study and wrote the manuscript. All authors contributed to the article and approved the submitted version.

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Current Status and Associated Factors of Depression and Anxiety Among the Chinese Residents During the Period of Low Transmission of COVID-19

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Background: The outbreak of coronavirus disease 2019 (COVID-19) has contributed to depression and anxiety among the general population in China. The purpose of this study is to investigate the prevalence and associated factors of these psychological problems among Chinese adults during the period of low transmission, which could reflect the long-term depression and anxiety of the COVID-19 outbreak.

Methods: A cross-sectional survey was conducted in China from 4 to 26 February 2021. Convenient sampling strategy was adopted to recruit participants. Participants were asked to filled out the questions that assessed questionnaire on the residents' depression and anxiety.

Results: A total of 2,361 residents filled out the questionnaire. The mean age was 29.72 years ($SD = 6.94$) and majority of respondents were female (60.10%). Among the respondents, 421 (17.83%), 1470 (62.26%), and 470 (19.91%) were from eastern, central, and western China, respectively. 1704 (72.17%) consented COVID-19 information has been disclosed timely. 142 (6.01%) and 130 (5.51%) patients suffered from depression and anxiety symptoms. Furthermore, some influencing factors were found, including marital status, place of residence, employment status.

Conclusion: This study revealed that anxiety and depression still are potential depression and anxiety for some residents, which suggested early recognition and initiation of interventions during the period of low transmission is still indispensable.

Keywords: epidemic, COVID-19, low transmission, risk factors, prevalence, depression, anxiety

INTRODUCTION

The COVID-19 epidemic was first detected in China at the end of December 2019, when unexplained cases of clustered pneumonia were detected (Nishiura et al., 2020). The Chinese New Year holiday, which coincides with the COVID-19 outbreak, is one of the most festive times of the year in China, causing mass panic when the virus was declared “human-to-human transmission” (Vella et al., 2020). Since the outbreak, the Chinese government has responded quickly, imposing a lockdown and travel restrictions on Wuhan on January 23, an unprecedented move to contain the spread of the epidemic. Within days, the quarantine was extended to other provinces and cities, affecting more than 50 million people in total. Many stayed at home and isolated to prevent infection (Horton, 2020). The constant emergence of infectious diseases caused fear (Xiang et al., 2020). COVID-19 is more contagious and spreads faster than previous outbreaks and pandemics, which could further exacerbate depression and anxiety in the public (Meo et al., 2020). Therefore, timely psychological assessment and appropriate intervention are necessary measures to prevent depressive and anxiety.

The epidemic is a major health crisis affecting several countries with high transmission and mortality rates, which are associated with adverse mental health consequences. Studies have shown that the global population is under extreme strain, leading to a higher risk of anxiety and depression during the COVID-19 outbreak (Özdin and Bayrak, 2020; Wang et al., 2020). Vulnerable populations and health care professionals are particularly affected by the mental health effects of the pandemic (Rajkumar, 2020). A systematic review and meta-analysis found the prevalence of anxiety and depression among health professionals was high during the pandemic (Pappa et al., 2020). The general population is also highly affected by the psychological impact of the COVID-19. Depression and anxiety could reduce patients' quality of life and increase the risk of chronic physical illness and suicide (Ettman et al., 2020; Rodríguez-Rey et al., 2020; Tan et al., 2020; van der Velden et al., 2020; Goularte et al., 2021). A Chinese study assessed the mental health burden of the COVID-19 pandemic on the general population and revealed that anxiety and depressive were prevalent in 35.1%, and 20.1% of the population, respectively (Huang and Zhao, 2020). Similarly, a study in China by Qiu et al. (2020) revealed that 35% of respondents had psychological distress. Other studies conducted during the COVID-19 period also showed that the prevalence of depression and anxiety was 906 (33%) and 517 (18%), respectively, in Italy (Mazza et al., 2020), 81 (23.6%), and 155 (45.1%) in Turkey (Özdin and Bayrak, 2020). Stress and anxiety further affect the physical and psychological health status (Hu et al., 2020; Liu et al., 2020; Wang et al., 2020) and results in negative health outcomes (Roy-Byrne et al., 2008; Smeeding et al., 2010) such as heart disease, high blood pressure, diabetes. Besides, stress and depression weakens the immune system (Kiecolt-Glaser et al., 2002a,b), and hurt the body's ability to fight infection (Esterling et al., 1994). Therefore, it is important to understand the depression and anxiety can be alleviated and to consider early intervention (Mahmoudi et al., 2015; Blake et al., 2020).

Unlike traumatic events at the individual level, the COVID-19 outbreak is an ongoing crisis for every member of society. There are profound and widespread psychosocial effects on individuals, communities and people at the international level during outbreaks of infectious diseases. In the early days of the COVID-19 outbreak in 2020, the number of cases in China rose sharply. The number reached eighty thousand in April, with several days of increases of more than a thousand (Cucinotta and Vanelli, 2020; Lau et al., 2020; Wang et al., 2020b). However, after the implementation of control measures, the epidemic was brought under control in China. By January 2021, the total number of cases in China had not exceeded ninety thousand, showing a slow growth (Liu Z. et al., 2021; Lu et al., 2021). Currently, although the epidemic in China has entered a period of low transmission, the prevalence of anxiety and depression in the population of acute infectious diseases is not clear. By investigating the anxiety and depression prevalence of residents in the low transmission period, this study can reflect the long-term impact of COVID-19, and also identify which types of residents are more likely to contain anxiety and depression in the long term, with proposing targeted strategies for mental health protection after the outbreak of similar acute infectious diseases in the future. As more and more countries enter the low transmission period, it become important to investigate the prevalence and risk factors of depression and anxiety in the population at this stage of infectious disease outbreak. 4–26 February, 2021 is considered as the China New Year. We conducted our study during this period and assumed that some of the residents were still suffering from anxiety and depression. Our survey respondents are residents who are older than 18 years old and live in China for more than 12 months and we only surveyed populations. This study explored the anxiety and depression prevalence in the Chinese population at one year after the COVID-19 outbreak, and clarified the potential psychological problems of the residents, which can provide a reference for health care and mental health policy makers.

MATERIALS AND METHODS

Ethics Statement

This study protocol was approved by the institutional review board of Tongji Medical College of Huazhong University of Science and Technology, Wuhan, China. All methods are performed in accordance with relevant guidelines and regulations. Respondents were informed that their participation was voluntary and implied consent on the completion of the questionnaire.

Study Participants and Survey Design

A cross-sectional survey was conducted in China from 4 to 26 February 2021. Convenient sampling strategy was adopted to recruit participants; the research team used WeChat, China's most popular social media platform, to publicize and distribute survey links to their network members. Network members were requested to distribute the survey invitation to all their contacts. Respondents were stratified according to the eastern

(Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan), central (Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan) and western (Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Inner Mongolia, and Guangxi) regions of China. Participants were informed that their participation was voluntary and their consent was implied by their completion of the questionnaire. The eligibility criteria are as follows: (1) Chinese citizens aged 18 or above; (2) Ability to understand and read Chinese. Exclusion criteria include: (1) Residents under the age of 18; (2) Residents who have resided in China for less than 12 months.

Instruments

The survey consisted of questions that assessed (1) demographic background, (2) Center for Epidemiological Studies-Depression (CES-D) scale, and (3) The Self-rating Anxiety Scale (SAS) scale. Demographic information, including gender, age, marital status, place of residence, highest educational level attained, region, employment status and whether participants' relative or friend has experienced COVID-19 were collected. Whether this psychological problem originates from COVID-19 is mainly due to the fact that this study have emphasized to the respondents in the survey process that the answer to this psychological question needs to be based on the context of COVID-19. Specifically, for each depression and anxiety item, residents need to specify that the various adverse mental states are specifically attributable to COVID-19. In this way, the relationship between psychological problems and COVID-19 is suggested.

CES-D was used to assess depressive symptoms. It includes 20 items; each item has a score of four, ranging from 0 ("little or no time") to 3 ("most or almost all time"). The total score is 0–60 points, the higher the score, the more severe the depressive symptoms. CES-D classifies participants according to the shard total scores, without rating levels. On the original CES-D scale, a total score of 16 was used to detect the presence of depressive symptoms (Cosco et al., 2020). However, a large number of studies have assessed the diagnostic accuracy of CES-D in detecting depression in the general population and have proposed multiple cutoff points, such as a cutoff point of 18 for elderly people living in residential homes (Dozeman et al., 2011) and a cut-off score of 22 in older Chinese (Cheng and Chan, 2005). A meta-analysis study systematically reviewed 28 CES-D studies, including several Chinese studies, and came up with an optimal cut-off point of 20 points (Vilagut et al., 2016). As a result, an overall score of 20 or higher was considered an indicator of depressive symptoms, consistent with previous research (Jiang et al., 2019). This scale has good reliability and validity, and has been widely used in Chinese population. In this study, the Cronbach's alpha coefficient of the scale was 0.91.

SAS was used to assess an individual's level of anxiety (Jegede, 1979; Lindsay and Michie, 1988; Olatunji et al., 2006). There are 20 items in the scale, with 15 forward scores and 5 reverse scores, which is a 4-point score. The cumulative score for each item is multiplied by 1.25 to get the standard total score. A total score of <50 was classified as no anxiety, 50–59 as mild anxiety, 60–69

as moderate anxiety, and ≥ 70 as severe anxiety. In this study, the Cronbach's alpha coefficient of the scale was 0.92.

Statistical Methods

Descriptive analysis includes the mean and standard deviation of continuous variables and the quantity and percentage of classified data. No clustering was observed in the respondents (correlation = 0.03, $P < 0.001$). Therefore, the multivariable linear regression analysis model was used to estimate factors associated with anxiety and depression in residents. We used a variance inflation factor to assess multicollinearity. All analyses were carried out using STATA 12.0, and all differences were tested using two-tailed tests and a P -value of 0.05 was considered statistically significant.

RESULTS

Descriptive Statistics

A total of 2,453 residents received the questionnaire. The response rate was 96.24% with 21 participants not responding and 71 questionnaires not completed. The remaining 2,361 complete questionnaires were used in our analysis.

TABLE 1 | Statistical description of study samples.

Variables	N (%)
Total	2361 (100)
Gender	
Male	942 (39.90)
Female	1419 (61.10)
Age group, y	
18–44	1845 (78.14)
45–59	369 (15.63)
>60	111 (4.70)
Marital status	
Unmarried	1560 (66.07)
Married	801 (33.93)
Place of residence	
Urban	1372 (58.11)
Rural	989 (41.89)
Highest educational level	
Primary school or below	68 (2.88)
middle school	186 (7.88)
College degree or above	2107 (89.24)
Region	
Eastern China	421 (17.83)
Central China	1470 (62.26)
Western China	470 (19.91)
Employment status	
Employed	1014 (42.95)
Unemployed	1347 (57.05)
Relative or friend has experienced COVID-19	
Yes	206 (8.73)
No	2155 (91.27)

TABLE 2 | Regression analysis of associated factors for CES-D Scores among respondents.

Variables	Unstandardized coefficients		Standardized coefficients	<i>t</i>	<i>p</i>	95%CI
	β	SE	β			
Total	37.812	1.168	NA	32.378	<0.001	35.523 ~ 40.101
Gender (Ref: Male)						
Female	-0.065	0.356	-0.004	-0.182	0.856	-0.763 ~ 0.634
Age group, y (Ref: 18–44)						
45–59	0.714	0.483	0.031	1.478	0.139	-0.233 ~ 1.661
> 60	2.533	0.730	0.073	3.472	0.001	1.103 ~ 3.964
Marital status (Ref: Unmarried)						
Married	-0.446	0.504	-0.025	-0.884	0.377	-1.435 ~ 0.543
Place of residence (Ref: Urban)						
Rural	0.185	0.393	0.011	0.470	0.638	-0.585 ~ 0.955
Highest educational level attained (Ref: Primary school or below)						
Middle school	-2.117	1.224	-0.068	-1.729	0.084	-4.516 ~ 0.282
College degree or above	-1.404	1.076	-0.052	-1.305	0.192	-3.513 ~ 0.704
Region (Ref: Eastern China)						
Central China	0.311	0.479	0.018	0.648	0.517	-0.629 ~ 1.250
Western China	0.604	0.569	0.029	1.060	0.289	-0.512 ~ 1.719
Employment status (Ref: Employed)						
Unemployed	0.627	0.494	0.037	1.270	0.204	-0.340 ~ 1.595
Relative or friend has experienced COVID-19 (Ref: No)						
Yes	0.111	0.625	0.004	0.177	0.859	-1.115 ~ 1.337
Ref: Reference						

Table 1 reports the socio-demographic characteristics of the 2,361 respondents. The mean age was 29.72 years ($SD = 6.94$) and majority of respondents were female (60.10%). Among the respondents, 421 (17.83%), 1470 (62.26%), and 470 (19.91%) were from eastern, central, and western China, respectively. Most respondents (89.24%) report having attained a bachelor's degree or higher. More than half of the participants were unemployed (57.05%), unmarried (66.07%), and lived in urban (58.11%). Many of the participants were students, so they were mostly unmarried and unemployed. The mean CES-D scores and SAS Scores of respondents was 8.96 ($SD = 10.78$) and 28.94 ($SD = 10.79$). Using a cutoff score of an overall score of 20 or higher was considered an indicator of depressive for CES-D and more than 50 scores was the indicator of anxiety for SAS. With this average, it is possible to conclude that the sample does not have anxiety or depression. More precisely, 142 (6.01%) and 130 (5.51%) patients had probable suffer from depression and anxiety.

Tables 2, 3 listed the multivariable linear regression analysis results of depression and anxiety factors in respondents. Data distribution coincidence the assumptions of normality and homogeneity of the variances. VIF value were 2.26 (depression) and 2.09 (anxiety), respectively. Residents over 60 years of age ($\beta = 2.533$, 198 95%CI: 1.103 ~ 3.964) had higher CES-D scores. And residents over 60 years of age ($\beta = 4.437$, 95%CI: 1.478 ~ 7.397), lived in rural ($\beta = 1.573$, 95%CI: 0.021 ~ 3.166) and had relative or friend has experienced COVID-19 ($\beta = 2.481$, 95%CI: 0.056 ~ 5.018) had higher SAS scores; while residents were married ($\beta = -2.929$, 95%CI: -4.975 ~ -0.883) had lower scores. R^2 value were 23.2% (depression) and 36.3% (anxiety), respectively.

DISCUSSION

The COVID-19 outbreak has disrupted people's normal lives. Cases of COVID-19 have increased rapidly around the world, causing feelings of uncertainty, depression, and anxiety. Moreover, the implementation of quarantine measures could also have a psychological impact on the residents. The research of Emerson (2020) showed that social distance has a significant impact on loneliness and health behaviors among American adults. In reality, previous studies have shown that at the beginning of the COVID-19 epidemic in China, the prevalence of anxiety and depression in the public was 28.8 and 16.5%, respectively (Wang et al., 2020). This cross-sectional study, based on 2,361 participants, assessed the prevalence and risk factors of depression and anxiety in the general Chinese population during periods of low transmission. We found that 142 (6.01%) and 130 (5.51%) patients suffered from depression and anxiety symptoms. In addition, age, marital status, location of residence, whether a relative or friend had COVID-19, and employment status were factors that influenced anxiety and depression. Because of the urgent need to control the spread of this epidemic, one of WHO's main recommendations is to implement social distancing procedures, which involve minimizing social and physical contact between people, making it impossible for older people to participate in various social activities, which may increase the risk of psychological problems (Williams et al., 2020).

Research by Shah et al. (2021) has shown that people who are unemployed are more likely to suffer from stress and depression during COVID-19; Tee et al. (2020) found that unmarried people

TABLE 3 | Regression analysis of associated factors for SAS Scores among respondents.

Variables	Unstandardized coefficients		Standardized coefficients	<i>t</i>	<i>p</i>	95%CI
	β	SE	β			
Total	73.355	2.417	NA	30.354	<0.001	68.619 ~ 78.092
Gender (Ref: Male)						
Female	0.235	0.738	0.007	0.319	0.750	-1.210 ~ 1.681
Age group, y (Ref: 18–44)						
45–59	-0.337	1.000	-0.007	-0.337	0.736	-2.297 ~ 1.623
>60	4.437	1.510	0.061	2.939	0.003	1.478 ~ 7.397
Marital status (Ref: Unmarried)						
Married	-2.929	1.044	-0.079	-2.806	0.005	-4.975 ~ -0.883
Place of residence (Ref: Urban)						
Rural	1.573	0.813	0.044	2.134	0.043	0.021 ~ 3.166
Highest educational level attained (Ref: Primary school or below)						
Middle school	-1.997	2.533	-0.031	-0.788	0.431	-6.962 ~ 2.968
College degree or above	0.288	2.226	0.005	0.129	0.897	-4.076 ~ 4.651
Region (Ref: Eastern China)						
Central China	0.391	0.992	0.011	0.394	0.694	-1.554 ~ 2.335
Western China	2.071	1.178	0.047	1.758	0.079	-0.238 ~ 4.380
Employment status (Ref: Employed)						
Unemployed	1.220	1.021	0.035	1.194	0.232	-0.782 ~ 3.222
Relative or friend has experienced COVID-19 (Ref: No)						
Yes	2.481	1.294	0.040	2.317	0.035	0.056 ~ 5.018
Ref: Reference						

were more likely to experience stress, anxiety and depression during the pandemic.

Previous research has explained this phenomenon that due to adaptive mechanisms that lack the capacity to deal with crises, which can be used to manage stress associated with the current pandemic (Goularte et al., 2021). Our findings also showed a higher prevalence of anxiety among unemployed and unmarried people. It can be speculated that this community is more prone to negative emotions in the crisis due to the lack of stable career and family support (Pasco et al., 2008; Hu et al., 2018; Gloster et al., 2020). Another group worth discussing is the participants who live in rural areas. Liu L. et al. (2021) showed that during COVID-19, there were significant differences in the mental states of urban and rural residents in China. People who live in rural areas are more likely to suffer from anxiety, depression, and other mental problem, which is consistent with our results. A systematic review by Wang et al. (2020a) also reported similar findings. One possible explanation is that rural residents are more at risk of COVID-19 and more likely to report psychological problems due to poor economic development and poor medical care in rural areas (Liu et al., 2014; Liu and Mao, 2019). Therefore, more attention should be paid to protecting the mental health of these populations during periods of low transmission. Our study also showed that individuals with a relative or friend who experienced COVID-19 were more likely to report anxiety symptoms, similar to previous studies (Wang et al., 2020). The possible explanation for this phenomenon is that they were more aware of COVID-19 infectivity, and therefore more

fearful. Therefore, more attention should be paid to protecting the mental health of these populations during periods of low transmission.

During periods of low transmission, some people still have psychological problems such as anxiety, depression, and stress (Kang et al., 2020; Liem et al., 2020; Xiang et al., 2020). The purpose of this study was to describe the prevalence of anxiety and depression, two major psychological problems, in different populations, and to analyze the potential risk factors during periods of low transmission. This could prompt government agencies and psychologists to pay attention to people's mental health. In addition, the interpretation of the conclusion requires special attention. Although the results of this study identified some potentially vulnerable groups, the results should be treated with caution. In reality, although these people showed higher values in the CES-D and SAS scales, the cut-off points do not indicate depression nor anxiety, because the averages are below the 50 points (SAS) and 20 points (CES-D). Therefore, further research is needed to explore this topic in the future.

LIMITATIONS

This is the first study to measure depression and anxiety in the population in the low transmission period. We used a nationwide sample of the Chinese population, and the results could be useful for countries entering a phase of low transmission. However, there were also some limitations. First, we use a snowball sampling strategy. Snowball sampling is a sampling method of

selecting potential interviewees based on existing interviews, rather than random sampling. The university's admissions information is posted on the website, which leads to the majority of respondents being young students. Therefore, the selection of participants in our study was biased, and the sample population of the study may not be a good representative of the actual patterns of the general population. In addition, the great disparity in size of some subsamples (e.g., age, relative or friend infected with COVID) may increase the probability of making a type 1 error, so consequently, new controlled studies are necessary to verify the results obtained in this research. Second, our study was cross-sectional; we cannot infer a causal relationship between risk factors and depressive symptoms. Therefore, a cohort study is needed to verify this temporal relationship. Third, CES-D is only a screening tool, not a diagnostic tool, although it is already widely used and validated in China. Fourth, this study used a self-administered online questionnaire, so participants needed to be able to use online tools, which might affect their responses to the questionnaire. In addition, future research should also explore more potential factors affecting depression and anxiety of residents, such as specific occupation, working in a home office and shift work.

CONCLUSION

This study indicates that during the low transmission period in China, there were still some general population suffered from depression and anxiety symptoms. People who were older, unemployed, unmarried, live in rural areas, and have a relative or friend who has experienced COVID-19 are more likely to have depression and anxiety. Based on our findings, we recommend the establishment of targeted psychological interventions to improve the mental health of the public during low transmission periods.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

This study protocol was approved by the institutional review board of Tongji Medical College of Huazhong University of Science and Technology, Wuhan, China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XS, SY, and YG conceived and designed the study. JF and ZL participated in the acquisition of data. XS and SY analyzed the data. HC and WZ gave advice on methodology. XS and SY drafted the manuscript. XS, SY, CL, and YG revised the manuscript. All authors read and approved the final manuscript. YG is the guarantor of this work and had full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis.

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Psychosocial Effects of the COVID-19 Pandemic on Patients With Schizophrenia and Their Caregivers

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The aim of this study was to analyze the psychosocial effects of the COVID-19 pandemic on 120 patients with schizophrenia, and their caregivers (control group), in the city of Arica, northern Chile. The hypotheses of this study hold that (1) self-reports of the impact of the COVID-19 pandemic among patients and caregivers would be positively correlated, (2) caregivers would self-report a greater impact of the pandemic on their daily lives, and (3) patients infected with COVID-19 would experience lower levels of mental health improvement and higher levels of psychological distress. Hypotheses were tested using correlations, mean differences, and effect sizes (Cohen's d). The results showed that patients with schizophrenia who had been in quarantine for almost a year showed similar levels of concern as their caregivers in the domains of health and social life. However, caregivers showed significant differences from patients in the areas of income, concern, and employment status. In addition, patients who were infected with COVID-19 showed lower levels of well-being and worse psychological recovery. The implications of the findings highlight the need to incorporate mental health interventions in the pandemic health context for caregivers of people with schizophrenia. Finally, the results suggest that Covid-19 infection has a significant effect on the recovery and psychological well-being of patients with schizophrenia.

Keywords: schizophrenia, psychosocial effects, COVID-19, well-being, recovery

INTRODUCTION

After the severe acute respiratory syndrome (SARS) pandemic in 2003, significantly elevated rates of psychiatric disorders and psychological distress were observed (Mak et al., 2009). Emerging evidence shows that the COVID-19 pandemic has similarly had a negative impact on mental health (Violant-Holz et al., 2020; Solé et al., 2021). Measures to control the pandemic, have had consequences for mental health related to social isolation (Marroquín et al., 2020; Smith and Lim, 2020) and lifestyle changes (Flanagan et al., 2021). A systematic review analyzed the consequences of the COVID-19 pandemic on mental health; it found that the general population had decreased psychological well-being and higher anxiety and depression scores compared to life before COVID-19. The population with pre-existing psychiatric

disorders reported a worsening of psychiatric symptoms independent of the COVID-19 contagion (Vindegård and Benros, 2020). The current COVID-19 pandemic has had a significant impact worldwide, leading to an increased burden on patients with schizophrenia and related disorders (Kozloff et al., 2020; Yao et al., 2020), which may affect the well-being of these patients (Burrai et al., 2020). Therefore, it is plausible that this impact on mental health translates to lower levels of psychological recovery in people with pre-existing mental disorders such as schizophrenia.

People with pre-existing psychiatric disorders are a vulnerable population. They have higher risks of infection and COVID-19 complications than those without a mental disorder, both due to cognitive deficits and comorbid conditions including obesity, diabetes, and hypertension (Shinn and Viron, 2020; Yao et al., 2020). Psychiatric patients are more likely to show moderate to severe worry about their physical health due to concerns that they may have unknowingly contracted the virus. They are also less likely to use effective coping strategies to manage stress (Chua et al., 2004; Phillips et al., 2009; Colizzi et al., 2020; Solé et al., 2021). In addition, there are other factors affecting the mental health of patients with psychiatric disorders, such as delays in the delivery of psychotropic medications, lack of access to primary care or outpatient clinics, increased financial hardship, longer lengths of stay at home, and more impoverished living conditions due to shortages of basic supplies (Hao et al., 2020).

Current evidence suggests that people with schizophrenia may have an increased risk of mortality and morbidity from COVID-19, although the underlying mechanisms are unclear (Mohan et al., 2021). While schizophrenia is recognized as a public health problem in Chile, there are no recent studies on its prevalence. The latest reports have stated that prevalence of schizophrenia was between 1.4 and 4.6 persons per thousand, with an incidence of 12 new cases per hundred thousand each year, and schizophrenia and other psychoses were responsible for 1.87% of the total years of life lost due to premature death and disability in Chile (MINSAL, 2009). Chile's outdated epidemiology of schizophrenia reveals a critical and complex invisibilization, considering that there are no official figures available which situate the panorama of schizophrenia within the current health crisis. Since the beginning of the pandemic, 1,615,771 people have been infected in Chile and the cumulative incidence rate is 9,931.1, but the current incidence rate is 60.1 (MINSAL, 2021).

Despite the COVID-19 pandemic's enormous media presence and profound impact on society, evidence on the subject is still limited. However, the available research links social isolation and loneliness with poor mental health and increased psychological distress in the general population, highlighting a need to assess global results in order to better contextualize Chile's situation (Burrone et al., 2020; Leiva et al., 2020). A group of researchers using self-reported data evaluated the psychological impact of fears and concerns in the general Ibero-American population, noting pervasive fear in participants during periods of isolation, particularly health-related fear (contamination, illness, and death due to coronavirus), fear related to work and loss of income, and fear of social isolation (Sandín et al., 2020).

Feelings of uncertainty are also linked to the social and economic consequences of isolation measures (Johnson et al., 2020; Rodríguez-Pinzón, 2020). Other research has found that the impact of the COVID-19 pandemic on mental health is less severe for people with better psychosocial support from their family and social networks (Lei et al., 2020; Ni et al., 2020). From the above, it is possible to conclude that the psychosocial impact of COVID-19 includes increased worry, fear associated with loss of loved ones and health problems, anxiety surrounding loss of income and employment, and deteriorating mental well-being due to changes in social habits (Johnson et al., 2020; Lei et al., 2020; Ni et al., 2020; Rodríguez-Pinzón, 2020; Sandín et al., 2020).

Clinical outcomes between patients diagnosed with schizophrenia and their caregivers tend to be addressed by isolation. However, understanding the degree of family functioning, particularly its concordance and correlates between patient and primary caregiver perceptions, can serve as a platform for achieving comprehensive patient care (Hsiao et al., 2020). A recent study emphasizes that perceptions of the patient-caregiver relationship play a fundamental role in the health-related quality of life of patients with schizophrenia and their caregivers (Hsiao et al., 2021). Previous studies in northern Chile have already established that the burden and restraint of altered behavior correlate with worsened patient-caregiver relationships (Caqueo-Úrizar et al., 2016), and that the quality of relationships with relatives and caregivers has a significant impact on the patient's quality of life (Caqueo-Úrizar et al., 2017). The degree of agreement in perception of patient suicidality, number of previous hospitalizations, and quality of care is often similar between patients and their primary caregiver, with patient-caregiver dyadic analysis being a good predictor of family functioning (Hsiao et al., 2020). Currently, there are no available studies which analyze perceptions in patient-caregiver relationships about the impact on their daily lives during the COVID-19 pandemic; therefore, it would be relevant to compare the degree of patient-caregiver agreement with a view of developing better psychosocial interventions (Caqueo-Úrizar et al., 2016; Hsiao et al., 2020, 2021).

While the impact of COVID-19 has been particularly problematic for patients with schizophrenia, studies conducted in the early phases of the pandemic reported that patients generally showed low levels of information and concern regarding contagion, likely as a result of the anti-social behaviors and tendency toward isolation that often characterize this population (Barlatti et al., 2021). In contrast, their caregivers have reported high levels of stress and burden during the pandemic (Eckardt, 2020). The COVID-19 pandemic has been a major source of stress (Zucca et al., 2021) and has resulted in a negative impact on the mental health of caregivers, especially considering that most caregivers do not seek out any mental health support as those resources typically target people living with a disorder (Gallagher and Wetherell, 2020; Alexopoulos et al., 2021). Prior to the COVID-19 pandemic, the quality of life for caregivers of people with schizophrenia was already low (Boyer et al., 2012; Stanley et al., 2017). During the pandemic, caregivers are concerned not only for their own health, but also for the continuity of care and well-being of their family member with

schizophrenia (Yasuma et al., 2021). While it is quite possible that there is a similar perception of the impact of COVID-19 among patients with schizophrenia and their caregivers, the disconnect associated with schizophrenia and the greater burden on the caregiver associated with avoiding COVID-19 infection would be expected to result in a greater perceived impact from caregivers.

The clinical features of schizophrenia suggest that this population may be at higher risk of contamination, and infected patients are also expected to be at higher risk of poor outcomes or complications from COVID-19, mainly due to higher rates of comorbidity and possible immunodeficiency associated with schizophrenia (Fonseca et al., 2020; Barlati et al., 2021). A study conducted in Chile showed that participants with schizophrenia had, at some point in their lives, experienced different forms of discrimination including job discrimination, lack of social support, acts of ridicule, disqualifying acts, and social isolation, among others (Herrera, 2018). Likewise, the stigma associated with COVID-19 poses a serious threat to the lives of healthcare workers, patients, and survivors of the disease (Bagcchi, 2020). Therefore, it is possible that patients diagnosed with schizophrenia and COVID-19 experience twice the stigmatization, which can negatively affect their psychological well-being and recovery.

Another reason to expect that the COVID-19 pandemic will negatively impact the mental health of patients with schizophrenia is the loss of social support. Patients with schizophrenia usually have small, poorer quality social networks than the general population (Degnan et al., 2018), so the pandemic could significantly impact patients with schizophrenia due to mandatory social confinement and distancing, which decreases access to social support that aids in treatment of the disorder (Corrigan and Phelan, 2004; Townley et al., 2013; Degnan et al., 2018) and ability to cope with stress (Montross et al., 2005; Volavka and Citrome, 2011). Social distancing may also have a disproportionate impact on quality of life, substance use, symptoms of paranoia, and ability to maintain basic needs, given the heavy reliance of people with schizophrenia on income support and other community services that are more difficult to access, which could lead to further deterioration due to the pandemic (Hakulinen et al., 2020; Hamada and Fan, 2020; Kozloff et al., 2020). In addition, duration of confinement, lack of coping strategies, financial problems, changes in sleeping and eating patterns, and disruption of daily routines are COVID-19 factors that may increase anxiety, stress, and depression in these patients (Salari et al., 2020). Furthermore, restrictions on access to mental health services and hospitals have generated new complications, especially for patients receiving long-acting injectable antipsychotics, leading to an increased risk of relapse resulting from lower treatment adherence (Ifteni et al., 2020; Zhand and Joobar, 2021). In an Italian study of residential and outpatient individuals with schizophrenia, those in outpatient treatment were four times more likely to perceive greater pandemic-related stress than those living in sheltered housing, and were two to three times more at risk for significant symptoms of anxiety and depression (Burrai et al., 2020).

Given the existing literature, there is a need to analyze the effects of the pandemic on those diagnosed with schizophrenia

(Burrai et al., 2020). Thus far, the effects have not been fully delineated (Tzur Bitan et al., 2021), particularly in Latin American countries. Therefore, the present study aimed to analyze the psychosocial effects of the COVID-19 pandemic in a group of patients diagnosed with schizophrenia and their caregivers (control group) in Arica, northern Chile. The hypotheses for this study were as follows: (1) self-reports about the impact of the COVID-19 pandemic from patients and caregivers would be positively correlated, (2) caregivers would self-report a greater impact of the pandemic on their daily lives, and (3) patients infected with COVID-19 would experience lower levels of mental health improvement and higher levels of psychological distress. The findings may have implications for prevention and psychosocial intervention concerning patients with schizophrenia during the pandemic.

MATERIALS AND METHODS

Methodological Strategy

A retrospective group comparison design with correlational scope was used.

Ethics Statement

The study was approved by the Ethics Committee of the University of Tarapacá (18/2009) and the National Health Service of Chile. Written informed consent was obtained from the patients and their primary caregivers. The objectives of the study were explained, as well as the voluntary nature of participation. No compensation was offered for participation in the study.

Participants

Participants were 120 patients diagnosed with schizophrenia according to the criteria of the International Classification of Diseases (ICD), 10th version [World Health Organization (WHO), 1992] and their relatives or caregivers surveyed during the months of August 2020 and May 2021 from three Centers of the Public Mental Health Service of Arica, Chile.

The mean age of participants was 40 years ($SD = 13.7$), of which 60% ($n = 72$) were male and 40% ($n = 48$) were female. Eighty-six percent ($n = 104$) were single, 60% ($n = 72$) reported being unemployed, and 70% ($n = 85$) were pensioned for mental disability. Twenty-seven percent ($n = 32$) reported having been infected with COVID-19 in the last 12 months.

The mean age of the caregivers was 57 years ($SD = 15.5$). Twenty-seven percent ($n = 32$) were men, and 73% ($n = 88$) were women, most of whom were mothers of the 120 patients. Almost all the caregivers (90%, $n = 107$) were living with the patient. Only 41% ($n = 49$) of the caregivers reported a salary as their main source of income. Twenty-seven percent ($n = 32$) reported having been infected with COVID-19 in the past 12 months.

The following inclusion criteria were defined: (1a) Patients diagnosed with Schizophrenia according to the criteria valid for the Chilean health system contained in the ICD, 10th version [World Health Organization (WHO), 1992], users of the various outpatient facilities of the Public Mental Health Service of Arica, (2a) Primary caregiver defined as the person who spends more

hours per day attending and caring for the patient (Gutiérrez-Maldonado et al., 2005); and (3a) only those patient-caregiver dyads that explicitly stated their willingness to participate by signing the informed consent form were considered.

On the other hand, non-inclusion criteria were defined as: (1b) Patients with a history of neurological disorders (including epilepsy and head injury) or other diseases affecting the central nervous system (blindness, deafness); (2b) Patients with dual pathology; and (3b) Patients with a clinical history of cognitive disorders or significant intellectual deficits that hindered their understanding of the interviewer's questions and the questionnaires used.

Instruments

COVID-19 Pandemic Concerns Measurement Guideline

In light of the Coronavirus Fears Scale used by Sandín et al. (2020) and the absence of valid questionnaires for the Chilean population to assess perceptions of the COVID-19 pandemic's impact, an *ad hoc* scale was developed based on self-reports in which participants were asked to characterize their level of exposure to COVID-19 (contagion, close contact, deceased family members, or close relatives). Subsequently, they were asked to assess their perception of the COVID-19 pandemic's impact on main areas of their daily life such as health, general worry, job occupation, social life, and income, using a Likert scale ranging from 1 = "Not at all" to 5 = "Too much". The level of internal consistency was assessed, delivering scores ($\alpha = 0.80$) in the patient sample and ($\alpha = 0.79$) in the caregiver sample. A sample of the administered instrument is provided in the **Supplementary Appendix 1**.

Kessler Psychological Distress Scale (K10)

The K10 (Andrews and Slade, 2001) was used to assess the level of anxiety and depression symptoms experienced by a person during the 4 weeks prior to participating. The scale consists of 10 items rated on a five-point scale ranging from 1 = "Not at all the time" to 5 = "All the time." A higher score on the K10 indicates greater psychological distress. The K10 has been found to have good content validity (Brooks et al., 2006), and predictive validity for DSM-IV affective disorders (Hides et al., 2007) and serious mental illness (Kessler et al., 2003). The K10 was translated into Spanish by Aranguren (2010), and Vargas Terrez et al. (2011) examined the psychometric properties of this instrument in Chile.

Recovery Assessment Scale (RAS-24)

The recovery assessment scale (RAS-24) (Corrigan et al., 2004) evaluates the subjective assessment of personal recovery regarding mental health, and includes 24 items that resulted from factor analysis of the original 41-item scale. The factors that make up the scale are personal confidence and hope (9 items), willingness to ask for help (3 items), goal and success orientation (5 items), reliance on others (4 items), and no domination by symptoms (3 items). The response options are on a 5-point Likert scale (1 = "Strongly disagree" to 5 = "Strongly agree"). Currently, there is no cut-off point for interpreting RAS-24 scores; thus, in

order to reduce arbitrariness, the scores were interpreted using quartiles ($Q1 = 3.29$; $Q2 = 3.75$; and $Q3 = 4.21$). Higher scores indicate more advanced, or better, personal psychological or mental health recovery. The RAS-24 presents adequate evidence of reliability and validity (Corrigan et al., 2004) and is probably the most widely used measure of recovery in research (Salzer and Brusilovskiy, 2014; Van Eck et al., 2018). The RAS-24 has been translated into Spanish by Muñoz et al. (2011), and Zalazar et al. (2017) examined the psychometric properties of this instrument in Argentina.

Positive and Negative Syndrome Scale for Schizophrenia

The positive and negative syndrome scale (PANSS) (Kay et al., 1987) is a 30-item self-report scale developed to assess psychotic symptoms in individuals with schizophrenia. There are five subscales in the PANSS that measure positive (5 items), negative (7 items), excitation (5 items), depression (4 items), and cognitive (3 items) symptom types (Lancon et al., 1998). Responses use a 7-point Likert scale (1 = "Absent" to 7 = "Extreme"). Scores are obtained by calculating the sum of all responses. The scores were interpreted according to the cut-off points of Leucht et al. (2005), where 58–74 suggests "mildly ill," 75–94 suggests "moderately ill," 95–115 suggests "markedly ill," and 116 and above suggests "severely ill." The PANSS has been translated and validated in Spain by Peralta and Cuesta (1994), and Fresán et al. (2005) examined the psychometric properties of it in Mexico.

Clinical and Treatment Data

Clinical variables included age at onset of the disorder (defined as the age at which the first acute psychotic episode appeared), age at onset of treatment, and the presence or absence of treatment (such as pharmacological treatment, psychotherapy, family psychoeducation, cognitive rehabilitation, and occupational therapy).

Procedure

The present study is part of a larger project on longitudinal indicators of recovery in patients with schizophrenia. To ensure the safety of the researchers, it was necessary to create guidelines to reinforce COVID-19 contagion patterns, as well as to serve as an additional source of information to control for possible extraneous variables that could affect the recovery trajectories when gathering data on the perceptions of the patients and their caregivers, about the impact of the pandemic.

Given the legislative regulations in Chile that protect the right to medical privacy and confidentiality for users of the public health system, the researchers were only able to contact the participants and access their clinical information once the patient confirmed their willingness to participate in the study. Treatment center staff were responsible for selecting potential candidates to participate in the study, including only people diagnosed with schizophrenia and excluding patients experiencing psychotic decompensation, severe cognitive impairment, and/or intellectual disability. Once a list of potential participants had been established, the collaborating treatment center staff contacted the candidates

by telephone. Patients and their caregivers who voluntarily agreed to participate in the study were asked to go to the treatment center to sign the informed consent form and complete the questionnaires according to their time availability, while respecting the social distancing protocols established by the Chilean health authority. Only patients who were receiving treatment for schizophrenia were included in the study. Patients diagnosed with schizophrenia and a comorbid disorder were not recruited.

The principal investigator hired three clinical psychologists in December 2019 to conduct the fieldwork. The team of evaluators was trained for 1 month for the correct administration of the questionnaires. During the months of March to June 2020, the researchers maintained contact with the treatment centers with the aim of establishing safe protocols and procedures to ensure adequate sanitary conditions during the evaluation for both participants and evaluators. Finally, the evaluation of the participants was carried out between August 2020 and May 2021, taking between 45 and 60 min to complete the questionnaire.

Data Analysis

Considering the exploratory nature of the study, an effort was made to report the main clinical characteristics available, to provide information on the treatment received and the severity of psychotic symptoms. Therefore, descriptive statistical analysis was performed. The first hypothesis was tested by calculating Pearson's correlation coefficients. The second hypothesis was tested using a paired samples *t*-test to compare differences in patients' and caregivers' perceptions of the impact of the pandemic on various aspects of daily life. The third hypothesis was tested using an independent samples *t*-test to compare recovery and psychological distress scores between patients with schizophrenia who reported COVID-19 infection during the past 12 months and those who did not. The effect size of the differences was estimated using the coefficient *d* proposed by Cohen (1988). Statistical hypothesis testing of the data analysis was performed at a significance level of 5%. All analyses were performed using Jamovi 1.6 Computer Software (The Jamovi Project, 2021).

RESULTS

Participant characteristics are provided in **Table 1**. On average, the age of onset was 21.4 years (*SD* = 8.4) and age of first treatment was 23.8 (*SD* = 8.9). All patients were taking antipsychotic medication, 29.2% were receiving psychotherapy, 17.5% were receiving occupational therapy, and 9.9% were receiving cognitive rehabilitation. Only 5.8% reported severe psychotic symptoms. Fifteen percent presented mean scores above the 75th percentile, suggesting that most reported a more advanced mental health recovery process.

Table 2 provides descriptive statistics of patients' and caregivers' perceptions of the impact of the COVID-19 pandemic on the five areas of daily life.

The correlation matrix (**Table 3**) shows that, in general, the perceptions of patients and their caregivers about the impact

TABLE 1 | Clinical and treatment patients characteristics.

Patients (<i>n</i> = 120)		<i>M</i> (<i>SD</i>) ± range or <i>n</i> (%)
Age of disease onset		21.4 (8.4) ± 8 – 50
Age of onset of treatment		23.8 (8.9) ± 11 – 50
Pharmacological treatment	Yes	120 (100%)
	No	0 (0%)
Psychotherapy	Yes	35 (29.2%)
	No	85 (70.8%)
Cognitive rehabilitation	Yes	13 (10.8%)
	No	107 (89.2%)
Occupational therapy	Yes	21 (17.5%)
	No	99 (82.5%)
RAS-24 total		66.7 (13.7) ± 22 – 89
PANSS categorized	Mildly ill	56 (46.7%)
	Moderately ill	39 (32.5%)
	Markedly ill	18 (15%)
	Severely ill	7 (5.8%)
PANSS total		60.2 (19.5) ± 30.0 – 111.0

M, mean; *SD*, standard deviation; *n*, Number of subjects; %, effective (percentage); RAS, recovery assessment scale; and PANSS, positive and negative syndrome scale.

of the COVID-19 pandemic on daily life were significantly positively correlated with income ($r = 0.53$), concerns ($r = 0.36$), health ($r = 0.39$), social life ($r = 0.32$), and employment status ($r = 0.27$). This suggests that the perceptions of patients and their caregivers may be related.

The results of the *t*-test for related samples (**Table 4**) show that there were statistically significant differences in the perceptions of patients and caregivers regarding the impact of the pandemic on areas including income ($t = -3.75$, $p < 0.001$), concerns ($t = -3.96$, $p < 0.001$), and employment status ($t = -4.68$, $p < 0.001$). Similarly, according to Cohen's *d* criteria, the magnitude of the difference was moderate for the three areas ($d = -0.35$ to -0.44). In this sense, caregivers tended to perceive a greater impact of the pandemic on their daily lives compared to patients. There were no significant differences in the areas of health and social life.

Table 5 presents the results of possible mental health repercussions associated with COVID-19 infection for the sample of patients diagnosed with schizophrenia. Those who had been infected in the last 12 months had a worse recovery process ($t = -2.02$, $p < 0.05$) and experienced more psychological distress ($t = 2.44$, $p < 0.01$). Effect size analysis indicated that the magnitude was moderate for both recovery ($d = -0.42$) and psychological distress ($d = 0.50$).

DISCUSSION

The present study aimed to analyze the psychosocial effects of the COVID-19 pandemic in a group of patients with schizophrenia and their caregivers (the control group) in the city of Arica, in northern Chile.

In relation to the first hypothesis, the results showed that the perceptions of patients and caregivers about the

TABLE 2 | Descriptives of the areas of concern.

		Group	Income		Concern		Health		Social life		Employment status	
Mean	(S.D)	Patients	2.08	(1.48)	2.46	(1.23)	1.92	(1.19)	2.15	(1.41)	1.70	(1.30)
		Caregivers	2.58	(1.45)	2.97	(1.28)	2.09	(1.26)	2.32	(1.42)	2.49	(1.68)

Patients (n = 120).

Caregivers (n = 120).

TABLE 3 | Correlation matrix.

	Income (P)	Concerns (P)	Health (P)	Social life (P)	Employment status (P)
Income (C)	0.053***	0.31***	0.27**	0.07	0.25**
Concerns (C)	0.28**	0.036***	0.22**	0.05	0.07
Health (C)	0.30***	0.27**	0.039***	0.18*	0.23**
Social life (C)	0.19*	0.10	0.15	0.032***	0.07
Employment status (C)	0.48***	0.23**	0.15	0.00	0.027**

(P), Patient reported (n = 120).

(C), Caregiver reported (n = 120).

*p < 0.05, **p < 0.01, and ***p < 0.001, one-tailed.

Bold and italic marks correspond to patient-caregiver correlations on the same dimension of the scale.

pandemic's impact were positively correlated. This suggests that the psychosocial effects of the pandemic would similarly affect patients diagnosed with schizophrenia, and their caregivers. It is possible that the psychosocial effects of the COVID-19 pandemic, when affecting an individual within a group, will in turn affect the rest of the group members, especially those involved in care for pre-existing disorders such as schizophrenia (Yasuma et al., 2021) and dementia (Greenberg et al., 2020; Altieri and Santangelo, 2021), or those raising children with cerebral palsy, autism, and attention-deficit/hyperactivity disorder (Dhiman et al., 2020). Overall, the evidence suggests that, during scenarios such as the COVID-19 pandemic, an increased demand for professional support combined with reduced levels of informal support can lead to serious risks for both caregivers and patients.

Although the perceptions of patients and caregivers were positively correlated, caregivers were significantly more affected than patients in the areas of income, concerns, and employment status, while no differences were observed in the areas of health and social life. It is possible that the pre-existing conditions of restricted personal freedom in people with a diagnosis of schizophrenia contributes to better adjustment to the impact of

the pandemic in areas of daily life, compared to healthy people who are not accustomed to the limitations of freedom required by confinement (Burrai et al., 2020). Additionally, caregivers may be in a position of greater burden because they assume responsibility for the patient in addition to other tasks such as household management or economic support; it is expected that they would be affected to a greater extent than patients, who generally do not work and whose income is dependent on state benefits or the support of other family members. These results are consistent with the second hypothesis of this study. These findings are similarly in line with previous studies that emphasize a close relationship between patients' and caregivers' views that shape family functioning (Caqueo-Úrizar et al., 2016; Hsiao et al., 2020, 2021). The relationship between patient and primary caregiver perspectives underscores the importance of family interventions to better address the psychosocial consequences of the COVID-19 pandemic.

In relation to the third hypothesis, the results showed that patients who had been infected with COVID-19 had higher levels of psychological distress and worse mental health recovery than those who had not been infected. This is similar to what was proposed by Fonseca et al. (2020), who reported that people with schizophrenia are a vulnerable group in the face of an infectious disease outbreak, given their high comorbidity and immunodeficiency, limited access to community care, and the

TABLE 4 | Paired samples t-test.

	t ^a	df	p	Mean difference	SE difference	Effect ^b size
Income	-3.75	117	<0.00	-0.49	0.13	-0.35
Concerns	-3.96	117	<0.00	-0.51	0.13	-0.36
Health	-1.36	117	0.08	-0.16	0.12	-0.13
Social life	-1.12	117	0.13	-0.16	0.15	-0.10
Employment status	-4.68	115	<0.00	-0.79	0.16	-0.44

^aStudent's t.

^bCohen's d.

Patients (n = 120).

Caregivers (n = 120).

TABLE 5 | Independent samples t-test.

	t ^a	df	p	Effect size ^b
Recovery	-2.02	58.3	0.048	-0.42
Psychological distress	2.44	58.0	0.018	0.50

^aWelch's t.

^bCohen's d.

Covid-19 infected patients (n = 32).

Covid-19 not infected patients (n = 88).

risk of medication interruption that increases the risk of relapse or worse clinical outcomes. COVID-19 treatment teams may also be unprepared to treat patients with severe mental disorders. Additionally, stigma related to schizophrenia may discourage patients from seeking help. They may experience discrimination when accessing care, resulting in them being underdiagnosed for comorbid physical illnesses, being less likely to receive definitive screening and interventions, and more likely to receive poorer quality care in general (Kozloff et al., 2020). The fact that people with severe mental disorders such as schizophrenia have greater difficulty recognizing and communicating physical symptoms or health needs (Shinn and Viron, 2020) may also contribute to poorer recovery and increased psychological distress.

Although differences were observed in the levels of well-being and recovery in patients infected with COVID-19, it should be noted that the number of patients infected was small, contrary to previous study findings where these patients tended to have higher rates of infection (Kozloff et al., 2020; Moreno et al., 2020). The low infection rate can be explained by the low social contact the patients tend to have, which was increased by a prolonged quarantine of almost 1 year. It can also be explained by the fact that most of the patients were not married or did not have a partner, which may have reduced the chance of infection, as was found by Tzur Bitan et al. (2021) in Israel.

This study has a few limitations. First, the sample size was relatively small, and availability sampling was used to recruit participants. Therefore, there are limitations in the generalizability of the results. Second, at the time of the study, there were no questionnaires that assessed COVID-19 pandemic-related psychological variables, so a newly created measure assessed the impact of the pandemic on daily life. Therefore, the findings should be interpreted with caution as the measure established provides a simple and reduced view of the impact of the pandemic, in which it is clear that – despite the good levels of Cronbach's alpha – it is an insufficient measure and requires further development. Third, there are limitations associated with the characteristics of the sample. Patient diagnosis was based on a psychiatric evaluation and ICD-10 criteria. There was no confirmation of the diagnosis through other criteria (e.g., ruling out other diagnoses through a blood test, MRI, or CT scan), and the more recent ICD-11 was not used because there was no standardization of the ICD-11 in Chile. Moreover, caregivers are likely to have some characteristics that may not be found in the general population because of their role. Therefore, the results may not be generalizable to non-caregivers. However, an advantage of including caregivers in the study is that they tend to share environmental qualities with the patients, which makes them a relevant comparison group for the purpose of this study.

Future longitudinal studies should evaluate the consequences of the pandemic not only on patient clinical outcomes, but also on their well-being and recovery, as well as the consequences in terms of caregiver burden, mental health, and well-being.

Although it is a descriptive study, this is the first study of patients with schizophrenia in Latin America that examined the psychosocial impact of the pandemic during which there was a prolonged period of quarantine.

CONCLUSION

The results showed that patients with schizophrenia from northern Chile, who had been in quarantine for almost a year, showed similar levels of concern as their caregivers in the domains of health and social life; however, caregivers showed significant differences from patients in the areas of income, concern, and employment status. In addition, patients who were infected with COVID-19 showed lower levels of well-being and worse mental health recovery.

The implications of this study are related to the need to increase healthcare system support, access to mental health services, and federal economic aid, not only for patients but also for caregivers, in order to reduce poor clinical outcomes and caregiver burden.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the University of Tarapacá and the National Health Service of Chile. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AC-U and FP-C: conception and design of the research, preparation of the introduction of the manuscript, data collection, data analysis, and discussion of the manuscript. RF: conception and design of the research, preparation of the introduction of the manuscript, and discussion of the manuscript. AU: preparation of the introduction of the manuscript, data collection, and discussion of the manuscript. All authors contributed to the manuscript and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.729793/full#supplementary-material>

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The Impact of the Corona Virus Disease 2019 Pandemic on Chinese Middle School Students' Self-Perceived Emotional States: A Wuhan Perspective

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This mixed-methods study examined the impact of the COVID-19 pandemic on 1493 Grades 7, 8, and 9 students' self-perceived emotional states in Wuhan, China when it was locked down for the pandemic on January 23, 2020 and when the lockdown was lifted on April 8, 2020, as well as the changes of their emotional states over the 1-year period after the lockdown was lifted. A five-point Likert scale survey was administered to the participants between March 1 and April 1, 2020 when Wuhan was blocked down; and three focus group interviews were conducted between May 1 and May 31, 2021, 1 year after the lockdown was lifted. The results showed that these students in Wuhan experienced feelings of loss of control and negative emotions when the city was locked down and they were home quarantined; furthermore, there were significant differences for their self-perceived feelings of loss of control and negative emotions across demographic variables of gender, grade level, physical activity, social economic status, and family cohesion; finally, their emotional states changed substantially at different time nodes during this pandemic. Implications for students, parents, and schools are discussed.

Keywords: the COVID-19 pandemic, middle school students, emotional states, feelings of loss of control, negative emotions

INTRODUCTION

The Corona Virus Disease 2019 (COVID-19) pandemic broke out suddenly at the beginning of 2020 in Wuhan, China and quickly spread across the whole country and other parts of the world (Chen et al., 2020, 2021; Dan, 2020; Li and Xu, 2020). Due to its highly contagious nature and unavailable treatment drugs, the public had to face a long period time of home quarantine, which not only increased the sensitivity of the general public to the new pandemic, but also posed a serious threat to people's mental health (Dan, 2020; Liu, 2020; Liu et al., 2021).

In a public health crisis, risk perception plays an important role in affecting people's mental health (Commodari et al., 2020; Ding et al., 2020). The public's perceptions of risk as well as their emotional states are different; furthermore, the perceptions of cognitive risk are negatively correlated with depression in people in a public health crisis; therefore, when improving health

policies for people's mental health in public health crises, risk perception should be taken into consideration (Commodari et al., 2020; Ding et al., 2020).

Empirical studies have shown that the COVID-19 pandemic triggered emotional problems for the general public, such as anxiety and depression (Liu, 2020; Wang et al., 2020; Liu et al., 2021). Middle school students, in particular, are the most likely affected group by the COVID-19 pandemic (Commodari and La Rosa, 2020, 2021; Guessoum et al., 2020; Wang et al., 2021). They could not accurately identify the authenticity of information about this pandemic because of the rapid flood of complex information on the Internet and social media; moreover, they would have to study online at home because schools had been closed; consequently, they could easily develop feelings of loss of control and negative emotions; and the increased such feelings may lead to mental health problems such as anxiety and depression (Liu, 2020; Yu et al., 2020).

Since Wuhan first became the center of this pandemic, it is important to investigate the mental states of its middle school students during this major public health emergency when the entire city was locked down for the COVID-19 pandemic on January 23, during the lockdown of the city, and after the lockdown was lifted on April 8, 2020. Such investigations would provide important implications for the schools, middle school students, and their parents and guardians to cope with future major public health emergencies.

A SUMMARY OF THE LITERATURE

Major public health emergencies refer to the sudden occurrence of major infectious diseases, mass diseases of unknown origin, major food and occupational poisoning, and other events that may cause serious damage to the public health (Liu Y. Y. et al., 2020). Research has shown that anxiety and depression are the most common mental health problems that the general public can easily develop under the major public health emergencies (Loh et al., 2005; Motreff et al., 2020; Og et al., 2020; Türk et al., 2021).

For example, the outbreak of the severe acute respiratory syndrome (SARS) in some areas of China at the end of 2002 posed a threat to the health and security of the public and many affected individuals experienced anxiety and depression (Leppin and Aro, 2009; Main et al., 2011). Similarly, after the COVID-19 pandemic outbreak at the beginning of 2020, the public experienced stress response, accompanied by such psychological disorders as anxiety and depression (Liu C. H. et al., 2020). Anxiety was the first to appear, depression was the next; the more individuals were in the worst-hit areas, the higher their anxiety and depression levels would be (Breslau et al., 2008; Liu C. H. et al., 2020).

Anxiety and depression are also common among middle school students (Su, 2006; Hankin et al., 2015; Ling, 2019). Adolescent anxiety and emotional disorders manifested as nervousness, crying, and irritability, accompanied by corresponding cognitive, behavioral changes, and physical symptoms (Su, 2006; Ling, 2019). The prevalence of anxiety has a long-term negative impact on different aspects of children and

adolescents' lives, and affects their cognitive, behavioral, and social functioning at different life stages, leading to education failure, low self-confidence, low self-esteem, and depression (Hankin et al., 2015; Ling, 2019).

Depression is a psychological or psychiatric term, indicating a series of symptoms such as decreased energy and feeling despair (Gong et al., 2019). Adolescent depression and mood disorders become a slow and long-term process, manifested by a sudden decline in academic performance, deterioration in friend relationships, reduction in social interaction or recreational activities, changes in diet, sleep disorders, frequent fatigue, feeling worthless, and hopeless (Su et al., 2011; Frison and Eggermont, 2015). Depressive symptoms including depressive emotions (i.e., feelings of sadness, unhappiness, or depression over an indefinite period of time) are commonly found in adolescents (Hankin et al., 2015). Before the end of puberty, approximately 20% of girls and 7% of boys experience such depressive symptoms (Angold et al., 2002).

Anxiety and depression are more common among adolescents (Seipp, 1991; Ferrari et al., 2013; Ingul and Nordahl, 2013; Chen et al., 2020; Commodari et al., 2020; Guessoum et al., 2020; Chen et al., 2021; Yang, 2021). Many research studies have shown that the prevalence of anxiety and depression is higher in women than in men (Madasu et al., 2019; Yang, 2021). For example, in 2018, the global prevalence of major depression for 12 months was 5.8% for women and 3.5% for men (Ferrari et al., 2013). Also, gender and age are significantly related to anxiety and depression symptoms (Madasu et al., 2019; Yang, 2021). Female adolescents exhibit a higher risk of anxiety and depression during the COVID-19 pandemic and older adolescents are more depressed than younger adolescents (Chen et al., 2020, 2021). Adolescents suffering from anxiety and depression may experience a variety of adverse consequences, such as learning difficulties, poor academic performance, dropping out, not adapting to social relationships, and even risk of suicide (Seipp, 1991; Ingul and Nordahl, 2013).

Moreover, family is one of the most important environments for the development of adolescents' mental health (Tian and Li, 2005; Xie et al., 2008; Türk et al., 2021). The higher the degree of family dysfunction, the higher the levels of adolescents' anxiety and depression would be (Xie et al., 2008). For example, adolescents with separated parents have higher levels of anxiety and depression (Türk et al., 2021).

Middle school students belong to the vulnerable groups (i.e., under the age of 18), and the outbreak of the COVID-19 pandemic has triggered them anxiety and depression to varying degrees (Chen et al., 2020; Lorenzo et al., 2021). Wang et al. (2020) conducted a study on the psychological status of school-age children and adolescents under the influence of the COVID-19 pandemic, and the results showed that 10.4 and 22% of the measured participants showed anxiety and depression symptoms, respectively, furthermore, the older adolescents were more likely to develop depression than the younger ones.

In addition, since the outbreak of the COVID-19 pandemic, middle school students have been learning online courses and carrying out daily activities indoors. This lifestyle change (e.g., long-term home isolation, reduced social activities, online

lessons, and increased parent-child time) as well as the threat of infection may lead to anxiety and depression (Jiang et al., 2020). Without proper psychological interventions, anxiety and depression in adolescents tend to persist into adulthood, causing more serious effects (Wang et al., 2020).

According to recent research studies, factors such as physical activity, social economic status (SES), and family cohesion are found to influence the mental health of middle school students (White, 2000; Pickett et al., 2017; Biddle et al., 2018; Pavey and Brown, 2019; Guhn et al., 2020). The following is a literature review summary of these factors.

First, long-term outdoor and sports activities can improve middle school students' mental health (Bélanger et al., 2019). Middle school students who regularly engage in physical activities are significantly less troubled by psychological stress than those with little physical activity (Ding et al., 1998; Biddle et al., 2018; Yan et al., 2019). This is because active physical activity can reinforce themselves and make them feel good, thereby helping them overcome obstacles and become active (Pickett et al., 2017). Long sitting time and less physical activity significantly increase the chance of developing depression symptoms (Pavey and Brown, 2019). However, physical activity can cultivate their positive self-awareness, provide a sense of belonging, improve physical function, and relieve emotional distress (Driver and Ede, 2009).

Furthermore, the low SES of the family is a recognized risk of poor mental health development in children (Reiss, 2013). It is directly or indirectly related to their emotional development and mental health (Amone-P'Olak et al., 2009). The common SES indicators are family per capita income, parents' education level, and their occupational status (Amone-P'Olak et al., 2009). Studies have shown that when adolescents are exposed to stressful life situations, among the three indicators that reflect the family's socioeconomic status, per capita income, parents' education, and parents' occupational status, adolescents with higher parents' education levels are less likely to experience mental health problems, while family income per capita and parents' occupational status have little predictability for adolescents' mental health (Reiss et al., 2019). During the pandemic, prolonged family isolation, uncertainty about the future, and financial difficulties experienced by the family may all trigger personal psychological symptoms (Karaman et al., 2021).

Finally, family cohesion refers to the degree of mutual commitment, help, and support between family members (Goodyer, 1998; Zhao et al., 2008; Williams, 2013; Yoon and Lian, 2020). Whether the emotional relationship between family members is concordant and harmonious has an important impact on the mental health of middle school students (Williams, 2013). Bad family relationships are one of the important factors that may cause them psychological problems (Goodyer, 1998; Yoon and Lian, 2020). Their overall level of anxiety is significantly negatively correlated with family cohesion; the lower the family cohesion, the easier it is for children to show depression and anxiety disorders (Yang, 2001; Craig et al., 2021). This may be due to the lack of emotional communication and mutual support between parents and children, and the family atmosphere is not harmonious, which not only makes children and adolescents

feel lonely, depressed, withdrawn and silent, but also makes them feel greater pressure and cause anxiety (Wu et al., 2005). Furthermore, when they find that they are connected with their family and can rely on the family in a difficult situation, the family has an important influence on their behaviors and attitudes, and they perceive that the higher the support from the family, the less likely they are to engage in negative behavior (Jhang, 2017). This kind of support and communication between family members may be an important factor in relieving stress (Marta, 1997; Li and Xu, 2020; Zhu et al., 2021).

Recently, researchers have started to examine the impact of the COVID-19 pandemic on people's lives in different countries (Commodari and La Rosa, 2020; Commodari et al., 2020; Ding et al., 2020; Guessoum et al., 2020). For example, Ding et al. (2020) investigated the psychological wellbeing and behavioral responses of adults in China during the COVID-19 pandemic and reported that risk perception and its associated factors significantly affect the mental health of people in public health crises. Furthermore, Commodari and La Rosa (2020) investigated 978 (males = 339; females = 639) secondary school students' psychological experience of quarantine during the COVID-19 pandemic in Italy. The results indicated that females showed more significant psychological negative feelings about the quarantine experience. Similarly, Commodari and La Rosa (2021) examined 1017 secondary school students' distance learning experiences during the first wave of the COVID-19 pandemic in Italy. The results indicated that distance learning was associated with a significant increase in student workload and consequent psychological distress related to homework.

To sum up, previous research studies on the COVID-19 pandemic were cross-sectional in nature (e.g., Chen et al., 2020, 2021). Few of them used longitudinal data for analysis. Moreover, most of previous research studies used quantitative methods in their investigations. The use of qualitative data would provide more in-depth information about the topic being investigated. To bridge these gaps, this study used both quantitative (i.e., a five-point Likert scale survey measuring participants' self-perceived feelings of loss of control and negative emotions) and qualitative (i.e., focus group interviews examining the changes of participants' emotional states) research methods in its design. Furthermore, it combined cross-sectional data with longitudinal data in its analysis.

RESEARCH QUESTIONS

This study aimed to examine the emotional states of middle school students in Wuhan City, when it was locked down for the COVID-19 pandemic on January 23, 2020, during the lockdown of the city, and after the lockdown was lifted on April 8, 2020. Specifically, the following four research questions guided the study: (a) what were the effects of gender, grade level, physical activity, SES, and family cohesion on participants' emotional states as measured by their self-perceived feelings of loss of control and negative emotions? (b) What were their emotional states when Wuhan was locked down for the COVID-19 pandemic? (c) What were their emotional states when the

lockdown was lifted in Wuhan? And (d) how did their emotional states change over the 1-year period after the lockdown was lifted?

MATERIALS AND METHODS

Instruments

A five-point Likert scale survey and follow-up focus group interviews 1 year after were used for the data collection of this study. The survey consisted of a demographic information section and 20 items which required the participants to indicate their responses on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The demographic information included participants' gender (i.e., male and female), grade level (i.e., Grades 7, 8, and 9), physical activity (i.e., low, medium, and high), SES (i.e., low, medium, and high), and family cohesion (i.e., low and high) information. The physical activity variable was measured by the length of time for daily physical exercise and physical labor (e.g., cleaning the floor and washing the dishes); with three levels of low (less than 1 h), medium (1–2 h), and high (more than 2 h) physical activity. The SES variable was measured by the monthly home income; with three categories of low (less than RMB5000), medium (RMB5000–10,000), and high (more than RMB10,000) SES. The family cohesion variable referred to the degree of mutual commitment, help and support between family members; with two levels of low and high family cohesion.

These 20 five-point Likert scale items were selected from previous literature (Cohen et al., 1983; Zigmond and Snaith, 1983; Moos and Moos, 1994) and were used to measure participants' self-perceived feelings of loss of control and negative emotions. Among the 20 items, 10 were reverse scored items (see **Table 1**). Participants' self-perceived feelings of loss of control and negative emotions were calculated by summing and building averages of these 20 items. Average scores around 4 and above may indicate high level feelings of loss of control and negative emotions. The increased such feelings and negative emotions would indicate that participants were experiencing emotional swings, which might lead to mental health problems eventually.

The follow-up focus group interviews with selected participants consisted of six interview questions (see **Table 2**) that required them to describe their emotional states when Wuhan was locked down and when the lockdown was lifted as well as the changes of their emotional states over the 1-year period after the lockdown was lifted. The criteria for selecting the participants were (a) they must come from different schools at different districts and represent different grades; (b) they must have gone through the entire process of Wuhan's lockdown and its lifted lockdown; and (c) they must come from different SES and gender backgrounds. The researchers believed that the selected participants are representative of the main sample.

Participants

The researchers first invited all the Grades 7–9 students studying at 22 middle schools across five districts of Wuhan City to participate in this study by providing them and their parents

with letters of information and consent forms. With their parents' permissions a total of 2000 students finally agreed to participate in the study. The total number of students in these 22 schools was 32,200 (see **Appendix Table 1**). These students were considered a representative sample of all middle school students in Wuhan. They were grouped by gender, grade level, physical activity, SES, and family cohesion for data analysis.

Data Collection Procedures

Data were collected at two phases. The first phase was survey data collection, which was completed from March 1 to April 1, 2020 when Wuhan was locked down for the COVID-19 pandemic. Due to the limited availability and accessibility of participants, the second phase was focus group interview data collection with 15 middle school students (three groups representing Grades 7, 8, and 9) who had participated in the first phase of the study; the focus group interviews were conducted 1 year after the lockdown was lifted (from May 1 to 31, 2021) in Wuhan. Survey data collection was conducted online with the assistance of head teachers or mental health teachers at each middle school. Focus group interviews were also conducted online between the researchers and selected participants. Although research ethics committees have not been established in Chinese colleges and universities and they do not mandate ethics reviews for non-medical research involving human participants, the researchers provided all the participants and their parents with letters of information and consent forms; and they all understood that the participation was totally voluntary and their responses were strictly confidential.

The researchers sent out the link of the survey electronically for the students who had agreed to participate in the study to fill out online anonymously in the classroom with the assistance of their teachers. The survey questions were not mandatory. They could choose not to answer any questions that they felt uncomfortable with. During this data collection process, 507 (25%) students chose not to complete the survey. A total of 1493 participants submitted their completed surveys, with a response rate of 75%. There were no missing values in the received 1493 surveys.

Data Analysis

Using SPSS, survey data were analyzed at different levels. First, exploratory factor analysis (EFA) was conducted to examine the construct validity of the survey. Second, after the correct number of factors was identified, the reliability (i.e., internal consistency) of the survey was calculated. Third, descriptive statistics, one-factor MANOVAs for demographic variables of gender, grade, physical activity, SES, and family cohesion were performed to examine significant group differences. It is important to note that since there are relatively small differences among these 22 middle schools in terms of their sizes and academic programs (see **Appendix Table 1**), significant differences among schools were not expected; and therefore, demographic variable of school was not included in the quantitative data analysis.

Furthermore, as previously mentioned, the 20 five-point Likert scale items were used to measure participants' self-perceived feelings of loss of control and negative emotions.

TABLE 1 | A description of the 20 items with factor loadings.

Item #	Brief description	*Factor 1	*Factor 2
2	I am unable to control the important things in my life.	0.34	
4	I feel upset because something unexpected is happening.	0.60	
6**	I often feel that things are going my way.	0.74	
8**	I am able to control irritations in my life.	0.79	
10**	I feel that I can control everything that is happening.	0.76	
12	I feel that I have many difficulties that I cannot overcome.	0.65	
14**	I feel that I am able to do things that I have to do.	0.69	
16	I feel angry because something out of my control is happening.	0.57	
18**	I feel confident about my ability to deal with problems.	0.71	
20	I feel stressed about things that I have to do.	0.63	
1	I feel worried about things I have to deal with.		0.67
3	I feel anxious about things I have to do.		0.57
5**	I laugh and feel relaxed.		0.61
7**	I am happy about things.		0.76
9	I have sudden feelings of panic.		0.67
11	I feel restless and cannot keep still.		0.73
13**	I enjoy reading books or watching television.		0.67
15	I feel like something frightening is going to happen.		0.74
17**	I look forward to happy things.		0.71
19**	I like things that I liked before.		0.73

*Factor 1 = self-perceived feelings of loss of control; Factor 2 = self-perceived negative emotions; **indicates reverse scored items.

TABLE 2 | Main themes of focus group interviews for research questions #2, #3, and #4.

Research questions	Interview questions	Main themes		
		Grade 7 group	Grade 8 group	Grade 9 group
#2: What were participants' emotional states when Wuhan was locked down for the COVID-19 pandemic?	a) What was your feeling when you learned that Wuhan was locked down? b) During the home isolation period, how were you feeling?	a) Surprised b) Worried c) Panic d) Happy	a) Terrified b) Fearful c) Scared d) Bored	a) Terrified b) Fearful c) Scared d) Depressed
#3: What were participants' emotional states when the lockdown was lifted?	a) What was your feeling when you learned that the lockdown was lifted? b) At the end of the home isolation period, how were you feeling?	a) Cheerful b) Worried c) Sad	a) Cheerful b) Anxious c) Calm	a) Excited b) Worried c) Relaxed
#4: How did participants' emotional states change over the past 1 year?	a) What was your feeling today, 1 year after the lockdown was lifted? b) What were the changes in your emotional states from the lockdown to the lifted lockdown, and then to today?	Surprised- happy- worried	Fearful- cheerful- relaxed	Terrified- excited- proud

They were calculated by summing and building averages of these 20 items. Because there was likely to be content overlap or multicollinearity among the summated and averaged scores, separate one-factor MANOVA analyses were employed to test for significant between-group differences (Casado and Dereshiwsky, 2001).

The qualitative data were first coded and sorted, then organized, and finally grouped and categorized according to the recurring themes (Creswell, 2014). It is important to note that all the researchers have rich qualitative data analysis experience. They first aligned the focus group interview questions with the corresponding research question, and then entered qualitative data into Excel spreadsheets. Specifically, the procedures for analyzing qualitative data included (a) finding codes; (b) connecting codes; (c) sorting codes into different categories and subcategories individually, (d)

organizing categories and subcategories collaboratively by content, (e) discussing conceptually similar responses, (f) grouping them together, and (g) categorizing them by the recurring themes. This process was to ensure inter-coder reliability of the qualitative data analysis. Also, to enhance the validity, direct quotes from the participants were incorporated (Creswell, 2014).

RESULTS

Demographic Characteristics of the Participants

A total of 1493 middle school students became the participants of this study. Among them, 778 (52.1%) were male and 715 (47.9%) were female; 489 (32.8%), 489 (32.8%), and

515 (34.5%) were Grades 7, 8, and 9 students, respectively, 652 (43.7%), 486 (32.6%), and 355 (23.8%) reported low, medium, and high levels of physical activity, respectively, 500 (33.5%), 607 (40.7%), and 386 (25.9%) came from low, medium, and high SES families, respectively, 789 (52.8%) were from low cohesion families and 704 (47.2%) high cohesion families. The participants of this study were fairly balanced across the demographic variables of gender, grade, physical activity, SES, and family cohesion. Furthermore, 15 middle school students representing three middle schools were selected to participate in the focus group interviews. There were three focus groups with five participants in each group, representing Grades 7 (one male and four female students), 8 (all five female students), and 9 (three male and two female students), respectively.

The Construct Validity and Internal Consistency Reliability of the Instrument

A maximum likelihood with promax rotation EFA was conducted to examine the construct validity of the 20 items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.85. Eigenvalues for two factors were > 1 ; furthermore, the scree plot suggested a two-factor model which explained 52% of the total variance (see **Table 1**). All items had moderate to high loadings (> 0.30) on the two common factors.

Specifically, ten items (i.e., items #2, 4, 6, 8, 10, 12, 14, 16, 18, and 20) had moderate to high loadings on the first common factor; ten items (i.e., items #1, 3, 5, 7, 9, 11, 13, 15, 17, and 19) had moderate to high loadings on the second common factor. As shown in **Table 1**, the first factor addresses their self-perceived feelings of loss of control, and the second factor indicates their self-perceived negative emotions.

The instrument has been shown to be reliable, with alpha reliability coefficients of 0.92; furthermore, the 10 items for self-perceived feelings of loss of control as well as the items for self-perceived negative emotions have also been shown to be reliable, with alpha reliability coefficients of 0.89 and 0.90, respectively.

Findings of the Quantitative Analysis

The one-factor MANOVAs for the each of the demographic variables of gender, grade, physical activity, SES, and family cohesion and major demographic variables were conducted to answer the research question #1, i.e., what were the effects of gender, grade level, physical activity, SES, and family cohesion on participants' emotional states as measured by their self-perceived feelings of loss of control and negative emotions? These MANOVAs yielded significant between group differences, respectively. The results are presented in **Table 3**.

As shown in **Table 3**, the most commonly reported multivariate Wilks' Lambda tests for demographic variables gender [$\text{Lambda} (2,1490) = 42.26, p < 0.01, \text{effect size} = 0.054$], grade [$\text{Lambda} (4,2978) = 10.70, p < 0.01, \text{effect size} = 0.014$], physical activity level [$\text{Lambda} (4,2978) = 173.58, p < 0.01, \text{effect size} = 0.189$], SES [$\text{Lambda} (4,2978) = 86.93, p < 0.01, \text{effect size} = 0.105$], and family cohesion [$\text{Lambda} (2,1490) = 100.08,$

$p < 0.01, \text{effect size} = 0.118$] yielded significant findings. Also the significant p -value (< 0.01) indicated individual between-group differences for both dependent variables of self-perceived feelings of loss of control and negative emotions.

Follow-up univariate ANOVAs indicated that there were significant differences for both dependent variables of self-perceived feelings of loss of control and negative emotions across all five demographic variables. Specifically, the female students experienced significantly higher level feelings of loss of control [$F(1, 1491) = 55.55, p < 0.01, \text{effect size} = 0.036$] and negative emotions [$F(1, 1491) = 73.55, p < 0.01, \text{effect size} = 0.047$] than the male students; Grade 9 students experienced significantly higher level feelings of loss of control [$F(2, 1490) = 11.81, p < 0.01, \text{effect size} = 0.016$] and negative emotions [$F(2, 1490) = 20.30, p < 0.01, \text{effect size} = 0.027$] than Grades 7 and 8 students; however, there were no significant differences between Grade 7 and Grade 8 students in both self-perceived feelings of loss of control and negative emotions.

Moreover, there were significant differences among students with low, medium, and high physical activities in terms of their self-perceived feelings of loss of control [$F(2, 1490) = 281.57, p < 0.01, \text{effect size} = 0.274$] and negative emotions [$F(2, 1490) = 257.71, p < 0.01, \text{effect size} = 0.257$]. Students with low physical activities experienced significantly higher level feelings of loss of control and negative emotions than students with medium and high physical activities ($p < 0.01$); also, students with medium physical activities experienced significantly higher level feelings of loss of control and negative emotions than students with high physical activities ($p < 0.01$).

Similarly, there were significant differences among students with low, medium, and high SES in terms of their self-perceived feelings of loss of control [$F(2, 1490) = 163.32, p < 0.01, \text{effect size} = 0.180$] and negative emotions [$F(2, 1490) = 103.64, p < 0.01, \text{effect size} = 0.122$]. Students with low SES experienced significantly higher level feelings of loss of control and negative emotions than students with medium and high SES ($p < 0.01$); also, students with medium SES experienced significantly higher level feelings of loss of control and negative emotions than students with high SES ($p < 0.01$).

Finally, the follow-up univariate ANOVAs indicated that students from low cohesion families experienced significantly higher level feelings of loss of control [$F(1, 1491) = 152.48, p < 0.01, \text{effect size} = 0.093$] and negative emotions [$F(1, 1491) = 151.62, p < 0.01, \text{effect size} = 0.092$] than students from high cohesion families.

Findings of the Qualitative Analysis

Three focus group interviews with 15 middle school students were conducted to answer research questions #2, #3, and #4, respectively, about the participants' emotional states when Wuhan was locked down for the COVID-19 pandemic on January 23, 2020 and when the lockdown was lifted on April 8, 2020 as well as the changes of their emotional states over the 1-year period after the lockdown was lifted. **Table 2** presents a summary of the main themes of the three focus group interviews.

TABLE 3 | MANOVA results comparing status differences.

Multivariate Wilks' Lambda tests					
Demographic variable	Value	F	Sig	Effect size	
Gender	0.946	42.258	**	0.054	
Grade	0.972	10.703	**	0.014	
Physical activity (PA)	0.658	173.582	**	0.189	
SES	0.802	86.932	**	0.105	
Family cohesion (FC)	0.882	100.081	**	0.118	
Tests of between-subjects effects					
Variable	Group mean			Sig.	Effect size
Feelings of loss of control	Male (3.72)	Female (4.32)		**	0.036
Negative emotions	Male (3.63)	Female (4.03)		**	0.047
Feelings of loss of control	Grade 7 (3.83)	Grade 8 (3.89)	Grade 9 (4.28)	**	0.016
Negative emotions	Grade 7 (3.69)	Grade 8 (3.74)	Grade 9 (4.03)	**	0.027
Feelings of loss of control	Low PA (4.86)	Medium PA (3.76)	High PA (2.78)	**	0.274
Negative emotions	Low PA (4.26)	Medium PA (3.78)	High PA (3.08)	**	0.257
Feelings of loss of control	Low SES (4.89)	Medium SES (3.79)	High SES (3.19)	**	0.180
Negative emotions	Low SES (4.23)	Medium SES (3.75)	High SES (3.41)	**	0.122
Feelings of loss of control	Low FC (4.46)	High FC (3.49)		**	0.093
Negative emotions	Low FC (4.08)	High FC (3.53)		**	0.092

**Significant at $p < 0.01$.

PA, physical activity; SES, socioeconomic status; FC, family cohesion.

Participants' Emotional States When Wuhan Was Locked Down for the Corona Virus Disease 2019 Pandemic

As shown in **Table 2**, Grade 7 participants reported that they were feeling surprised, worried, panic, and even happy when Wuhan was locked down for the COVID-19 pandemic. Grade 8 participants described that they felt terrified, fearful, scared, and bored when they heard about the lockdown of the city. Similarly, Grade 9 participants were feeling terrified, fearful, scared, and depressed at the time when Wuhan was locked down.

Four out of five Grade 7 participants described that they were feeling surprised, worried, and panic when Wuhan was locked down for the COVID-19 pandemic. *"On hearing the news, I was surprised," "when hearing the news about the lockdown of Wuhan city, my first feeling was panic and worried," and "I worried that the virus would spread to myself and my family"* were their common feelings. However, one male participant indicated that he was feeling happy because his parents went out to work every day and rarely spent time with him at home; but after the lockdown of the city he could stay with them every day and enjoyed the time together.

Grades 8 participants felt terrified, fearful, scared, and bored on hearing the news that Wuhan was locked down for the COVID-19 pandemic. *"...I could hardly believe that the virus was so infectious," "my mother is a community worker and she may be affected," and "my father works in another city, and I am scared that he may get the virus"* were their common feelings. Unlike her peers, one participant mentioned that she felt bored at home all day and night.

Similarly, Grades 9 participants felt terrified, fearful, scared, and depressed when they heard the news that Wuhan was

locked down. One female participant mentioned that she had visited crowded places a few days before the lockdown of the city and was terrified that she might have been affected. Other participants made the following comments: *"when I heard the news, I was scared," and "when I learned that Wuhan was the most seriously affected city, I was scared to death."* Several participants emphasized that the atmosphere at their homes became depressing when they saw the increasing death toll on the news.

Participants' Emotional States When the Lockdown Was Lifted

As shown in **Table 2**, Grade 7 participants reported that they were feeling cheerful, worried, and even sad when the lockdown was lifted. Grade 8 participants described that they felt cheerful, anxious, and calm when they heard that the lockdown of the city was lifted. Similarly, Grade 9 participants were feeling excited, worried, and relaxed at the time when the lockdown was lifted in Wuhan.

Four out of five Grade 7 participants described that they were feeling cheerful and anxious when the lockdown was lifted in Wuhan. *"I was very cheerful because I should be able to see my classmates and friends again," "I could finally go outside to breathe fresh air," and "I am worried about the recurrence of the pandemic"* were their common feelings. However, the one male participant indicated that he was feeling sad because his parents would go out to work every day and hardly spend time with him at home.

Grades 8 participants felt cheerful, anxious, and calm on hearing the news that the lockdown was lifted in Wuhan. *"I felt very cheerful because I could go wherever I want," "I was very happy because I could meet my classmates and have dinner with"*

them in our favorite restaurant,” and “I thought the virus would not go away easily and I felt anxious about it” were their common feelings. Unlike her peers, one participant mentioned that she did not feel very excited but pretty calm because she had been used to staying at home with her family members.

Similarly, Grades 9 participants felt excited, worried, and relaxed when they learned that the lockdown was lifted. One female participant commented that she felt very happy because her family and friends were safe and sound. Other participants made the following comments: “I was so excited and could not believe that the pandemic had been brought under control,” and “I felt worried that the virus might come back again.” Several participants emphasized that the atmosphere at their homes became relaxing when they saw the new case was zero on the news.

Changes of Participants' Emotional States Over the Past Year

As shown in Table 2, Grade 7 participants reported that their emotional states changed from being surprised to happy and then to worried from the lockdown to the lifted lockdown, and then to today. Grade 8 participants' emotional states changed from being fearful to cheerful and then to relaxed. Slightly differently, Grade 9 participants' emotional states changed from being terrified to excited and then to proud at these different time nodes.

Grade 7 participants described the changes of their emotional states at the three time nodes as being surprised-happy-worried. For example, one female participant provided the following description, “I was first surprised to learn that Wuhan was locked down due to the COVID-19 pandemic and then felt happy when the lockdown was lifted in April 2020, but felt worried today because the COVID-19 pandemic was still a public health threat worldwide.” Several participants added that the pandemic had become a serious threat to middle school students' mental health.

Grade 8 participants felt fearful first, and then cheerful, and now relaxed. These changes of their emotional states were clearly reflected in one female participant's description, “I was fearful that the virus would spread to my family when the city was locked down; I felt happy and cheerful when the lockdown was lifted because the COVID-19 pandemic was under control; and now I feel relaxed because my life has become normal again.”

Similarly, Grade 9 participants felt terrified first, and then excited, and now proud. One male participant's comments clearly indicted these changes: “I was very terrified when the city was locked down for the pandemic, and I did not know how to deal with it; afterwards, I felt excited when the lockdown was lifted. China is now the safest country in the world and I become very proud of being a Chinese citizen.”

To sum up, the participants in the three focus groups experienced similar feelings at different time nodes. Most of them were surprised and scared when they heard the news of the lockdown of Wuhan City. They became cheerful and excited when the lockdown was lifted. One year after the lockdown was lifted, students returned to their schools and their life became normal. It is interesting to mention that Grade 9 students expressed their trust and pride in their home country.

DISCUSSION AND CONCLUSION

The first research question was about the effects of gender, grade level, physical activity, SES, and family cohesion on Wuhan middle school students' emotional states as measured by their self-perceived feelings of loss of control and negative emotions. Significant differences were found across all five demographic variables. Female students, Grade 9 students, students with low physical activities and SES, and students from low cohesion families experienced significantly higher level feelings of loss of control and negative emotions than male students, Grades 7 and 8 students, students with medium and high physical activities and SES, and students from high cohesion families, respectively. These results were consistent with the previous research findings (Ding et al., 1998; Reiss, 2013; Pavey and Brown, 2019; Yan et al., 2019; Chen et al., 2020; Commodari and La Rosa, 2020; Wang et al., 2020; Yoon and Lian, 2020).

It is important to note that the obtained effect size was small for each of these MANOVAs, which yielded significant group differences. Effect size identifies the strength of the conclusions about groups; and it often provides a more practical reading of the results (Creswell, 2014). The obtained small effect sizes suggest that these findings were significant only due the large sample size of the study. Therefore, these significant quantitative results should be interpreted with caution.

The second, third, and fourth research questions asked about the selected 15 middle school students' emotional states (a) when Wuhan was locked down for the COVID-19 pandemic, (b) when the lockdown was lifted in Wuhan, and (c) the changes of their emotional states from the lockdown to the lifted lockdown, and then to today, i.e., 1-year after the lockdown was lifted. These 15 participants represented Grades 7, 8, and 9 student groups. Both similarities and differences were found among the three groups.

When Wuhan was locked down on January 23, 2020, all 15 participants except for one male student in Grade 7 group experienced worry, fear, feelings of loss of control, and negative emotions. The lockdown brought lifestyle changes to these middle school students. Home quarantine, reduced activities, online classes, and increased time with family members would create feelings of loss of control and negative emotions (Jiang et al., 2020; Wang et al., 2020).

On hearing the news that the lockdown was lifted on April 8, 2020, they felt cheerful, calm, relaxed, and excited. However, they became further anxious and worried because they thought they might experience the lockdown again. Unlike his peers, the male student in Grade 7 group felt sad about it because his parents had to go out to work and he would hardly see them at home.

After the lockdown was lifted, schools resumed and their life went back to normal. Their feelings changed over the past year, from being surprised, fearful, terrified schools when Wuhan was locked down, to being happy, cheerful, and excited when the lockdown was lifted, and to being worried, relaxed, and proud 1 year after the lifted lockdown. Grades 8 and 9 students are feeling relaxed and proud today because the pandemic is back in control and living in China becomes safe. However, several Grade 7 students explained that they are still feeling worried even today

because the pandemic is still ongoing globally and it has become a serious threat to their mental health.

The present study was limited in the following three ways. First, it examined Wuhan middle school students' emotional states during the COVID-19 pandemic only from a student perspective. Their parents' perceptions were not included in the study. Therefore, the results should be interpreted with caution. Second, due to the limited availability and accessibility of participants, the second phase of data collection (i.e., focus group interviews) involved only 15 middle school students; this small sample size may limit the generalization of the findings to all the middle school students in Wuhan. Third, the interviews in this study were retrospective. Many factors may have distorted the participants' answers in one way or the other when they reported about their emotional states in the past. Again, the results should be interpreted with caution.

In light of these limitations, the following two conclusions were reached. First, the middle school students in Wuhan experienced emotional changes during the COVID-19 pandemic when the city was locked down and they were home quarantined. During this major public health emergency, feelings of loss of control and negative emotions were commonly found in these students (Liu, 2020; Wang et al., 2020; Liu et al., 2021).

Second, the emotional states of middle school students in Wuhan changed substantially at different time nodes during this pandemic. They felt fearful and scared when the city was locked down; and these feelings were developed into feelings of loss of control and negative emotions (Liu Y. Y. et al., 2020; Main et al., 2011). They became happy and excited when the lockdown was lifted. During the 1 year after the lockdown was lifted, they were feeling relaxed and safe.

The results of this study have the important implications for the students, their parents, and the schools they attend. The middle school students should be aware of the threat of the major public health emergencies and be psychologically prepared for dealing with such emergencies. Their parents should notice their emotional changes during these emergencies and provide them with protection and guidance so that they can get over them successfully. The schools should also require their teachers and

psychologists to provide students with guidance and consulting services so that they become psychologically and emotionally prepared before these emergencies occur.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because data belong to the funder. Requests to access the datasets should be directed to YH, 316678481@qq.com.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

YH: study design, data collection, and research funding provider. JH: data analysis, drafting, editing, revising, and proofreading the entire manuscript. TW: literature search, drafting literature review section, and data collection. SX: data collection and data preparation. JL: partial data collection and data preparation. All authors contributed to the article and approved the submitted version.

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APPENDIX

TABLE A1 | Profiles of 22 public schools involved in the study.

District	School	Grade	# of students in school	# of teachers in school
Wuhan District A	School A	Grades 7–9	1,500	103
	School B	Grades 7–9	1,500	97
	School C	Grades 7–9	1,600	107
	School D	Grades 7–9	1,300	79
	School E	Grades 7–9	1,500	89
	School F	Grades 7–9	1,400	81
Wuhan District B	School A	Grades 7–9	1,300	71
	School B	Grades 7–9	1,300	76
	School C	Grades 7–9	1,400	83
	School D	Grades 7–9	1,500	101
	School E	Grades 7–9	1,600	109
	School F	Grades 7–9	1,400	98
Wuhan District C	School A	Grades 7–9	1,600	97
	School B	Grades 7–9	1,500	90
	School C	Grades 7–9	1,400	83
	School D	Grades 7–9	1,700	102
	School E	Grades 7–9	1,300	78
	School F	Grades 7–9	1,300	71
Wuhan District D	School A	Grades 7–9	1,700	112
	School B	Grades 7–9	1,500	98
	School C	Grades 7–9	1,500	92
	School D	Grades 7–9	1,400	89



The Status and Influencing Factors of Cyberchondria During the COVID-19 Epidemic. A Cross-Sectional Study in Nanyang City of China

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Cyberchondria is considered “the anxiety-amplifying effects of online health-related searches.” During the COVID-19 pandemic, people are likely to search health-related information online for reassurance because of fear and related physical symptoms, while cyberchondria may be triggered due to the escalation of health anxiety, different online seeking behavior preference, information overload, and insufficient e-health literacy. This study aimed to investigate the status and influencing factors of cyberchondria in residents in China during the epidemic period of COVID-19. The participants were 674 community residents of Nanyang city surveyed from February 1 to 15, 2020. We administered online measures, including the Chinese Short Form of the Cyberchondria Severity Scale (C-CSS-12), Short Health Anxiety Inventory (SHAI), eHealth Literacy Scale (eHEALS), Patient Health Questionnaire-15 (PHQ-15), and COVID-19-related online information seeking behavior questionnaire. In our study, the average C-CSS-12 total score of residents was 30.65 ± 11.53 during the virus epidemic; 25% of participants scored 22 or below, 50% scored 23 to 38, and 21.9% scored 39 to 60. The SHAI total score ($\beta = 0.598 > 0$, $P < 0.001$), the use of general search engines ($\beta = 1.867 > 0$, $P = 0.039$), and searching for information on how to diagnose COVID-19 ($\beta = 2.280 > 0$, $P = 0.020$) were independent risk factors for cyberchondria, while searching lasting less than 10 min each ($\beta = -2.992 < 0$, $P = 0.048$), the use of traditional media digital platforms ($\beta = -1.650 < 0$, $P = 0.024$) and professional medical communication platforms ($\beta = -4.189 < 0$, $P = 0.007$) were independent protective factors. Our findings showed that nearly a quarter of the participants scored 39 or higher on the C-CSS-12 in Nanyang city during the pandemic, which should be taken seriously. Health anxiety and COVID-19-related online information seeking behavior including online duration, topics and choice on different information channels were important influencing factors of cyberchondria. These findings have implications for further research and clinical practice on cyberchondria in China.

Keywords: cyberchondria, health anxiety, health-related information seeking, residents, COVID-19

INTRODUCTION

In recent years, health-related internet usage has grown rapidly. By June 2019, there were 4.5 billion internet users worldwide, with the majority located in Asia (50.7%), followed by Europe (16%) and Africa (11.5%) (Vismara et al., 2020). And an American survey showed that 88% of American internet users searched for medical information online (Vismara et al., 2020). According to the 48th “Statistical Reports on Internet Development in China” (China Internet Network Information Center, 2021), by June 2021, China’s Internet users has reached 1011 million, and according to the “2018 Chinese Internet users’ popular science demand search behavior report” (China Association for Science and Technology, 2018), the proportion of health and medical science inquiries accounted for 66.83% of the total, indicating that health information has been accessible via the internet to an increasing number of people hoping to better understand their own health and to obtain reasonable explanations for relevant symptoms. However, online health information searches have the potential to escalate medical concerns (Navas-Martin et al., 2012) and trigger unnecessary worry about health. This phenomenon is referred to as “cyberchondria” (Loos, 2013).

Cyberchondria is an “emerging risk” accompanied by the information era. Since cyberchondria was proposed by news media in the mid-1990s and coined from a combination of “cyber” and “hypochondriasis” (Loos, 2013; Vismara et al., 2020), it has received some attention from researchers in recent years. Some researchers have proposed that it is considered as “the anxiety-amplifying effects of online health-related searches” (Starcevic, 2017) and denotes repeated and excessive online searches for health-related information that are associated with increasingly higher levels of health anxiety than before the search (Baumgartner and Hartmann, 2011; Muse et al., 2012). Others have argued that cyberchondria is a “multi-dimensional structure,” including excessive and repeated online health information searches, negative emotional states related to online health information searches, the resulting interruption of other activities and doctor consultations due to increased anxiety (McElroy and Shevlin, 2014).

Cyberchondria is closely related to health anxiety and online health information searches (Starcevic, 2017). A group of studies (Baumgartner and Hartmann, 2011; Muse et al., 2012; Fergus, 2013; Fergus and Dolan, 2014; Doherty-Torstrick et al., 2016; McMullan et al., 2019; Vismara et al., 2020) found that there is a moderate to strong relationship between health anxiety and cyberchondria. Subjects with elevated health anxiety suffer greater anxiety during and after online health-related searches. Even individuals with low levels of health anxiety may experience increased anxiety when searching online (Tyrer, 2018; Tyrer et al., 2019). When people browse the internet for their common and possibly harmless symptoms, they tend to escalate to look for more serious and rare symptoms. This escalation may be related

to the way information is presented such as ranking, terminology, and the user’s preference for more serious explanations of the illness (White and Horvitz, 2009), which may lead to more frequent and longer searches. Studies have shown that searching for health information may indeed increase levels of distress and uncertainty about one’s feared condition (White and Horvitz, 2009; Baumgartner and Hartmann, 2011; Doherty-Torstrick et al., 2016) and that there is a positive correlation between health anxiety and online health-related information seeking frequency and duration (McMullan et al., 2019). Due to the ambiguity of online health information (Eysenbach et al., 2002; McMullan et al., 2019), difficulties in filtering and acquiring clear information is a key anxiety-amplifying factor related to cyberchondria (Starcevic, 2017). Individuals seeking reassurance about their health may spend much of their time attempting to determine the validity of health-related information, and this process contributes to the cycle in which repeated online searches increase distress and anxiety (Starcevic and Berle, 2013). Some scholars have proposed that e-health literacy could negatively moderate the indirect effect of affective responses on cyberchondria (Zheng et al., 2020) and that improving it may be an effective intervention for cyberchondria.

Other studies reported that problematic internet use (PIU) appears highly relevant to cyberchondria (Starcevic and Berle, 2013; Fergus and Spada, 2017). Besides, intolerance of uncertainty (IU) and anxiety sensitivity (AS) may confer vulnerability for cyberchondria (Norr et al., 2015a), and the relationship between health anxiety and the frequency of internet searches for medical information grows increasingly stronger as IU increased (Fergus, 2013). Additionally, obsessive-compulsive symptoms, especially for contamination/washing and responsibility for harm symptoms, are positively correlated with cyberchondria (Norr et al., 2015c). For the consequences of cyberchondria, studies have revealed that it is associated with negative health outcomes such as functional impairment, lower quality of life, less satisfaction with doctor consultation, increased health care utilization (Barke et al., 2016; Doherty-Torstrick et al., 2016; Tanis et al., 2016; Mathes et al., 2018).

As we all know, the COVID-19 pandemic is a global crisis that causes high morbidity and mortality and has been declared by the World Health Organization (WHO) to be a public health emergency (Jungmann and Witthoft, 2020). During the pandemic, due to movement restriction issued by governments and social isolation measures, many Chinese people rely on the internet for COVID-19-related health information (Huang and Zhao, 2020) to better understand the disease and spent more time on it to seek reassurance (Jacobs et al., 2017; Jungmann and Witthoft, 2020; Kiraly et al., 2020; Wang et al., 2020; Zhao et al., 2020). However, the vast amount of information can be confusing (Navas-Martin et al., 2012), especially when the reliability and credibility of information provided by different information sources and channels varies (Cui et al., 2020; Gehrau et al., 2021). Moreover, the novel coronavirus has caused a widespread search for information with the dissemination of unregulated or misleading health information (Cuan-Baltazar et al., 2020; Song et al., 2021). Both of them potentially result in overconcern even anxiety

Abbreviations: C-CSS-12, The Chinese Short Form of the Cyberchondria Severity Scale; SHA1, Short Health Anxiety Inventory; eHEALS, eHealth Literacy Scale; PHQ-15, Patient Health Questionnaire-15; HP, helicobacter pylori.

(Doherty-Torstrick et al., 2016; Jungmann and Witthoft, 2020). Recent studies have showed that excessive media consumption and information overload during the COVID-19 pandemic is associated with increased anxiety (Farooq et al., 2020; Gao et al., 2020; Laato et al., 2020) and that virus anxiety (Jungmann and Witthoft, 2020) and fear of COVID-19 (Seyed Hashemi et al., 2020) is positively correlated with cyberchondria. Starcevic V pointed that the factors that contribute to cyberchondria at this time include a heightened perception of threat and fear of a newly identified and poorly understood disease, lack of authoritative and trustworthy sources of relevant health information, difficulty in coping with abundance of information that is often confusing, conflicting, unverified and constantly updated, along with a decreased ability to filter out unnecessary information and inability of excessive online health information seeking to provide the necessary information and deliver reassurance and so on (Starcevic et al., 2021).

Accordingly, during the pandemic, people are likely to search health-related information online because of fear of COVID-19 and related physical symptoms, while cyberchondria may be triggered due to the escalation of health anxiety, different online seeking behavior preference (such as frequency, duration, topics, choice on information channels), information overload, and insufficient e-health literacy. However, research on cyberchondria is still in its infancy, and data on the status and influencing variables of cyberchondria are still scarce (Vismara et al., 2020), especially in residents in China during the epidemic period of COVID-19. This study aimed to understand the status of cyberchondria in residents during the pandemic and explore whether health anxiety, online information seeking behavior, e-health literacy, and physical symptoms have an impact on cyberchondria.

MATERIALS AND METHODS

Participants and Procedure

The objects of this study are residents of a community in Nanyang city (located in central China, Henan Province), specifically residents who have lived in this area for more than 6 months. We selected a community by random sampling method. Referring to the standard deviation of CSS-12 score in a literature is 6.01 (Zheng et al., 2021), the required sample size was calculated (Fang, 2010; Sun and Xu, 2014) and increased by 10–20% to prevent sample loss. It was concluded that more than 665 samples should be selected to meet the demand. The questionnaire was made and uploaded to the popular online professional survey platform what is named “Wenjuanxing¹” for data collection questionnaire surveys. Then we got permission from the community office, shared the link of the questionnaire with residents through “WeChat” community groups. WeChat has location-based online communities, and we arranged for WeChat community moderators to invite residents to participate in this study. The anonymous survey was conducted from February 1st to 15th, 2020. The inclusion

criteria were as follows: (a) voluntarily participating in this study; (b) being able to understand and complete the questionnaire independently; (c) experience searching COVID-19-related online health information. The exclusion criteria were as follows: (a) no experience of searching COVID-19-related online health information; (b) answer time is <400 s (lower than the normal answer time); (c) repeated IP addresses; (d) live in this selected community for less than 6 months; (e) answer the polygraph question incorrectly. Interested participants were presented an online informed consent statement and each participant was compensated with 1–3 CNY for his or her participation. All procedures were approved by the institutional review board (IRB) of the Third Xiangya Hospital, Central South University. There were 817 questionnaires from community residents who completed the survey. However, 143 questionnaires were removed due to the exclusion criteria, and 674 valid questionnaires were selected (82.5%). The process of participants sampling and recruitment in **Figure 1**.

Measures

Chinese Short Form of the Cyberchondria Severity Scale

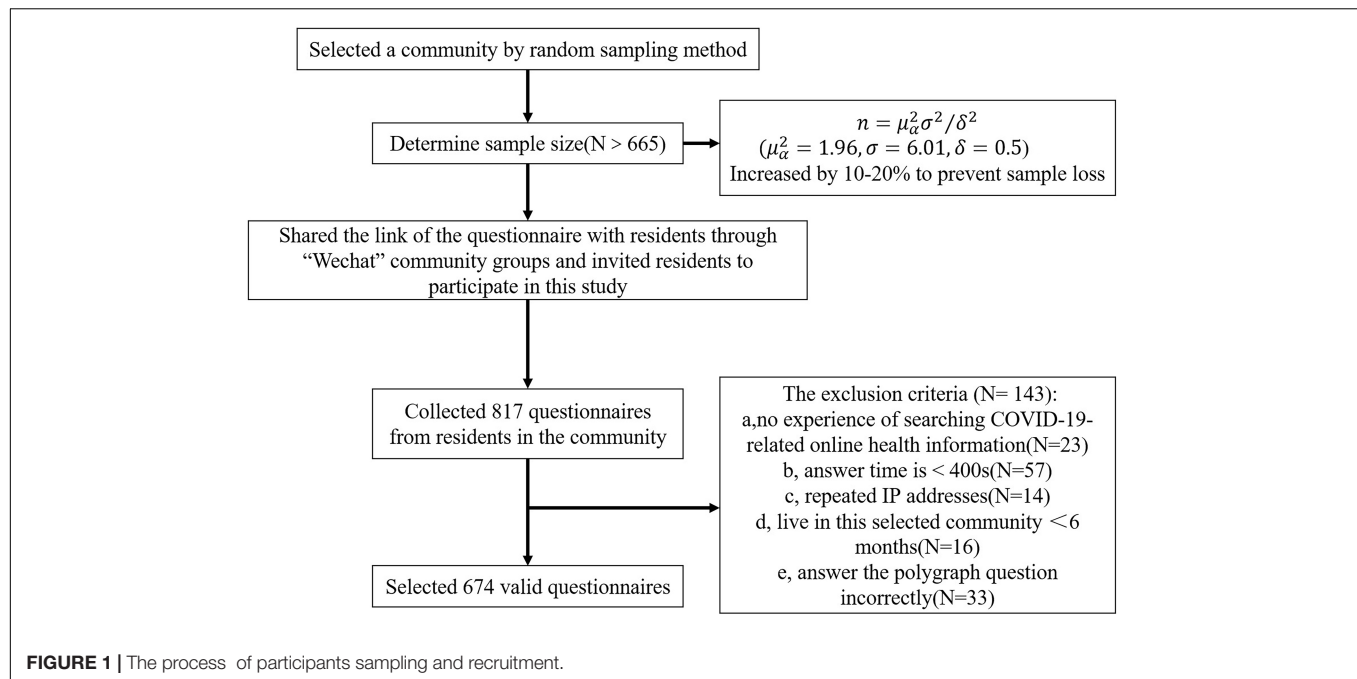
McElroy and Shevlin (2014) developed the first trial version of the Cyberchondria Severity Scale (CSS) dedicated to assessing the severity of cyberchondria. The CSS has a total of 33 items and includes five subscales: Compulsion, Distress, Excessiveness, Reassurance Seeking and Mistrust of Medical Professional. McElroy et al. (2019) revised it into the 12-item Cyberchondria Severity Scale Short Form (CSS-12) and deleted “Mistrust of Medical Professional” because several authors considered this subscale to be distinct from cyberchondria and strongly recommended its removal (Fergus, 2014; Norr et al., 2015b).

The C-CSS-12 was translated from the CSS-12 and semantically adapted for the Chinese population. It has the same total items as the CSS-12 and uses a five-point Likert-type scale ranging from “never” to “always,” with a score of 1–5 points for each item and 60 points total. The higher the score, the higher the severity of the suspected cyberchondria (McElroy et al., 2019). The descriptions of CSS-12 items 5, 11, and 12 were modified during the process of translation. “General practitioners (GPs)” in item 5 of the original scale was changed to “community primary care physicians.” “My GP/medical professional” in item 11 and “consult with other medical specialists, e.g., consultants” in item 12 were simplified and changed to “physician” and “I might consult a specialist,” respectively. According to our studies on the reliability and validity of the C-CSS-12, the Cronbach's α coefficient of the C-CSS-12 was 0.931, which matched the Cronbach's α of 0.90 in the original version (McElroy et al., 2019), indicating a high level of internal consistency. In this study, the scale was used to measure the general cyberchondria under the virus epidemic.

Short Health Anxiety Inventory

The SHAI is an 18-item self-report questionnaire measuring health anxiety that includes two subscales: illness likelihood, IK (items 1–14) and negative consequence, NC (items 15–18). Items are rated on a four-point Likert-type scale ranging from 0 to 3,

¹<http://www.wjx.cn>



with a total score of 0–54. A total SHAI score of ≥ 15 points indicates health anxiety (Bailey and Wells, 2015); the higher the score, the higher the degree of health anxiety (Alberts et al., 2013). The Chinese version of the SHAI has good reliability and validity (Yuan et al., 2015). In this study, the internal consistency (Cronbach's α coefficient) of the SHAI was 0.927. In this study, the scale was used to measure the general health anxiety under the virus epidemic.

EHealth Literacy Scale

The eHEALS is an 8-item self-report questionnaire assessing users' combined knowledge, comfort, and perceived skills at finding, evaluating, and applying electronic health information to health problems. Items are rated on a five-point Likert-type scale ranging from 1 to 5, with higher scores indicating greater literacy. Both the original and Chinese versions of the scale have sufficient reliability and validity (Norman and Skinner, 2006; Sudbury-Riley et al., 2017; Wong and Cheung, 2019). In this study, the internal consistency (Cronbach's α coefficient) of the eHEALS was 0.924.

Patient Health Questionnaire-15

The PHQ-15 mainly evaluates the degree of difficulty caused by various common physical symptoms in the past 4 weeks (Kroenke et al., 2002). It is an independent self-rating scale for somatic symptom groups and consists of 15 items, with a score of 0–2 points for each item and 30 points total. The higher the score, the more severe the physical symptoms. Scores of 0–4 are classified as no physical symptoms, 5–9 are classified as mild physical symptoms, 10–14 are classified as moderate physical symptoms, and 15–30 are classified as severe physical symptoms (Elhai et al., 2020). It has good internal consistency (Kroenke et al., 2002), criterion validity, and test–retest reliability

(van Ravesteijn et al., 2009). The internal consistency in this study was 0.904.

General Questionnaire

The main content includes demographic information such as gender, age, occupation, education level, monthly income, self-report personal medical condition and relatives' medical condition.

COVID-19-Related Online Information Seeking Behavior Questionnaire

COVID-19-related online information seeking behavior mainly includes active seeking frequency, duration, topics, and choice on different information channels. This questionnaire involves a series of questions associated with it.

Quality Control

We devised a common-sense question in the questionnaire for polygraph detection (what day is the National Day of China?) to filter out questionnaires with low authenticity. Besides, the questionnaires with repeated IP addresses and too short answer time were eliminated. Additionally, we checked the logic and completeness of the collected questionnaires.

Statistical Analysis

Statistical analyses were performed with SPSS for Windows, version 25.0 (SPSS Inc., Chicago, IL, United States). Categorical variables were expressed as (%), and continuous variables were presented as mean (M) \pm standard deviation (SD). Use percentile to describe the distribution of C-CSS-12 scores. The *t*-test or analysis of variance (ANOVA) was used to compare normally distributed continuous variables between two or more groups. The correlations among cyberchondria (C-CSS-12),

health anxiety (SHAI), e-health literacy (eHEALS) and Patient Health Questionnaire-15 (PHQ-15) were verified using Pearson correlation. The independent factors of cyberchondria were determined using linear regression models. All probabilities were two-tailed, and the level of significance was set at 0.05.

RESULTS

Participant Sociodemographic and Health Information

The sociodemographic and health information characteristics of participants are displayed in **Table 1**. Of the 674 respondents, approximately 43.6% (294/674) were male and 56.4% (380/674) were female. The participants' age ranged from 16 to 70 years (average age: 32.67 ± 11.21) and were mainly distributed between 20 and 30 (33.7%, 227/674) and 31 and 40 (25.8%, 174/674) years old. The education level was mainly distributed at university/college degree or below (91.5%, 617/674). The respondents spanned all occupation ranks. The individual monthly income was mainly distributed at $\leq 4,500$ CNY (79.4%, 535/674). The top four personal illnesses were chronic gastritis or peptic ulcer (7.9%), hypertension (7.4%), chronic bronchitis (5.0%), and HP infection (4.2%); the top four relatives' illnesses were hypertension (28.5%), diabetes (16.8%), coronary heart disease (10.5%), and chronic bronchitis (6.2%).

Distribution of Chinese Short Form of the Cyberchondria Severity Scale Scores of Participants

The C-CSS-12 total scores of participants ranged from 12 to 60. The average of the C-CSS-12 total scores was 30.65 ± 11.53 , while that of "Excessiveness" subscale was 8.89 ± 3.25 , that of "Compulsion" subscale was 6.80 ± 3.23 , that of "Distress" subscale was 7.02 ± 3.42 , and that of "Reassurance Seeking" subscale was 7.94 ± 3.27 . It showed that 25% (172/674) of participants scored 22 or below, 50% (353/674) scored 23 to 38, and 21.9% (149/674) scored 39 to 60, which roughly reflected the severity level of cyberchondria (**Table 2**).

Characteristics of COVID-19-Related Online Information Seeking Behavior

The characteristics of COVID-19-related online information seeking behavior are displayed in **Table 3**. We found that 49.7% (335/674) of participants searched for COVID-related online information 1–3 times a day, 17.2% (116/674) searched 2–6 times a week, and 13.9% (94/674) searched six times a day or more. During the online search for COVID-19-related information, nearly half of the participants (48.4%, 326/674) searched for 10 min to 30 min each time. With regard to the choice on different information channels, the most commonly used were social platforms (67.2%, 453/674) such as QQ, WeChat and Weibo, which can also provide the function of searching information except for the chat function, followed by traditional media digital platforms (62.0%, 418/674) such as People's Daily and CCTV News and social news apps such as Headlines Today (40.5%,

TABLE 1 | Sociodemographic and health information characteristics of participants.

Characteristic	Values (N = 674)
Gender n (%)	
Male	294 (43.6)
Female	380 (56.4)
Age (years) n (%)	
<20	108 (16)
20–30	227 (33.7)
31–40	174 (25.8)
41–50	110 (16.3)
>50	55 (8.2)
Education level n (%)	
\leq High middle school	235 (34.9)
Undergraduate/college	382 (56.7)
\geq Postgraduate	57 (8.5)
Vocation n (%)	
Civil servants	39 (5.8)
Educational practitioners	115 (17.1)
Medical practitioners	45 (6.7)
Media/IT practitioners	8 (1.2)
Practitioners of public security and law	5 (0.7)
Business managers	65 (9.6)
Professional skilled workers	60 (8.9)
Self-employed persons	34 (5.0)
Freelancers	86 (12.8)
Farmers	27 (4.0)
Students	131 (19.4)
Unemployed	27 (4.0)
Others	32 (4.7)
Monthly income (CNY) n (%)	
<2000	197 (29.2)
2000–3000	178 (26.4)
3001–4500	160 (23.7)
4501–6000	77 (11.4)
6001–8000	26 (3.9)
>8000	36 (5.3)
Personal illness (top 4) n (%)	
Chronic gastritis or peptic ulcer	53 (7.9)
Hypertension	50 (7.4)
Chronic bronchitis	34 (5.0)
Helicobacter pylori infection	28 (4.2)
Relatives' medical illness (top 4) n (%)	
Hypertension	192 (28.5)
Diabetes	113 (16.8)
Coronary heart disease	71 (10.5)
Chronic bronchitis	42 (6.2)

TABLE 2 | The distribution of C-CSS-12 scores of participants (n = 674).

Categories	Corresponding raw score of C-CSS-12	N (%)
At or below 25th percentile	22 and below low	172 (25.5)
Above 25th and below 75th	Between 23 and 38	353 (52.6)
At or above 75th percentile	39 and above	149 (21.9)

TABLE 3 | Characteristics of COVID-19-related online information seeking behavior.

Characteristic	Values (N = 674)
Frequency n (%)	
Once a week or less	52 (7.7)
2–6 times a week	116 (17.2)
1–3 times a day	335 (49.7)
4–6 times a day	77 (11.4)
6 times a day or above	94 (13.9)
Duration n (%)	
Less than 10 min	200 (29.7)
10–30 min	326 (48.4)
30–60 min	93 (13.8)
More than 1 h	55 (8.1)
Information channels n (%)	
Social platforms such as QQ, WeChat, and Weibo	453 (67.2)
Traditional media digital platforms such as People's Daily and CCTV News	418 (62.0)
Social news apps such as Headlines Today	273 (40.5)
Short video platforms such as Tik Tok	251 (37.2)
General search engines such as Baidu	160 (23.7)
Q&A platforms such as Quora	58 (8.6)
Professional medical communication platform such as DXY	41 (6.1)
Topics n (%)	
How to prevent	566 (84.0)
Symptoms and manifestations	525 (77.9)
Treatment drugs	325 (48.2)
Inspection methods	307 (45.5)
How to diagnose	258 (38.3)
Efficacy and prognosis	201 (29.8)
Health service	188 (27.9)

273/674). In terms of COVID-19-related online information topics, respondents were most concerned about prevention (84%, 566/674), symptoms and manifestations (77.9%, 525/674), treatment drugs (48.2%, 325/674), inspection methods (45.5%, 307/674) and diagnosis (38.3%, 258/674).

Comparison of Different Groups of Demographics and COVID-19-Related Online Information Seeking Behavior on Cyberchondria

As depicted in **Table 4**, gender ($P = 0.023$), age ($P = 0.004$), monthly income ($P = 0.012$) and education level ($P = 0.017$) were significantly associated with the C-CSS-12 total score. Males scored slightly higher than females (males 31.82 ± 12.27 , females 29.75 ± 10.86), and the 20-to 30-year-old age group had the highest score (32.08 ± 11.18). The C-CSS-12 total score of the group with monthly income above CNY 8,000 (35.22 ± 12.75) was higher than other groups, and the C-CSS-12 total score of the group with a master's degree and above (32.16 ± 11.68) was higher than other groups. The C-CSS-12 total score of the group with HP infection was higher than that of the group without HP infection ($P = 0.013$). The score of the C-CSS-12 subscale

“Distress” with relatives suffering from chronic bronchitis was higher than that of the group without relatives with chronic bronchitis ($P = 0.013$). However, no significant relationship was found between vocation and the C-CSS-12 total score ($P = 0.089$).

As for COVID-19-related online information seeking behavior, frequency ($P = 0.001$) and online duration ($P = 0.002$) were significantly associated with the C-CSS-12 total score; the C-CSS-12 total score of the group that searched 4–6 times a day (33.66 ± 11.52) was higher than that of the other groups. The C-CSS-12 total score of the group that searched online more than 1 h each time (33.65 ± 12.48) was highest among all groups. In terms of different information channels, the use of social news apps such as Headlines Today ($P = 0.046$) and general search engines such as Baidu ($P = 0.041$) were significantly associated with the C-CSS-12 total score, the use of traditional media digital platforms such as CCTV News was significantly associated with the score of the C-CSS-12 subscale “Distress” ($P = 0.013$), and the use of social platforms such as QQ ($P = 0.005$) and Q&A platforms such as Quora ($P = 0.027$) were significantly associated with the score of the C-CSS-12 subscale “Compulsion.” With regard to searching COVID-19-related information topics, treatment drugs ($P = 0.004$), inspection methods ($P = 0.018$), diagnosis ($P < 0.001$), efficacy and prognosis ($P < 0.001$), and health services ($P = 0.004$) were significantly associated with the C-CSS-12 total score.

Relationship Between Cyberchondria and Other Measured Variables

As depicted in **Table 5**, the average of the SHAI total score was 18.23 ± 11.09 , while that of the eHEALS total score was 30.72 ± 6.54 and that of the PHQ-15 was 4.01 ± 4.95 .

Besides, **Table 5** shows the relationships among cyberchondria (C-CSS-12), health anxiety (SHAI), e-health literacy (eHEALS) and Patient Health Questionnaire-15 (PHQ-15). Cyberchondria showed positive relationships with health anxiety ($r = 0.623$, $P < 0.01$), e-health literacy ($r = 0.115$, $P < 0.01$), and physical symptoms ($r = 0.290$, $P < 0.01$). Health anxiety correlated positively with the physical symptoms ($r = 0.438$, $P < 0.01$).

Multiple Linear Regression Model for Cyberchondria

According to the results of the t -test or analysis of variance, we included gender, age, education level, monthly income, personal illness, relative illness, frequency, duration, topics and information channels in the multiple linear regression model. **Table 6** presents the multiple regression results on the associations of sociodemographics, personal/relatives' illness, COVID-19-related online information seeking behavior characteristics, eHEALS, the SHAI, and the PHQ-15 with the C-CSS-12 total score. The eHEALS score ($\beta = 0.162 > 0$, $P = 0.003$), SHAI total score ($\beta = 0.598 > 0$, $P < 0.001$), use of general search engines such as Baidu ($\beta = 1.867 > 0$, $P = 0.039$), and searching for information on how to diagnose COVID-19 ($\beta = 2.280 > 0$, $P = 0.020$) were independent risk factors for the impact of the C-CSS-12 total score, while searching lasting less than 10 min each time ($\beta = -2.992 < 0$, $P = 0.048$), using

TABLE 4 | Cyberchondria (C-CSS-12) according to sociodemographic factors and COVID-19-related online information seeking behavior.

Variable	C-CSS-12/C-CSS-12 subscale score mean (SD)	t/F**	P-value
Gender		2.276	0.023*
Male	31.82 (12.27)		
Female	29.75 (10.86)		
Age (years)		3.950	0.004**
<20	28.84 (11.05)		
20–30	32.08 (11.18)		
31–40	31.95 (11.34)		
41–50	29.25 (11.74)		
>50	27.00 (12.81)		
Education level		4.120	0.017*
≤High middle school	28.94 (11.13)		
Undergraduate	31.48 (11.66)		
≥Postgraduate	32.16 (11.68)		
Monthly income (CNY)		2.961	0.012*
<2000	28.67 (10.52)		
2000–3000	30.72 (11.79)		
3001–4500	32.09 (11.75)		
4501–6000	31.01 (11.21)		
6001–8000	28.96 (12.73)		
>8000	35.22 (12.75)		
Personal illness		2.482	0.013*
Helicobacter pylori infection	Have 28 Not have (646)	35.93 (12.88) 30.42 (11.43)	
Relative's illness		2.491	0.013*
Chronic bronchitis	Have 42 Not have (632)	8.29 (3.20) ^a 6.94 (3.42) ^a	
Frequency		4.805	0.001**
Once a week or less	26.29 (11.05)		
2–6 times a week	29.14 (11.29)		
1–3 times a day	30.49 (10.96)		
4–6 times a day	33.66 (11.52)		
6 times a day or above	33.04 (13.09)		
Duration		5.118	0.002**
Less than 10 min	28.18 (10.37)		
10–30 min	31.32 (11.90)		
30–60 min	31.86 (11.23)		
More than 1 h	33.65 (12.48)		
Information channels			
Traditional media digital platforms such as People's Daily and CCTV News	Use (418) Not use (256)	6.76 (3.36) ^a 7.44 (3.46) ^a	–2.497 0.013*
Social platforms such as QQ, WeChat and Weibo	Use (453) Not use (221)	9.13 (3.22) ^b 8.39 (3.27) ^b	2.799 0.005**
Social news apps such as Headlines Today	Use (273) Not use (401)	31.73 (11.54) 29.92 (11.48)	1.997 0.046*
Q&A platforms such as Quora	Use (58) Not use (616)	9.79 (3.50) ^b 8.80 (3.22) ^b	2.221 0.027*
General search engines such as Baidu	Use (160) Not use (514)	32.28 (11.18) 30.15 (11.60)	2.050 0.041*

(Continued)

TABLE 4 | (Continued)

Variable	C-CSS-12/C-CSS-12 subscale score mean (SD)		t/F**	P-value
Topics				
Treatment drugs	Search (325)	31.98 (11.56)	2.896	0.004**
	Not search (349)	29.42 (11.38)		
Inspection methods	Search (307)	31.80 (12.00)	2.380	0.018*
	Not search (367)	29.69 (11.05)		
How to diagnose	Search (258)	33.42 (12.12)	4.866	<0.001**
	Not search (416)	28.94 (10.81)		
Efficacy and prognosis	Search (201)	33.71 (12.17)	4.547	<0.001**
	Not search (473)	29.36 (11.01)		
Health service	Search (188)	32.69 (11.93)	2.870	0.004**
	Not search (486)	29.86 (11.29)		

*Statistically significant ($P < 0.05$). **Statistically significant ($P < 0.01$). ^aRepresents the C-CSS-12 subscale "Distress." ^bRepresents the C-CSS-12 subscale "Compulsion".

traditional media digital platforms such as People's Daily and CCTV News ($\beta = -1.650 < 0$, $P = 0.024$), and using professional medical communication platforms such as DXY ($\beta = -4.189 < 0$, $P = 0.007$) were independent protective factors for the impact of the C-CSS-12 total score.

DISCUSSION

This study was a cross-sectional, anonymous, self-report questionnaire survey that aimed to investigate the status of cyberchondria as well as its influencing factors during the virus epidemic in community residents in Nanyang city, China.

In our study, we found that the average C-CSS-12 total score of residents was 30.65 ± 11.53 during the virus epidemic; 25% of participants scored 22 or below, 50% scored 23 to 38, and 21.9% scored 39 to 60. Gender, age, monthly income, education level, personal illness with HP infection, relatives' illness with chronic bronchitis, COVID-19-related online information seeking frequency and duration were all significantly associated with cyberchondria. Health anxiety, the use of general search engines and searching for information on how to diagnose COVID-19 were independent risk factors for cyberchondria, while searching lasting less than 10 min each, the use of traditional media digital platforms and professional medical communication platforms were independent protective factors.

Status of Cyberchondria

Overall, the results should be interpreted against the background of the situation in China at the time the study was conducted. The study took place from February 1 to 15, 2020, at the peak of the virus outbreak in China. According to the literature, only a small amount of data on the level of cyberchondria were present, especially for the general population (Vismara et al., 2020). In our study, the average C-CSS-12 total score of residents was 30.65 ± 11.53 and 21.9% of participants scored 39 and above, which was higher than the score of German residents during the epidemic (22.45 ± 7.28) (Jungmann and Witthoft, 2020) and much higher than the baseline score (Vismara et al., 2020). Another study found that Chinese residents had a C-CSS-12 total

score of 42.50 ± 6.01 under the epidemic (Zheng et al., 2021). At that time in China, the large number of patients with few medical supplies, the various transmission route of the virus, the uncertainty of the incubation period, and possible asymptomatic infection increased the anxiety and stress of residents (Yang et al., 2020). In particular, unprecedented lockdown measures and social isolation made it possible for people to search for COVID-19-related information more frequently online (Chinese Center for Disease Control and Prevention, 2020). Besides, the difficulty of dealing with uncertainty, information overload, the dubious credibility of online information and the failure to seek reassurance online have made some residents more anxious, which might be the reasons for the increase in the severity of cyberchondria.

Sociodemographic and Health Condition Factor Distribution in Cyberchondria

We found that the C-CSS-12 total score of men during the epidemic was slightly higher than that of women, which was consistent with some studies (Akhtar and Fatima, 2020). This difference was especially reflected in the C-CSS-12 subscales "Compulsion" and "Reassurance Seeking." The 20- to 30-year-old age group had the highest C-CSS-12 total score, which could be explained by the likelihood of younger adults using the internet more than older adults and was also consistent with the results of Doherty-Torstrick (Doherty-Torstrick et al., 2016) and Bajcar (Bajcar et al., 2019). Some studies have noted that due to the absence of a consensus definition, data reliably linking cyberchondria with sociodemographic variables, including gender and age, are conflicting and scarce (Vismara et al., 2020). Barke reported that age was unrelated to the CSS total, and women had a higher CSS score than men (Barke et al., 2016). Bajcar found no effect of gender but a significant negative effect of age on CSS scores (Bajcar et al., 2019). Another investigation conducted among university students reported higher male scores for the subscale "Compulsion" than female scores, with no gender difference in the total CSS score (Bati et al., 2018). In this study, residents with a monthly income of more than CNY 8000 and a master's degree or above had

TABLE 5 | Spearman's correlations among C-CSS-12, SHAI, eHEALS, PHQ-15 ($n = 674$).

Correlations*	Score mean (SD)	C-CSS-12 total	C-CSS-12 excessiveness	C-CSS-12 compulsion	C-CSS-12 distress	C-CSS-12 reassurance seeking	eHEALS total	SHAI total	SHAI IK	SHAI NC	PHQ-15 total
C-CSS-12 total	30.65 (11.53)	1									
C-CSS-12 excessiveness	8.89 (3.25)	0.848**	1								
C-CSS-12 compulsion	6.80 (3.23)	0.912**	0.659**	1							
C-CSS-12 distress	7.02 (3.42)	0.889**	0.638**	0.841**	1						
C-CSS-12 reassurance seeking	7.94 (3.27)	0.855**	0.680**	0.696**	0.625**	1					
eHEALS total	30.72 (6.54)	0.115**	0.169**	0.062	0.001	0.177**	1				
SHAI total	18.23 (11.09)	0.623**	0.523**	0.573**	0.591**	0.496**	0.027	1			
SHAI IK	14.00 (8.71)	0.625**	0.527**	0.569**	0.595**	0.497**	0.031	0.985**	1		
SHAI NC	4.23 (2.92)	0.504**	0.416**	0.478**	0.469**	0.402**	0.010	0.858**	0.757**	1	
PHQ-15 total	4.01 (4.95)	0.290**	0.244**	0.260**	0.303**	0.209**	-0.041	0.438**	0.438**	0.355**	1

*Statistically significant ($P < 0.05$). **Statistically significant ($P < 0.01$).

higher C-CSS-12 total scores, which might be related to their greater health concerns and more in-depth health information search demands. In addition, the score of the C-CSS-12 subscale “Distress” among those with relatives suffering from chronic bronchitis was higher than that of the group without, which might be related to the concern of these residents that the underlying respiratory diseases of their relatives may increase their relatives’ susceptibility to new coronary pneumonia or increase the possibility of illness in the family. However, the results of multiple linear regression indicated that gender, age, monthly income, education level, personal illness with HP infection, and relatives’ illness with chronic bronchitis were not independent influencing factors for cyberchondria.

Association With Health Anxiety

This study was designed to determine the general anxiety and cyberchondria of residents affected by the epidemic rather than the specific ones on COVID-19. We found that cyberchondria had a strong positive correlation with health anxiety ($r = 0.623$); the regression coefficient was 0.596, which is consistent with most literature results (McMullan et al., 2019). Several studies have found that residents with elevated health anxiety experience greater anxiety during and after online health searches and report more frequent and longer searches compared to those with lower or normal levels of health anxiety (Doherty-Torstrick et al., 2016; Singh and Brown, 2016; Te Poel et al., 2016). And in the context of the pandemic, recent studies showed that some individuals exposed to social media and incorrect information about COVID-19 perceived anxiety and threat more strongly (Kavakli et al., 2020). The higher the current virus anxiety, the stronger the cyberchondria (Jungmann and Witthoft, 2020). The average SHAI total was higher than the anxiety level in Germany during the epidemic (Jungmann and Witthoft, 2020), and the average C-CSS-12 total score was higher than that in Germany as well. This might be related to Chinese residents’ awareness of the disease, concerns about the prevention and control of the epidemic, the degree of attention to epidemic information, and the ability to distinguish between credible and non-credible sources of online information (Chang et al., 2020; Yang, 2021). In another study, cyberchondria was reported as a risk factor for “coronavirus anxiety,” which was reduced with full understanding knowledge of the pandemic (Jungmann and Witthoft, 2020). Accordingly, this paper further confirmed the positive relationship between health anxiety and cyberchondria.

Association With COVID-19-Related Online Information Seeking Behavior

Our results indicated that COVID-19-related online information seeking frequency and online duration were significantly associated with the C-CSS-12 total score. The higher the frequency and the longer the time, the higher the score. Some studies have reported that illness-related information consumption could cause worry or anxiety about one’s health (Liu, 2020), and more frequent social media exposure to COVID-19 is positively correlated with anxiety symptoms (Elhai et al., 2020; Gao et al., 2020). This might be related to the fact

TABLE 6 | The multiple linear regression results on associated factors with cyberchondria.

Model		Unstandardized coefficients		Standardized coefficients	<i>t</i>	<i>P</i>	Collinearity statistics	
		β	Std. error	β			Tolerance	B
(Constant)		15.163	3.125		4.852	<0.001**		
eHEALS score		0.162	0.055	0.092	2.964	0.003**	0.890	1.123
SHAI total		0.598	0.036	0.575	16.725	<0.001**	0.726	1.378
Duration	Less than 10 min	−2.992	1.510	−0.119	−1.981	0.048*	0.239	4.176
	10–30 min	−1.594	1.412	−0.069	−1.129	0.259	0.229	4.367
	30–60 min	−1.679	1.577	−0.050	−1.064	0.288	0.385	2.597
Information channel	Traditional media digital platforms such as People's Daily and CCTV News	−1.650	0.727	−0.070	−2.270	0.024*	0.916	1.092
	Social platforms such as QQ, WeChat and Weibo	−0.516	0.774	−0.021	−0.667	0.505	0.864	1.157
	Social news apps such as Headlines Today	0.538	0.761	0.023	0.706	0.480	0.816	1.225
	Short video platforms such as Tik Tok	0.688	0.759	0.029	0.906	0.365	0.846	1.182
	Q&A platforms such as Quora	−0.356	1.350	−0.009	−0.263	0.792	0.795	1.257
	General search engines such as Baidu	1.867	0.902	0.069	2.070	0.039*	0.774	1.292
	Professional medical communication platform such as DXY	−4.189	1.538	−0.087	−2.723	0.007**	0.843	1.186
	Inspection methods	−0.344	0.867	−0.015	−0.397	0.691	0.612	1.635
	How to diagnose	2.280	0.976	0.096	2.337	0.020*	0.507	1.974
Topics	Treatment drugs	−0.470	0.835	−0.020	−0.563	0.574	0.654	1.528
	Treatment drugs	1.223	1.021	0.049	1.198	0.232	0.523	1.914
	Health service	−0.936	0.906	−0.036	−1.033	0.302	0.691	1.448
	R^2					0.453		
	F					14.666		
P						<0.001**		
Dependent variable: C-CSS-12 total								

*Statistically significant ($P < 0.05$), **Statistically significant ($P < 0.01$).

Predictors (constant): eHEALS score; SHAI total; PHQ-15 total; gender; age; monthly income; education level; frequency; duration; personal illness on helicobacter pylori infection; relatives' illness on chronic bronchitis; information channels on traditional media digital platforms, social platforms, social news apps, short video platforms, Q&A platforms, general search engines, professional medical communication platform; topics on inspection methods, how to diagnose, treatment drugs, treatment drugs, health service.

that during long-term attention to health information on the epidemic, excessive stimulation can inactivate the happiness produced by the brain's secretion of dopamine, lower the excitement threshold, cause emotional disorders, and weaken emotional regulation and processing capabilities, which may cause negative emotions such as anxiety (Gao et al., 2020). Some studies have suggested that patients with "moderate-severe health anxiety" should avoid using the internet for health-related information based on a strong association between health anxiety and cyberchondria (Doherty-Torstrick et al., 2016). However, it may be difficult for people to do this in the digital age. The results of the multiple linear regression indicated that searching for less than 10 min each time was an independent protective factor for cyberchondria, which might be a suggested and recommended approach. Searching for COVID-19-related online information topics, treatment drugs, inspection methods, diagnostic methods, efficacy and prognosis, and health services was significantly associated with the C-CSS-12 total score; in particular, searching for information on diagnostic methods was an independent risk factor. This may be explained by the fact that people might notice similar symptoms and thus seek information for self-diagnosis given the high infectivity of the virus, thus increasing their concerns (Buhr and Dugas, 2009). Additionally, to a certain extent, the findings reflect that online information on the diagnosis of new coronary pneumonia was possibly unclear and conflicting at the time, and determining whom to trust became a guessing game. The internet is not designed to always provide relevant, accurate, non-conflicting, non-ambiguous or reassuring information, and misinformation on COVID-19 has been proliferating on the internet. These make it difficult to distinguish between reliable and unreliable information and leads to failure to obtain the expected reassurance in the course of online health-related searches, which increases health anxiety (Starcevic, 2017).

Our research also showed that Chinese residents tend to obtain information about the epidemic through traditional media digital platforms, social platforms, news apps, short video platforms, and general search engines. However, due to widespread access to the enormous amount of information facilitated by various digital media platforms, individuals might be overwhelmed with uncertainty, and their concerns regarding the pandemic may be increased. We found that using general search engines such as Baidu and Sougou was an independent risk factor for cyberchondria ($\beta = 1.867$). This may be related to the multisource information, high degree of openness, poor consistency, and large differences in information accuracy and completeness of this type of search engine, which make it more difficult for people to distinguish whether the information is reliable. In addition, when searching online, users are more inclined to view and click on titles containing potentially dangerous medical terms (White and Horvitz, 2013), which may also be related to the escalation of anxiety. Starcevic V (Starcevic, 2017) proposed improving the presentation of online health information and online health-related engine search results to present online health information in a way that is clear and user-friendly. Furthermore, checking online

search results based on the true probability of the relationship between specific symptoms and diagnosis methods such as ranking may reduce misunderstandings and the escalation of health anxiety. We also found that using traditional media digital platforms ($\beta = -1.650$), such as the People's Daily and CCTV News, was an independent protective factor for cyberchondria, which may be related to the supervision of the government and relevant departments for information release through these channels. The authority and quality of the information is better, which could give users more comfort when seeking COVID-19-related health information. Likewise, information from professional medical communication platforms such as DXY is mostly professionally certified by the doctor's editorial department. This channel is becoming increasingly popular with residents and could provide relatively reliable medical content and advice (Venkatasubramanian, 2020). Therefore, it was suggested that the choice of information channels, especially the network information quality of platforms, may have an impact on cyberchondria, and that improving the information quality of different channels or guiding users to choose authoritative platforms may be good interventions for cyberchondria.

Association With E-Health Literacy and Physical Symptoms

Some scholars have noted that cyberchondria is considered a specific form of health-related problematic internet use (Vismara et al., 2020), especially involving the ability to distinguish reliable information (Starcevic, 2017). It is shown that e-health literacy could negatively moderate the indirect effect of affective responses on cyberchondria (Zheng et al., 2020). Some studies have noted that people with high e-health literacy are able to understand the information that they find on the internet, verify the veracity of the information, and use this information to promote health behaviors (Huang et al., 2020). They might avoid excessive online health searches, although they are anxious about their health status (Zheng et al., 2020). However, unexpectedly, we found a slightly positive correlation between e-health literacy and cyberchondria in our study. This might be that e-health literacy was positively correlated with online time and frequency (Yuan et al., 2015; Wong and Cheung, 2019) to the same extent as cyberchondria and served as an enabler to online health information seeking (Li et al., 2014). Therefore, the impact of e-health literacy on cyberchondria needs further exploration.

In addition, cyberchondria was slightly positively correlated with personal physical symptoms, indicating that cyberchondria is a comprehensive problem involving psychology, physiology, online information search behavior, information resources, and social public health. Recent study found that the psychosomatic symptom level was positively related to perceived COVID-19 threat and anxiety (Gica et al., 2020; Ran et al., 2020; Xu et al., 2020). In particular, individuals with symptoms, such as pain catastrophizing (Gibler et al., 2019), searched online for more information about their symptoms, resulting in disruption of daily functioning, escalations in health-related concerns, excessive health-related checking behaviors and greater healthcare utilization.

LIMITATIONS

The research reported in our paper has several limitations. Since cyberchondria is a relatively new area of research, there is no diagnostic criteria yet, and the CSS-12 does not yet define the diagnostic cut-off score, so we cannot scientifically distinguish the severity level and just describe the distribution of scores. How to classify the severity will be the research direction in the future. Second, the cross-sectional design of the study did not allow exploration of causal or temporal relationships between variables. A longitudinal design would better assist in establishing that link. In addition, we used a sample from only one large city. To understand the overall status of cyberchondria in China, the sample size needs to be further expanded.

CONCLUSION

Our findings showed that nearly a quarter of the participants scored 39 or higher on the C-CSS-12 in Nanyang city during the pandemic, which should be taken seriously. Health anxiety and COVID-19-related online information seeking behavior including online duration, topics and choice on different information channels were important influencing factors of cyberchondria. These findings have implications for further research and clinical practice on cyberchondria in China.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the institutional review board (IRB) of the Third Xiangya Hospital, Central South University. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

X-QP conceptualized and designed the study as well as the investigation. She also drafted the original manuscript. YC designed the questionnaires together with X-QP, and distributed questionnaires with Y-CZ, FL as well as H-YH. X-QP and YC carried out the initial analyses and interpreted the data and review and revised the manuscript. Y-CZ, FL, and H-YH distributed and collected questionnaires together with YC. TL and P-PD reviewed the initial data and analytical outcome. A-JL and W-ZX obtained funding for the research and supervised the procedure of the whole investigation evaluated the project. All authors contributed to the article and approved the submitted version.

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Stress and Burnout in Teachers During Times of Pandemic

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In Argentina, once mandatory isolation was declared due to the COVID-19 pandemic, teachers of all educational levels and modalities had to substantially modify their way of working. The aim of this study was to identify the work situations that education professionals perceived as threats under the modality of non-face-to-face teaching, and to describe the level of perceived stress and its possible effect on psychophysical symptoms. Likewise, it sought to examine possible differences in the manifestations of burnout depending on the level of perceived stress and associated symptoms. An empirical study with a cross-sectional design was developed, in which 9,058 Argentine teachers, who had to complete self-report measures, participated. The sampling method was non-random, using an online procedure of reclusion of volunteers. Descriptive techniques and non-parametric tests were used for data analysis. More than 60% of the educators reported high and moderately high levels of stress. The predominant stressors were uncertainty about the consequences of the pandemic, work overload and inadequate working environment. The more stress they perceived, the higher the manifestation of unwanted psychophysical symptoms. Professional burnout was higher for teachers with a higher load of stress and with more psychophysical indicators of discomfort. These results reveal the psychological impact of the COVID-19 pandemic on the education staff, and encourage the development of intervention measures to preserve the health of professionals.

Keywords: stress, burnout, teaching, pandemic, COVID-19

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INTRODUCTION

The World Health Organization declared the outbreak of the new coronavirus a pandemic on March 11, 2020, after the number of people infected and deaths from COVID-19 increased exponentially in 110 countries on different continents. Given the aggravation of the epidemiological situation at an international level, this organization urged world leaders to take immediate measures in order to face this sanitary crisis. In Argentina, the National Executive Branch established the social, preventive and mandatory isolation, starting March 20, 2020, as a measure to prevent the contagion, mitigate the circulation of the virus and preserve public health. Consequently, face-to-face classes were suspended from that date at all levels and modalities. Facing this situation, educational institutions had to quickly reorganize in order to give continuity to the academic year under the non-face-to-face modality.

After the first weeks of mandatory quarantine, several journalistic reports highlighted that education professionals throughout the country manifested feelings of distress due to the closure

of schools, and felt overwhelmed by the dizzying change that virtual teaching implied (Carnese, 2020; Di Vincenzo, 2020; Favant, 2020; Fernández, 2020; Figueroa Díaz, 2020; Santoro, 2020; Vallejos, 2020). In the same way, studies conducted by different teachers' unions revealed that social confinement had substantially transformed the work scenario of educators. At the same time, they noticed that these changes were affecting the health of teachers of all levels (see Confederación de Trabajadores de la Educación de la República Argentina, 2020; Sindicato Argentino de Docentes Particulares, 2020; Sindicato Unificado de Trabajadores de la Educación de Buenos Aires, 2020).

Over the years, various authors have pointed out that education workers show a high risk of developing anxiety, stress and burnout as a consequence of being exposed to a wide range of work stressors in their daily activities (Esteve, 1994; Gil-Monte and Peiró, 1997; Schaufeli and Enzmann, 1998; Vandenberghe and Huberman, 1999; Manassero et al., 2003; Schaufeli, 2003; Gil-Monte, 2005; Menghi, 2015; Othman and Sivasubramaniam, 2019). In Argentina, since March of 2020, teachers have seen many aspects of their work modified. This situation could lead to an increase in the perception of work stressors and/or intensity educators attribute to those stressors, making them even more prone to those maladjustments.

The interactional model of stress, proposed by Lazarus and Folkman (1986), offers a conceptual framework that allows us to understand not only the background, but also the mediators and the possible consequences of psychological stress. According to this perspective, stress arises when the transactions with the environment are assessed as threatening. In this way, different situations and stimuli may assume the nature of stressors, as long as they are considered dangerous for the achievement or the maintenance of wellness. The greater the potential for damage perceived in the demands of the environment and the lower the ability of the individual to cope with them, the greater the negative impact of stress.

Demands are conceived as explicit or implicit pressures in the environment that lead to acting in a particular way. When these demands cannot be easily satisfied with available physical, psychological, social or material resources, and when demands come into conflict with personal goals, beliefs and expectations, they become a powerful source of stress (Lazarus, 2000).

Specifically in the occupational area, and following this line of thought, the World Health Organization defined burnout as the result of an imbalance between the demands and pressures of work, on the one hand, and the knowledge and abilities of workers, on the other hand (Leka et al., 2004). Regarding the educational context, various investigations have allowed the identification of those demands and working conditions that are habitually perceived as threatening and boosters of physical and psychological discomfort among teachers in non-isolation conditions. Among the most commonly signaled risk factors are: (a) behavioral problems, demotivation, absences and accidents suffered or provoked by students, (b) problems with the families of the students (criticism, complaints and lack of accompaniment to the student), (c) lack of support among colleagues, poor coordination and difficulties in teamwork, (d) administrative demands, conflict with superiors, injustices and

low social and remunerative recognition, (e) work overload (multiple and excessive tasks to carry out in short periods of time and without sufficient breaks), (f) conflict and role ambiguity, (g) inadequate physical environment, lack of pedagogic material and lack of adequate equipment, (h) use of new technologies and (i) difficulties in combining work and family (Lambert et al., 2001; Salanova et al., 2003; Urquidí Treviño and Rodríguez Jiménez, 2010; Menghi, 2015; Goebel and Carlotto, 2019).

In the United States, a scale was created to assess the stress associated with different demands and resources peculiar to teaching work in primary schools based on the theoretical model of Lazarus and Folkman (1986) specifically (Lambert et al., 2001). The demands included behavior problems and student absences, administrative demands, a shortage of teaching materials, and so on. Among the resources, the availability and help of school support personnel, administrative support, community support and specialized training were assessed. The researchers noted a higher risk of occupational stress in those teachers who perceived high demands and low resources (Lambert et al., 2019).

The epidemiological situation framing the exercise of teaching today generates other concerns that are not inherent to the teaching role, but with a possible catalytic effect, such as fear of contagion, uncertainty about the duration of the pandemic and its possible impact on the economic situation, the physical distancing from social support networks, among others (MacIntyre et al., 2020; Sánchez Mendiola et al., 2020).

As a result, psychophysical manifestations of distress might emerge, with more or less severe consequences, depending on the case. Studies carried out with education professionals during the pandemic have reported an increase in headaches, muscle contractures, fatigue, anxiety, anguish, dizziness, lightheadedness, nervousness, and sleeping and eating disorders (Asociación del magisterio de Santa Fe, 2020; Confederación de Trabajadores de la Educación de la República Argentina, 2020; Sindicato Argentino de Docentes Particulares, 2020; Sindicato Unificado de Trabajadores de la Educación de Buenos Aires, 2020; Casali and Torres, 2021; Idris et al., 2021).

Moreover, it is known that when the teaching workload is perceived as higher than the resources available to meet it, the intention to continue practicing the profession, or choose it again if the opportunity arises, decreases significantly (Lambert et al., 2019). On the other hand, inadequate and long-term efforts to meet work demands can lead to burnout syndrome.

In current research on burnout syndrome, Maslach and Jackson's (1981, 1986) definition is the most widely accepted by the scientific community and belongs to the multidimensional model they develop. According to these authors, burnout syndrome is an individual stress experience embedded in a context of complex social relationships that encompasses the concept the person has of themselves and others. Moreover, they defined it as a psychological syndrome of emotional exhaustion (i.e., drainage or reduction of emotional resources produced by interpersonal demands), depersonalization (i.e., development of negative, insensitive and cynical attitudes toward the recipient) and low personal fulfillment at work (i.e., tendency to negatively evaluate the work done) that can be developed in individuals in any type of activity whose object of work are people.

Gil-Monte and Peiró (1997) state that the burnout syndrome should be understood as a response to work stress that arises when the coping strategies the subject initially uses are not successful. The individual develops feelings of low personal fulfillment at work and emotional exhaustion by not being able to cope effectively with the stressors. Later on, the person displays behaviors of depersonalization as a new way of confrontation. Taking the transactional models as a reference, these authors recognize burnout as a variable that mediates between the stressors and their long-term effects. Within this context, burnout syndrome may be considered as an intermediate step in the stress-consequences of stress relationship.

Many studies have shown that stress and burnout are a potential problem within a wide range of occupations (Maslach et al., 2001; Schaufeli, 2003; Gil-Monte, 2005; Schaufeli et al., 2009). As regards teaching, studies conducted in different parts of the world have found that an important number of teachers are suffering from burnout syndrome (e.g., Fernández, 2002; Figueiredo-Ferraz et al., 2009; Rionda Arjona and Mares Cárdenas, 2011; Arias Gallegos and Jiménez Barrios, 2013; Ratto Dattoli et al., 2015), who show, in some cases, higher levels of burnout as compared to other occupations (e.g., Schaufeli and Enzmann, 1998; de Heus and Diekstra, 1999; Schaufeli, 2003; Johnson et al., 2005).

Although in recent years there has been interesting progress regarding the study of stress and burnout in Latin American teachers, new and more complex approaches are needed (Luy-Montejo et al., 2019). This research intends to expand the knowledge of these variables in a historical moment in which health care and well-being of educators are crucial. As it was expressed before, the conditions of isolation and social distancing imposed new potentially stressful and possibly more aversive challenges due to their cumulative effect that is associated to other factors typical of the pandemic. Given this context, it is urgent and necessary to know the levels of stress and burnout education professionals express. Mainly, because several studies portray the harmful consequences these maladjustments carry for the educators who suffer from them, for the students and for the organization where they work (see Maslach et al., 2001; Schaufeli, 2003; Schaufeli and Buunk, 2002). Considering this background, this study seeks to identify the working conditions that education professionals perceive as threatening in times of pandemic, and describe the level of perceived stress and its possible effect on psychophysical symptoms. Additionally, this study intends to identify differences in the manifestations of burnout according to the level of perceived stress and associated symptoms.

Based on the interactional model by Lazarus and Folkman (1986), significant differences are hypothesized in the experience of stress symptoms according to the level of perceived threat. The higher the perception of threat, the higher the cognitive deficit, the nervousness and the physical symptomatology. On the other hand, taking into consideration Maslach and Jackson's (1986) classical approach (1986) and current research on stress and burnout syndrome in the teacher population (e.g., Esteras et al., 2016; Granados et al., 2019; Seijas-Solano, 2019), significant differences are hypothesized in the manifestations of burnout according to the perception of threat and the symptoms of stress.

The higher the perception of threat and the symptoms of stress, the greater the burnout.

MATERIALS AND METHODS

Type of Study and Design

An empirical, quantitative, *ex post-facto*, cross-sectional survey design was carried out (Calderón Saldaña and Alzamora de los Godos, 2018).

Participants

In this study, 9,058 teachers residing in different Argentinian provinces participated. They worked in public or private education institutions, or both, in one of the four educational levels, in special or permanent education of youngsters and adults. The selection of participants was conducted through a non-randomized procedure of volunteer recruitment. Demographic and working characteristics of the sample are exposed in **Table 1**. The registered teachers completed all the required tests. The test basis was free of missing data.

Instruments

In order to collect information about the demographic and working characteristics of the participants, closed questions were used, which revealed information regarding gender, age, educational level, work seniority and institutional management, among other aspects.

In order to analyze the situations that teachers perceive as stressful, a Scale of Teachers' Stressors in Times of Pandemic (Oros et al., 2020) was used, which consists of 21 items, with five Likert-type answer options (Not stressful = 1, A little stressful = 2, Somewhat stressful = 3, Quite stressful = 4, Very stressful = 5). The items are factorially grouped into five factors: work environment and work overload (e.g., *Having little time to do all the tasks involved in remote work*), use of new technologies (e.g., *Learning how to use and master new technologies*), uncertainty about the duration and consequences of the pandemic for the teacher and the students (e.g., *Feeling uncertain toward the future, not knowing when the pandemic will end*), the organizational aspect of the educational institution (e.g., *Feeling that superiors do not understand the difficulties of working under these conditions*), and relationship with the students' environment, conflict and role ambiguity (e.g., *Receiving multiple and simultaneous inquiries from students and/or parents*). The internal consistency values reported by the authors ranged between $\omega = 0.78$ and 0.85 for the factors, being of $\omega = 0.93$ for the full scale. In this study, the values obtained were: $\alpha = 0.85$ for Work environment and work overload factor, $\alpha = 0.80$ for Use of new technologies factor, $\alpha = 0.83$ for Uncertainty about the duration and the consequences of the pandemic for the teacher and the students factor, $\alpha = 0.81$ for Organizational aspect of the educational institution factor, and $\alpha = 0.77$ for Relationship with the students' environment, conflict and role ambiguity factor.

In order to know the symptoms of stress, the Scale of physical psychoemotional indicators of stress (Oros and Neifert, 2006)

was administered. This scale consists of 22 items grouped in three dimensions: Cognitive deficit (e.g., “I find it difficult to focus,” “I forget things easily”) ($\alpha = 0.79$), Nervousness (e.g., “I get nervous easily,” “I feel I worry excessively about everything”) ($\alpha = 0.74$) and physical symptoms (“I have insomnia or difficulty in falling asleep,” “I have neck and back pain”) ($\alpha = 0.62$). The items were answered in a Likert scale with five answer options (Never, Hardly ever, Sometimes, Often, Always). The internal consistency values for this study sample were: $\alpha = 0.84$ for Cognitive deficit, $\alpha = 0.86$ for Nervousness, and $\alpha = 0.74$ for Physical symptoms.

Finally, in order to evaluate the burnout, a Spanish adaptation by Seisdedos (1997) of the Maslach Burnout Inventory (MBI), by Maslach and Jackson (1986) was used. This instrument consists of 22 items assessed with a Likert-type scale. Individuals indicate, through a range of seven adjectives, ranging from “Never” (0) to “Every day” (6), how often they experience each of the situations described. The factorization of the 22 items shows three orthogonal factors, which are called: (a) Emotional exhaustion, (b) Depersonalization, and (c) Personal fulfillment. The study of the MBI internal consistency in its original version in English showed, through the Cronbach alpha index, good values for each of the three subscales (0.90 for Emotional exhaustion, 0.79 for Depersonalization, and 0.71 for Personal fulfillment). In our country and region, this self-administered inventory has been used in various studies, showing psychometric properties between moderately acceptable and satisfactory (e.g., Marucco et al., 2009; Malander, 2019). In this sample, Cronbach alpha values were very good for Emotional exhaustion (0.89) and Personal fulfillment (0.85), and fairly acceptable for Depersonalization (0.64).

Data Collection Procedures

Due to the special conditions of social isolation in which this research was developed, the data collection was made through an online form. Volunteer recruitment was carried out through social media, electronic mail and digital messaging services, in some cases with the support of institutional and jurisdictional education authorities. The activity demanded approximately 15 min. The data collection started 46 days after the preventive social isolation was decreed in our country, in a period between April 27 and September 15, 2020. Teachers were provided with an email address for inquiries and an optional section at the end of the form to express opinions and comments.

Statistical Procedures

The teachers' answers were quantified and statistically processed. No missing data were recorded either at an item level or at a scale level.

To identify the situations valued as threatening, and the level of perceived stress, basic statistical analyses were conducted (calculus of means and standard deviations). In order to make descriptive comparisons between the different dimensions of the Stressor Scale, these means were considered by the number of items in each dimension.

The percentages of adherence to each answer section were calculated so as to estimate the general level of stress teachers

perceived, taking into consideration the options of the Likert scale that were used in the evaluation (Not stressful = 1, A little stressful = 2, Somewhat stressful = 3, Quite stressful = 4, Very stressful = 5). In that way, scores weighted between 1 and 2 were considered indicative of Low level of stress, scores between 2.01 and 3 as indicative of moderately low level of stress, scores between 3.01 and 4 as moderately high, and scores over 4.01 as a high level of stress perception.

The assumptions of homoscedasticity and normality of the variables (univariate and multivariate) were also tested to determine the most adequate statistical test to study the hypotheses. For this purpose, the Kolmogorov-Smirnov, Box, Bartlett and Levene tests were used, from which the non-compliance with the mentioned assumptions was confirmed.

Therefore, with the purpose of analyzing possible differences among the psychophysical symptoms according to the level of stress, a non-parametric Kruskal Wallis H analysis was performed. Previously, the scores for each stressor were categorized in four groups (low stress, moderately low stress, moderately high stress and high stress) using the same criteria as with the general value. The Kruskal Wallis H test was also used to investigate the differences in the three manifestations of burnout based on perceived stress on the one hand, and psychophysical symptoms on the other. The psychophysical symptoms variable was categorized for this analysis using two cut points (< 33.33 = low symptomatology, 33.33 – 66.66 = moderate symptomatology, > 66.66 = high symptomatology).

The effect size for the H tests was estimated with the squared epsilon statistical (E^2_R), considering for its interpretation the Cohen's criteria for the analogous test of partial η^2 : 0.01 (small), 0.06 (moderate) and 0.14 (large). In all cases, *post hoc* contrasts were conducted through the non-parametric Mann-Whitney U -test.

Ethical Considerations

The actions carried out in this work complied with the international ethical recommendations for research with human beings (i.e., Asamblea Médica Mundial, 2013; American Psychological Association, 2017). The teachers participated anonymously and voluntarily, stating their consent before answering the instructions on the form. No incentives of any kind were provided in exchange for participation. The information collected was treated confidentially, and was not accessed by persons outside the investigation.

RESULTS

Situations Valued as Threatening and Level of Perceived Stress

According to the analysis of weighted means, of the five major stressors that were assessed, the preeminence of Uncertainty about the duration and the consequences of the pandemic is highlighted, followed in order of importance by Work environment and work overload, Relationship with the students' environment, conflict and role ambiguity, Organizational aspect

TABLE 1 | Demographic and working characteristics of the participants ($n = 9,058$).

Variables	Frequency	Percentage	Mean	SD
Gender				
Female	7,870	86.90		
Male	1,182	13.00		
Other	6	0.10		
Age			41.08	8.820
Educational level or modality in which they perform				
Kindergarden education	1,057	11.70		
Primary education	3,865	42.70		
Secondary education	2,592	28.60		
Higher education	349	3.90		
Special education	573	6.30		
Continuing education of young people and adults	622	6.90		
Seniority in teaching			12.85	8.390

SD, Standard Deviation.

TABLE 2 | Descriptive information of the main variables.

Variables	Min	Max	M	SD	Skewness	Kurtosis
Teachers' stressors						
Environment and work overload	1	5	3.37	1.09	-0.38	-0.83
Uncertainty	1	5	3.64	0.96	-0.54	-0.49
Organizational aspect	1	5	3.10	1.12	-0.03	-1.01
Relationships and role	1	5	3.14	1.12	-0.08	-0.95
New technologies	1	5	3.10	1.05	-0.05	-0.92
Psychophysical symptoms						
Cognitive deficit	0	28	11.03	5.27	0.14	-0.26
Nervousness	0	28	13.92	5.61	-0.12	-0.02
Physical symptoms	0	32	15.21	5.64	-0.07	-0.21
Burnout						
Emotional exhaustion	0	54	23.86	13.29	0.12	-0.91
Personal fulfillment	0	48	36.79	9.39	-1.05	0.76
Depersonalization	0	30	3.97	5.30	1.84	3.83

Min, Minimum value of the subscale; Max, Maximum value of the subscale; M, Mean; SD, Standard deviation.

of the educational institution, and Use of new technologies factors (see Table 2).

On the other hand, statistical analyses revealed that 62.1% of teachers in the sample display general levels of stress between moderately high and high.

Experience of Psychophysical Symptoms According to the Level of Stress

The analysis indicated significant differences in the psychophysical symptomatology according to the levels of perceived stress. The size of these differences was between moderate and large, the largest being the cognitive deficit. *Post hoc* contrasts showed significant differences among all the comparison groups, for all the variables included in the analysis ($p < 0.001$). The frequency with which physical symptoms,

nervousness, and cognitive deficit are experienced increases significantly as the perception of stress increases (see Table 3).

Manifestations of Burnout According to Level of Stress and Psychophysical Symptoms

The results revealed statistically significant differences in the three dimensions of Burnout depending on the level of stress. The size of the effect was larger for the Emotional exhaustion dimension (see Table 4). The *post hoc* contrasts showed significant differences among all the comparison groups for the dimensions of Emotional exhaustion and Depersonalization, whereas for Personal fulfillment a few pairs of non-significant average ranges were observed (see Table 5). In general, it is observed that as the level of stress increases, Exhaustion and Depersonalization increase, and Personal fulfillment decreases. An exception to this tendency was seen in Uncertainty about the consequences of the pandemic factor; in this case, both high and low levels of stress were associated with lower Personal fulfillment.

Statistically significant differences were also observed in the three dimensions of Burnout according to the frequency of the psychophysical symptoms experienced. Again, the effect size was larger for Emotional exhaustion (see Table 6). The *post hoc* contrasts showed significant differences among all the comparison groups, for all the variables included in the analysis ($p < 0.001$). The higher the score in Cognitive deficit, Physical symptoms and Nervousness, the higher the score in Emotional Exhaustion and Depersonalization, but the lower the score in Personal fulfillment.

DISCUSSION

This study was conducted with the objective of: (a) identifying the workplace situations that teachers perceive as threatening in times of pandemic, (b) describing the level of perceived stress and its effect on the psychophysical symptoms, and (c) studying possible differences in burnout according to the level of perceived stress and associated symptoms. Hereinafter, the obtained results will be discussed, with reference to their adjustment degree with the previously stated hypotheses.

Situations Valued as Threatening and Level of Perceived Stress

Of the five stressors assessed, uncertainty about the consequences of the pandemic for the teacher and the student stood out for its intensity (e.g., not knowing how the socioeconomic situation will continue, knowing there are students who do not have the technological resources to work remotely, being uncertain about the future, not knowing when the pandemic will end, and not knowing if students are understanding the contents). Preeminence of stressors associated with the working environment and work overload was observed (e.g., overlapping of work with household tasks, work schedule that is disorderly, unpredictable or different from the usual schedule,

TABLE 3 | Results of the Kruskal Wallis test for the Psychophysical symptoms according to the Level of stress.

Level of stress	Psychophysical symptoms								
	Cognitive deficit			Physical symptoms			Nervousness		
	AR	H	E ² _R	AR	H	E ² _R	AR	H	E ² _R
Environment and work overload									
Low	2509.09	2020.33***	0.22	2855.21	1575.19***	0.17	2715.17	1860.83***	0.21
Moderately low	3627.56			3631.93			3533.57		
Moderately high	4780.37			4728.99			4766.98		
High	6007.08			5870.17			5976.23		
Use of new technologies									
Low	2999.28	1376.91***	0.15	3396.87	805.75***	0.09	3255.51	1028.28***	0.11
Moderately low	4129.24			4216.52			4137.52		
Moderately high	5068.12			4873.68			4978.98		
High	5978.46			5711.89			5823.75		
Uncertainty about the duration and the consequences of the pandemic									
Low	2766.42	1254.52***	0.14	3072.99	939.62***	0.10	2939.71	1077.14***	0.12
Moderately low	3403.51			3585.95			3508.31		
Moderately high	4457.98			4394.04			4413.40		
High	5593.49			5485.73			5539.48		
Organizational aspect									
Low	2999.83	1416.80***	0.16	3226.55	1056.38***	0.12	3140.00	1214.16***	0.13
Moderately low	4178.77			4210.08			4171.52		
Moderately high	5070.38			4978.76			5023.18		
High	5899.99			5737.15			5820.77		
Relationships with the student environment, conflict and ambiguity of role									
Low	3065.00	1287.06***	0.14	3262.33	1042.48***	0.12	3188.21	1170.02***	0.13
Moderately low	4173.73			4142.54			4118.58		
Moderately high	5049.78			4998.50			5026.35		
High	5860.07			5759.46			5832.59		

AR, Average range; H, Kruskal Wallis test; E²_R, Epsilon squared effect size.****p* < 0.001.

and lack of time to perform the tasks involved in remote work), as well as organizational aspects of the educational institution (e.g., receiving a greater number of requirements and demands from superiors), and the relationship with the students' environment (e.g., receiving multiple and simultaneous inquiries from students and/or parents). As regards stress, it was noticed that 62.1% of educators presented high and moderately high levels of stress.

Similarly, studies conducted with Latin American teachers reported that they presented high levels of stress, anguish and anxiety during the suspension of face-to-face classes due to the global COVID-19 pandemic (Becerra Hernández, 2020; Casimiro Urcos et al., 2020). In Europe, under the same circumstances, Klapproth et al. (2020) found that German teachers experienced moderately high levels of stress on average. Likewise, they found that most educators pointed to the lack of technological equipment, internet connectivity, excessive workload and students' demotivation as internal and external obstacles that made distance educational work difficult.

MacIntyre et al. (2020) examined work stressors that teachers who taught foreign languages in different educational levels and countries were exposed during school closings. These authors found that teachers identified work overload and concern for their family's health as the most stressful. This was followed by loss of control over work, overlapping of work with household tasks, loss of control over personal decisions, irregular schedules and concern about finances. Coinciding with this study, they also highlighted that some educators mentioned not knowing when the pandemic would end as a source of stress.

In Argentina, between the months of April and June of 2020, different syndicates conducted studies in order to learn about aspects associated with the health and working conditions of educators of all educational levels and modalities, in the context of isolation and mandatory social distancing. These organizations reported that most teachers pointed out their work-related activities had increased and demanded more time. Consequently, they had to dedicate more hours to their

TABLE 4 | Results of the Kruskal Wallis test of variance for Burnout according to the Level of stress.

Level of stress	Burnout								
	Emotional exhaustion			Depersonalization			Personal fulfillment		
	AR	H	E ² _R	AR	H	E ² _R	AR	H	E ² _R
Environment and work overload									
Low	2058.39	2913.39***	0.32	3929.62	215.34***	0.02	4818.84	32.44***	0.00
Moderately low	3435.64			4247.09			4624.82		
Moderately high	4906.87			4556.41			4465.53		
High	6254.87			5029.37			4371.97		
Use of new technologies									
Low	2903.12	1524.98***	0.17	4010.89	182.27***	0.02	4777.75	26.17***	0.00
Moderately low	4108.50			4342.48			4497.00		
Moderately high	5128.24			4776.39			4383.83		
High	6022.08			4999.18			4533.25		
Uncertainty about the duration and the consequences of the pandemic									
Low	2265.94	1644.81***	0.18	3891.83	210.14***	0.02	4338.18	22.19***	0.00
Moderately low	3400.45			4151.11			4744.48		
Moderately high	4436.88			4405.94			4569.48		
High	5732.11			4989.32			4426.19		
Organizational aspect									
Low	2580.40	2403.76***	0.27	3839.82	394.90***	0.04	4897.70	76.85***	0.01
Moderately low	4009.44			4211.83			4616.17		
Moderately high	5232.31			4859.60			4341.14		
High	6350.27			5238.77			4269.94		
Relationships with the student environment, conflict and ambiguity of role									
Low	2543.63	2371.27***	0.26	3902.01	340.87***	0.04	4782.79	43.20***	0.00
Moderately low	4015.91			4208.55			4622.50		
Moderately high	5286.08			4841.80			4414.93		
High	6305.07			5199.79			4291.45		

AR, Average range; H, Kruskal Wallis test; E_R², Epsilon squared effect size.****p* < 0.001.**TABLE 5 |** U de Mann Whitney values of the *post hoc* contrasts for Personal fulfillment according to the Levels of stress.

Stress factors	L/ML	L/MH	L/H	ML/MH	ML/H	MH/H
1	1379399*	1987614.5***	1823521***	2725458*	2500551**	3873727
2	2404464.5***	2379220.5***	1585064.5**	3538759.5	2322003.5	2298818
3	642825.5**	1178648*	1314508	2630342**	2760480.5***	5111892*
4	2431776***	2291782***	1790543***	2911322***	2275758***	2438424
5	2465516.5*	2443509.5***	1739315***	3111660.5**	2210118.5***	2405541

L, Low; ML, Moderately low; MH, Moderately High; H, High; 1 = Work environment and work overload; 2, Use of new technologies; 3, Uncertainty about the duration and the consequences of the pandemic; 4, Organizational aspect of the educational institution; 5, Relationships with the student environment, conflict and ambiguity of role.

p* < 0.05, *p* < 0.01, ****p* < 0.001.

daily work. A high percentage of educators reported not having adequate technological resources nor a comfortable isolated place to work at home. Moreover, combining work-related activities, household task and caring for their children, elderly or other family members was largely problematic for teachers. They also reported receiving communications outside working hours and contradictory instructions from educational

authorities. Likewise, they revealed difficulties in supporting students' schooling, mainly because many students did not have the necessary equipment and connectivity to work from home. Lastly, a significant number of educators expressed feeling concerned, anguished and suffering from stress (see Asociación del magisterio de Santa Fe, 2020; Confederación de Trabajadores de la Educación de la República Argentina, 2020;

TABLE 6 | Results of the Kruskal Wallis test of variance for Burnout according to the Level of symptoms.

Symptoms of stress	Burnout								
	Emotional exhaustion			Depersonalization			Personal fulfillment		
	AR	H	E ² _R	AR	H	E ² _R	AR	H	E ² _R
Cognitive deficit									
Low	2864.06	2975.03***	0.33	3859.85	535.62***	0.06	5248.29	503.27***	0.06
Moderate	4681.17			4557.81			4360.79		
High	6426.26			5321.55			3803.74		
Physical symptoms									
Low	3055.60	2055.72***	0.23	3980.93	259.37***	0.03	5337.08	528.64***	0.06
Moderate	4742.23			4722.83			4254.79		
High	6160.81			4991.77			3836.38		
Nervousness									
Low	2941.14	2468.81***	0.27	3878.74	383.32***	0.04	5365.19	606.29***	0.07
Moderate	4687.02			4721.97			4317.44		
High	6269.67			5106.17			3751.54		

AR, Average range; H, Kruskal Wallis test; E²_R, Epsilon squared effect size.

****p* < 0.001.

Sindicato Argentino de Docentes Particulares, 2020; Sindicato Unificado de Trabajadores de la Educación de Buenos Aires, 2020).

Experience of Psychophysical Symptoms According to the Level of Stress

Results indicated that as the perception of stress increases, so do cognitive deficit, nervousness and various physical symptoms. These findings confirm the initial hypothesis and are consistent with the preliminary report by Arias et al. (2020). The authors observed that after 60 days of the onset of the quarantine in Argentina, teachers reported a significant increase in their workload and that this was associated to physical symptoms, especially lower back pain and discomfort in their arms and wrists. Similarly, Nieva's (2020) study, conducted in Argentina during the context of social isolation due to COVID-19, registered a positive and significant correlation among various occupational stressors, somatization and other psychological symptoms in teachers. Likewise, 62% of Argentine teachers consulted by Casali and Torres (2021) expressed having worsened some psychophysical signs linked to stress in the context of the pandemic.

Similar results have also been documented before the onset of this sanitary contingency. For instance, Oramas Viera et al. (2007) assessed a sample of Venezuelan teachers, observing that the perception of stressors was positively and statistically significantly related to different functional symptoms (cognitive, affective, conative and psychosomatic). Comparably, Harmsen et al. (2019) found that the perception of stressors in teachers in the Netherlands kept a positive correlation with various stress responses, such as loss of pleasure, poorer sleep quality, fatigue, etc.

The general stress model proposed by Lazarus and Folkman (1986) and later taken up by Peiró and Salvador (1993) to

explain work stress provides a solid frame for the interpretation of these results. According to their postulates, the stimuli that are perceived as threatening, in this case coming from the occupational context of teaching, produce a series of changes in the individual at a social, emotional and physiological level. These changes, with immediate and long-term effects, may produce suffering and deterioration of health and well-being (Ramos et al., 1997). Lazarus (2000) states that stress processes affect health in two ways. In the first place, they alter the neurochemistry of the body, that is, chemical and hormonal defenses that produce changes in sympathetic activity, secretion of catecholamines, etc., are activated as a reaction to stress (Krantz et al., 1985). Secondly, stress may favor the adoption of dysfunctional behaviors and coping styles. People exposed to situations perceived as stressful may attempt to obtain relief through the implementation of inadequate strategies, such as the consumption of alcohol, tobacco and other harmful substances, and excess or lack of food, which would derive in several psychophysical ailments.

On the other hand, some specific symptoms, such as those associated with the lower back, may be clearly explained by the large number of hours that teachers had to work sitting down in their own homes, possibly in an incorrect posture and/or using ergonomically inadequate furniture. Similarly, the excess of activities, the lack of time and the impossibility of leaving their residencies (due to the isolation dispositions) may have significantly increased sedentary lifestyles, also generating the appearance or exacerbation of these symptoms and others associated to the quality of sleep, to eating habits or to mental state (Bane et al., 2021).

Beyond the particular impact the stated situations may have had, it was probably the combination of all that explained the manifestation of various psychophysical symptoms presented when facing the stress involved in teaching in such particular contextual conditions.

Manifestations of Burnout According to the Level of Stress and Psychophysical Symptoms

The results showed that as stress increases, so do Emotional exhaustion and Depersonalization, with Emotional exhaustion having a greater size effect. Regarding personal fulfillment, it was observed that, in general, it decreases as the perception of stress increases. It was also noted that the more teachers experience Cognitive deficit, Physical symptoms and Nervousness, the lower their Personal fulfillment, and the higher their Emotional exhaustion and Depersonalization. These results confirm the second hypothesis presented in this study.

Studies conducted with teachers before the COVID-19 pandemic was declared have reported results similar to those obtained in this study. For instance, a study with Venezuelan teachers found that Burnout syndrome was significantly correlated with the perception of stress and its symptoms. In this study, Emotional exhaustion also showed a higher correlation with perception of stress and psychophysical symptoms (Oramas Viera et al., 2007). In a similar way, a research conducted with Portuguese teachers found that the perceived stress was inversely proportional to Personal fulfillment and directly proportional to Emotional exhaustion and Depersonalization (Teles et al., 2020).

As stated before, burnout syndrome is a prolonged response to chronic stressors at work. It appears when the coping strategies used to handle work stressors are not functional. The individual, unable to mitigate or eliminate the source of stress, generates a series of physiological, cognitive, affective, attitudinal and behavioral responses that work as mediating variables between perceived stress and its consequences (Gil-Monte, 2005; Maslach, 2009). In this context, it is possible to think that teachers who experienced intense levels of work stress under the non-face-to-face teaching modality may have used ineffective coping strategies. In response, they possibly saw their emotional resources depleted, developed negative attitudes toward the students and experienced feelings of low competence and success at work.

It was surprising that, in reference to Uncertainty about the consequences of the pandemic for the teacher and the student dimension, both high and low levels of stress were associated with lower Personal fulfillment. This finding is partially dissenting with the starting hypothesis, and not easy to interpret, especially considering the lack of empirical background on the topic. It would be appropriate to deepen on this topic in future research.

CONCLUSION, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

In conclusion, it is possible to assert that a large proportion of Argentine teachers were significantly affected by occupational stress during the suspension of face-to-face classes. During this period, the stressors with a higher impact were associated with pandemic concerns and work overload, which, along with other situations perceived as threatening, explained the appearance of various psychophysical symptoms and burnout.

Based on these results, it would be desirable that national, jurisdictional and institutional education authorities critically reviewed the administrative protocols that were used during the so called first wave of cases, in order to adjust communication, planning, assessment and supervision procedures that have exceeded the actual capacities of many teachers (in terms of time, knowledge, technological skills, etc.). This review would be crucial to provide good quality education to students and offer better working conditions to educators, for as long as the pandemic lasts, schooling in Argentine educational institutions will be face-to-face, non-face-to-face or combined, depending on the epidemiological conditions.

At the same time, and beyond the measures educational institutions may carry out for the benefit of teachers, it is compelling that from health psychology instances that promote the psychosocial resources of teachers are generated. The results of this study could be capitalized to implement intervention measures (workshops, trainings, focus groups) aiming at reducing teacher discomfort and strengthening those resources that enhance the recovery and protection of their health and wellbeing. In this sense, it is especially recommended to strengthen teachers' engagement, social support networks, existential beliefs and locus of control, social skills and functional coping strategies (Lazarus and Folkman, 1986). Similarly, it is suggested to offer seminars and guidance on how to optimize physical health and prevent discomfort, putting emphasis on, for instance, indications on correct body posture, good sleeping and eating habits, physical exercise, among others.

Although several months have passed since the beginning of the sanitary contingency, and teaching is no longer exclusively remote in formal education, it is possible that educators continue to perceive several demands as stressful, especially because of their changing nature. If no psycho-educational and therapeutic alternatives that allow the drainage of tensions are offered to educators, their psychophysical state may continue to deteriorate with serious long-term consequences, both at personal level (e.g., health loss, demotivation), and at organizational level (e.g., absenteeism, leaves, dropouts, decrease in the education quality).

This research presents some limitations that could be supplemented in future studies on this topic. Firstly, although the sample size was large, the lack of randomization restricts the generalization of the results. It would be desirable in future studies to extract random samples with representativeness from different regions of the country.

On the other hand, it should be noted that there are still no Argentine standardization studies that establish cut-off points for the interpretation of the variables analyzed here. For this reason, an *ad hoc* procedure based on sample frequencies and percentiles was used to categorize stress levels and psychophysical symptoms. In future studies, it is recommended to work on the development of normative values for the Argentine population.

In relation to the variables involved, this research has not included the analysis of coping, a variable that is crucial to deepen the understanding of stress and its possible consequences. It is

recommended that its evaluation be included in future studies so as to determine how coping may mediate the relationship between perceived stress and its consequent burnout.

The cross-sectional nature of this study could also be considered a limitation, since no information is provided about the evolution of the perception of stressors, symptoms and burnout over time. This will be pending for future works.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

NV was the originator of the idea, organized the database, and wrote sections of the manuscript. LO contributed to the design of the study, performed the statistical analysis, and wrote sections of the manuscript. Both authors contributed to the data collection, read, and approved the final manuscript.

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Influence of the COVID-19 Pandemic on Parenting Stress Across Asian Countries: A Cross-National Study

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Background: In a previous study, we demonstrated that the accumulation of parenting stress during prolonged school closures and restrictions on daily activities due to the COVID-19 pandemic in Japan indicates the need for mental health intervention for parents at higher risk of parenting stress. However, few studies have focused on parenting stress in other Asian countries, although they have experienced higher numbers of infections. The aim of the present study was to investigate whether parenting stress among caregivers increased across Asia due to school closures and restrictions on activities during the COVID-19 pandemic and to examine whether there were any country-specific, cross-country, or cross-regional risk factors for increased parenting stress.

Methods: We conducted an online survey immediately after the number of new cases in India significantly increased (September–November 2020). We measured parenting stress, anxiety, and fear associated with the COVID-19 crisis, as evaluated by the Parenting Stress Index, Short-Form (PSI-SF), and the Coronavirus Anxiety Scale (CAS), across three Asian countries—India ($n = 142$), Malaysia ($n = 69$), and Japan ($n = 182$)—in addition to the United States ($n = 203$). We also investigated whether respondents had adverse childhood experiences (ACE) as a risk factor for parenting stress.

Results: For all countries, we found significant increases in participants' current parenting stress levels, compared to what they recalled regarding their lives before COVID-19-related restrictions and school closures were enacted. Textual analysis qualitatively identified common terms related to parenting stress across all countries. We also found a statistical model that indicated ACE in parents was a critical risk factor for higher parenting stress *via* increasing anxiety and fear related to the pandemic.

Conclusion: These results indicate the need to improve the mental health of caregivers who are at risk for higher levels of parenting stress during the COVID-19 pandemic in Asian countries as well as Western countries. These results indicate that there is a need to improve the mental health of caregivers who are at risk for higher levels of parenting stress during the COVID-19 pandemic globally.

Keywords: Coronavirus Anxiety Scale (CAS), Parenting Stress Index (PSI), school closure, parenting stress, COVID-19, Adverse Childhood Experiences (ACE)

INTRODUCTION

On March 11, 2020, the outbreak of the novel coronavirus disease 2019 (COVID-19) which began in Wuhan, China in December 2019 was classified by the World Health Organization (WHO) (World Health Organization, 2021) as a pandemic, a situation that has persisted for more than a year. Since the beginning of the pandemic, many schools worldwide were closed for an average of 3.5 months in 2020 (UNICEF, 2021). As a result of these prolonged school closures, children have often shown tendencies toward mood swings, anxiety, emotional problems, and behavioral and cognitive changes (Fegert et al., 2020; Francisco et al., 2020; Jiao et al., 2020; Tso et al., 2020; Tang et al., 2021). Further, the restrictions on daily life due to school closures and those placed on activities affect not only children's mental health but also that of their caregivers (Cusinato et al., 2020).

Previously, we were the first to survey the impact of prolonged school closure due to the COVID-19 pandemic on the mental health of caregivers in Japan. Our survey of caregivers with children out of school revealed an increase in parenting stress compared to pre-pandemic levels. Further, qualitative analysis using textual mining of free descriptions regarding parenting stress during the pandemic indicated that spending a lot of time with their children was the primary stressor (Hiraoka and Tomoda, 2020). A high number of cumulative stressors in caregivers due to school closures and quarantine measures related to the pandemic has been shown to be associated with higher parenting stress, which indirectly becomes a potential risk factor for child maltreatment (Ramaswamy and Seshadri, 2020; Afrin and Zainuddin, 2021; Lee et al., 2021). Thus, several reports have indicated the importance of adequate mental health care for caregivers (Brown et al., 2020; Marchetti et al., 2020; Spinelli et al., 2020). As the pandemic shows no indications of ending soon, increased risk of parenting stress among caregivers, as described above, is an urgent issue that must be addressed in consideration of children's healthy development and lifelong physical and mental health of parents and children.

From August to September 2020, shortly after we reported the findings of our previous survey conducted in Japan, a large-scale outbreak occurred in India, unlike any sudden rise in cases during a pandemic seen before in Asia. As a result, India became the country with the second highest number of COVID-19 infections worldwide after the United States; then, the tension about the spread of COVID-19 increased. Subsequently, the number of cases in Malaysia began to increase around September 2020, before dramatically increasing starting around December 2020 and continuing to grow

(Supplementary Figure 1). Nevertheless, few epidemiological studies examining the influence of restrictions placed on activities during the pandemic, on the mental health of children and their caregivers have been conducted in Asian countries, except for China, as there had not yet been large-scale outbreaks such as those in Europe and the United States. However, the Indian government declared a state of emergency in March 2020, and imposed school closures and restrictions on activities for 7 months, which was twice as long as the global average. In Malaysia, a movement control order (MCO) was declared in March 2020. School closures and restrictions on activities have been repeatedly imposed since, to varying extents. Recently, a state of emergency was declared and continues to be in operation in Malaysia. Although the situation has been very serious, with many severe cases and deaths, the social situation of children and caregivers in these Asian countries seems to have been similar to that in Japan, Europe, and the United States.

In addition to biological vulnerabilities, such as psychiatric disorders, brain substrates, and genetic and epigenetic variations among caregivers themselves, psychological and social vulnerabilities such as poverty, single parenting, lack of social support, and the caregivers' own childhood experiences of maltreatment can also be significant risk factors for engaging in child maltreatment in the context of situations where parenting stress is exceptionally high (Bowers and Yehuda, 2016; Shimada et al., 2018, 2019; Hiraoka and Nomura, 2019; Park et al., 2019; Cecil et al., 2020; Kuboshita et al., 2020; Hiraoka et al., 2021; Kasaba et al., 2021). One vital psychological and social risk factor for engaging in child maltreatment, regardless of country, ethnicity, or culture, is when caregivers themselves had adverse childhood experiences (ACE) (Felitti et al., 1998). It has been reported that the more adversity experienced in childhood, the higher the vulnerability to stress in adulthood (Albott et al., 2018). Even in the absence of unprecedented circumstances such as a pandemic, child-rearing often involves stress; thus, caregivers who experience more adversity in childhood may be at higher risk of developing child-rearing difficulties (Lange et al., 2019). Individuals who have experienced childhood adversity have been shown to exhibit mental vulnerability to the large-scale social change of COVID-19 (Guo et al., 2020). In addition to the ACE, a higher level of anxiety related to COVID-19 in caregivers may also be an additional contributing risk factor to increased parenting stress. However, since this high anxiety level may interact with caregivers' ACE, it is also necessary to consider this structure when comprehensively investigating increases in parenting stress.

Therefore, the present study first aimed to investigate whether parenting stress among caregivers increased across Asia, as it did in Europe and the United States (Brown et al., 2020; Calvano et al., 2021; Lee et al., 2021), due to school closures and restrictions on activities during the COVID-19 pandemic. We chose India, which experienced an outbreak in August and September 2020 and had the world's second highest number of infections, to represent South Asia; Malaysia, where the first rise in cases occurred after September 2020 and is still increasing, to represent Southeast Asia; and Japan, which was the target country of our longitudinal survey based on our previous study (Hiraoka and Tomoda, 2020), to represent East Asia. The United States, which has the world's largest number of infections and is ethnically and culturally different from regions in Asia, was chosen as the reference country for comparison. The second aim of the present study was to examine whether there were any country-specific, cross-country, or cross-regional risk factors for increased parenting stress. Finally, the third aim was to clarify how childhood adversity is related to COVID-19 anxiety as a common risk factor for high parenting stress.

MATERIALS AND METHODS

Data Collection

We collected data across the three Asian countries examined in this study—India, Malaysia, and Japan as representative cases for South, Southeast, and East Asia, respectively—in addition to the United States as a reference country. Participants from CrowdWorks (Japan) and Amazon's Mechanical Turk (MTurk) (India and the United States) online worker pools provided consent for participation prior to beginning the survey on the impact of COVID-19 on parenting stress. We used pre-screening filters offered by the platforms to limit participant age (18–55 years; MTurk only), parenthood status, and location (Japan, India, and the United States). All information gathered was processed anonymously, and participants received an incentive of US\$1.50. The survey was conducted entirely on the web *via* psyToolkit (Stoet, 2010, 2017) on any platform between September 28th to October 21st, 2020, approximately 1 week after the number of new cases rapidly increased in India. Responses from the same ID and those with the exact same free text, which were thought to be from the same individual, were excluded (39 in India, 4 in Japan, and 8 in the United States), as shown in **Table 1**. We simultaneously conducted an extra survey in Malaysia from September to November 2020, when the number of new cases had begun to gradually increase for the first time, as it would be valuable to prospectively capture the live dynamics of parenting stress from the beginning. Unlike the other countries where we used online worker pools, in Malaysia, participants were recruited as volunteers. All participants provided informed consent before the survey. The survey was conducted in a similar manner to those in India and the United States *via* psyToolkit (Stoet, 2010, 2017). The study protocol and all procedures were approved by the Ethics Committee of the University of Fukui, Japan (Assurance #FU-20200007).

Psychological Questionnaires

The Parenting Stress IndexTM, Third Edition, Short Form (Abidin, 1995) (PSI-SF) was used to measure parenting stress. Each item of the PSI-SF is rated on a five-point scale, ranging from 1 (strongly disagree) to 5 (strongly agree). We used three subscales which assess different types of parenting stress: Parental Distress (PD), the extent to which parents feel competent, restricted, conflicted, supported, and/or depressed in their role as a parent; Parent-Child Dysfunctional Interaction (P-CDI), the extent to which parents feel satisfied with their child and their interactions with them; and Difficult Child (DC), how a parent perceives their child to be, whether the child is easy or difficult to take care of, in addition to the total stress which is an indication of overall level of stress a person is feeling in their role as a parent. Participants were asked to complete the PSI-SF twice. First, the participants answered the PSI-SF without any particular instructions. Then, following completion, they were asked to complete the PSI-SF again, recalling what it was like before school closures and restrictions on activities. Such retrospective measuring methods have often been used when examining the health effects of COVID-19 (Gao and Scullin, 2020; Robillard et al., 2021).

In addition to the PSI-SF, we used the Coronavirus Anxiety Scale (CAS) to evaluate excessive concern and dysfunctional anxiety symptoms associated with the COVID-19 pandemic (Lee, 2020). Each item of the CAS is rated on a five-point scale, ranging from 0 (not at all) to 4 (nearly every day), based on experiences over the past 2 weeks. A CAS total score ≥ 9 indicates probable dysfunctional coronavirus-related anxiety (Lee, 2020). Elevated scores on a particular item may indicate problematic symptoms that could warrant further assessment and/or treatment.

Whether participants had ACE was determined based on their responses to the questions from the Centers for Disease Control (CDC)'s 2011 Behavioral Risk Factor Surveillance System (BRFSS) questionnaire, which contains 11 questions to measure three types of child abuse (physical, sexual, and emotional) and five types of household dysfunction (substance abuse, mental illness, domestic violence, incarceration/jail, and divorce/separation) (Merrick et al., 2018). Self-reported exposure to any single ACE category is counted as one point toward the final ACE score (range: 0–8).

Qualitative Measurement of Parenting Stress

Participants were also asked to freely describe any parenting stress they were currently experiencing ("Are you experiencing parenting stress due to the spread of COVID-19? What kind of stress are you feeling as a result of school closures?"). Although this question was not compulsory, 89% of participants answered it. While participants from India, Malaysia, and the United States answered this question in English, Japanese participants answered it in Japanese. We analyzed the text data, which was translated into English *via* Google Translate for Japanese cases.

TABLE 1 | Demographics of the participants.

	India, <i>N</i> = 142 ^a	Malaysia, <i>N</i> = 67 ^a	Japan, <i>N</i> = 182 ^a	United States, <i>N</i> = 203 ^a
Age (year)	32.5 (6.8)	39.4 (4.7)	37.4 (6.4)	36.5 (8.7)
Female	51 (35.9)	48 (71.6)	145 (79.7)	120 (59.1)
Number of children	2.2 (3.4)	2.4 (1.1)	1.6 (0.6)	1.7 (1.3)
Cohabitation				
Children (single)	32 (22.5)	6 (10.7)	6 (3.4)	40 (19.7)
Children + spouse/partner	46 (32.4)	35 (62.5)	157 (88.2)	116 (57.1)
Children + spouse/partner + parent/others	64 (45.1)	15 (26.8)	15 (8.4)	47 (23.2)
Race				
Asian (including Indian)	139 (97.9)	53 (98.1)	182 (100.0)	7 (3.4)
Caucasian	0 (0.0)	0 (0.0)	0 (0.0)	166 (81.8)
Other	3 (2.1)	1 (1.9)	0 (0.0)	30 (14.8)
Ethnicity (Hispanic or latino/a)	NA	NA	NA	23 (11.3)
Education (> graduated college)	138 (97.2)	50 (74.6)	NA	175 (86.2)
House hold income (per year)				
<\$30,000	89 (62.7)	40 (59.7)	25 (13.7)	34 (16.7)
\$30,000–\$75,000	38 (26.8)	10 (14.9)	129 (70.9)	96 (47.3)
\$75,000 <	15 (10.6)	17 (25.4)	28 (15.4)	73 (36.0)

^aStatistics presented: mean (SD); *n* (%). NA, not applicable.

Statistical Analysis

To investigate the effects on parenting stress from prolonged school closures and restraints on activities due to the pandemic in each country, a two-way mixed ANOVA was conducted. Considering the literatures on the COVID-19 pandemic highlights a greater impact on the female population (Lebel et al., 2020; Grumi et al., 2021; Malkawi et al., 2021), we also conducted a three-way mixed ANOVA to explore gender differences were existing. Additionally, to visualize the characteristics of the frequently reported words and the similarities or differences among countries, we conducted co-occurrence network analysis using KH-Coder (Higuchi, 2016, 2017). Words were extracted from free descriptions of parenting stress, and the top 60 words that occurred most frequently were extracted. In the co-occurrence network analysis, words that were unique to each country were linked to the circle of the country. If a word was similarly extracted across countries (e.g., stress or time), that word was linked to the respective country circle. Pearson correlation analyses were conducted between each outcome to examine any associations between PSI, CAS, and ACE. We conducted mediation analysis to assess whether the CAS mediated the link between ACE and PSI. The indirect effect was tested by bootstrapping confidence intervals using the lavaan package (Rosseel, 2012) of the R statistical software program (R Core Team, 2019). The model parameters were set to give bias-corrected 95% confidence intervals and to run 2,000 bootstrap resamples. Then, multi-group analysis was used to examine differences among countries in the path coefficients between PSI, CAS, and ACE. We compared the first (which allowed for the structural paths to vary across countries) and second models (which constrained the regression paths to remain the same for countries) to identify any country-related differences. In addition, to confirm if there were gender differences in the path coefficients among countries in the path analysis, we conducted

multi-group analyses between men and women in each country. All statistical analyses were performed using R 3.6.1.

RESULTS

As shown in **Table 2**, a two-way mixed ANOVA for PSI-SF total scores revealed significant main effects for “country” [$F(3, 526) = 32.7, p = 2.16\text{E-}19, \eta^2 = 0.15$] and “time” [$F(1, 526) = 20.8, p = 6.43\text{E-}06, \eta^2 = 0.002$] in all the sub-scales and the total score. However, no significant interactions between “country” and “time” were observed for all cases [$F(3, 526) = 0.9, p = 0.45, \eta^2 = 0.0002$]. Pairwise *t*-tests of PSI-SF total scores between each “country,” irrespective of the “time,” revealed India was the highest compared to the other countries (vs. Malaysia: $p = 6.9\text{E-}22$, vs. Japan: $p = 1.2\text{E-}24$, and vs. United States: $p = 0.02$; *p*-values were adjusted using the Bonferroni multiple correction method). All other combinations of the pairwise *t*-tests between each “country” were also significant (Malaysia vs. Japan: $p = 9.55\text{E-}3$, Malaysia vs. United States: $p = 0.02$, and Japan vs. United States: $p = 2.59\text{E-}16$). No significant main effect for gender difference and interactions between gender and the other factors across the countries was found [$F(1, 517) = 1.59, p = 0.21, \eta^2 = 0.003$]. Five participants were excluded from the analysis due to no gender assignment information available.

The results of the co-occurrence network analysis for open-ended statements regarding parenting stress are shown in **Supplementary Figure 2**. Commonly, “child” and “school,” which may be related to school closure, were reported as parenting stressors in each country. In addition, the word “time” was also found for all countries. While there were some positive comments, such as that school closures allowed children to spend more time at home and for parents to spend more time with their children, there were also several comments indicating that

TABLE 2 | The results of the psychological questionnaires.

	Time	India, N = 139	Malaysia, N = 39	Japan, N = 155	United States, N = 197	Statistics*
PSI-SF						
PD	Before	38.0 (13.6)	23.2 (7.7)	29.3 (9.2)	35.1 (12.6)	$F(1, 526) = 18.7, P = 1.81\text{E-}05, \eta^2 = 0.003$
	After	39.3 (12.6)	25.2 (7.5)	30.5 (8.7)	36.6 (12.0)	
P-CDI	Before	35.2 (14.2)	20.6 (6.9)	22.7 (6.4)	32.0 (13.4)	$F(1, 526) = 5.2, P = 0.023, \eta^2 = 0.0005$
	After	35.2 (13.0)	22.1 (7.0)	23.8 (6.4)	32.0 (13.0)	
DC	Before	35.2 (12.8)	22.5 (7.8)	27.3 (9.6)	33.7 (12.4)	$F(1, 526) = 16.9, P = 4.63\text{E-}05, \eta^2 = 0.002$
	After	36.0 (12.1)	23.7 (7.1)	29.2 (9.0)	34.6 (12.1)	
Total	Before	108.5 (39.3)	66.3 (20.3)	79.3 (22.2)	100.8 (36.7)	$F(1, 526) = 20.8, P = 6.43\text{E-}06, \eta^2 = 0.002$
	After	110.5 (35.7)	71.0 (19.5)	83.4 (21.3)	103.2 (34.8)	
CAS	–	7.5 (5.6)	0.6 (1.4)	2.3 (3.7)	5.3 (5.3)	
ACE	–	3.3 (2.1)	0.8 (1.1)	1.6 (1.6)	3.1 (2.2)	

Statistics presented: mean (SD), PSI-SF; The short form of the Parenting Stress Index, PD, Parental Distress; P-CDI, Parent-Child Dysfunctional Interaction; DC, Difficult Child; CAS, COVID-19 anxiety scale; ACE, Adverse childhood experience. *Two-way mixed ANOVA main effect of "Time."

parents did not have time to relieve their own stress (e.g., "I am stressed a lot more because my kids are ALWAYS here. Them being here all the time bring more chores, bills, and less me time. I never get privacy anymore just like when they were toddlers."). This suggests that it may be necessary to find ways for parents to secure time for themselves in the limited space of the home to maintain their mental health during the pandemic.

Pearson correlation analyses between the PSI-SF (including sub-scales), CAS, and ACE across all countries revealed they were robustly correlated with each other (**Supplementary Figure 3**). For example, total PSI-SF scores were significantly correlated with CAS scores ($r = 0.61, p = 5.5\text{E-}59$), and ACE ($r = 0.53, p = 3.7\text{E-}42$). All within-country combinations were also significant.

We designed the mediation model with CAS as a mediating variable, ACE as an explanatory variable, and PSI as an outcome variable. In this model, the paths from ACE to CAS (a) and from CAS to PSI (b) were significant ($a = 1.05, SE = 0.09, p = 2\text{E-}16$; $b = 2.97, SE = 0.27, p = 2\text{E-}16$), and the total effect was also significant (total effect = 8.13, $SE = 0.56, p = 2\text{E-}16$). There was a significant indirect effect [indirect effect = 3.11, $SE = 0.38, 95\% CI = (2.41, 3.88)$]. Furthermore, the direct effect of ACE on PSI was until significant after addition of the mediator (direct effect = 5.02, $SE = 0.58, p = 2\text{E-}16$), which indicated CAS had a partial indirect effect on PSI.

Finally, we ran a multi-group analysis to examine whether the path coefficients differed significantly between countries (**Figure 1**). A model with no constraints on the path coefficients and a model with equality constraints were compared. The significant chi-square differences indicated that the regression coefficient differed by country [$\chi^2(9) = 47.7, p = 2.9\text{E-}07$]. The AIC of the former model (8530.8) was smaller than that of the latter model (8560.5), and the model without constraints was adopted. In both India and the United States, the coefficients between each variable were high, indicating that ACE was closely related to anxiety about COVID-19 and parenting stress. A similar relationship was found in Japan, but the path coefficients were not necessarily higher than India and United States, and ACE was not significantly associated with

parenting stress. Finally, regarding Malaysia, the associations among each variable were not significant and the coefficients were smaller than the other countries. These results suggested that ACE may not necessarily be associated with anxiety and parenting stress in Malaysia. Or, there is another possibility that ACE may have been under-reported by participants due to the prevailing cultural norms in Malaysia. The multi-group analyses, in which a model with no constraints on the path coefficients and a model with equality constraints were compared between men and women in each country, showed no significant Chi-square differences indicating that the regression coefficient did not differ between gender [India: $\chi^2(3) = 6.61, p = 0.09$, Malaysia: $\chi^2(3) = 3.52, p = 0.32$, Japan: $\chi^2(3) = 3.34, p = 0.34$, and United States: $\chi^2(3) = 6.41, p = 0.09$].

DISCUSSION

This study examined the social and psychological risk factors contributing to increased parenting stress amidst the COVID-19 pandemic, across countries. The results showed that, as we expected, parenting stress increased under the COVID-19 pandemic in all the Asian countries and the United States compared to the pre-pandemic period. This study is the first to concurrently examine and compare parenting stress in three different Asian countries. We also found that there was originally a difference in PSI scores among countries regardless of the period, which has been discussed in detail later. However, India had the highest PSI scores, followed by the United States of the sample countries. The mediation analysis showed that the number of ACE was strongly associated with higher parenting stress, and that anxiety and fear about the pandemic itself mediated the effect.

When we conducted this online survey in September–October 2020, the United States and India were the first and second most infected countries globally, while Malaysia and Japan had relatively fewer cases than other countries where COVID-19 was prevalent. Nevertheless, both Malaysia and Japan showed an increase in parenting stress during the pandemic. Other

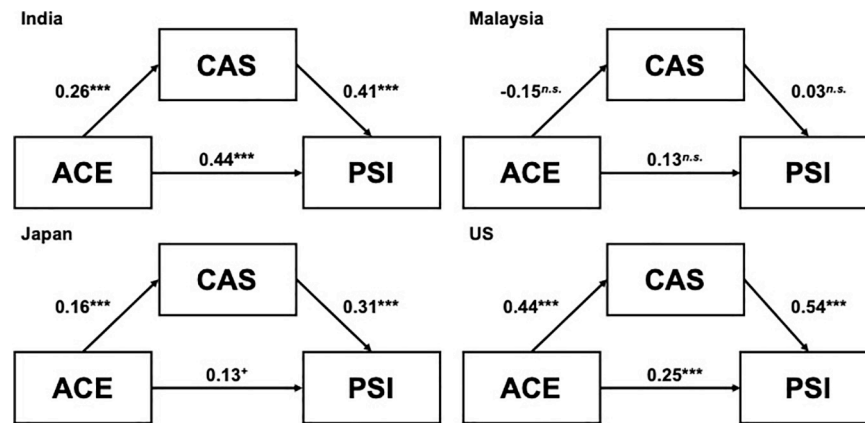


FIGURE 1 | The cross-cultural mediating relationships between adverse childhood experiences, anxiety about COVID-19, and parenting stress. The paths represent unstandardized regression coefficients. ACE, Adverse childhood experience; CAS, Coronavirus Anxiety Scale; PSI, Parenting Stress Index (Total score). *** $p < 0.001$, * $p < 0.05$, + $p < 0.10$.

studies conducted in Italy and Germany showed that parents experienced more parenting-related exhaustion due to social distancing as well as the closure of schools and child-care facilities, which manifested itself in increased parenting stress (Marchetti et al., 2020; Calvano et al., 2021). However, these studies were conducted in countries with high numbers of infections and deaths, unlike Malaysia and Japan. Therefore, the present study suggests that the cause of increased parenting stress is likely not only from factors directly related to the severity of the COVID-19 pandemic, such as the high number of infections and deaths but also other factors. Many Asian countries, including Malaysia and Japan, repeatedly declared a lockdown, MCO or state of emergency to combat the pandemic; schools were closed, activities were restricted, and many experienced social isolation (Nazif-Muñoz et al., 2021; Tang et al., 2021). It is to be noted that the social environment changed drastically due to unemployment and telecommuting (Lawson et al., 2020). The results of our textual analysis showed that the words “children,” “school,” and “time” were commonly reported as the specific stressors of the participants in every country. Although some participants viewed the situation in a positive light, reporting that they had “more family time since schools were closed and children spent more time at home,” many viewed it negatively, saying that “they had less free time and did not have time to relieve their stress.” The inflation of these inconveniences compared to the pre-pandemic era, and the maladaptation to new environmental changes, may have led to increased parenting stress. For example, Dickerson and Kemeny (2004) conducted a meta-analysis of the relationship between the characteristics of stressors and cortisol responses, and found that tasks containing uncontrollable elements were associated with robust cortisol reactivity (Dickerson and Kemeny, 2004). It is possible that in a situation where action is restricted worldwide, the physical symptoms of stress response, such as exhaustion, or changes in sleeping habits (Elhadi et al., 2021) are also seen, which may have led to an increase in parenting stress. However, there are some individual differences in tolerance to stressors. Individuals vulnerable to ambiguity are more stressed

and rate their subjective well-being lower (Hancock and Mattick, 2020). The spread of COVID-19 can also be considered as an ambiguous situation, unlikely to be resolved immediately (Durodié, 2020), and the adaptation to this situation may be affected by individual differences. Further identification of factors may be necessary for the future.

We also found that childhood adversity as well as anxiety and fear about COVID-19 were risk factors for higher parenting stress during the pandemic. If high parenting stress is a risk factor for child maltreatment, our results support the well-known theory concerning the intergenerational cycle in survivors who were exposed to maltreatment during childhood that leads them to maltreat their child after becoming a parent (Lange et al., 2019; Uddin et al., 2020). In the mediation analysis, it was found that those with more ACE were more likely to have higher anxiety and fear about the COVID-19 pandemic. A model for predicting parenting stress has been suggested from childhood adversity, anxiety and fear about COVID-19. Numerous studies suggest that individuals who have experienced many childhood adversities, are vulnerable to hypothalamic pituitary adrenal (HPA) axis responses and a variety of other psychiatric disorders (Heim et al., 2000). Kalia et al. (2020) reported that individuals who were maltreated as children, but were not exposed to other social adversities such as poverty, were associated with fear of COVID-19, which resulted in higher anxiety. Moreover, given that a higher number of ACE is linked to greater susceptibility to parenting stress, this influence may occur with additional reinforcement in this unusual situation. The simultaneous multi-population analysis revealed that this mediation model was not completely common in every country. Cultural differences may exist across countries. Guo et al. (2020) studied maternal mental health in China, Italy, and Netherlands under the impact of the current pandemic and reported the protective effect of grandparenting support and higher number of children, on mental health symptoms of Chinese mothers, but not Italian and Dutch mothers. Protective/risk factors on maternal mental health may differ according to each country's socio-cultural background.

Thus, the relationship between ACE, anxiety and fear due to COVID-19, and parenting stress might be influenced by each country's socio-cultural background, including history, culture, ideology, and values. India and the United States, where the influence of ACE was profound, were the regions with the most significant spread of infections globally during the study (October 2020), where parents were more likely to be anxious about COVID-19. Those who had ACE and were highly vulnerable to stress were more likely to be affected emotionally by their childhood adversity in situations where the infection rate had substantially increased such as India and the United States. It is possible that the link between the ACE and anxiety and fear in these countries appeared stronger than in Malaysia and Japan. It appears that the pandemic situation and lockdown will continue intermittently. Above all, when the infection rates rise, social support and mental health care would be required, especially for individuals with more ACE than usual.

Furthermore, our data indicated that the original level of parenting stress differed in each country, and India had the highest level. In some areas in India, the standard of living remains low (International Monetary Fund, 2021); thus, economic poverty may have been directly related to high parenting stress. Furthermore, insufficient mental health care systems (Sharma et al., 2007), labor shortages, high population densities that make it easier for infections to spread, and shortages and price surges of face masks and other protective equipment may also have contributed to the high levels of parenting stress (Haque et al., 2020). Moreover, it was noticed that many of the respondents in India were men (64%). Under the pandemic, men's burden of housework and childcare may have increased. In contrast, several studies have reported that COVID-19 has increased the psychological burden on Indian women (Gopal et al., 2020; Malhi et al., 2021). Traditionally, there is a longstanding concept of "patriarchy" in certain parts of India, a family structure in which the father has absolute power and control over family members. Therefore, Indian women and children tend to internalize distress from an early age, based on the socially accepted notion that externalizing feelings is unacceptable (Levey et al., 2017). The extra stress caused by the unexpected pandemic added to the original oppressive stress may result in a higher level of parenting stress than in other countries. Parenting stress in the United States was the second-highest after India, probably because the United States has been the world's leading country in terms of the number of infections and deaths for an extended period. This may lead to a high level of anxiety about the threat to life directly related to COVID-19 infection.

The present study has six major research limitations. First, it did not have a consistent online survey platform across countries. India and the United States used Amazon MTurk, Japan used CrowdWorks, and Malaysia did not use any online worker pool. As a result, there was a bias in the number of participants and their characteristics among the countries. Therefore, cautions should be taken when comparing our results from Malaysia with those of other countries. However, the online survey itself was effective as it allowed us to promptly collect a large amount of data in a short period because of the ever-changing situation due to the COVID-19 pandemic and the period of social distancing and self-isolation. Second, the sample

size of the present study was relatively small than the other previous studies. We started the present study based on our previous study in Japan (Hiraoka and Tomoda, 2020), and thus we have tried to match its sample size for the other countries. Third, we did not match age and gender across the countries. There is a report that MTurk workers are predominantly male (Djellel et al., 2018). In this instance, the percentage of males was high in India and the United States. Fourth, the evaluation instrument was a self-administered questionnaire, leading to a bias toward socially desirable answers. Although there is a problem of accuracy, since online behavioral experiments are now available (Stoet, 2010, 2017), a more objective evaluation could have been made if such experiments were utilized. Fifth, the assessment of parenting stress before the pandemic was conducted using a retrospective response method. Although the reliability of retrospective response methods may be questioned as the data is limited to individual data, it is more consistent at the population level (Lena et al., 2020). Therefore, we did not use retrospective response methods in our analysis except when comparing before and after the pandemic. Longitudinal studies in particular, should be conducted prospectively. However, as we had to capture response promptly due to the unpredictable situation, this method was unavoidable. Finally, the timing of the survey may influence the outcomes. Parenting stress may fluctuate depending on the situation of the infections at the time.

CONCLUSION

In the present study, we found that parenting stress increased in the three Asian countries and the United States during the COVID-19 pandemic. Higher number of ACE were strongly associated with higher parenting stress, an influential risk factor across countries. Anxiety and fear about the COVID-19 pandemic also mediated the effect. ACE may lead to vulnerable parenting and trigger stress responses which induce child maltreatment, which can be aggravated by a negative unprecedented situation. In addition to examining the caregivers' current state, a retrospective assessment of past adversity experiences is warranted, because it can be expected to capture the risk of maltreatment more closely representative of the actual situation. A focus on ACE to provide more accurate support for parents and their evaluation should also be considered.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the University of Fukui, Japan (Assurance #FU-20200007). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SK, DH, and SN designed the study. SK conducted interviews with supervision from DH and SN. AA, SJ, NH, and AA-F collected the sample data from Malaysia. DH and SN completed all analysis and prepared tables and figures. SK wrote the main manuscript. Write up was completed by SK with critical revisions and supervision from DH and SN. All authors made substantial contributions to the analysis and data interpretation prior to agreeing upon key findings, conclusions, and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.782298/full#supplementary-material>

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Psychological Health Conditions and COVID-19-Related Stressors Among University Students: A Repeated Cross-Sectional Survey

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The Coronavirus Disease 2019 (COVID-19) pandemic has broadly impacted university students' customary life, resulting in remarkable levels of stress and psychological suffering. Although the acute phase of the crisis has been overcome, it does not imply that perceived stress related to the risk of contagion and to the changes in the relational life experienced over more than 1 year of the pandemic will promptly and abruptly decrease. This study aims at comparing university students' psychological health conditions before and during the COVID-19 pandemic, but also at providing information on how psychological health conditions evolved over the 1 year of the pandemic. We analyzed data from a repeated cross-sectional survey on different samples of university students before the pandemic in 2017 ($n=545$) and during the pandemic ($n=671$). During the pandemic, data were collected at three stages (Stage 1, April 2020 $n=197$; Stage 2, November 2020 $n=274$; and Stage 3, April 2021 $n=200$). The COVID-19 Student Stress Questionnaire (CSSQ) and the Symptom-Checklist-90-Revised (SCL-90-R) were used to assess, respectively, COVID-19-related stressors (Relationships and Academic Life, Isolation, and Fear of Contagion) and the presence of psychological symptoms. Psychological health conditions were compared at baseline and during the pandemic, whereas both psychological health conditions and perceived levels of COVID-19-related stressors were compared over the three pandemic stages. In addition, Logistic Regression was used to explore the associations between COVID-19-related stressors and psychological symptoms. Findings revealed a significant increase in symptoms of Depression (DEP), Phobic-Anxiety (PHOB), Obsessive-Compulsive (O-C), and Psychoticism (PSY) from pre to during the pandemic. Perceived levels of COVID-19-related stress and specific psychological symptoms significantly increased as the pandemic was progressing. COVID-19-related stressors emerged as significantly associated with several psychopathological symptoms. Findings are discussed with the aim of providing tailored interventions to prevent mental disease and promote psychological adjustment in this specific stage of transition within this exceptional global emergency.

Keywords: COVID-19 pandemic, psychological health, repeated cross-sectional survey, stress, university students

INTRODUCTION

Over the last year, the spread of the Coronavirus Disease 2019 (COVID-19) and the consequent containment measures, which have been internationally adopted have significantly and extensively challenged people's customary life, resulting in notable levels of psychological suffering reported by people worldwide (Cavallera, 2020; Lima et al., 2020; Rajkumar, 2020; Rossi et al., 2020; Becerra-García et al., 2021; Bueno-Notivol et al., 2021), and showing, in some cases, doubling and tripling of the prevalence of common mental illnesses (Pierce et al., 2020; Winkler et al., 2020). From this perspective, several studies have underlined the detrimental psychological impact of COVID-19 and containment measures, revealing high perceived loneliness, hopelessness, reduced life satisfaction, fatigue, and health anxiety not only among the health care workers, who are frontline facing the emergency, but also across the general population (Wallace et al., 2020; Duong, 2021; Mansueto et al., 2021).

In the last decade, growing research attention was given to university students' mental health, and previous research carried out among this specific population across the world have revealed, even before the pandemic, increasing rates of psychological suffering (Zivin et al., 2009; Auerbach et al., 2018). Indeed, entering university represents a critical period for life development due to the different changes and challenges to be faced, i.e., the transition from adolescence to adulthood; the adjustment of the family roles/relationships; the achievement of independence; the restructuring of the social network by the inclusion of new relationships both in the academic (professors, university colleagues) and in the private life (friends, partner); the process of adapting to new academic/social demands (Sussman and Arnett, 2014; Saleh et al., 2017).

Over the last year, the spread of COVID-19 pandemic has imposed even more changes and challenges in university students' daily life (Aristovnik et al., 2020). Specifically, several studies have broadly explored the impact of the COVID-19 on university students' lives, underlining a wide spread of different psychological symptoms (Li et al., 2021), such as stress and difficulties in concentrating (Son et al., 2020; Zurlo et al., 2020; Baltà-Salvador et al., 2021; Lardone et al., 2021; Somma et al., 2021), anxiety and depression (Cao et al., 2020; Husky et al., 2020; Galvin et al., 2021; Rusch et al., 2021), eating disorders, alcohol/substance abuse (Gritsenko et al., 2020; Browning et al., 2021; Charles et al., 2021), sleep disorders (Debowska et al., 2020), and suicidal behaviors (Xu et al., 2021).

From this perspective, the containment measures undertaken worldwide – started from March 2020 and protracted for over 1 year – have deeply affected the academic context, by prescribing the closure of universities, the evacuations of campuses and accommodations, and the re-scheduling of the activities/events, with all the interactions (formal/informal) radically and exclusively transposed onto online platforms (United Nations Educational, Scientific and Cultural Organization, 2020). All these circumstances, therefore, implied wide and long-lasting modifications in students' lives.

In particular, research conducted over the last year among university students has highlighted that the COVID-19

pandemic-related experiences induced fears due to the contagion risk (Rodríguez-Hidalgo et al., 2020; Yang et al., 2021), perceived stress related to the condition of social isolation (Filho et al., 2021), as well as to the extensive changes in their daily routine, mainly with respect to the relational domain. Indeed, the pandemic has implied wide modifications in key aspects of students' customary lives, influencing (limiting/intensifying) all relationships both within the academic context (e.g., professors and colleagues) and within the private domain (e.g., friends, relatives, and partner; Zurlo et al., 2020). From this perspective, despite the massive rely on Information and Communication Technology (ICT) during the pandemic represented a key resource (allowing the fulfillment of the educational path and contacts with people outside their own home), this however entailed further potential risks for students' psychological health (i.e., long hours on screens/working from home in shared and/or inappropriate spaces; unavailability of technological devices; lack of reliability of the internet connection; difficulties in using online platforms for distance learning; difficulties in “disconnecting” from the virtual world; Aguilera-Hermida, 2020; Islam et al., 2020; Kiraly et al., 2020; Papouli et al., 2020). Therefore, research also underlined the detrimental effects of perceived stress linked to the extended and exclusive use of technology, mainly in terms of increased anxiety and depression (Galvin et al., 2021).

Currently, despite the containment measures are gradually loosened worldwide, the COVID-19 and the associated restrictions are expected to have enduring consequences on mental health (Daly et al., 2021). This issue is particularly relevant also in light of research underlining the negative effects of students' psychological suffering linked to the pandemic on several aspects of their academic life, in terms of difficulties in concentrating (Son et al., 2020), as well as reduction of self-efficacy, commitment/engagement, and academic performance (Aguilera-Hermida, 2020; Talsma et al., 2021).

Therefore, considering that previous studies exploring the effects of comparable periods of epidemics and quarantine [e.g., the Severe Acute Respiratory Syndrome (SARS) and the Middle East Respiratory Syndrome (MERS) outbreaks] underlined that, without timely psychological assessment and interventions, the prevalence of psychological disease may significantly escalate (Lam et al., 2009; Mak et al., 2009; Liu et al., 2012), there is an increasing need of developing longitudinal studies to assess and to monitor the perceived levels of stress and the psychological consequences of this unique crisis to target interventions (Becerra-García et al., 2021).

In this direction, longitudinal or repeated cross-sectional studies have been developed among university students from Poland (Debowska et al., 2020), Switzerland (Volken et al., 2021), and China (Zhang et al., 2020), revealing an increase in psychological disease, even if they only assessed psychological health during the early stages of the pandemic. Moreover, these studies lack a reliable baseline analysis against which it compares the prevalence of mental disorders to, and, to the best of our knowledge, research that compared pre to during pandemic mental health conditions refers to the general population, without specifically addressing the population of university

students (Pierce et al., 2020; Winkler et al., 2020; Daly et al., 2021). Therefore, the present study has a two-fold objective. It aims at comparing university students' psychological health conditions before and during the pandemic and at exploring how perceived levels of COVID-19-related stressors and psychological health conditions evolved over the 1 year of the pandemic (from April 2020 to April 2021). Moreover, considering the potential effects of enduring changes in all relationships within the private (e.g., relatives, friends, and partner) and academic domains (e.g., professors and colleagues), as well as of perceived isolation due to the lockdowns and fear of contagion, we also analyzed the associations between these specific COVID-19-related stressors and the development of psychopathological symptoms among university students.

In line with the study aims, the following research questions were proposed and tested:

Research Question One (RQ1): Are there differences in psychological health conditions reported by university students before (2017) and during (April 2020–2021) the pandemic?

Research Question Two (RQ2): Are there differences in perceived levels of COVID-19 related stressors and psychological health conditions reported by university students according to the three study stages (April 2020; November 2020; and April 2021) over the 1 year of the pandemic?

Research Question Three (RQ3): Are there significant associations between COVID-19-related stressors and psychological symptoms among university students?

This study could foster the development of more tailored psychological assessment, interventions, and follow-up taking into account university students' pathways of adjustment to the pandemic emergency and capturing factors influencing the potential escalation of psychological suffering in the long term. Indeed, this may help to organize tailored support services and counseling interventions to promote students' psychological health and, in turn, foster commitment and motivation, prevent withdrawal and dropout, and support a better adjustment to the academic and relational life.

MATERIALS AND METHODS

Participants and Sampling

Over the period from April 2020 to April 2021, different samples of university students from Southern Italy were contacted three times, corresponding to the three main peaks of the pandemic (Stage 1, April 2020; Stage 2, November 2020; and Stage 3 April 2021). The three pandemic peaks varied in the number of COVID-19 confirmed cases/deaths as in the type of containment measures adopted [Istituto Superiore di Sanità (ISS), 2021; World Health Organization (WHO), 2021]. In particular, in April 2020, students were experiencing the first lockdown-type control measures, including the closing of universities, the cancelling of all events and the first semester of distance learning. In November 2020, after an attempt to loosen the restrictions in October, students were experiencing a significant strengthening of lockdown-type measures, with the enduring of distance

learning. There was also an increase in the number of cases (involving youth to a greater extent, given the decrease in the average age of infected people). Finally, in April 2021, students were experiencing the effect of the 1 year of the pandemic, restriction, and distance learning, with still increasing rates of cases due to the widespread of variants of the virus.

Students were asked by the authors of the present study to participate in an online survey (Online Microsoft Teams forms) *via* institutional and informal channels (i.e., academic mailing lists; social media groups; and Microsoft Teams channel). They were given information about the study aims and they were assured about the confidentiality of the data. Research was performed in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards, and it was approved by the Ethical Committee from the University where the study took place (IRB: 12/2020). Overall 671 university students (Stage 1, April 2020 $n=197$; Stage 2, November 2020 $n=274$; and Stage 3 April 2021 $n=200$) completed the questionnaires online. For the baseline analysis, data collected in 2017 with a self-selected sample of 545 university students from Southern Italy were used. The survey conducted in 2017 raised in the context of a wider research project – still carried out by the authors of the current study – which aimed at identifying risk and protective factors predicting psychological health of university students. All the students (contacted before the pandemic and during the pandemic) provided the informed consent. The two samples matched for Gender (Pre-Pandemic Women $n=409$, 75.0%; During-Pandemic Women $n=506$, 75.4%) and Age (Pre-Pandemic Age $M=21.6$, $SD=2.72$; During-Pandemic Age $M=21.3$, $SD=3.27$).

Measures

In both the 2017 and 2020 surveys, the form included background information and the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1994; Prunas et al., 2010). The COVID-19 Student Stress Questionnaire (CSSQ; Zurlo et al., 2020) was also administered in the three stages (2020–2021).

COVID-19 Student Stress Questionnaire

The CSSQ (Zurlo et al., 2020) was used to assess perceived stress related to the COVID-19 pandemic lockdown. It consists of seven items on a five-point Likert scale ranging from zero (Not at all stressful) to four (Extremely stressful) divided into three subscales: Relationships and Academic Life (four items, e.g., “How do you perceive the relationships with your university professors during this period of COVID-19 pandemic?”; Cut-off=7.69), Isolation (two items, e.g., “How do you perceive the condition of social isolation imposed during this period of COVID-19 pandemic?”; Cut-off=5.56), and Fear of Contagion (one item, i.e., “How do you perceive the risk of contagion during this period of COVID-19 pandemic?”; Cut-off=2.73). The scale provides a Global Stress score (seven items, range=0–28; Cut-off=14.59; Cronbach's $\alpha=0.71$). Cut-off scores and reliabilities were provided by the Italian validation study (Zurlo et al., 2020).

Psychological Health Conditions

The SCL-90-R (Derogatis, 1994; Italian version: Prunas et al., 2010) was administered to assess self-reported symptoms of psychological disease. The scale comprises 90 items on a five-point Likert scale ranging from zero (Not at all) to four (Extremely) and divided into nine subscales: Anxiety (ANX; 10 items, Cronbach's $\alpha=0.84$; Cut-off male=0.91, Cut-off female=1.31), Depression (DEP; 13 items, Cronbach's $\alpha=0.87$; Cut-off male=1.08, Cut-off female=1.62), Somatization (SOM; 12 items, Cronbach's $\alpha=0.83$; Cut-off male=1.09, Cut-off female=1.67), Interpersonal Sensitivity (I-S; 9 items, Cronbach's $\alpha=0.83$; Cut-off male=1.01, Cut-off female=1.34), Hostility (HOS; 6 items, Cronbach's $\alpha=0.80$; Cut-off male=1.18, Cut-off female=1.34), Obsessive-Compulsive (O-C; 10 items, Cronbach's $\alpha=0.82$; Cut-off male=1.41, Cut-off female=1.61), Phobic-Anxiety (PHOB; 7 items, Cronbach's $\alpha=0.68$; Cut-off male=0.44, Cut-off female=0.72), Psychoticism (PSY; 10 items, Cronbach's $\alpha=0.77$; Cut-off male=0.71, Cut-off female=0.81), and Paranoid Ideation (PAR; 6 items, Cronbach's $\alpha=0.76$; Cut-off male=1.00, Cut-off female=1.67). Cut-off scores and reliabilities were provided by the Italian validation study (Prunas et al., 2010).

Data Analysis

The statistical analyses were carried out using Statistical Package for Social Science (SPSS) version 21. Preliminarily, descriptive statistics were conducted. Skewness and Kurtosis were used to judge the normality of data, considering values between -2 and $+2$ as falling in the acceptable range (George and Mallery, 2019). Given that Skewness and Kurtosis values for all the variables fell within the range of -2 to $+2$, indicating that the data are fairly normally distributed, the following analyses were carried out. Firstly, in order to address *Research Question One* (RQ1) on differences in university students' psychological health conditions before and during the pandemic, *t*-tests were carried out to compare mean scores of psychological symptoms reported by students during the pandemic with those reported by students at the baseline. In order to address the risk of false positive in *t*-tests (i.e., the probability of apparently significant results arising from repeated statistical tests), Benjamini-Hochberg False Discovery Rate (FDR) multiple testing corrections were used (Benjamini and Hochberg, 1995). Secondly, in order to address *Research Question Two* (RQ2) on differences in perceived levels of COVID-19 related stressors and psychological health conditions reported by university students according to the three study stages during the pandemic, ANOVA tests were used along with Bonferroni's *post hoc* tests. Afterward, the study variables were dichotomized into low and high levels referring to the clinical cut-off points reported by the Italian validation studies of the CSSQ (Zurlo et al., 2020) and of the SCL-90-R (Prunas et al., 2010) (see Measure section), and frequencies and percentages of students reporting low and high (clinically relevant) levels of COVID-19-related stressors and psychological symptoms were calculated and compared by the three stages (Cross-tabulations and χ^2 analyses). Finally, in order to address *Research Question Three* (RQ3) on the associations between COVID-19-related stressors and psychological symptoms, Logistic Regression Analyses were conducted.

TABLE 1 | Descriptive statistics for psychological health conditions among university students before the pandemic ($n=545$) and during the pandemic ($n=671$).

	Before the pandemic 2017	During the pandemic 2020–2021	
	Mean \pm SD	Mean \pm SD	B-H <i>p</i> -value ^a
Psychological symptoms			
Anxiety (ANX)	1.12 \pm 0.76	1.19 \pm 0.77	0.193
Phobic-anxiety (PHOB)	0.37 \pm 0.50	0.60 \pm 0.63	0.000***
Depression (DEP)	1.24 \pm 0.80	1.48 \pm 0.82	0.000***
Somatization (SOM)	1.03 \pm 0.72	1.03 \pm 0.75	0.945
Obsessive-compulsive (O-C)	1.38 \pm 0.77	1.54 \pm 0.81	0.003**
Psychoticism (PSY)	0.65 \pm 0.61	0.75 \pm 0.60	0.015*
Interpersonal-sensitivity (I-S)	1.05 \pm 0.78	1.14 \pm 0.76	0.086
Hostility (HOS)	0.93 \pm 0.73	1.00 \pm 0.74	0.175
Paranoid-ideation (PAR)	1.13 \pm 0.83	1.12 \pm 0.77	0.921

^aDifferences were determined by Student *t*-tests; B-H: Benjamini-Hochberg corrections. * $p<0.05$; ** $p<0.01$; *** $p<0.001$.

RESULTS

Changes in Psychological Health Conditions During the Pandemic From the Baseline

Table 1 shows mean scores for psychological health conditions, as measured by the SCL-90-R, reported by students at baseline (pre-pandemic) and during the pandemic. Responding to RQ1, findings from *t*-tests revealed that, during the pandemic, university students reported significantly higher levels of Depression ($p<0.001$), Phobic Anxiety ($p<0.001$), Obsessive-Compulsive ($p<0.01$), and Psychoticism ($p<0.05$). Scores regarding symptoms of Anxiety, Somatization, Interpersonal-Sensitivity, Hostility, and Paranoid Ideation reported by students during the pandemic did not differ significantly from the baseline (pre-pandemic).

Changes in Perceived COVID-19-Related Stressors and Psychological Health Conditions Across the Three Study Stages During the Pandemic

Table 2 shows means scores for perceived levels of COVID-19-related stressors and psychological health conditions across the study stages during the pandemic.

Responding to RQ2, findings from ANOVA and Bonferroni's *post hoc* tests revealed a significant increase in perceived COVID-19-related stress and psychological symptoms reported in Stage 3 from those reported in Stage 1. In particular, with respect to COVID-19-related stressors, it emerged that perceived stress related to changes in Relationship and Academic Life, Isolation, and perceived Global Stress score in Stage 2 and in Stage 3 increased significantly from Stage 1. Moreover, perceived stress related to Fear of Contagion constantly increased as the pandemic was progressing, so that scores

TABLE 2 | Descriptive statistics including means (M) and Standard Deviations (SD) for perceived levels of Coronavirus Disease 2019 (COVID-19)-related stressors and psychological health conditions across the three study stages during the pandemic.

	During the pandemic						ANOVA <i>F</i>	Comparison (s) ^a
	April 2020 (S1) <i>n</i> = 197		November 2020 (S2) <i>n</i> = 274		April 2021 (S3) <i>n</i> = 200			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Perceived COVID-19-related stressors								
Relationships and academic life	4.99	2.58	6.62	2.95	6.61	3.21	11.84***	S1 < S2***, S3***
Isolation	3.71	2.00	4.73	1.87	4.81	2.03	11.21***	S1 < S2***, S3***
Fear of contagion	1.79	1.22	2.15	1.16	2.59	1.13	11.61***	S1 < S2*, S3***; S2 < S3**
Global stress	10.49	4.32	13.51	4.52	14.01	4.85	18.78***	S1 < S2***, S3***
Psychological symptoms								
Anxiety (ANX)	1.03	0.70	1.16	0.75	1.44	0.82	7.09***	S1 < S3***; S2 < S3**
Phobic anxiety (PHOB)	0.51	0.58	0.59	0.62	0.72	0.66	2.83	-
Depression (DEP)	1.24	0.71	1.49	0.83	1.71	0.83	7.94***	S1 < S2*, S3**
Somatization (SOM)	0.91	0.69	1.00	0.72	1.26	0.84	6.15**	S1 < S3***; S2 < S3**
Obsessive-compulsive (O-C)	1.46	0.74	1.54	0.84	1.59	0.81	0.61	-
Psychoticism (PSY)	0.67	0.44	0.73	0.63	0.88	0.62	3.17*	S1 < S3*
Interpersonal-sensitivity (INT)	0.96	0.65	1.15	0.80	1.31	0.71	5.18**	S1 < S3**
Hostility (HOS)	0.92	0.67	1.00	0.75	1.11	0.76	1.54	-
Paranoid ideation (PAR)	0.99	0.69	1.09	0.78	1.33	0.77	5.04**	S1 < S3***; S2 < S3*

S1, Stage 1; S2, Stage 2; and S3, Stage 3.

^aBonferroni test.**p* < 0.05; ***p* < 0.01; ****p* < 0.001.

in Stage 2 and 3 increased significantly from Stage 1, as well as scores in Stage 3 increased significantly from Stage 2.

With respect to psychological health conditions, data revealed that perceived levels of Anxiety, Somatization, and Paranoid Ideation in Stage 3 increased significantly from Stage 1 and from Stage 2. Furthermore, perceived levels of Depression in Stage 2 and in Stage 3 increased significantly from Stage 1, whereas perceived levels of Interpersonal-Sensitivity, and Psychoticism in Stage 3 increased significantly from Stage 1. Finally – despite higher – perceived levels of Phobic-Anxiety, Obsessive-Compulsive, and Hostility did not statistically differ across the three stages of the pandemic.

Furthermore, noteworthy and increasing number of students reporting clinically relevant levels of COVID-19-related stress and psychological symptoms were also found across the three stages of the pandemic (Table 3). In particular, referring to data from the last stage (April 2021), it emerged that about one half of the sampled students reported clinically relevant levels of COVID-19-related stress, mainly related to Fear of Contagion (59.0%), but also to perceived Isolation (39.0%) and Relationships and Academic Life (38.0%). Considering the psychopathological symptoms underlined by using the SCL-90-R, it emerged that in Stage 3 about/more than half of students reported clinically relevant levels of Depression (57.5%) and Psychoticism (55.0%), followed by Obsessive-Compulsive (50.0%), Anxiety (46.5%), and Interpersonal-Sensitivity (46.5%). Notable number of students reporting clinical levels of Phobic-Anxiety, Paranoid-Ideation, Somatization, and Hostility were also found.

Associations Between COVID-19-Related Stressors and Psychological Symptoms

Table 4 shows the associations between perceived COVID-19-related stressors and psychological symptoms among university students.

Responding to RQ3, data revealed that high perceived levels of stress related to Relationships and Academic Life and to Fear of Contagion were significantly associated with high risk for reporting clinical levels of Anxiety and Phobic-Anxiety, while high perceived levels of stress related to Relationships and Academic Life and to Isolation were significantly associated with high risk for reporting clinical levels of Somatization, Obsessive-Compulsive, Depression, Hostility, Psychoticism, and Interpersonal-Sensitivity. No significant associations between perceived COVID-19-related stressors and Paranoid Ideation were found.

DISCUSSION

The present study aims at providing a greater understanding of the psychological impact of COVID-19 and containment measures among university students by comparing their psychological health conditions before and during the pandemic and by exploring how perceived levels of COVID-19-related stressors and psychological symptoms evolved over the 1 year of the global crisis (from April 2020 to April 2021). This, indeed, can support the development of timely and tailored

TABLE 3 | Number and percentages of university students reporting low and high (clinically relevant) levels of perceived COVID-19-related stressors and psychological symptoms by the three study stages during the pandemic.

	During the pandemic						χ^2 ^a
	April 2020 <i>n</i> = 197		November 2020 <i>n</i> = 274		April 2021 <i>n</i> = 200		
	<i>N</i>	(%)	<i>N</i>	(%)	<i>N</i>	(%)	
Perceived COVID-19-related stressors							
Relationship and academic life							
Low	166	(84.3)	171	(62.4)	124	(62.0)	17.20***
High	31	(15.7)	103	(37.6)	76	(38.0)	
Isolation							
Low	150	(76.1)	170	(62.0)	122	(61.0)	7.15*
High	47	47 (23.9)	104	(38.0)	78	(39.0)	
Fear of contagion							
Low	136	(69.1)	163	(59.5)	82	(41.0)	16.90***
High	61	(30.9)	111	(40.5)	118	(59.0)	
Global stress							
Low	158	(80.2)	162	(59.1)	110	(55.0)	17.03***
High	39	(19.8)	112	(40.9)	90	(45.0)	
Psychological symptoms							
Anxiety (ANX)							
Low	130	(66.0)	162	(59.1)	107	(53.5)	3.12
High	67	(34.0)	112	(40.9)	93	(46.5)	
Phobic anxiety (PHOB)							
Low	147	(74.6)	183	(66.8)	117	(58.5)	5.21
High	50	(25.4)	91	(33.2)	83	(41.5)	
Depression (DEP)							
Low	122	(61.9)	145	(52.9)	85	(42.5)	6.98*
High	75	(38.1)	129	(47.1)	115	(57.5)	
Somatization (SOM)							
Low	164	(83.0)	210	(76.6)	135	(67.5)	6.32*
High	33	(17.0)	64	(23.4)	65	(32.5)	
Obsessive-compulsive (O-C)							
Low	122	(61.9)	153	(45.8)	100	(50.0)	2.58
High	75	(38.1)	121	(44.2)	100	(50.0)	
Psychoticism (PSY)							
Low	128	(65.0)	173	(63.9)	90	(45.0)	11.97**
High	69	(35.0)	99	(36.1)	110	(55.0)	
Interpersonal-sensitivity (INT)							
Low	147	(74.6)	175	(63.9)	107	(53.5)	9.07*
High	50	(25.4)	99	(36.1)	93	(46.5)	
Hostility (HOS)							
Low	151	(76.6)	205	(74.8)	146	(73.0)	0.351
High	46	(23.4)	69	(25.2)	54	(27.0)	
Paranoid ideation (PAR)							
Low	149	(75.6)	194	(70.8)	126	(63.0)	3.58
High	48	(24.4)	80	(29.2)	74	(37.0)	

^aCross-tabulations and Chi-Square Analyses.**p* < 0.05; ***p* < 0.01; ****p* < 0.001.

interventions preventing the escalation of psychological disease in the context of this specific and delicate stage of transition within the COVID-19 global emergency.

Firstly, responding to *Research Question One* (i.e., exploring differences in students' psychological health conditions before and during the pandemic), we found that symptoms of Depression, Phobic-Anxiety, Obsessive-Compulsive, and Psychoticism reported by students during the pandemic significantly increased from those reported in 2017, while perceived levels of Anxiety, Somatization,

Interpersonal-Sensitivity, Hostility, and Paranoid Ideation remained similar. These findings were consistent with research examining mental health among the general population before and during the pandemic (Winkler et al., 2020; Becerra-García et al., 2021; Daly et al., 2021) and supported – also among the student population – the detrimental psychological impact of the COVID-19 outbreak. Nonetheless, these data also provided evidence on specific outcomes to be carefully considered in the context of the contemporary research and interventions related to the COVID-19, so helping to identify symptoms of

TABLE 4 | Logistic Regression Analyses: Associations between COVID-19-related stressors and psychological symptoms among university students ($n=671$).

Predictors	Relationships and academic life		Isolation		Fear of contagion	
	OR	CI	OR	CI	OR	CI
Outcomes						
Anxiety (ANX)	3.2***	2.1–4.9	1.4	0.9–2.2	1.5*	1.0–2.3
Phobic anxiety (PHOB)	2.1**	1.3–3.2	1.2	0.8–1.8	2.0***	1.8–4.1
Depression (DEP)	4.2***	2.7–6.6	1.6*	1.1–2.5	0.9	0.6–1.3
Somatization (SOM)	3.4***	2.1–0.5.4	1.7*	1.1–2.8	1.3	0.8–2.1
Obsessive-compulsive (O-C)	2.8***	1.8–4.3	1.7*	1.1–2.6	1.2	0.8–1.8
Psychoticism (PSY)	2.6***	1.7–3.9	1.7**	1.1–2.6	1.0	0.7–1.5
Interpersonal-sensitivity (INT)	2.4***	1.5–3.6	1.7*	1.1–2.5	1.0	0.7–1.6
Hostility (HOS)	2.2**	1.4–3.6	2.6***	1.6–4.1	0.6	0.4–1.0
Paranoid ideation (PAR)	1.4	0.9–2.2	1.3	0.8–2.0	0.7	0.5–1.1

OR, odds ratios; CI, confidence intervals. * $p<0.05$; ** $p<0.01$; *** $p<0.001$.

individual and relational disease that may have been occurred in response to this new reality.

In this direction, responding to *Research Question Two* (i.e., exploring differences in students' perceived levels of COVID-19 related stressors and psychological health conditions according to the three study stages during the pandemic), overall data confirmed the substantial exacerbation of psychological suffering over the 1 year of the outbreak, providing evidence matching concerns about the detrimental trend of mental disease escalation as the pandemic was progressing (Debowska et al., 2020; Zhang et al., 2020; Li et al., 2021; Volken et al., 2021).

Specifically, considering COVID-19-related stressors, our findings revealed that perceived stress related to Relationship and Academic Life and Isolation significantly increased from the beginning of the pandemic, with the main exacerbation peak from April 2020 to November 2020 (Stage 1–Stage 2), and a substantial invariance of the higher levels of stress reported in November 2020 and April 2021 (Stage 2–Stage 3). These results could potentially reflect the adjustment processes adopted by students to the pandemic condition; indeed, after an initial sharp increase in perceived stress linked to the drastic and abrupt changes in relationships and academic life and to the condition of isolation, we hypothesized that the enduring of this exceptional crisis may have resulted in attempts to adjust to this new restricted and modified life conditions. Nonetheless, such efforts may not necessarily imply a successful adaptation, and they may instead result in chronicization of stress and increased levels of several outcomes, as revealed by our data on students' psychological health conditions.

From this perspective, these data can be also interpreted considering the specificities of the three major peaks of the pandemic, corresponding to the three stages of the present study. Italy was, indeed, the first European country to implement a national quarantine (full lockdown from March to June 2020; World Health Organization (WHO), 2021). It mandated isolation at home ("stay-at-home-order") with permitted mobility for essential services or seeking medical care only. Schools and universities were all provisionally closed, resulting in growing stress and feelings of uncertainty among students (Lee 2020), which were experiencing the first semester of distance learning.

Our data on the perceived stress that emerged in April 2020 reflect this stage of pandemic.

After summer, however, restrictions were gradually eased, to be abruptly worsened in October–November 2020 (e.g., activities prohibited except for work/health/urgent reasons; social-distancing), with higher education still adopting distance learning; the latter entailing both further risks (i.e., techno-stress) and resources (i.e., techno-sociality) due to the possibility to maintain – despite virtually – key relational contacts (Galvin et al., 2021). Our findings on the perceived stress that emerged in November 2020 reflect this stage of pandemic. From November 2020 to April 2021, in Italy, the majority of regions were still facing the enduring of lockdowns and containment measures, which kept challenging students' academic life and the whole social and relational sphere, so determining a stabilization of these circumstances and the potential chronicization of perceived stress. Therefore, there is a clear need to deal with the psychological effects of more than 1 year of distance learning, isolation, restrictions, and emergency.

Still considering COVID-19-related stressors, our data revealed that stress related to Fear of Contagion significantly and constantly increased across the three stages. These data may be interpreted considering the progression of the pandemic, characterized worldwide by increasing number of diagnosed cases, hospitalizations, and deaths, together with the decrease in the average age of infected people [Istituto Superiore di Sanità (ISS), 2021; World Health Organization (WHO), 2021]. Moreover, with particular reference to the last period examined (April 2021), the widespread of variants of the virus and the several issues and delays in the vaccination campaign may have resulted in an even growing fear and uncertainty related to the contagion risk.

Overall, these data can explain the remarkable and growing number of students reporting clinically relevant levels of all COVID-19-related stressors and of psychological symptoms highlighted in the present study. In particular, when analyzing clinically relevant levels of psychological disease reported by students in April 2021, it emerged that nearly 60% of students reported clinical levels of Depression, probably reflecting the detrimental effects of stress experienced over the 1 year of the pandemic and containment measures. Indeed, these data were

noteworthy higher than those reported in the Italian general population during the first wave of the pandemic (17.3%; Rossi et al., 2020), so supporting evidence on the growing COVID-19-related psychopathological risk in younger people to be timely addressed to reduce the risk of mental illness escalation (Peng et al., 2020).

In this perspective, still considering the last peak of the pandemic, our findings revealed, in line with previous studies, alarming clinical levels of Obsessive-Compulsive (Ji et al., 2020), Anxiety and Phobic-Anxiety (Faisal et al., 2021), as well as Interpersonal Sensitivity (Jiang, 2020), which could be largely linked to the measures taken for infection prevention and to the radical changes in students' individual and relational life (avoiding face-to-face-contacts and crowded places; isolation and social distancing; hand-washing/checking). Furthermore, our findings also underlined that more than one half of the students reported clinically relevant levels of Psychoticism. However, despite previous evidence suggested the presence of reactive psychosis in the context of the pandemic, mainly as a consequence of COVID-19 diagnosis (Smith et al., 2020), our data should be interpreted with caution, given that the Psychoticism subscale from the SCL-90-R reflects a *continuum* from the psychotic disorder to symptoms of interpersonal alienation, the latter characterized by isolation and withdrawal from social life, which were largely prescribed and forcibly experienced over more than 1 year of isolation, restrictions, and adjustment to a new reality. In this perspective, data induced to reflect upon the pathologizing feature of the containment measures, which, in themselves, endorsed social isolation, alienation, and withdrawal.

From this perspective, responding to *Research Question Three* (i.e., exploring associations between COVID-19-related stressors and psychological symptoms), findings from Logistic Regression analyses highlighted that COVID-19-related stressors were significantly associated to the risk for reporting psychopathological symptoms among students. Specifically, data revealed that Relationship and Academic Life, which, as we have previously underlined, has become a chronic source of stress over the 1 year of the outbreak, emerged as associated with almost all SCL-90-R subscales, with particular reference to Depression, Anxiety, and Somatization. These data underlined how the COVID-19-related restrictions drastically impaired students' relational domain (i.e., impossibility to benefit from living the university life; online-only relationships with professors and colleagues; new circumstances of co-habiting with relatives with nearly exclusive sharing time/spaces), potentially resulting in depressive and anxious symptoms and in somatic manifestations of suffering linked to feelings of losses and lack of control.

Similarly, our data suggested that students who perceived high levels of stress related to Isolation (i.e., enduring and chronic stress related to social isolation and to changes in intimacy/sexual life) were at higher risk of reporting clinical levels of mental health outcomes, particularly in terms of Hostility. This may be due to the negative effects of the prolonged lack of contacts and closeness with loved ones (non-cohabiting relatives/friends/partner), which resulted in the escalation of anger and frustration related to the COVID-19 experiences. These data

should be carefully considered when defining interventions fostering students' well-being, given that younger people and individuals who had a higher initial stress response to the pandemic were at increasing risk for hostility escalation (Duan et al., 2020).

Finally, students who perceived high stress related to both Relationship and Academic Life and Fear of Contagion were at higher risk of suffering from Anxiety and Phobic-Anxiety. This clearly highlighted how not only the stressors related to the fear of the virus but also the perceived relational stress related to the strict measures imposed to limit the spread of contagion may have led to increasing feelings of uncertainty, tension, and worry and to behavioral responses of avoidance in the attempt to control the risk of infection and to adjust to this exceptional condition.

In summary, within this complex portrait, we considered the findings from the present study could help to effectively foster the development of tailored interventions to prevent mental disease escalation as well as to counteract the adverse effects of COVID-19 on psychological health among university students. Indeed, by comparing university students' psychological health conditions before and during the pandemic, by exploring how their mental health evolved over the 1 year of the crisis and by testing the associations between specific COVID-19-related stressors and psychopathological symptoms, findings highlighted those areas to be carefully considered within health promotion campaigns as well as within psychological settings during this delicate transition stage of the pandemic, which could potentially represent a key turning point toward a gradual recovery or, conversely, a further worsening of the emergency.

From this perspective, interventions should carefully take into account the consequences of lockdowns – protracted for more than 1 year – and should mainly target students particularly affected by the COVID-19 and its related restrictions and those lacking social networks, who are, indeed, at higher psychopathological risk. These include the offering of tailored initiatives and counseling services for students, on the one side, fostering the re-appraisals of the COVID-19-related experiences and the adjustment to this new reality and, on the one other side, preventing that future potential lockdowns further exacerbate the feeling of loneliness and the psychological burden (Mansueto et al., 2021; Voltmer et al., 2021). This can be achieved, for example, by preserving social contacts both face-to-face (i.e., professors, tutors, and counselor could maintain safe personal meetings at the universities) and online (i.e., the universities could provide support to improve students' digital skills for effectively participating in distance learning), so reducing the negative impact of changes in relationships and academic life and of perceived isolation, fostering a sense of support and belonging to a community, and eventually reducing the risk of students' drop-out.

Notwithstanding the strengths of this study, some limitations need to be addressed. Firstly, this study adopted a repeated cross-sectional design, so limiting the possibility to propose cause-effect relationships, as well as to achieve information on trajectories of students' psychological health

conditions at the individual level. Moreover, only students from southern Italy were assessed, reducing the generalizability of the results. Therefore, future studies using longitudinal data and based on larger and nationally representative samples are needed to support our findings. Secondly, the study explored COVID-19-related stressors and psychological symptoms only, without addressing some confounding variables, as preset or past psychotherapy, as well as other dimensions which may play as key resources or further hindrance for students' psychological health. Accordingly, in order to further deepen COVID-19-related stress and well-being processes among students, future research could address the exploration of negative social emotions such as guilt and shame (Cavalera, 2020), which can be triggered in university students within the current pandemic period, and could also address potential confounding variables (e.g., preset or past psychotherapy). Moreover, future studies could investigate the role of individual characteristics (e.g., personality traits and coping strategies), as well as of further situational characteristics (e.g., both risk and protective factors related to the use of technology), and could also consider other risks such as suicidal behaviors (Xu et al., 2021) and substance and/or alcohol use disorders (Gritsenko et al., 2020). In the same perspective, this study addressed psychological symptoms as outcome variables, while the COVID-19 pandemic as well as the containment measures may have had a significant impact not only on students' psychological health conditions but also on their academic path. Future research could therefore include academic performance, academic motivation, and leaving intention as outcome variables. Future studies could also consider comparing psychological health conditions reported by university students with those reported by other specific population groups (e.g., emerging adults not enrolled in university degree courses; employees) and also students from other countries.

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In conclusion, the study provided evidence which may assist policymakers and healthcare professionals in effectively organize and develop tailored assessment and interventions fostering students' adjustment during this transition stage of pandemic and preventing this unique emergency become overwhelming for university students' mental health.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Psychological Research of the University of Naples Federico II. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MCZ: study conception and design, interpretation of data, drafting of manuscript, and critical revision. MFCDV: analysis and interpretation of data and drafting of manuscript. FV: acquisition of data, analysis and interpretation of data, and drafting of manuscript. All authors contributed to the article and approved the submitted version.

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Facing the Pandemic in Italy: Personality Profiles and Their Associations With Adaptive and Maladaptive Outcomes

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The negative impact of the COVID-19 pandemic on individuals' psychosocial functioning was widely attested during the last year. However, the extent to which individual differences are associated with adaptive and maladaptive outcomes during quarantine in Italy remains largely unexplored. Using a person-oriented approach, the present study explored the association of personality profiles, based on three broad individual dispositions (i.e., positivity, irritability, and hostile rumination) and two self-efficacy beliefs in the emotional area (i.e., expressing positive emotions and regulating anger emotion), with adaptive and maladaptive outcomes during the first Italian lockdown (March–June 2020). In doing so, we focused also on how different age groups (i.e., young adults and adults) differently faced the pandemic. The study was conducted through an online survey from May to June 2020 and included 1341 participants living in Italy, divided into two groups: 737 young adults aged 18–35 and 604 adults aged 36–60 years old. Latent Profile Analysis identified three personality profiles: resilient, vulnerable, and moderate. A subsequent path analysis model showed that the resilient profile was positively associated with prosocial behavior as an indicator of adaptive outcome, and negatively associated with three maladaptive outcomes: interpersonal aggression, depressive symptoms, and anxiety problems. Contrarily, the vulnerable profile resulted negatively associated with prosocial behavior and positively associated with the three maladaptive outcomes. Finally, regarding age group differences, young adults belonging to the vulnerable profile showed a greater association especially with interpersonal aggression, depression, and anxiety problems, as compared to adults belonging to the same profile. Overall, the results of the present study highlighted the importance to analyze individual functioning during an isolation period by using a person-oriented approach. Findings evidenced the existence of three different profiles (i.e., Resilient, Vulnerable, and Moderate) and subsequent path analysis revealed, especially for the vulnerable profile and young adults, a greater maladaptive consequence of the quarantine. The practical implications will be discussed.

Keywords: COVID-19 quarantine, person-oriented approach, young adults, prosocial behavior, interpersonal aggression, depressive symptoms, anxiety problems

INTRODUCTION

In February 2020, Italy became the first and most affected country in Europe by the COVID-19 pandemic. In response to the ongoing public health emergency, the Italian government implemented strong containment measures, such as self-isolation and social distancing and the complete closure of schools, commercial stores, and public offices. Also, due to the high percentage of COVID-related mortality and the lack of adequate knowledge about the COVID-19 virus, Italians experienced concerns and worries about both their own and their relatives' physical and mental health. Although the COVID-19 preventive measures guaranteed protection in terms of contagious' spread and sustainability of national health services (Anderson et al., 2020), long-term isolation negatively affected individuals' physical and psychological wellbeing (e.g., Phiri et al., 2021). For instance, previous studies conducted during this first lockdown period in Italy documented an increase in symptoms of depression, anxiety, and sleep disorders as compared to the period before the quarantine (e.g., Cellini et al., 2020), especially for young adults (e.g., Di Giuseppe et al., 2020).

Thus, the containment measures implemented during the COVID-19 pandemic caused a wide range of reactions. According to some authors (e.g., Harriger et al., 2021), while some people reported maladaptive problems (i.e., anxiety, depression, aggression) in response to the uncertainty and extraordinary preventive measures implemented during COVID-19, other people put into action adaptive responses mostly associated to the welfare of others. In this vein, prosocial-oriented actions, such as the desire to help, comfort, and care about others in need might represent an alternative response to COVID-19 related stress.

In our study, we wanted to advance knowledge on the role of personality characteristics in facing the psychological effect of the COVID-19 pandemic in Italy. We used a person-oriented approach to identify groups of individuals who share a set of individual characteristics that may protect from or exacerbate the psychological impact of COVID-19. The person-oriented approach is the most suitable framework and technique to capture the uniqueness of individuals in terms of understanding the dynamic process of interaction of operating factors within individuals and seems to be more valuable in contributing to the explanation of individual behaviors (Bergman and Magnusson, 1997; Bergman et al., 2003). Accordingly, we selected a set of personality predispositions (i.e., positivity, irritability, and hostile rumination) and a set of self-efficacy in the emotional domain (i.e., expressing positive emotions and regulating anger emotion) that have been shown to function as risk and protective factors for individual adjustment (Caprara and Cervone, 2000; Caprara and Steca, 2007; Caprara, 2015).

Overall, we explored patterns of personality profiles and tested their associations with adaptive (i.e., prosocial behavior) and maladaptive (i.e., interpersonal aggression, depressive symptoms, and anxiety problems) outcomes among Italian young adults and adults.

Personality Dispositions and Self-Efficacy Beliefs

According to the interactionist perspective (Bandura, 1986; Magnusson, 1998), human functioning and behaviors are interrelated with social experiences and environmental factors. Individual characteristics are differentiated and act interdependently in a complex system influenced by life experiences and behaviors. In order to capture different aspects of individual functioning, it is crucial to consider both individual dispositions and individual perceptions of agency and capabilities (Caprara and Cervone, 2000; Caprara et al., 2008; Mischel and Shoda, 2008).

Based on this theoretical premise, we aimed to explore different configurations of personality characteristics by focusing on (1) three individual dispositions, such as positivity, irritability, and hostile rumination, and (2) two facets of self-efficacy beliefs in the emotional domain, such as self-efficacy in expressing positive emotions and self-efficacy in regulating anger during quarantine.

First, in regards to individual dispositions, several studies conducted before the pandemic demonstrated the unique beneficial role of positivity on psychosocial functioning (e.g., Caprara et al., 2019). Positivity represents an enduring dispositional self-evaluative tendency to view oneself, life, and the future under a positive outlook (Caprara et al., 2012), and played a beneficial role in people's wellbeing (see Caprara et al., 2019, for a review). For example, cross-sectional (e.g., Zuffianò et al., 2019) and longitudinal (e.g., Luengo Kanacri et al., 2017) studies demonstrated the positive association between positivity and prosociality in late childhood and adolescence. Positivity also resulted negatively associated with anxiety, depression, and aggressive behaviors from late childhood (Zuffianò et al., 2019) through the elderly period (e.g., Borsa et al., 2016; Caprara M. et al., 2017). Moreover, irritability, or the individual tendency to react impulsively and rudely at the slightest provocation (Caprara et al., 1985), and Hostile Rumination, or the individual tendency to store ill feelings, expectations, attributions, and desires for vengeance after self-threatening provocation (Caprara et al., 1986), have been related to exacerbation of aggressive behaviors (e.g., Caprara et al., 2007), to respond to threatening stimuli in a reactive and impulsive manner (e.g., Bettencourt and Kernahan, 1997), and to manifest higher levels of anxiety and emotional instability problems (e.g., Butler and Nolen-Hoeksema, 1994; Nolen-Hoeksema et al., 1994).

Second, in regards to the emotion regulation domain, we considered self-efficacy in expressing positive emotions, or the individual perception to be capable to express positive emotions, such as joy, happiness, and satisfaction (Caprara and Gerbino, 2001), and self-efficacy in regulating anger, which is the individuals' belief to be capable to adequately regulate their anger under several challenging circumstances (Caprara and Gerbino, 2001). These two aspects of individuals' beliefs in the emotional domain resulted strictly associated on the one side, with a higher tendency to engage in prosocial behaviors (e.g., Caprara and Steca, 2007), and on the other, to a lower

tendency toward aggressive behaviors, anxiety and depression (e.g., Caprara et al., 2008).

Based on these premises, we aimed to explore how these pivotal personality characteristics (i.e., positivity, irritability, hostile rumination, self-efficacy beliefs in expressing positive emotions, and self-efficacy beliefs in managing anger) interact with each other during the COVID-19 pandemic. To our knowledge, no previous studies investigated patterns of personality profiles and their association to individual adjustment in a novelty and challenging situation as the first lockdown in Italy.

Adaptive and Maladaptive Outcomes During COVID-19 Pandemic

An increasing number of studies have examined the negative effects of COVID-19 lockdown on psychosocial functioning (e.g., Gloster et al., 2020), such as adaptive (i.e., prosocial behavior) and maladaptive (i.e., interpersonal aggression, depressive symptoms, and anxiety problems) responses.

Prosocial Behavior

Prosocial behaviors were generally defined as voluntary actions aimed to benefit others (e.g., Eisenberg, 2006). The role that these kinds of positive behaviors play within societies is not a novelty in the literature. For example, Luengo Kanacri et al. (2014) showed that in the transition to adulthood, prosocial Italian youth are more likely to engage in civic actions. The beneficial influence of prosocial behavior on civic engagement was also highlighted during the COVID-19 pandemic. In fact, some individuals have shifted from a self to a more collectivistic view (e.g., Ling et al., 2020), in which long-term collective interests depend on the respect of social norms dictated by COVID-19 pandemic restrictions.

Considering that prosocial behavior is related to self-transcendent values (i.e., values that emphasize concern for the welfare and interest of others, such as, e.g., benevolence and universalism; Schwartz, 2010) and other-oriented dispositions (i.e., agreeableness; Caprara and Steca, 2007), scholars stressed that individuals' compliance with government's restrictions and recommendations (i.e., wearing masks, social distancing) could be considered as forms of prosocial behaviors. Likely, recent results from a study by Campos-Mercade et al. (2021) conducted with Swedish adults showed that prosociality predicted health behaviors during the COVID-19 pandemic. In detail, people with higher levels of prosocial behavior showed a high tendency to follow governments norms that reduced contagious' spread (i.e., buying face masks, staying at home, and maintaining physical distancing). Moreover, significant associations were found between higher levels of individuals trust in government actions determined by clear messages regarding the pandemic trend or well-organized process aimed to reduce COVID-19 spread, and prosocial behavior during the pandemic, also across different societies (e.g., Han et al., 2021; Romano et al., 2021).

Since prosocial behavior seems to play an adaptive role during the COVID-19 emergency, identifying configurations of personality profiles associated with prosocial behavior during the COVID-19 pandemic may be informative regarding

individuals' predisposition to engage in collectivistic actions during a pandemic.

Interpersonal Aggression

Aggressive behaviors can be defined as those behaviors aimed at physically or verbally hurting others, namely, aggressive behaviors (Caprara and Pastorelli, 1989). Some recent studies have shown an increase in interpersonal aggression and aggressive behaviors during the COVID-19 pandemic. For example, a longitudinal study conducted on Italian young adults showed an increasing tendency to enact different forms of aggressive behaviors (e.g., blaming others or screaming a lot) across the first 4 weeks of the Italian lockdown (Parola et al., 2020). Moreover, Deng and Feng (2021) showed that in the Hubei, the most affected province of China by the COVID-19, a higher level of life satisfaction (e.g., conceptualized as individual strength) buffered the relationship between perceived threat of COVID-19 and aggressive tendencies during the health emergency. Studies have also shown that aggressive behaviors during COVID-19 occurred through online communications (e.g., Chu et al., 2021; Pascual-Ferrá et al., 2021; Ye et al., 2021), suggesting the importance of considering internet-based communication experiences when assessing for aggressive behaviors in the era of COVID-19.

Depressive Symptoms and Anxiety Problems

Depressive and anxiety problems can be defined as emotional problems concerning the manifestation of mood deflection, worries, sadness, and guilt that tend to frequently appear together (Weissman et al., 1999; Graber and Sontag, 2009). The COVID-19 pandemic has increased fear of infection and worries among the general population. Also, long-term isolation and a high alert period exacerbated feelings of loneliness and symptoms of anxiety and depression (e.g., Deng et al., 2020; Lakhani et al., 2020). Results of several reviews indicated an increase of these symptoms since the beginning of the health emergency. For instance, a review by Deng et al. (2020) attested a prevalence of anxiety and depression during the pandemic between 45 and 47% in Ecuador, China, Iran, Italy, and Turkey. Across studies conducted from December 2019 to June 2020 in Italy, Spain, Iran, India, and China, Lakhani et al. (2020) found that people experienced 35% of anxiety problems and 20% of depressive symptoms. Similar results were found in a review of Luo et al. (2020), which included 62 studies conducted from November 2019 to May 2020 with samples from China, Iran, Italy, Spain, and Turkey. In detail, across these meta-analytic studies, results showed a prevalence of 33% of depression and 28% of anxiety symptoms, which were exacerbated in the case of coronavirus infections, reaching 55% of depression and anxiety prevalence. Studies conducted with only the Italian population showed similar alarming rates since the beginning of the first Italian lockdown (i.e., March–June 2020; e.g., Rossi et al., 2020). For example, Mazza et al. (2020) through an online survey with 2766 participants, identified that 19% of individuals reported high levels of anxiety problems and 32% high depressive symptoms. Taken together, these findings suggest a steady increase of depressive symptoms and anxiety problems in times of pandemic.

Young Adults and Adults Differences in Facing the COVID-19 Pandemic

From a developmental point of view (e.g., Arnett, 2006), it is possible to consider different developmental stages across adulthood, with specific characteristics, demands, and challenges. In this view, young adults are generally defined as individuals between 18– and 29-year-olds involved in a process to become adults characterized by identity changes and explorations. However, cultural and socioeconomic factors could influence this transition period (Mary, 2014). For example, Italians young adults showed lower levels of emerging adulthood dimensions (i.e., entry to the labor market, parenthood, marriage) compared to populations with similar socioeconomic characteristics (e.g., Crocetti et al., 2015).

Despite some studies evidenced heterogeneous reactions of young adults during the COVID-19 pandemic (e.g., Harriger et al., 2021; Truskauskaitė-Kunevičienė et al., 2021), a growing amount of studies attested a greater negative impact of COVID-19 quarantine especially on young adults (e.g., Ohannessian, 2021). For example, several findings showed that young adults reported higher depressive symptoms and anxiety problems than adults and older adults in the period related to the health emergency (e.g., Ahmed et al., 2020; Gao et al., 2020; Huang and Zhao, 2020; Lei et al., 2020; Ozamiz-Etxebarria et al., 2020; Perveen et al., 2020). Negative correlations were found between age and levels of depression and anxiety during the COVID-19 pandemic (e.g., Panchal et al., 2020; Solomou and Constantinidou, 2020). Finally, regarding aggressive behavior, Parola et al. (2020), using an Italian sample, showed an increase in frequencies to behave aggressively toward others from their first to the fourth week of lockdown in young adults. Overall, these findings showed that, during the COVID-19 pandemic, young adults resulted more compromised in developing maladaptive problems compared to adults.

Accordingly, in the present study, we explored patterns of personality profiles and tested their associations with adaptive (i.e., prosocial behavior) and maladaptive (i.e., interpersonal aggression, depressive symptoms, and anxiety problems) outcomes among young adults and adults.

The Present Study

Despite the growing number of studies investigating the effects of restrictive measures due to the COVID-19 pandemic, the extent to which different configurations of individual dispositions and self-efficacy beliefs were associated with adaptive and maladaptive outcomes during this period remains largely unexplored. Following previous conceptualizations of personality functioning (e.g., Caspi et al., 2005), we adopted a person-oriented approach, which is more informative in terms of patterns of individual functioning. The person-oriented approach allows us taking into account more precisely oscillations in single individual dispositions that operate concurrently with other personality characteristics that, in turn, affect individuals' behaviors and adjustment (e.g., Magnusson, 1998; Caspi et al., 2005).

The aim of the present study is threefold.

First, to identify personality profiles based on three broad dispositional tendencies (i.e., positivity, irritability, and hostile rumination) and two self-efficacy beliefs in the emotional domain (i.e., self-efficacy in expressing positive emotions and self-efficacy in regulating anger) in Italy during the first lockdown (March–June 2020). Based on several previous studies investigating patterns of individual functioning based on personality characteristics (e.g., Isler et al., 2017), we expect to find at least two profiles: a well-adapted profile characterized by higher emotional regulation (i.e., higher scores in emotional self-efficacy), higher positivity, and lower reactive or negative responses to threatening situations (i.e., lower scores in irritability and hostile rumination); and a more compromised profile, characterized by a lower emotion regulation (i.e., lower scores in emotional self-efficacy), lower positivity, and a higher tendency to react toward environmental stimulus with anger and hostility (i.e., higher irritability and hostile rumination).

Second, to examine the associations among emerged personality profiles and the occurrence of prosocial behavior, interpersonal aggression, depressive symptoms, and anxiety problems during the first lockdown in Italy (March–June 2020). We expect to find that a well-adapted profile will be associated with a better adjustment during quarantine (e.g., higher frequency to behave prosocially, lower interpersonal aggression, and lower depression and anxiety), while a compromised profile will be more associated with maladjustment during quarantine (e.g., lower prosocial behaviors, higher interpersonal aggression, and higher depression and anxiety).

Third, to examine the moderating role of age (young adults vs. adults) both in the personality profile configurations and in their associations with adaptive and maladaptive outcomes. In detail, since previous studies evidenced the challenging and demanding period of young adults (e.g., Arnett et al., 2014) and its higher impairment compared to adults in coping with the challenges associated with the COVID-19 pandemic (e.g., Parola et al., 2020), we hypothesize that young adults will be more compromised than adults in both personality profiles and in facing the challenging of COVID-19 pandemic.

Finally, since previous studies showed that women were more compromised compared to men in maladaptive outcomes (e.g., Lei et al., 2020; Mazza et al., 2020) and that individual who was certainly or uncertainly exposed to COVID-19 infection scored lower in psychological wellbeing (e.g., Favieri et al., 2021), we control for gender and exposure to COVID-19 covariates in our analysis.

MATERIALS AND METHODS

Participants

Participants were drawn for a wider project entitled “Facing with COVID-19: The role of individual resources and new technologies,” aimed to investigate the effects of COVID-19 pandemic on individual's psychological wellbeing, as well as the impact of new technologies—use and increase in that use—in the Italian population. We considered 1341 participants (33% men) from 18 to 60 years old ($M_{age} = 36.88$; $SD = 12.22$). To

TABLE 1 | Sociodemographic characteristics of the sample.

	Total sample		Young adults		Adults	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Civil status						
Single	340	25.4	268	36.4	72	11.9
Married	389	29.0	37	5.0	352	58.3
Divorced	42	3.1	-	-	42	6.9
Separated	29	2.1	3	0.4	26	4.3
Cohabiting	225	16.8	156	21.2	69	11.4
In a relationship, but not living together	297	22.1	271	36.8	26	4.3
Widowed	14	1.0	-	-	14	2.3
Other	5	0.4	2	0.3	3	0.5
Region						
Northern Italy	200	24.8	104	14.1	96	15.9
Central Italy	809	60.3	467	63.4	342	56.6
Southern Italy	200	14.9	166	22.5	166	27.5
Education						
Elementary school	4	0.3	-	-	4	0.7
Middle school	112	8.4	41	5.6	71	11.8
High school	497	37.1	229	31.1	268	44.4
Bachelor degree	250	18.7	203	27.5	47	7.8
Master degree or higher	477	35.6	264	35.8	213	35.4
Work condition (before the COVID-19 breakdown)						
Students (i.e., high school or university)	263	19.7	255	33.6	8	1.3
Full-time job	584	43.6	236	32.0	348	57.7
Part-time job	143	10.7	69	9.4	74	12.3
Unemployed	161	12.0	102	13.8	59	9.8
Retirement	8	0.6	-	-	8	1.3
Other (not specified)	181	13.5	75	10.2	106	17.6
Job loss due to COVID-19 pandemic						
No	409	79.6	302	79.5	107	79.9
Yes	105	20.4	78	20.5	27	20.1
Family income						
Up to 15.000 €	357	27.9	239	34	118	20.6
16.000–50.000 €	717	56.1	369	52.4	348	60.7
51.000–70.000 €	105	8.2	60	8.5	45	7.9
Beyond 71.000 €	98	7.7	36	5.1	62	10.9
Change in family income related to COVID-19 pandemic						
It decreased a lot (more than 25%)	255	19.3	117	16.1	138	23.3
It decreased a little bit (between 5 and 25%)	421	31.9	261	36.0	160	27.0
It did not change at all or it did not significantly change (less than 5%)	603	45.8	330	45.5	273	46.1
It increased a little bit (between 5 and 25%)	35	2.7	18	2.5	17	2.9
It increased a lot (more than 25%)	4	0.3	-	-	4	0.7

respond to the third aim of the present study, we divided our total sample into two different age groups, the first group (55% of the total sample) in which we categorized subjects from 18 to 35 years old ($M_{age} = 27$; 30% males), and the second group (the 45% of the total sample) in which we categorized subjects from 36 to 60 years old ($M_{age} = 49$; 36% males). We refer to young adults for the 18–35-year-olds groups and adults for the 36–60-year-olds. Although the young adult period has a timeframe

between late adolescence and 30 s (e.g., Arnett, 2006), there is evidence for Italian young adults of a prolonged delay in reaching developmental tasks related to the adult role, such as entrance into the labor market and the formation of a new family (e.g., Mazzucco et al., 2006; Buhl and Lanz, 2007; De Rose et al., 2008; Mary, 2014; Crocetti et al., 2015). In respect to the adult groups, we considered subjects into a more stable working-age group that was still far from the retirement period. In **Table 1** were summarized the sociodemographic characteristics of our sample (e.g., civil status, work position, income).

Procedure

Ethical approval by the local Institutional Review Board of the Department of Psychology of Sapienza University of Rome and informed consent from participants were obtained. Data collection was carried out from May until June of the first year of the pandemic, *via* an electronic platform. Links were sent anonymously to participants by trained researchers. Eligibility criteria were the legal age and the formal acceptance of the informed consent. Participation was voluntary and personal information was not included in the dataset. The online survey was filled autonomously by each participant and lasted approximately 25 min.

Measures

Positivity

Positivity was assessed using eight items of the Positivity Scale (Caprara et al., 2012) which measures individuals' dispositional tendency to view oneself, life, and future under a positive outlook. Items were rated on a 5-point Likert scale, ranging from 1 = "strongly disagree" to 5 = "strongly agree" (i.e., "I look forward to the future with hope and enthusiasm," or "I am satisfied with my life"). Previous studies attested to the reliability and the validity of the scale (i.e., Caprara et al., 2012; Zuffianò et al., 2019). In the present study, Cronbach's reliability was $\alpha = 0.83$, $\alpha = 0.86$, and $\alpha = 0.78$ for the total sample, young adults, and adults, respectively.

Irritability

Irritability was assessed using four items of the Irritability Scale (Caprara et al., 1985) which measures the personality tendency to react impulsively, aggressively, and rudely at the slightest provocation and disagreement. Items were rated on a 6-point Likert scale, ranging from 1 = "Completely false to me" to 6 "Completely true to me" (i.e., "When I am tired, I easily lose control," or "I often feel like a powder keg ready to explode"). Previous studies supported the psychometric properties of this instrument (i.e., Caprara et al., 1992; Caprara G. V. et al., 2017). In the present study, Cronbach's reliability was $\alpha = 0.72$, $\alpha = 0.67$, and $\alpha = 0.77$ for the total sample, young adults, and adults, respectively.

Hostile Rumination

Hostile rumination was assessed using five items derived from the Dissipation-Rumination Scale (Caprara, 1986) that measures the extent to which individuals show frequently and prolonged negative antagonistic thoughts after self-threatening

provocations, and to experience prolonged negative feelings, expectations, attributions, and desires. Items were rated on a 6-point Likert scale, ranging from 1 = “Completely false to me” to 6 = “Completely true to me” (i.e., “I hold a grudge, for a very long time, toward people who have offended me,” or “When I am offended by someone, the more I think about it the angrier I feel”). Previous studies attested the validity and the reliability of the scale across time and countries (i.e., Guzman, 2006; Caprara et al., 2007). In the present study, Cronbach’s reliability was $\alpha = 0.77$, $\alpha = 0.76$, and $\alpha = 0.80$ for the total sample, young adults, and adults, respectively.

Regulatory Emotional Self-Efficacy During Quarantine

Self-efficacy beliefs in Expressing Positive Emotions (SE-positive emotion) and in Anger regulation (SE-anger) were assessed using thirteen items adjusted for the purposes of the study from the Emotional Self-Efficacy Beliefs Scale (Caprara and Gerbino, 2001; Bandura et al., 2003) that originally includes two dimensions assessing individual’s perceived capability to express positive emotions and to manage negative emotions. In the present study we asked each participant, during the lockdown period, how well can he/she felt capable to express positive emotions (SE-positive emotions, three items, for example, “Express joy when good things happen to you,” or “Enjoy fully for the good things that happen to you”), or to manage anger (SE-anger, three items, for example, “Get over irritation quickly for wrongs you have experienced,” or “Avoid flying off the handle when you get angry”). Each item was rated on a 5-point Likert scale, ranging from 1 = “not well at all” to 5 = “very well.” Previous studies supported the validity of the instrument across different ages and countries (i.e., Caprara et al., 2008). In the present study, Cronbach’s reliability for SE-positive emotions was $\alpha = 0.90$, $\alpha = 0.91$, and $\alpha = 0.89$ for the total sample, young adults, and adults, respectively, and Cronbach’s reliability for SE-anger were $\alpha = 0.77$, $\alpha = 0.75$, and $\alpha = 0.79$ for the total sample, young adults, and adults, respectively.

Prosocial Behavior

Prosocial behaviors during the quarantine were measured using nine items of the Prosocial Behavior Scale (Caprara et al., 2005). In general, this scale was widely used to assess different forms of engaging in prosocial behaviors, such as helping, donating, or sharing things with others. For the purposes of the present study, we asked each participant to focus on the entire lockdown period. Items were assessed on a 5-point Likert scale ranging from 1 = “never/almost never” to 5 = “always/almost always” (i.e., “I try to console those who are sad,” or “I easily put myself in the shoes of those who are in discomfort”). Previous studies supported the psychometric properties of the scale (e.g., Pastorelli et al., 2016). In the present study, Cronbach’s reliability was $\alpha = 0.87$, $\alpha = 0.86$, and $\alpha = 0.88$ for the total sample, young adults, and adults, respectively.

Interpersonal Aggression

Interpersonal aggressive behaviors during the quarantine were assessed using the Physical and Verbal Aggression Scale (PVA; Caprara and Pastorelli, 1993; Archer and Coyne, 2005). Overall,

the instrument was created to assess a variety of aggressive behaviors, such as hurt, fight, and verbally insulting others, operationalized into the sub-domain of physical, verbal, and indirect aggression. For the purposes of the present study, we considered four items of the verbal aggression sub-scale, asking each participant to focus over the entire lockdown period. Items were assessed on a 5-point Likert scale ranging from 1 = “never/almost never” to 5 = “always” (i.e., “I insult others,” or “I joke others”). Previous research supported the reliability and the validity of this instrument (e.g., Caprara et al., 2001). In the present study, Cronbach’s reliability was $\alpha = 0.80$, $\alpha = 0.82$, and $\alpha = 0.72$ for the total sample, young adults, and adults, respectively.

Depressive Symptoms

Depressive symptoms during the quarantine were assessed through the eleven items of the Depression Center for Epidemiologic Studies—Depression Scale (CES-D; Radloff, 1977). Overall, this scale is widely used to measure depressive symptoms of individuals during the last months or the last 2 weeks. For the purposes of the present study, we asked each participant to focus over the last week. Items were assessed on a 4-point Likert scale ranging from 0 = “rarely or never” to 3 = “most of the time” (i.e., “I felt that I could not shake off the blues even with help from my family or friend,” or “I thought my life had been a failure”). A large body of studies supported the psychometric properties of this instrument (e.g., Fava, 1983). In the present study, Cronbach’s reliability was $\alpha = 0.90$, $\alpha = 0.90$, and $\alpha = 0.89$ for the total sample, young adults, and adults, respectively.

Anxiety Problems

Anxiety problems during the quarantine were assessed using eight items derived from the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Overall, this instrument is one of the most frequently used measures of anxiety symptoms and problems, both in research and clinical fields. For the purposes of the present study, we considered the state anxiety scale, which assesses how participants feel at the moment in which they collected the survey. Items were assessed on a 4-point Likert scale ranging from 1 = “not at all” to 4 = “completely” (i.e., “I am worried,” or “I feel upset”). A large body of research demonstrated the validity of this measure (e.g., Balsamo et al., 2013). In the present study, Cronbach’s reliability was $\alpha = 0.90$, $\alpha = 0.91$, and $\alpha = 0.89$ for the total sample, young adults, and adults, respectively.

Control Variables

Gender

Participants were asked to report their gender. Gender was coded 0 for men and 1 for women.

Exposure to COVID-19

Participants were asked to report their personal experience with the infection of the COVID-19 virus. Items were in line with the Survey Tool and Guidance COVID-19 published by the World Health Organization (World Health Organization, 2020) and were aimed to assess individuals’ exposure to pandemic risks.

Dichotomous items (0 = no 1 = yes) asked much information such as if the participant or some of its relatives (e.g., a member of the family, a friend) was infected by the COVID-19 virus or was dead due to the virus. If a participant answered “no” to all the items was categorized in the group “No exposure to COVID-19” (i.e., 45.8% of the total sample); if a participant answered one or more “yes” was categorized in the group “Exposure to COVID-19” (i.e., 54.2% of the total sample), due to the lowest frequency of “yes” in the overall sample.

Data Analytic Approach

First, to test our hypothesis, we conducted a series of Latent Profile Analysis models using Mplus 8.4 (Muthén and Muthén, 1998–2017), to identify profiles based on participants’ levels of positivity, irritability, hostile rumination, self-efficacy in expressing positive emotions, and self-efficacy in managing anger in the total sample. This technique was frequently used in order to organize or classify a sample of individuals into several sub-groups mutually exclusive, each with a unique specific distribution and with similar characteristics within groups that are different from the characteristics that define the other groups (Nylund et al., 2007; Lanza and Cooper, 2016). The underlying statistical framework of this approach is the Bayes’ Theorem and the conditional probabilities (Collins and Lanza, 2009; van de Schoot et al., 2014), which provides two types of information for the identification of latent classes or profiles: a nominal variable that represents the categorical membership to belong to a specific latent class/profile; several continuous variables (i.e., one for each latent class/profile) that represent, for each subject, the posterior probabilities to belong to each of the identified latent class/profile (Collins and Lanza, 2009; Lanza and Cooper, 2016). The entire identification process follows estimation mechanisms that aim to maximize the probabilities to classify individuals in the most probable group for them, using the LogLikelihood algorithm with multiple iterations in order to estimate a set of parameters for maximizing the log-likelihood functions (Collins and Lanza, 2009). In order to select the model that best fit the number of profiles in our sample, we compared the 2-, the 3-, and the 4- class models, using the following criteria: (a) The information criterion indices, such as the Akaike Information Criterion (AIC; Akaike, 1973), the Consistent AIC (CAIC; Bozdogan, 1987), the Bayesian Information Criterion (BIC; Schwarz, 1978), the Sample-size Adjusted Bayesian Information Criterion (SABIC; Sclove, 1987), and the Approximate Weight of Evidence Criterion (AWE; Banfield and Raftery, 1993), in which lower values indicate a better model fit; (b) The Bootstrap Likelihood Ratio Test (BLRT; McLachlan, 1987): significant values ($p < 0.05$) indicate that the model with $k + 1$ classes is better than the k class model; (c) Entropy: a level of 0.06 or higher is considered acceptable (Reinecke, 2006; Asparouhov and Muthén, 2014); (d) The percentage of each profile: each class had to represent at least 5% of the sample (Speece, 1994); (e) The interpretability of each profile (Wang and Wang, 2012). After the identification of the best latent profiles solution, in order to test if the item-response probabilities were equal across age-groups and to compare the latent profile solution across different age-stages (i.e., the groups

showed similar characteristics across age in our sample), we run a multiple-group Latent Profile Analysis in which we compared the best profiles solution into two different age groups: the Young Adulthood group (i.e., 18–35 years old) and Adulthood (i.e., 36–60 years old; Collins and Lanza, 2009). We conditioned profiles’ prevalence and item-response probabilities on the two different age groups, estimating two different sets of prevalence and probabilities of profiles across age, in order to compare the two solutions (Collins and Lanza, 2009). Thus, we examined the invariance of profiles across ages, using a series of multiple-group latent profile analyses (LPAs) with age-groups as the grouping variable, comparing a model in which means of the latent profiles were constrained to be equal across age-groups and a model in which means of the latent profiles were freely estimated in the two different age-groups (Eid et al., 2003). We compared these two different models using the BIC index, in which the lowest values indicate the best model solution (Eid et al., 2003; Collins and Lanza, 2009). Lastly, in order to examine the discriminant contribution of the identified profiles solution, we run a Multivariate Analysis of Variance (MANOVA; Von Eye, 1990), examining the shape of the identified profiles (i.e., the configuration of each profile compared to the other profiles), as well as the level of profiles (i.e., the mean differences among profiles on the indicator variables that we used to identify profiles). We conducted this analysis both on the total sample as well as on each of the two age groups, to analyze characteristics of profiles.

Second, we run a path analysis model within a multiple-group approach, in order to examine associations of latent profiles with concurrent prosocial behaviors, interpersonal aggression, depressive symptoms, and anxiety problems, controlling for participants’ gender and level of exposure to COVID-19. According to previous research (e.g., Broidy et al., 2003; Luengo Kanacri et al., 2014; Favini et al., 2018), as an indicator of latent profiles we considered the posterior probabilities of each individual of being in each latent profile (i.e., the continuous variables). The multiple-group path analysis model was modeled considering age groups as the grouping variable, participants’ gender, and level of exposure to COVID-19 as the two covariates, the latent profiles as predictors, and indicators of prosocial behaviors, interpersonal aggression, depressive symptoms, and anxiety problems as outcomes. We estimated the models using the Robust Maximum Likelihood estimation (MLR; Wang and Wang, 2019), comparing a linear full-constrained model (i.e., a model in which all the estimated parameters were constrained to be equal across groups) with a full-unconstrained model (i.e., a model in which all the parameters were freely estimated across groups) using the Chi-square difference test ($\Delta\chi^2$) with $p < 0.01$; if the difference was significant, we released one parameter at a time, comparing the partially constrained model with the previous model each time, until the $\Delta\chi^2$ was no longer significant (Kline, 1998). In order to evaluate the goodness of fit of the path model, we used the following criteria: χ^2 Likelihood Ratio Statistic, the Comparative-Fit Index (CFI) and the Tucker-Lewis-Fit Index (TLI) greater than 0.95 (Hu and Bentler, 1999), the Root Mean Square Error of Approximation (RMSEA)

with associated confidence intervals lower than 0.05, and the Standardized Root Mean Square Residual (SRMR) lower than 0.06 (Kline, 2016).

RESULTS

Results of the Personality Profiles

LPA was used to identify personality profiles characterized by broad individual dispositions (i.e., positivity, irritability, and hostile rumination), SE-positive emotions, and SE-anger. The 2-class, 3-class, and 4-class models were compared based on criteria detailed in the Data Analytic Approach section. As shown in **Table 2**, results indicated that the 3-class model was the model that best fit our data. In detail, the 3-class model identifies three different profile configured as follow (see **Figure 1**):

1. The Resilient profile included 18.9% of the sample and was characterized by higher scores of Positivity, SE-positive, and SE-anger and lower scores of Irritability and Hostile Rumination.
2. The Vulnerable profile included 22.0% of the sample and was characterized by higher scores of Irritability and Hostile Rumination and lower scores of Positivity, SE-positive emotions, and SE-anger.
3. The Moderate profile included 59.1% of the sample and was characterized by average scores of all dimensions.

Following the recommendations of Eid et al. (2003), we conducted the measurement invariance of prevalence and item-response probabilities across the two age groups (young adults vs. adults). Results showed that the full constrained model showed a lower BIC ($BIC = 18884.539$) compared to the freely estimated model ($BIC = 18897.074$) indicating substantial equality of prevalence and item-response probabilities across the two age-groups, thereby allowing meaningful comparison between young adults and adults profiles in their associations with adaptive and maladaptive outcomes.

Results of the Multivariate Analysis of Variance (MANOVA) allowed us to corroborate the discriminant value of the 3-class solution. In detail, the configuration of each profile significantly differs compared to the other profiles (Wilks' $\lambda = 0.251$, $p < 0.001$), as well as results indicated a significant mean differences among profiles on the indicator variables (i.e., Positivity: [$F(2,1275) = 147.609$, $p < 0.001$], Irritability [$F(2,1275) = 709.148$, $p < 0.001$], Hostile Rumination [$F(2,1275) = 617.431$, $p < 0.001$], SE-positive [$F(2,1275) = 74.222$, $p < 0.001$], and SE-anger [$F(2,1275) = 673.501$, $p < 0.001$]).

Results of the Multiple-Group Path Analysis Model

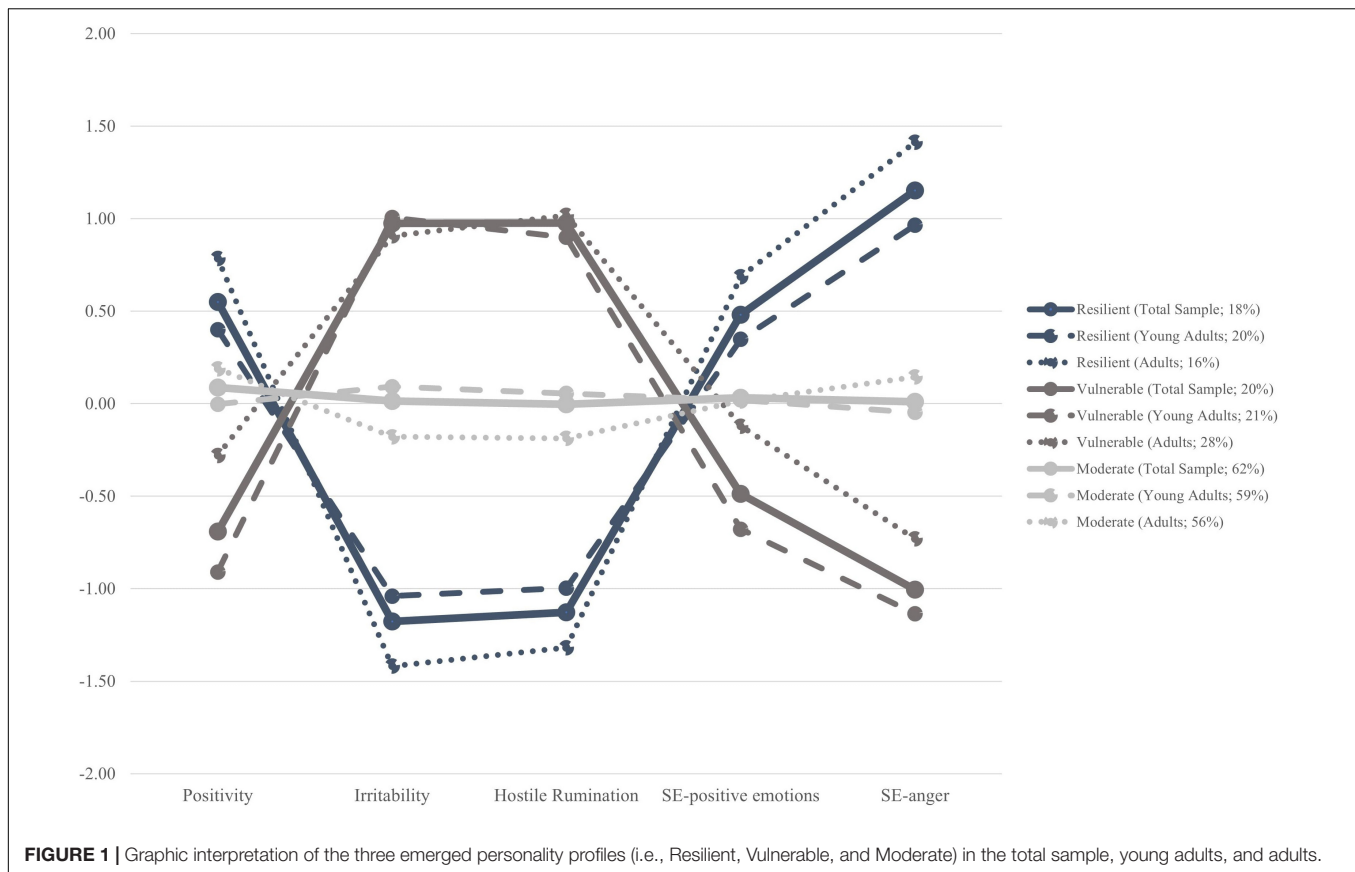
To explore whether the identified personality profiles were related with adaptive and maladaptive COVID-related outcomes, we conducted a path analysis with a multiple-group approach, in which the probability of belonging to two (i.e., Resilient and Vulnerable profiles) of the three emerged personality profiles were simultaneously regressed on one indicator of adjustment

(i.e., prosocial behavior) and three indicators of maladjustment (i.e., interpersonal aggression, depressive symptoms, and anxiety problems) occurred during the first Italian lockdown. We excluded the Moderate profile because of methodological and theoretical reasons. Methodologically, using the posterior probabilities of group membership means that each individual has a membership probability from 0.00 to 1.00 in each group. Thus, considering all the three posterior probabilities variables would imply a perfect correlation ($r = 1.00$) between the three variables. From a theoretical point of view, considering the average scores on all indicators, one may hypothesize that the Moderate profile would be less informative regarding cross-sectional associations with adaptive and maladaptive COVID-related outcomes, therefore our aim was to analyze more in-depth how specific difficulties in a particular overarching pattern of functioning was associated with specific indicators of adjustment and maladjustment. Moreover, we included two covariates in our path analysis model: gender and exposure to COVID-19.

Overall, across both age groups (i.e., young adults and adults), results showed positive associations between the Resilient profile and prosocial behavior and negative associations with interpersonal aggression, depressive symptoms, and anxiety problems. Contrarily, results indicated negative associations between the Vulnerable profile and prosocial behavior, and positive association with interpersonal aggression, depressive symptoms, and anxiety problems that occurred during the first Italian lockdown.

Results of the multiple-group path analysis model were reported in **Table 3**. Specifically, we simultaneously constrained all the regression paths to be equal across young adults and adults. However, the significant increase in the $\Delta\chi^2$ [$\Delta\chi^2(25) = 53.958$, $p = 0.001$] indicated that the tested effects were not equal across the two age groups. Therefore, a closer inspection of the Modification Indexes (MI) suggested releasing some regression path across the two age groups. In detail, we released—one at a time—the effect of the vulnerability profile on anxiety problems (MI = 12.443), interpersonal aggression (MI = 6.016), and depressive symptoms (MI = 7.173). The final partly constrained model was retained since the lack of statistical significance in the $\Delta\chi^2$ compared to the freely estimated model [$\Delta\chi^2(22) = 33.899$, $p = 0.050$] and the acceptable fit to our data [$\chi^2(26) = 38.407$, $p = 0.055$, CFI = 0.992, TLI = 0.984, RMSEA = 0.028 (90% CI: 0.000, 0.046), SRMR = 0.033]. These released paths indicated that the effect of the vulnerable profile on the maladaptive outcomes (i.e., interpersonal aggression, depressive, and anxiety problems) that occurred during the first lockdown in Italy differed across young adults and adults.

As reported in **Table 3**, results of the final model showed that gender resulted significantly associated with all adaptive and maladaptive outcomes in both age groups. In detail, women reported significant association with prosocial behavior, depressive symptoms, and anxiety problems, while men resulted associated with interpersonal aggression. Contrary to our expectations, the covariate exposure to COVID-19, which represented a direct or indirect contact with COVID-19 infection,



did not show significant associations with either adaptive or maladaptive outcomes during the first Italian lockdown, indicating the prominent role of personality profiles and gender in accounting effects of quarantine on adaptive and maladaptive outcomes.

DISCUSSION

The present study examined the extent to which personality profiles derived from three broad dispositional tendencies (i.e., positivity, irritability, and hostile rumination) and

self-efficacy beliefs in the emotional domain (i.e., self-efficacy in expressing positive emotions and self-efficacy in regulating anger) were associated with adaptive and maladaptive outcomes occurred during the first Italian COVID-19 lockdown (March–June 2020). These associations were also explored with a special focus on differences between young adults (18–35-year-olds) and adults (36–60-year-olds).

Overall, within a person-oriented approach (e.g., Magnusson, 1998; Bergman et al., 2003), we obtained three configurations of personality profiles (i.e., resilient, vulnerable, and moderate) with different dispositional and self-efficacy characteristics that resulted distinctly and uniquely associated with adaptive and

TABLE 2 | Model fit statistics for the Latent Profile Analysis of the personality profile.

Model	K	-2LL	npar	AIC	CAIC	BIC	SABIC	AWE	LRTp	Adj LRT p	BLRTp	Entropy
(1) 2-class	2	-8611.628	16	17255.257	17353.667	17337.668	17286.844	17500.078	<0.001	<0.001	<0.001	0.654
(2) 3-class	3	-8470.890	22	16985.780	17121.095	17099.096	17029.213	17322.411	<0.001	<0.001	<0.001	0.715
(3) 4-class	4	-8387.595	28	16831.190	17003.410	16975.410	16886.468	17259.629	0.671	0.675	<0.001	0.676
(4) 3-class (free)	3	-9305.523	40	18691.045	18937.074	18897.074	18770.014	19303.102				
(5) 3-class (constrained)	3	-9306.406	38	18688.812	18922.539	18884.539	18763.832	19270.265				

k, number of profiles provided in the model; *npar*, number of parameters estimated.

The following fit indexes are reported: AIC, Akaike Information Criterion; CAIC, Consistent Akaike's Information Criterion; BIC, Bayesian Information Criterion; SABIC, Sample-Size Adjusted BIC; AWE, Approximate Weight of Evidence Criterion; BLRT, The Bootstrap Likelihood Ratio Test.

Significant values ($p < 0.05$).

TABLE 3 | Profile Membership and covariates effects on Prosocial Behavior, Interpersonal Aggression, Depressive Symptoms, and Anxiety Problems during the first Italian Lockdown due to COVID-19 pandemic.

	Prosocial behavior			Interpersonal aggression			Depressive symptoms			Anxiety problems		
	b (β)	SE	p	b (β)	SE	p	b (β)	SE	p	b (β)	SE	p
18–35-year-olds												
(1) Vulnerable profile	−0.180 (−0.093)	0.063	<0.05	0.632 (0.311)	0.085	<0.001	0.590 (0.352)	0.065	<0.001	0.699 (0.387)	0.070	<0.001
(2) Resilient profile	0.234 (0.109)	0.063	<0.001	−0.336 (−0.149)	0.045	<0.001	−0.331 (−0.178)	0.044	<0.001	−0.354 (−0.177)	0.046	<0.001
(3) Gender (0 = men 1 = women)	0.205 (0.139)	0.042	<0.001	−0.131 (−0.085)	0.037	<0.001	0.149 (0.116)	0.030	<0.001	0.161 (0.117)	0.032	<0.001
(4) Exposure to COVID-19 (0 = no 1 = yes)	0.058 (0.043)	0.039	0.136	0.022 (0.015)	0.034	0.512	0.005 (0.004)	0.030	0.876	0.012 (0.009)	0.031	0.697
36–60-year-olds												
(1) Vulnerable profile	−0.180 (−0.086)	0.063	<0.05	0.365 (0.216)	0.084	<0.001	0.357 (0.219)	0.076	<0.001	0.346 (0.205)	0.075	<0.001
(2) Resilient profile	0.234 (0.118)	0.063	<0.001	−0.336 (−0.211)	0.045	<0.001	−0.331 (−0.216)	0.044	<0.001	−0.354 (−0.222)	0.046	<0.001
(3) Gender (0 = men 1 = women)	0.205 (0.146)	0.042	<0.001	−0.131 (−0.116)	0.037	<0.001	0.149 (0.136)	0.030	<0.001	0.161 (0.143)	0.032	<0.001
(4) Exposure to COVID-19 (0 = no 1 = yes)	0.058 (0.042)	0.039	0.136	0.022 (0.020)	0.034	0.512	0.005 (0.004)	0.030	0.876	0.012 (0.011)	0.031	0.697

Unstandardized (b) and Standardized (β) regression coefficient, standard error (SE), and p-value (p) of b are reported.

maladaptive outcomes during the prolonged isolation of the first Italian lockdown.

Across the three emerged profiles, while the moderate profile was characterized by average-scores in all variables and the most prevalent in our population (i.e., about 60%), both resilient and vulnerable profiles, were found in approximately 20% of the population and were characterized by a specific pattern of functioning.

The resilient profile seems the well-adapted profile as indicated by higher scores of individual strengths such as positivity, self-efficacy in expressing positive emotions, and self-efficacy in regulating anger, and lower scores in irritability and hostile rumination. As a resilient individual is able to endure and recover quickly from difficult circumstances (Newman, 2005), a higher level in the positivity trait and emotional self-efficacy, and a lower dispositional tendency to react impulsively and have prolonged negative feelings under a threatening circumstance, contributes to sustain people in dealing with internal emotional states (e.g., feelings of loneliness, Lakhan et al., 2020) and assume a more agentic role in shaping the course of their life when facing difficulties as the prolonged isolation of the COVID-19 pandemic.

In contrast, the vulnerable profile seems the most compromised profile, because it was characterized by higher scores in irritability and hostile rumination and lower scores in protective factors such as positivity, self-efficacy in expressing positive emotions, and self-efficacy in regulating anger. This configuration was defined as vulnerable because individuals belonging to this profile may be less capable to manage feelings and challenges related to circumstances perceived as threatening as the strong changes determined by the COVID-19 pandemic, due to their higher level of irritability and hostile rumination and a lower control of one's internal emotional states (i.e., emotional self-efficacy), as well as a lack of a positive cognitive orientation toward life.

Although these personality profiles resulted substantially equal in their prevalence and item-response probabilities across

young adults and adults, the vulnerable profile among the young adults showed lower levels of positivity and emotional self-efficacy beliefs, and higher levels of hostile rumination, compared to the same profile among adults, indicating an emotional-related dysregulation among the youngest. This result is not surprising because several studies found greater difficulties in dimensions such as controlling impulsive reactions or being aware of one's emotions, and ability to respond in accordance with own's internal emotional states among the youngest populations (e.g., Cole et al., 1994; Gratz and Roemer, 2004; Arnett et al., 2014).

Our findings supported the expected associations of the resilient and vulnerable profiles with adjustment (i.e., prosocial behavior) and maladjustment (i.e., interpersonal aggression, depressive symptoms, and anxiety problems) during the first Italian lockdown, accounting for some differences among young adults and adults. The resilient profile was positively associated with prosocial behavior and negatively associated with interpersonal aggression, depressive symptoms, and anxiety problems, both in young adults and adults. These results are consistent with previous studies attesting the protective role of individual strengths against the challenging circumstance of the COVID-19 pandemic (e.g., Fischer et al., 2021; Reizer et al., 2021). Individuals with a resilient profile possess dispositions and self-efficacy beliefs conducive to a generally positive outlook toward life, to feel capable to express joy and satisfaction and manage anger responses also toward a challenging situation, as well as to tolerate frustrations, to dominate and modulate emotional and behavioral reactions, and a lower tendency to have prolonged negative antagonistic thoughts toward threatening experiences. Coherently with previous studies (e.g., Mojsa-Kaja et al., 2021; Monteiro et al., 2022), the vulnerable profile, which possesses a lack of dispositional strengths and a general tendency to have prolonged negative feelings and thoughts and easily react to provocation, was negatively associated with the enactment of prosocial behavior during quarantine and positively associated with interpersonal aggression, depressive symptoms, and anxiety problems in both age groups.

As regards the differences that emerged between young adults with adults in these associations, we found that young adults were significantly different than adults in the positive association of the vulnerable profile with interpersonal aggression, depressive symptoms, and anxiety problems. Since young adults showed a more compromised vulnerable personality profile than adults belonging to the same profile, the significantly different association between young adults' probabilities of belonging into the vulnerable profile and higher level of maladaptive outcomes that occurred during the first Italian lockdown attested greater negative consequences of the quarantine for the youngest. As reported elsewhere (e.g., Ahmed et al., 2020; Gao et al., 2020; Huang and Zhao, 2020; Lei et al., 2020; Ozamiz-Etxebarria et al., 2020; Bareeqa et al., 2021), these results indicated a more compromised experience for young adults than adults during the COVID-19 pandemic.

Regarding the effect of gender, no age group difference emerged. For both young adults and adults, gender resulted statistically significant in predicting prosocial behavior, interpersonal aggression, depressive symptoms, and anxiety problems. Thus, in line with previous studies on differences across gender of the COVID-19 psychosocial effect (e.g., Lei et al., 2020; Mazza et al., 2020; Parola et al., 2020), our results showed that young adults and adults' women showed a greater tendency to engage in prosocial behaviors, and to experience depression and anxiety symptoms, while young adults and adults' men showed a greater tendency to engage in interpersonal aggression.

Finally, although we did not find any significant effect of the exposure to COVID-19 in our sample, it is important to consider this result with caution. In the present study, we assessed the exposure to COVID-19 by using a checklist about direct or indirect contact with the COVID-19 infection during the first Italian lockdown. Even if 54.2% of the total sample answered "yes" in one or more statements, this reflected both direct or indirect exposure to the virus. Thus, it is possible to assume a heterogeneity across direct or indirect exposure that did not allow us to capture experience with the virus with a greater level of stress (e.g., impairment symptoms conditions due to the contagious or a relative's death).

Overall, the present study contributes to further understanding how different configurations of personality profiles resulted associated with adaptive and maladaptive outcomes that occurred during the prolonged isolation lived in Italy from March to June 2020. To our knowledge, this is the first study during the COVID-19 pandemic that used a person-oriented approach to identify groups with different levels of individual characteristics that may mitigate or exacerbate the psychological effect of the COVID-19 lockdown in Italy. Moreover, the present study offered further evidence regarding the greater maladaptive consequences of COVID-19 for vulnerable young adults. Thus, in times of pandemic, intervention actions that promote the capacity to regulate negative emotions in vulnerable young adults should be a priority. Moreover, our results have also important implications for future studies not related to the pandemic era. Previous studies that explored individual functioning under the person-oriented approach mostly focused on Big Five

personality profiles (e.g., Favini et al., 2018) or multi-faceted aspects of individual characteristics (e.g., identity exploration, Crocetti et al., 2015). The present study is the first to consider more malleable characteristics as individual dispositions and individual perceptions of agency and capabilities (i.e., self-efficacy beliefs) under a person-oriented approach.

Limitations and Future Directions

Despite different strengths, the present study has some limitations that should be taken into consideration. First, although our large sample included 1341 participants, approximately 70% were women and a small percentage (i.e., 15%) was in the north of Italy, which was the Italian area most affected by the COVID-19 contagious spread during the first wave. Moreover, our results might be biased due to the use of a non-probabilistic sampling method (e.g., convenience sample, snowball sample). Thus, the generalizability of our results could be affected by these unbalanced sociodemographic characteristics and the sampling method. Second, the cross-sectional design of our study did not allow us to explore the predictive role of personality profiles on the development of adaptive and maladaptive outcomes. Moreover, considering the partly malleable nature of individual dispositions (e.g., Roberts et al., 2008) and the domain and time specificity of self-efficacy beliefs (Bandura, 1997), we could not control for any possible changes across levels of individual dispositions and self-efficacy beliefs due to the prolonged isolation period. Future studies should cover these gaps by using a longitudinal design that could clarify the predictive role of personality profiles on adjustment and maladjustment during the pandemic, as well as to capture possible changes of personality profiles related to the COVID-19 outbreak. Finally, the present study used self-report measures that might be affected by social desirability.

CONCLUSION

The present study demonstrates the importance to consider a holistic perspective of individual functioning in the examination of psychological consequences of the COVID-19 pandemic. Furthermore, we evidenced that in a condition of high stress, such as the COVID-19 emergency in Italy, the Resilient individuals are better protected and adjusted, while vulnerable young people are at risk of psychological and psychosocial maladjustment. The transition to adulthood is a period of major biological, psychological, and social changes, characterized by opportunities and challenges that can have long-term implications. The emergence of the pandemic might have further jeopardized this life transition. We have contributed to the identification of the vulnerable young adult group, and this is an important step for the development of preventive and promotion actions. Vulnerable young adults with less personal resources are more likely to experiment uncertainty and worry about decisions related to their formative period and work, have less hope in the future, and are less able to regulate their thought and manage their emotions. We do not know yet when the COVID-19

pandemic will be over, but we think that it is crucial for researchers and health professionals to prioritize individuals belonging to the vulnerable group.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the corresponding author on request, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Local Institutional Review Board—Department of Psychology, Sapienza University of Rome (Rome, Italy). The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

FC conceived of the study, participated in its design, drafted the manuscript, performed the statistical analysis, and interpreted the data. CP conceived of the study, participated in its design, drafted the manuscript, and interpreted the data. AF participated in the study design, drafted the manuscript, and performed the statistical analysis. CR conceived of the study, participated in its design, and drafted the manuscript. AZ contributed on interpretation of the data, and drafted and revised the manuscript. EB participated in the study design, contributed on interpretation of the data, and drafted and revised the manuscript. ET conceived of the study, participated in its design, contributed on interpretation of the data, and revised the manuscript. MG contributed on interpretation of the data and revised the manuscript. FG contributed to drafting and revising the manuscript. All authors read and approved the final manuscript.

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The Fear of Contagion and the Attitude Toward the Restrictive Measures Imposed to Face COVID-19 in Italy: The Psychological Consequences Caused by the Pandemic One Year After It Began

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The pandemic nature of COVID-19 has caused major changes in health, economy, and society globally. Albeit to a lesser extent, contingent access to shops and places to socialize the imposition of social distancing and the use of indoor masks is measures still in force today (more than a year after the start of the pandemic), with repercussions on economic, social, and psychological levels. The fear of contagion, in fact, has led us to be increasingly suspicious and to isolate ourselves from the remainder of the community. This has had repercussions on the perception of loneliness, with significant psychological consequences, such as the development of stress, anxiety, and, in extreme cases, depressive symptoms. Starting from these assumptions, this research was developed with the aim of deepening the perceptions that the participants have of their own mental health, loneliness, fear linked to contagion, and attitudes toward imposed social distancing. In particular, we wanted to analyze whether there is a relationship between perceived fear and the perceived level of mental health, loneliness, and attitude toward social distancing. Finally, we wanted to analyze whether there are differences related to gender, age, marital status, current working mode, and educational qualifications. The research, performed after the diffusion of the vaccination in Italy, lasted 14 days. The participants were 500 Italians who voluntarily joined the study and were recruited with random cascade sampling. The research followed a quantitative approach. The analyzed data, from participants residing throughout the national territory, allow us to return the picture of the perceptions that Italians have of the fear of contagion, of their level of mental health, of loneliness and of their attitude toward social distancing. In particular, the data show that fear of COVID-19 is an emotional state experienced by the entire population and that young people have suffered more from loneliness and have been less inclined to accept the imposed social distancing. The data that emerged should make policymakers reflect on the need to find functional strategies to combat

COVID-19 or other health emergency crises whose effects do not affect the psychological wellbeing of the population.

Keywords: COVID-19, Italy, psychological impact, fear of contagion, loneliness, mental health, social distance

INTRODUCTION

The COVID-19 pandemic, which began in February 2020 in Italy, has had a dramatic impact on health, economic, and social levels. People have faced profound changes imposed by governments to reduce contagion, including the use of masks, social distancing, and more or less stringent lockdowns that have been repeated over the course of more than a year with different modalities and levels of restrictions. These changes have led to decidedly strong and invasive changes in everyday life with heavy repercussions on a psychological level. In Italy, as of December 27, 2021, according to the data reported by the civil protection,¹ The number of cases is equal to 5,647,313 and even if the number of recovered is significantly higher than number of dead; to this day, the number of infected is constantly increasing. The use of masks maintaining a distance of at least 1 m and vaccines is some of the measures taken by the government to counter the spread of the virus. The fear of contagion toward the most fragile people (those that are elderly or vulnerable), but also toward ourselves, has led us to be increasingly suspicious and to isolate ourselves from the remainder of the community for fear that others could be a danger to our safety. This has had repercussions on the perception of loneliness, felt particularly by the population in this period, leading to psychological consequences, such as the development of stress, anxiety (Porcelli, 2020; Tull et al., 2020; Rania and Coppola, 2021), and, in extreme cases, depressive symptoms. As stated by Briscese et al. (2020) in order to try to counter the spread of COVID-19, governments have applied measures of social distancing relying on the will of citizens to respect these restrictions. From the research conducted by the authors, it emerges that the expectations that people have about the expected duration of the lockdown influence their willingness to comply: if the restrictive measures are applied for a longer time than expected, their willingness to adhere to it will be less. In connection with the previous outbreak caused by the Syndrome (SARS), as noted by Wu et al. (2005), a risk factor for the development of depressive symptoms is the direct knowledge of people with SARS or having survived the disease. Finally, some authors have highlighted how the fear experienced during COVID-19 has had repercussions on people's mental health, manifesting in feelings of anxiety, loneliness, uncertainty, and panic (Fitzpatrick et al., 2020).

Fear of COVID-19 and Loneliness: Risk and Protection Factors

The COVID-19 pandemic has had repercussions, in the present, but it will also have them in the future, not only on people's health, but also on different areas of life, including the economic and social sphere (Ceccato et al., 2021) with a significative level of traumatic stress, in women more than in men (La Rosa et al., 2021).

The fear experienced during the COVID-19 pandemic has had repercussions on psychological wellbeing: as noted, in fact, by Duong (2021), both fear and anxiety during the pandemic were determining factors in predicting forms of psychological distress, making emerging difficulties in mental wellbeing. Starting from the theory of attachment and the management of terror, referring to the pandemic situation we are going through, Steele (2020) suggests how the fear and anxiety experienced in one's life are closely connected, in addition to the lack of coherent information, to fear of losing loved ones. Furthermore, Di Crosta et al. (2020) found that female gender, the perception of low economic stability and the fear of contagion are factors that negatively affect the psychological fallout due to COVID-19 and are predictors of a high symptoms of post-traumatic stress disorder. In the literature, it has been highlighted that infectious diseases are associated with fear, anxiety, and other psychological disorders (Cheng et al., 2004; Duong, 2021). COVID-19, as an infectious disease, can cause psychological distress, depression, anxiety, and fear (Lee and Crunk, 2020; Satıcı et al., 2020a; Duong, 2021). Research conducted by Di Crosta et al. (2021) shows how fear and anxiety about COVID-19 are predictors of changes in consumers, who under the effect of these emotions would feel the need to purchase goods necessary for survival. Fear, in particular, is defined as an emotional state, a response to a general malaise that is not well identifiable or quantifiable and clinically difficult to manage, particularly when it is linked to events of a broader nature, such as those related to terrorism and public health (Fitzpatrick et al., 2020). These cases include the COVID-19 pandemic, a direct threat that causes individual reactions. The speed and in-depth understanding of the exact methods of contagion have led people to feel panic and fear (Deniz, 2021), including the fear of being infected or infecting others, the risk of death, the loss of loved ones, and not receiving adequate care (Montemurro, 2020; Saricali et al., 2020; Satıcı et al., 2020b; Deniz, 2021). Several studies performed during the pandemic found that there was a progressive increase in COVID-19 fear around the world (Knipe et al., 2020) and that there is an association between fear and depression (Daly and Robinson, 2020; Lee et al., 2020; Lee and Crunk, 2020; Satıcı et al., 2020; Ye et al., 2020), which in severe cases

¹<https://opendatadpc.maps.arcgis.com/apps/dashboards/b0c68bce2cce478eaac82fe38d4138b1>

can lead to suicide (Dsouza et al., 2020). Furthermore, during the COVID-19 pandemic, every society faced multiple challenges, including the pressure of social distancing and attention to contagion (Duong, 2021).

The most fragile population has been the most affected by COVID-19 and the effects caused by the restrictions imposed to limit its spread. Older people suffer most from the negative effects of COVID-19. Restrictive measures, fear, and loneliness have had negative repercussions on the resilience of people aged 65 and over, thus compromising their physical and psychological wellbeing (Plagg et al., 2020; Set, 2020; Savci et al., 2021). Esposito et al. (2021) underline how young participants due to the social restrictions imposed suffered of anxiety and depression; furthermore, Biviá-Roig et al. (2020) found that pregnant women during lockdowns suffered most from anxiety and depression. Rodríguez-Rey et al. (2020), moreover, underline how stress caused by COVID-19 is associated with alcohol use, more in women than in men.

Research conducted by Commodari and La Rosa (2020) highlights how young people have a lower perception of risk because they see COVID-19 as a less risky disease for them. However, previous research has shown that social isolation, regardless of age, is closely linked to symptoms of anxiety and depression (Matthews et al., 2019; Santini et al., 2020). Furthermore, during the pandemic, some authors found that the lockdowns caused mental illness even in the youngest (Lee et al., 2020; Coppola et al., 2021). Additionally, other studies (Porcelli, 2020; Tull et al., 2020) have found that being forced to stay at home has led to the development of greater stress, social isolation, loneliness, and anxiety about one's health. Social distancing, in fact, one of the impositions dictated by many states in the hope of curbing the spread of the virus, has been defined as a possible factor that has contributed to the increase in dissatisfaction, anxiety (De Pedraza et al., 2020; Duong, 2021), and loneliness, with negative effects on wellbeing of the population (Boursier et al., 2020). Although social isolation and loneliness represent two distinct concepts, they are closely interrelated and are potential risk factors for suicide during and after the pandemic (Allan et al., 2021).

MATERIALS AND METHODS

The present research follows quantitative and exploratory methods. The questionnaire, administered online with the use of Microsoft Forms platform in open survey, was provided *via* a link sent by email, WhatsApp, discussion forums, and social networks, such as Facebook. The compilation of the protocol, *via* mobile phone or computer, took on average about 20 min per participant. No type of incentive was provided for the participants, who joined exclusively on a voluntary basis.

Before sharing the link, the researchers themselves filled out the questionnaire, in order to test its feasibility and functionality both through the use of smartphones and with a laptop and desktop pc. Both from the mobile phone and from the computer, the participant viewed four questions per

page for a total of six pages. For each page, there was the possibility to go back to check or modify the answers given.

The convenience sample was recruited through random cascade sampling, starting from some subjects known to the research group, and involved participants who were at least 18 years old and Italian-speaking citizens.

The data were collected in accordance with the ethical recommendations of the Declaration of Helsinki and in compliance with the American Psychological Association (APA) standards for the treatment of human volunteers.

The questionnaire was proposed throughout Italy, thanks to its dissemination through the use of social media; however, most of the participants who filled out the questionnaire are from the same region as those who conducted the research. The research, of an exploratory nature, does not want to return a representative image of the Italian population but rather to give a picture of the perceptions of the population in relation to perceived fear and their own mental health (Lagomarsino et al., 2020).

Before starting the completion of the questionnaire, on an introductory page, the objectives of the study were described, the themes proposed, and an informed consent was offered to them through which the participants were asked to join voluntarily and they were informed that they could withdraw at any moment by closing the browser window. Only by accepting the consent could the participants start filling out the questionnaire. In addition, each participant was asked to build a code so that they could be contacted for further research. The code, therefore, allowed us to verify that the same participant has not filled out the proposed questionnaire several times.

The research was performed for 1 month and was carried out in April 2021; approximately, two-thirds of the questionnaires were compiled on the first 3 days of the questionnaire launch. Only fully completed questionnaires were analyzed.

Measures

Fear of COVID-19 Scale

The FCV-19S (Ahorsu et al., 2020; Italian validation, Soraci et al., 2020) included seven items with a five-point Likert scale (from 1 = strongly disagree to 5 = strongly agree) that assess the fear of COVID-19. The higher the score, the greater the fear of COVID-19. The scale showed good internal consistency ($\alpha = 0.85$).

Mental Health

The General Health Questionnaire with 12 items (GHQ-12) scale measures the state of mental health over the previous few weeks and was developed by Goldberg in the 1970s and validated in Italy by Piccinelli et al. (1993). The 12-item version, GHQ-12, is the most widely used (Elovanio et al., 2020). Participants had to report whether they experienced a particular symptom of mental distress according to a four-point Likert-type scale ("not at all," "less than usual," "more than usual," or "rather more than usual"). The six positive items were corrected. Participants who answered "rather more than usual"

or “more than usual” scored 1, while those who answered “less than usual” or “not at all” scored 0 (the so-called “0-0-1-1 method”; Elovania et al., 2020). As pointed out by Piccinelli et al. (1993), this type of scoring, called conventional, “eliminated the problem of “middle and end users” and that of the “conceptual distance” between positions on the response scale. A total score ranged from 0 to 12 points; higher scores indicate worse health. The scale showed good internal consistency ($\alpha=0.82$).

Loneliness Scale

We used the Three-Item Loneliness Scale developed by Hughes et al. (2004) from the revised UCLA Loneliness Scale (Russell et al., 1980) in the Italian version of Solano and Coda (1994). It is a short scale for measuring loneliness in large surveys, and it assesses feelings of isolation, disconnectedness, and not belonging. Respondents are rated on a three-point Likert scale from 1=hardly ever to 3=often, with a total score ranging from 3 to 9 points; higher scores indicate greater loneliness. The three-item scale showed good internal consistency ($\alpha=0.72$).

Coronavirus Social Distance Attitudes Scale

The scale was composed of 14 items with eight expressing support to social distancing (*Positive Attitudes*, example item is “it is our duty as good citizens to follow social distance orders,”) and six expressing opposition to social distancing (*Negative Attitudes*, example item is “social distance orders violate my individual rights”; An et al., 2021). Items were answered using a five-point Likert scale (from 1=strongly disagree to 5=strongly agree). Both the positive social distance scale ($\alpha=0.81$) and negative social distance scale showed good internal consistency ($\alpha=0.84$).

The *demographic section* was composed of eight items exploring the demographic characteristics of the participants, their instruction level, and information about their work during the COVID-19 pandemic.

Data Analysis

Descriptive statistics were calculated for sociodemographic characteristics, consisting of percentages, while the scores of Fear of COVID-19, General Health Questionnaire (GHQ-12), Loneliness, and Positive and Negative Social Distance Attitudes were expressed as means and standard deviations. To investigate the gender differences in relation to the constructs investigated, *t*-tests were used for independent samples. To compare the differences between our participants and the Italian normative sample and therefore in relation to the prepandemic data, *t*-tests were conducted for single samples. While variance analysis was used to investigate the differences between groups (age, marital status, current work mode, and educational qualification) in relation to the variables investigated, with *post-hoc* Tukey (for homogeneous variances) or Games-Howell (for non-homogeneous variances) between group comparisons in case of a significant overall *F*-value. Appropriate effect size statistics that adjust for differences in group sizes were obtained of Cohen's *d* for *t*-tests and η_p^2 for ANOVAs. To explore the relationship between variables investigated, correlation analyses Pearson correlation coefficient

was conducted. We used multiple linear step way regressions to calculate the univariate associations. SPSS (v. 20) software was used for these analyzes.

A *post-hoc* power analysis to evaluate power of this study was conducted using the software package, GPower (Faul and Erdfelder, 1992). The sample size of 500 was used for the statistical power analyses and a five predictor variable equation was used as a baseline. The recommended effect sizes used for this assessment were as follows: small ($f_2=0.02$), medium ($f_2=0.15$), and large ($f_2=0.35$; see Cohen, 1977). The alpha level used for this analysis was $p<0.05$.

Participants

A total of 500 adults from across Italy responded to the online questionnaire. Most respondents were women (86%), young adults (age $M=39.52$ years, $SD=16.58$; range 20–89), unmarried (47.7%), or married/cohabiting (44.7%), without children (62.4%), and with a secondary school diploma (41.9%).

The *post-hoc* analyses revealed the statistical power of this study was 0.67 for detecting a small effect, whereas the power exceeded 0.99 for the detection of a moderate to large effect size. Thus, there was more than adequate power (0.99) at the moderate to large effect size level but less than adequate statistical power at the small effect size level (Winnifred, 2009).

In **Table 1**, we report the sociodemographic characteristics in detail.

RESULTS

Fear of COVID-19

From the analysis of the results of the fear of COVID-19 scale (see **Table 2**) it emerged that there is a significant difference between the score obtained from the participants in the research and that reported by the normative sample. In fact, the participants in the research relating to fear of COVID-19 obtained a lower score compared to the normative sample, which refers to the first wave of the pandemic (Servidio et al., 2021). However, from the analysis of the *t*-test and ANOVA, with reference to the results obtained from the participants in the research, no significant differences emerged in the sociodemographic variables of gender, age, marital status, current work mode, and educational qualifications.

General Health Questionnaire

As seen from the data reported in **Table 3**, regarding the GHQ-12, the comparison with the normative sample shows a significant difference. The participants in the research reported higher levels of mental illness than the normative sample; moreover, when the comparison with the normative data is divided by gender, significant differences emerged. Both women and men reported a higher level of malaise than those in the female and male normative sample (Preti et al., 2007).

However, no significant differences emerge from the comparison with the averages recorded during the first wave of the pandemic (Coppola et al., 2021, see **Table 4**). From the

TABLE 1 | Sociodemographic characteristics of the participants ($N=500$).

Category variables	%
Gender	
Male	14
Female	86
Marital status	
Unmarried	47.7
Married/cohabiting	44.7
Separate/divorced	6.2
Widower	1.4
Children	
Participants with children	37.6
Participants without children	62.4
Educational qualification	
Junior high school	1.2
Secondary school	41.9
Graduation	39
postgraduate specialization	17.9
Work arrangements during COVID-19	
Unchanged	67.9
Smart working	26.4
Loss of job/work permit/leave	5.7
Age	
$M (SD)$	39.52 (16.58)
18–24	26.2
25–34	24.1
35–44	10.9
45–54	12.9
55–64	16.9
65 or older	9

analysis of the results reported by the participants, there were no significant differences in relation to age, gender, or educational qualifications.

Regarding marital status, however, a significant difference emerged between those who were single ($M=7.3$, $SD=3.11$) and those who were married/cohabiting ($M=6.45$, $SD=2.98$), $F(3, 493)=4.27$, $p<0.01$, $\eta_p^2=0.03$. The former report lower mental wellbeing than the latter. With regard to the current working mode, a significant difference emerged between those who reported an unchanged mode ($M=6.43$, $SD=2.74$) and those who were smart working ($M=6.35$, $SD=3.27$) or had lost their jobs ($M=8.71$, $SD=2.71$). Those who continued to work without changes reported lower mental wellbeing than those who were smart working, but higher mental wellbeing than those who lost their jobs, $F(2, 293)=5.11$, $p<0.01$, $\eta_p^2=0.033$.

Loneliness

Regarding loneliness, significant differences emerged from the comparison with the normative sample (Caputo, 2017, see Table 5). The participants in the research reported a lower level of loneliness than the normative sample. Similarly, a significant difference emerged from the comparison with the normative sample divided by gender with regard to women. The participants in the research report a lower level of loneliness than the women in the normative sample. No significant differences emerged from the comparison between the male participants in the research and the males of the normative sample.

TABLE 2 | Fear of COVID-19 scale: comparison between the average values of the participants and the average values of the Italian normative sample (Servidio et al., 2021).

	Fear of COVID-19		T (df)	p	Cohens' d
	Participants	Italian normative sample during COVID-19			
	M (DS)	M (DS)			
Total sample	2.13 (0.75)	2.61 (0.87)	-14.274 (496)	0.000	0.59

Regarding the comparison between the averages recorded during the first wave of the pandemic and the data from the participants in the research regarding loneliness, significant differences emerged (Rania and Coppola, 2021, see Table 6). Both women and men reported a level of loneliness lower than the average recorded during the first wave of the pandemic. From the analysis of the results reported by the participants in the research, however, no differences emerged in relation to the current work mode and educational qualifications. However, differences emerged with respect to the age groups, particularly between those who were in the 18–24 age group ($M=5.46$, $SD=1.56$) and those who were in the 25–34 age group ($M=4.86$, $SD=1.63$), the 35–44 age group ($M=4.70$, $SD=1.46$), the 55–64 age group ($M=4.82$, $SD=1.49$), and those 65 or older ($M=4.44$, $SD=1.18$), $F(5, 491)=4.58$, $p<0.01$, $\eta_p^2=0.05$. Participants in the 18–24 age group reported a higher level of loneliness. Regarding marital status, the analysis of the results shows a significant difference between those who are single ($M=5.26$, $SD=1.60$), those who are married/cohabiting ($M=4.73$, $SD=1.46$), and widowers ($M=4$, $SD=0.58$). The former shows a higher level of loneliness than those who are married or widowed. Furthermore, a significant difference emerges between those who are divorced/separated ($M=5.23$, $SD=1.76$) and those who are widowers ($M=4$, $SD=0.58$). The former reports a higher level of loneliness than the latter, $F(3, 493)=4.27$, $p<0.01$, $\eta_p^2=0.03$.

Positive Social Distance

Regarding the analysis of positive attitudes toward social distancing during COVID-19, a significant difference in relation to gender emerged from the comparison with the normative sample (An et al., 2021, see Table 7). The female participants in the research obtained a higher score than the women in the normative sample. Conversely, there were no significant differences between the scores of the male participants and the scores reported by the men in the normative sample. The analysis of the results reported by the participants in the research did not reveal any significant differences based on gender, marital status, current work modes, or educational qualifications. Instead, a significant difference emerged in relation to age, and in particular, between those who are in the age 25–34 group ($M=4.08$, $SD=0.59$) and those who are in the age 45–54 group ($M=3.66$, $SD=0.83$) and 65 or older ($M=4.36$,

TABLE 3 | Mental health comparison between the average values of the participants and the average values of the Italian normative sample pre-COVID-19 (Preti et al., 2007).

	GHQ-12		<i>t</i> (df)	<i>p</i>	Cohens' <i>d</i>
	Participants	Italian normative sample			
	<i>M</i> (DS)	<i>M</i> (DS)			
Total sample	6.84 (3.04)	1.8 (2.3)	36.948 (496)	0.000	
Male	6.67 (2.9)	1.4 (2.0)	15.09 (68)	0.000	2.11
Female	6.89 (3.05)	2.5 (2.6)	29.6 (422)	0.000	1.55

TABLE 4 | Mental health comparison between the average values of the participants and the average values of the first wave (Coppola et al., 2021).

	GHQ-12	
	Participants	Italian sample during COVID-19
	<i>M</i> (DS)	<i>M</i> (DS)
Male	6.67 (2.9)	6.01 (3.07)
Female	6.89 (3.05)	6.45 (3.04)

SD=0.46). The younger participants reported a positive attitude toward social distancing higher than those who are in the intermediate age group, but lower than older people. Furthermore, there was a significant difference between those who are in the age 35–44 group ($M=3.8$, $SD=0.82$) and the age 45–54 group ($M=3.66$, $SD=0.83$) and those who are in the age 55–64 group ($M=4.18$, $SD=0.52$) and 65 or older ($M=4.36$, $SD=0.46$), $F(5, 491)=9.81$, $p<0.01$, $\eta_p^2=0.09$. Older people report higher positive social distancing scores than younger people.

Negative Social Distance

Compared to the analysis of negative attitudes toward social distancing during COVID-19, a significant difference emerges between the averages obtained from the male participants in the research and those obtained from the male normative sample (An et al., 2021, see Table 8). The men of the normative sample referred to during the first pandemic period (An et al., 2021) scored higher than the males participating in the research. From the analysis of the results obtained by the participants in the research, no significant differences emerged related to gender, marital status, and educational qualifications. Instead, a significant difference emerged in relation to the age groups, particularly between those who were 18–24 years old ($M=2.48$, $SD=0.78$), 35–44 years old ($M=2.41$, $SD=0.79$), and 45–54 years old ($M=2.71$, $SD=0.91$) and those who are 55–64 years old ($M=1.93$, $SD=0.68$) and 65 or older ($M=1.84$, $SD=0.58$). Older people scored lower for negative social distancing than younger participants. Finally, a significant difference also emerged between those who were 25–34 years old ($M=2.22$, $SD=0.73$) and those who were 45–54 years old

TABLE 5 | Loneliness comparison between the average values of the participants and the average values of the Italian normative sample (Caputo, 2017).

	UCLA		<i>t</i> (df)	<i>p</i>	Cohens' <i>d</i>
	Participants	Italian normative sample			
	<i>M</i> (DS)	<i>M</i> (DS)			
Total sample	5 (1.56)	5.46 (2.06)	−6.555 (496)	0.000	0.25
Male	4.8 (1.4)	4.94 (1.92)	−8.484 (68)	0.399	
Female	5.04 (1.58)	5.58 (2.08)	−7.092 (422)	0.000	0.29

TABLE 6 | Loneliness comparison between the average values of the participants and the average values of the first wave (Rania and Coppola, 2021).

	UCLA		<i>t</i> (df)	<i>p</i>	Cohens' <i>d</i>
	Participants	Italian normative sample during COVID-19			
	<i>M</i> (DS)	<i>M</i> (DS)			
Male	4.8 (1.4)	5.23 (1.71)	−2.570 (68)	0.012	0.28
Female	5.04 (1.58)	5.68 (1.97)	−8.394 (422)	0.000	0.36

($M=2.71$, $SD=0.91$); the latter had greater negative attitudes toward social distancing with respect to the former, $F(5, 491)=12.98$, $p<0.01$, $\eta_p^2=0.12$.

Correlations and Regressions

From the analysis of the correlations reported in Table 9, it is clear how the fear of COVID-19 correlates positively with loneliness ($r=0.136$, $p<0.01$), the perception of mental illness ($r=0.178$, $p<0.01$), and a positive attitude toward social distancing ($r=0.161$, $p<0.01$). Loneliness correlates positively with the perception of mental illness ($r=0.433$, $p<0.01$), with a negative attitude toward social distancing ($r=0.184$, $p<0.01$).

Further investigation highlighted the factors affecting the general health scale. The stepwise model selection in multiple linear regression analysis that considered the GHQ-12 scale as a dependent variable is presented in Table 10.

The model has an $R^2=0.199$, which means that 20% of the variance in the GHQ-12 scale is explained by the model. The R^2 value was statistically significant. Loneliness ($\beta=0.122$, $p=0.01$) and fear of COVID-19 ($\beta=0.122$, $p=0.003$) were significant predictors.

DISCUSSION

From the analysis of the results, it emerges that in this particularly complex period, the perception of fear of COVID-19 affects

TABLE 7 | Positive attitudes toward comparison between the average values of the participants and the average values of the Italian normative sample (An et al., 2021).

	Positive social distance		<i>t</i> (df)	<i>p</i>	Cohens' <i>d</i>
	Participants	Italian normative sample during COVID-19			
	<i>M</i> (DS)	<i>M</i> (DS)			
Male	3.84 (0.89)	3.73 (0.97)	NS	0.303	0.13
Female	4.04 (0.59)	3.94 (0.91)	3.624 (422)	0.000	

TABLE 8 | Negative attitudes toward social distance: comparison between the average values of the participants and the average values of the Italian normative sample (An et al., 2021).

	Negative social distance		<i>t</i> (df)	<i>p</i>	Cohens' <i>d</i>
	Participants	Italian normative sample during COVID-19			
	<i>M</i> (DS)	<i>M</i> (DS)			
Male	2.3 (1.0)	2.60 (1.13)	−2.534 (68)	0.014	0.28
Female	2.28 (0.75)	2.29 (1.00)	NS	0.821	

the levels of psychological wellbeing of the population. Regarding the fear of COVID-19, the results show that compared to the first period of the pandemic, the participants in the research perceive lower levels of fear of COVID-19. This change may be because compared to the first wave, the government has implemented strategies to combat the spread of the virus, including the development of vaccines, which the majority of the population has received (Rania et al., in press); additionally, there has been a reduction in the rate of mortality, as reported by the National Institute of Statistics (Istat, 2021). It has also emerged that the perception of fear of COVID-19, albeit at lower levels than before, is an emotional state that has overwhelmed the population regardless of gender, age, marital status, current working modes, and educational qualifications. However, regarding perceived mental wellbeing, while the participants show a lower mental wellbeing compared to the normative sample, no significant differences emerge from the data collected during the first wave of the pandemic. These data are significant as it highlights how the malaise has significantly increased during the pandemic, as highlighted by several studies (Ahmed et al., 2020; Casagrande et al., 2020; Ferrucci et al., 2020; Moccia et al., 2020; Tian et al., 2020; Wang et al., 2020a,b; Yang and Ma, 2020; Rania and Coppola, 2021), and that it also remained high 1 year later despite the various strategies implemented to counter the spread of the virus. Furthermore, while there are no differences regarding the perception of mental health related to age group and gender. This result differs from what was found by La Rosa et al. (2021), who report how the women participating in their research reported a higher level of traumatic stress than men. Significant differences emerged in relation to marital status: a difference emerged between those who are single and those who are married. The latter reported lower levels of mental illness than the former. This may be because living with a partner and family in general can be considered a source of fundamental support, especially in situations where relational dynamics are experienced in a positive and satisfying way (Li and Wang, 2020; Parisi et al., 2021), particularly during moments of great complexity (Pyari et al., 2012). Finally, differences also emerged regarding the mode of working during COVID-19. Those who continued to work without changes in the

mode reported a lower level of mental health than those who switched to smart working. This could be because the former felt less protected from a health perspective than those who were able to work from home; however, the most affected were those who lost their jobs during this emergency phase—they reported lower mental health scores. In fact, as highlighted in the literature, having a job has been described as a protective factor during the pandemic period (Li and Wang, 2020). Regarding the construct of loneliness, from the analysis of the results, it emerged that the perception of loneliness decreased significantly both when compared with the normative sample and when compared with data collected during the first wave of the pandemic. These results could be because following the imposed lockdown phase, the participants sought social activities in order to return to everyday life and cultivate their social relationships, which were significantly affected during the first phase of the pandemic, despite the availability of social networks.

Furthermore, from the results, it emerges that the youngest reported higher levels of loneliness, as also found by previous research (Li and Wang, 2020; Ruma et al., 2021), precisely because those most dedicated to activity were the most affected by the restrictions imposed. Finally, regarding marital status, the data show how single and divorced/separated were the most affected by loneliness; in fact, as also highlighted in the literature, the presence and support received from a family considerably influence the perceived level of loneliness (Rania and Coppola, 2021).

Regarding the positive attitude toward social distancing, the female participants reported a higher score than the women in the regulatory sample, showing a broader adherence to the restrictions imposed 1 year after their introduction into daily life. This result is in line with what emerged from the research conducted by An et al. (2021) and with the findings of a research conducted with a young population, which shows that women from a young age are more likely to adhere to the requests made by the authorities (Esposito et al., 2021).

Furthermore, contrary to what emerged from previous research (An et al., 2021), a general positive attitude toward social distancing emerges regardless of gender, marital status, current working modes, and educational qualifications. This attitude could be linked to the fact that the population has witnessed the deleterious effects

TABLE 9 | Correlations between the constructs investigated.

	1	2	3	4	5
1.UCLA_TOT	1	0.433**	-0.069	0.184**	0.136**
2.GHQ_TOT	0.433**	1	-0.063	0.074	0.178**
3.DIST_SOC_POS	-0.069	-0.063	1	-0.715**	0.161**
4.DIST_SOC_NEG	0.184**	0.074	-0.715**	1	-0.063
5.FEAR OF COVID-19 SCALE	0.136**	0.178**	0.161**	-0.063	1

**The correlation is significant at the 0.01 (two tailed) level.

of the pandemic, and this could have contributed to greater acceptance of the restrictions imposed. Finally, even with respect to this dimension, the elderly report more positive attitudes toward social distancing than the young, as also reported by previous research (An et al., 2021). This may be because the mortality rates caused by COVID-19 are higher among older people, who are more exposed to the risk of contracting the virus and its side effects (Onder et al., 2020). Regarding the negative attitude toward social distancing from the analysis of the results, it emerges that the men participating in the research obtained a lower score than the normative sample (from the first period of the pandemic). This could be because, over time, people have become accustomed to the imposed social distancing and have introjected this measure, perceiving it as a necessity to counter the spread of the virus. The results show that young people between 18 and 24 years old reported a higher score in this dimension than the elderly. This is probably because young people have been most socially affected by the health crisis, as founded by some research carried out in the era of COVID-19 (Cao et al., 2020; Li and Wang, 2020). Furthermore, as noted by Higuchi et al. (2020), staying at home has led to an excessive use of technologies in young people in particular. Furthermore, from the analysis of the correlations, there are positive correlations between the fear linked to COVID-19 and the perception of loneliness, mental health, and positive social distancing. In fact, the fear of COVID-19 leads to a favorable perception of social distancing to isolate oneself and consequently to perceive a low level of mental health. From the regression analysis, it emerges just how fear of COVID-19 and loneliness are predictors of perceived mental health, influencing people's wellbeing. In this regard, Soraci et al. (2020) report that during other epidemics, some authors found associations between disorders, such as anxiety and depression and fear, which compromised the quality of life (Ford et al., 2018; Huang and Zhao, 2020a, 2020b), and note that these associations also occur in the current epidemic due to social isolation, which had previously been shown to be strongly connected with anxiety and depression in both young and old individuals (Matthews et al., 2019; Santini et al., 2020).

CONCLUSION

This study focused mainly on analyzing the fear of COVID-19 and social distancing and the repercussions on mental wellbeing

TABLE 10 | Regression model: General health (GHQ-12) as dependent variable.

Variables*	B	SE	Beta	t	R ² _{Adj}
1.UCLA_TOT	0.810	0.079	0.417	10.27	
2.FEAR OF COVID-19 SCALE	0.492	0.164	0.122	3	0.199

*In this model, the negative and positive social distance variables have been included but excluded from the model.

and perceived loneliness by the participants. Although the study conducted represents an opportunity to illuminate the psychological consequences of the health crisis, there are limits that should be emphasized. The main limitation is due to the method of administration. While the online questionnaire made it possible to reach a larger number of participants, the lack of a predefined setting in which to dedicate themselves to completing it may have led the participants to provide careless answers (Ward et al., 2017). Furthermore, the use of the online questionnaire may have hindered the participation of some sections of the population less inclined to use technology. Moreover, although a large number of participants joined the research, it should be emphasized that there was an imbalance in participation in favor of women, as often happens in this type of research (Søgaard et al., 2004; Rania and Coppola, 2021); finally, while believing that this research helps to bring out the impact that COVID-19 has had on the mental health of the population, it should be emphasized that by not employing questions or exclusion criteria based on the presence of psychiatric or psychological comorbidities, it cannot be excluded that some participants may have previous psychological or psychiatric pathologies unknown to us. Despite these limitations, some strengths are represented by the fact that this research has made it possible to highlight how COVID-19 has led to nonnegligible psychological consequences even 1 year after the most critical phase; moreover, the large number of participants, who joined voluntarily and without any type of reward, made it possible to determine differences related to some sociodemographic variables analyzed, including age, marital status, and work modes. To conclude, the results emerging from this research should make policymakers reflect on the need to find containment strategies and tools for this pandemic or other health crises that have a limited impact on the sociopsychological wellbeing of the population.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the datasets generated for this study cannot be shared for ethical reasons related to privacy; however, the authors will attempt to make the data available for valid requests. Requests to access the datasets should be directed to NR, nadia.rania@unige.it.

ETHICS STATEMENT

Ethical review and approval was not required for the current study in accordance with the local legislation and institutional requirements. Research was carried out in accordance with the Ethics Research Recommendations of the American Psychological Association (APA) and in accordance with the Declaration of Helsinki. Participation was entirely voluntary, confidential and anonymous. The participants were informed that they were free to withdraw from the study at any time. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

NR: conceptualization, visualization, supervision, and project administration. NR and IC: methodology, formal analysis, investigation, data curation, writing—original draft preparation, and writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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Relationships Between Depressive Symptoms, Interpersonal Sensitivity and Social Support of Employees Before and During the COVID-19 Epidemic: A Cross-lag Study

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This study examined the correlation between depressive symptoms, interpersonal sensitivity, and social support before and during the COVID-19 pandemic and verified causal relationships among them. The study used Social Support Scale and Symptom Self-Rating Scale to investigate relevant variables. A total of 1,414 employees from company were recruited for this longitudinal study, which a follow up study was conducted on the same group of participants 1 year later. Paired sample *t*-test results showed that significant differences were only found in social support, not in depressive symptoms or interpersonal sensitivity. The results of correlation analysis showed that social support, depressive symptoms, and interpersonal sensitivity were significantly correlated between wave 1 and wave 2. The cross-lag autoregressive pathway showed that employees' social support level, depressive symptoms, and interpersonal sensitivity all showed moderate stability. Crossing paths showed that wave 1 social support could significantly predict wave 2 depressive symptoms ($\beta = -0.21, p < 0.001$) and wave 2 interpersonal sensitivity ($\beta = -0.21, p < 0.001$). Wave 1 depressive symptoms ($\beta = -0.10, p < 0.01$) could significantly predict wave 2 social support, while wave 1 interpersonal sensitivity ($\beta = 0.07, p = 0.10$) could not predict wave 2 social support. Social support can be considered as a protective factor against mental health problems.

Keywords: depressive symptoms, interpersonal sensitivity, social support, cross-lag, COVID-19

INTRODUCTION

Since the outbreak of COVID-19 in 2019, 1.9 million confirmed cases and more than 30,000 deaths have been reported globally as of 31 August 2020 (WHO, 2020). In order to prevent the spread of COVID-19, many countries have actively adopted to protective alienation measures, such as social isolation. Changes in lifestyle and limited transportation may cause negative emotions among residents and affect their mental health status (Lemanska et al., 2021). A meta-analysis conducted during the outbreak showed that the global prevalence of depression during COVID-19 was seven times (25.00%) higher than the estimated global prevalence of depression in 2017 (3.44%) (Bueno-Notivol et al., 2021). In some economically developed countries, sick leave due to mental

health problems, such as depressive symptom, has increased in recent years (Henderson et al., 2014). Employees suffering from depressive symptom were more likely to commit suicide (Lueck, 2019), violence (Choi et al., 2010), and other risky behaviors that may endanger social order and safety of citizens. On the other hand, the depressive symptoms of employees would lead to the decline of labor productivity and increase the labor production cost (Ammerman et al., 2016). According to the latest research of the World Health Organization, depressive symptom causes about 1 trillion US dollars of losses to the global economy every year (WHO, 2019). Depressive symptom is the most serious mental health problem affecting employees and businesses.

For majority of people, one third of their lifetime was spent in workplaces with their colleagues. According to Mayo's (Yin and Yin, 2012) theory of interpersonal relationships, workers will have certain informal circles, and such relationships can improve work efficiency and increase the sense of belonging. People with high level of interpersonal sensitivity tend to be more sensitive to other people's attitudes and opinions toward themselves (Bell and Freeman, 2014). When engage in interpersonal communications with colleagues, this type of people often have a sense of inferiority and discomfort, which could turn into social fear and self-doubt and led to low sociability (Derogatis and Melisaratos, 1983). The outbreak of COVID-19 causes people to have a strong sense of distrust, nervousness, and overreaction to people around them. People from affected areas will feel the panic and unfriendliness of people around them, and have no courage and confidence to socialize, which aggravates the level of interpersonal sensitivity of individuals (Su et al., 2020).

As a resource to protect physical and mental health, social support plays an important role in reducing depressive symptoms and interpersonal sensitivity. Social support is defined as any tool, information, and emotional support provided to an individual by a social network composed of family members, friends, and colleagues (Cohen, 2004). High quality of social support can not only provide protection for individuals during the epidemic, but also maintain good emotional experience networks for individuals (Bergeron et al., 2007). Studies have shown a correlation between depressive symptoms and low quality of family and peer support in employees during the epidemic (Suhail et al., 2021). At the same time, people with more social support and close relationships with family and friends were less likely to report depressive symptoms (Peirce et al., 2000).

As a personality trait, interpersonal sensitivity has been proved to be an unstable characteristic, and it is likely to be affected by any external factors (Mandel et al., 2018). In an investigation of the impact of social support on mental health, it was proposed that high level of family support and peer support could effectively promote the communication between individuals (Jibeen, 2016), enhance individual's self-esteem and ability to resist stress, and thus weaken individual's level of interpersonal sensitivity (Hicdurmaz and Oz, 2016). Similarly, the main-effect model emphasizes that social support is an independent predictor of individual mental health, and it can improve the adverse mental health status caused by interpersonal sensitivity even in the period of epidemic isolation (Dubois et al., 1994).

In conclusion, there are many cross-sectional studies on the relationship between social support and depressive symptoms at present, but there is a lack of research on the correlation between social support and interpersonal sensitivity, and few researchers have studied all three variables together. This study examines the causal relationship between depressive symptoms, interpersonal sensitivity, and social support with the longitudinal data gathered on the same sample group before and during the epidemic. Based on literature reviews, we propose two hypotheses. H1: the quality of social support of employees can predict subsequent depressive symptoms and interpersonal sensitivity; H2: Depressive symptoms and interpersonal sensitivity of employees can predict subsequent levels of social support.

MATERIALS AND METHODS

Participants

Cluster random sampling method was used to investigate the employees of a large company in Jilin Province of China. The survey was conducted twice: the first test (wave 1) was conducted in August 2019, and the second measurement (wave 2) was conducted a year later. Employees participated in the study belonged to different sections of the company, including the administrative department, the technical department, the marketing department, the production department, and the logistics department. In the pre-test, 1,650 employees completed the printed questionnaire, of which 51.2% were male and 48.8% were female. In the post-test, after excluded temporary employees, subjects with incomplete information and illogical answers, we used employee' ID card number to match the data from two times of data collection. In the end, the study obtained 1,414 sets of follow-up data, of which 49.4% were male employees and 50.6% were female employees, losing 236 subjects. The baseline data showed the study included 9.9% employees from the administrative department, 16.6% from the technical department, 36.8% from the marketing department, 29.5% from the production department, and 7.2% employees from the logistics department. Before the investigation, this study was approved by the relevant leaders of the company, orally agreed by the respondents, and approved by the Ethics Committee of School of Public Health, Jilin University.

Measurement

Social Support Scale

Social support was measured using the Social Support Scale compiled by Xiao (1994). The scale contains 10 items, which can be divided into three subcategories: objective support (three items), subjective support (four items), and support utilization (three items). For questions 1–4 and 8–10, a four-point Likert scale was adopted. For question 5, the total score was calculated from five items and each item was calculated from none to full support by 1–4 points, respectively. For question 6,7, if the answer “no sources” was 0 points, and if the answer “the following sources” was several points. The overall score for social support was calculated by adding the items together, and the higher the total score, the higher the level of social support.

The Cronbach's α coefficient measured before and after were 0.91 and 0.92, respectively.

Symptom Self-Rating Scale

The mental health status was measured by the Symptom Self-Rating Scale compiled by Derogatis et al. (1976), which included 10 subcategories of somatization, anxiety, depressive symptom, interpersonal sensitivity, obsessive symptoms, hostility, terror, paranoia, psychosis, and sleep. It consisted of 90 items, rated on a five-point Likert scale (1 = never 5 = often). The total score was calculated by adding the score of each item, with higher score reflecting poorer mental health, and a factor score of more than 2 meaning positive. The reliability and validity of this scale were well-demonstrated in the Chinese population (Zhou et al., 2021). Mental health status was measured using depressive symptom and interpersonal sensitivity subscales. The Cronbach's α coefficient measured before and after the two dimensions were 0.96, 0.97 and 0.94, 0.93, respectively.

Statistical Analyses

The data was imported into statistical analysis software SPSS 24.0 (IBM). After the data was processed by reverse question, validity test, and latent variable score calculation, descriptive analysis was conducted on the tested variables, and Pearson correlation analysis was used to investigate the internal relationship among the variables. Paired *t*-test was used to detect whether there was significant difference between the two measured data, and independent sample *t*-test was used to analyze gender difference on depressive symptom and interpersonal sensitivity during the epidemic. Structural equation modeling analysis was performed using AMOS 22.0 (IBM) to verify the cross-lag model. χ^2 statistical index and root-mean-square approximation error (RMSEA) were used as absolute fitting measures. Incremental fit index (IFI), Tucker-Lewis index (TLI) and goodness of fit index (GFI) were used as incremental fit indexes. Ratio of $\chi^2/\text{df} < 5$, RMSEA < 0.08 , IFI, TLI, and GFI values > 0.9 indicates that the model fits well.

RESULTS

Preliminary Analysis

Table 1 provided the descriptive statistics of participants. Table 2 displayed the means, SDs, and correlation coefficient of the variables. The wave 1 social support was negatively correlated with the depressive symptom and interpersonal sensitivity of wave 1 and wave 2, and significantly positively correlated with the wave 2 social support. Similarly, wave 2 social support was negatively correlated with depressive symptom and interpersonal sensitivity of wave 2 and wave 1. Demographic variables have a correlation relationship with research variables. A paired sample *t*-test of the scores from the first and second measures showed a significant difference in social support ($t = 6.03$, $p < 0.001$), the score of the second measurement was smaller than that of the first measurement. There was no significant difference between the pre and post measures of

TABLE 1 | Demographic characteristics of the participants ($N = 1,414$).

Variables	Category	N (%)
Gender	Female	698 (49.4)
wave 1, wave 2	Male	716 (50.6)
Department	Administrative department	140 (9.9)
(wave 1)	Technical section	235 (16.6)
	Marketing department	520 (36.8)
	Production department	417 (29.5)
	Logistics department	102 (7.2)
Department	Administrative department	123 (8.7)
(wave 2)	Technical section	242 (17.1)
	Marketing department	529 (37.4)
	Production department	409 (28.9)
	Logistics department	111 (7.9)

depression ($t = -1.13$, $p = 0.26$) and interpersonal sensitivity ($t = -0.10$, $p = 0.93$). During the COVID-19 pandemic, the detection rate of depressive symptoms and interpersonal sensitivity level among employees was 28.8% and 27.7%, respectively. Independent sample *t*-test results showed significant differences in depressive symptoms ($t = 9.85$, $p < 0.001$) and interpersonal sensitivity ($t = 10.15$, $p < 0.001$) between males and females during the pandemic, with higher levels of depression and interpersonal sensitivity in males than in females.

Cross-lag Model

Figure 1 showed the complete model of cross-lagged paths and autoregressive paths. The model used all the data of the measured variables. The results showed that the model has good fitting indicators ($\chi^2/\text{df} = 4.854$, RMSEA = 0.052, IFI = 0.998, TLI = 0.992, and GFI = 0.998). The autoregressive path analysis results of the same variable at different time points showed that the employee's social support showed high stability, with an autoregressive coefficient of 0.59. Interpersonal sensitivity and depressive symptom showed moderate stability at the two time points, with autoregressive coefficients ranging from 0.33 to 0.35. The results of cross regression path analysis showed that wave 1 social support has significant predictions for wave 2 depressive symptom ($\beta = -0.21$, $p < 0.001$) and wave 2 interpersonal sensitivity ($\beta = -0.21$, $p < 0.001$). Wave 1 interpersonal sensitivity ($\beta = 0.07$, $p = 0.10$) did not significantly predict wave 2 social support, but wave 1 depressive symptom ($\beta = -0.10$, $p < 0.01$) has a significant predictive effect on the wave 2 social support.

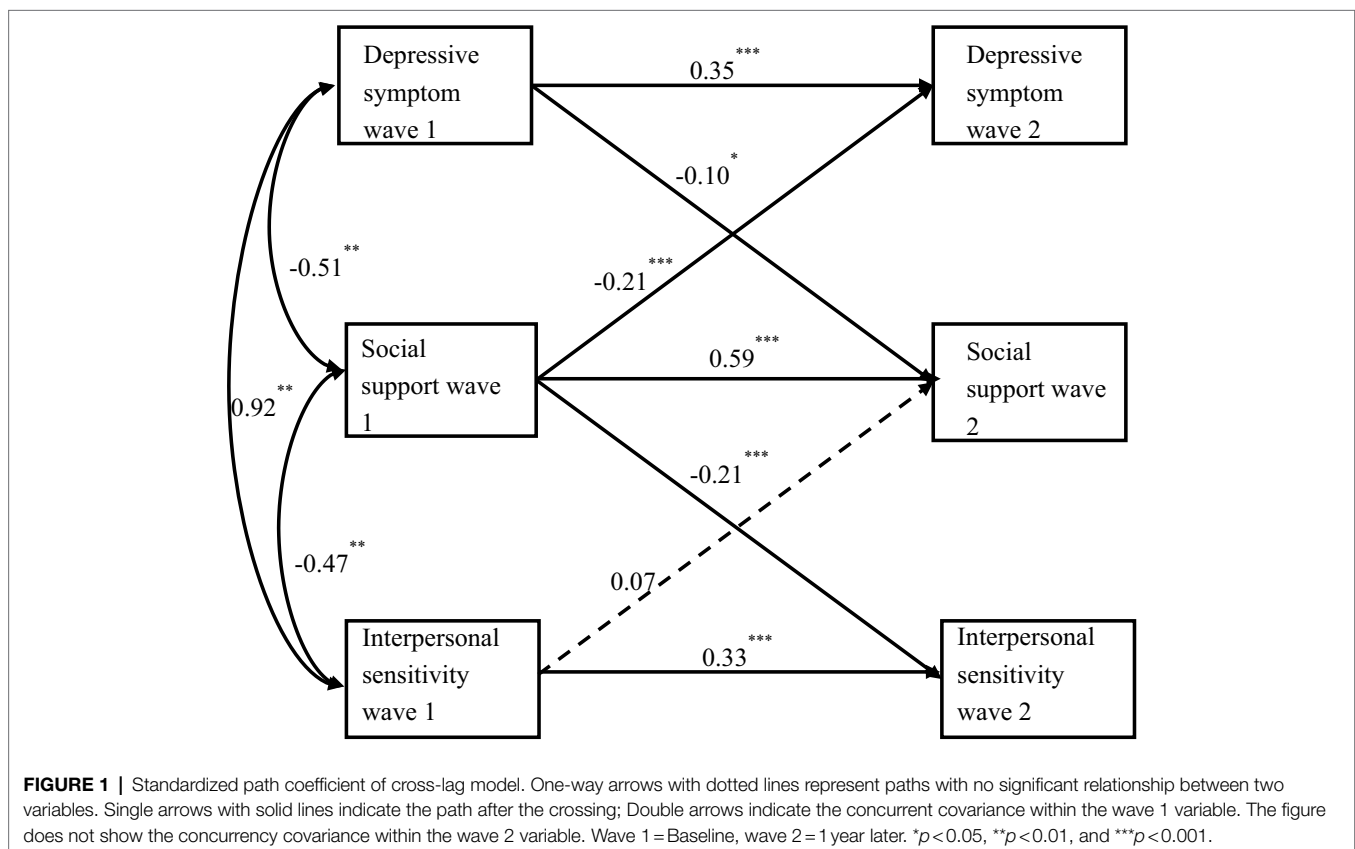
DISCUSSION

The study used two sets of data from a longitudinal study conducted in Jilin Province of China to explore the relationship between depressive symptoms, interpersonal sensitivity, and social support. Paired sample *t*-test was used to test whether there were differences between two sets of data, independent sample *t*-test was used to analyze gender differences on depressive symptom and interpersonal sensitivity during the epidemic, and cross-lag model was used to verify the mutual predictive effect among depressive symptoms, interpersonal sensitivity, and social support. The study found that there were significant differences in the level of social support

TABLE 2 | Bivariate correlations, means, and SDs of study variables.

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
Social support (wave 1)	41.77	10.49	1					
Social support (wave 2)	40.13	12.35	0.61**	1				
Interpersonal sensitivity (wave 1)	15.57	7.92	-0.47**	-0.32**	1			
Interpersonal sensitivity (wave 2)	15.59	8.17	-0.36**	-0.49**	0.46**	1		
Depressive symptom (wave 1)	23.17	11.87	-0.51**	-0.36**	0.92**	0.47**	1	
Depressive symptom (wave 2)	23.53	12.28	-0.39**	-0.52**	0.45**	0.94**	0.49**	1
Gender wave 1, wave 2			0.24**	0.34**	-0.22**	-0.26**	-0.21**	-0.25**
Department (wave 1)			-0.13**	-0.11**	0.08**	0.10**	0.09**	0.10**
Department (wave 2)			-0.13**	-0.12**	0.07**	0.08**	0.07**	0.08**

Wave 1 represents pre-test, wave 2 represents post-test. ** $p < 0.01$.



at both times point of measurement. However, the level of social support was lower during the epidemic compare to the time when epidemic did not occur, which was consistent with previous

researches (Savolainen et al., 2021). COVID-19 was a virus with high infectious rate and severe health consequences, which forced countries to deploy extreme measures to contain the spread.

When an employee needed help or comfort, his colleagues or friends, considering the current situation of the epidemic, can only offer support and encouragement online. Studies have shown that face-to-face communication and physical contact make people feel better than online greetings (Macias et al., 2013). As a result, individuals' perceived levels of social support were lower than they were before the pandemic. The research results showed that the detection rate of depression and interpersonal sensitivity during the epidemic was lower than other studies (Su et al., 2020). By the time of second data collection, the pandemic situation had been effectively controlled. The public has gained confidence in the government's rapid and effective prevention and control measures, they also gained a better understanding of health information about novel coronavirus pneumonia, and reduce the panic caused by misinterpretations. The state's strong control strategies and individual's correct perceptions reduced the psychological distress and improved the mental health of individuals.

There was no significant difference between depressive symptom and interpersonal sensitivity by paired sample *t*-test, and it was different from previous studies (Gallagher and Wetherell, 2020; Jiang, 2020). Possible reason was as follows, as of 31 August 2020, 138 cases of COVID-19 patient have been reported in Jilin Province, among which 136 cases have been cured and discharged (People, 2020). Since the outbreak of the new coronavirus in Jilin Province, good protective measures have been taken. The number of people infected by the new coronavirus was relatively small, and the stimulus-response theory (Jacoby, 2002) in psychology showed that the external environmental stimulus can significantly affect people's psychological behavior. The situation of COVID-19 infection in Jilin Province is far less than that in other provinces. This kind of stimulus in quantity will reduce public fear about the epidemic, and make people reclaim their calmness and have positive state of minds. Independent sample *t*-test results show significant gender differences in depressive symptoms and interpersonal sensitivity during the COVID-19 pandemic. More severe depressive symptoms and higher interpersonal sensitivity in men than women, which is different compared to other study results (Vloo et al., 2021). According to Chinese traditional gender roles and division of labor, men bear more economic responsibilities in the family, but the economic downturn caused by the epidemic and the implementation of layoff announced by many companies greatly increased the psychological pressure in men (Ren et al., 2020). Compared to women, men have more active and frequent social activities (Olaseni et al., 2020), but preventive measures like social isolation and family isolation limited these activities, causing men to feel more socially isolated, and negatively affected their mental health status. Studies have shown that men tend to reduce stress by addressing problems caused by stressors, while women turn to psychological adaptation (Liu et al., 2021). Under stay-at-home orders and social distance policy, men worried about their status of employment and social relationships, but have no solution to resolve the problem which caused more psychological distress.

It is found that wave 1 social support can predict wave 2 depressive symptom and wave 2 interpersonal sensitivity, the results validate hypothesis 1. This indicates that higher level of social support can reduce severity of depressive symptoms

and interpersonal sensitivity of individuals, which also confirms the protective effects of social support on individual's mental health status (Schug et al., 2021). As an important environmental resource (Thoits, 2011a), social support affects people's physical and mental health and behavioral patterns, and can effectively get help from their own support system, which is closely related to the control and prevention of depressive symptoms (Thoits, 2011b). During the COVID-19 pandemic, employees were exposed to multiple stressors (for example, the pressure of layoffs, the pressure of fear of infection), which increases the likelihood of individuals suffering from depression (Knolle et al., 2021). Social support can make individuals who were under pressure more easily obtain self-esteem and self-efficacy, enhance their coping ability and reduce the harm caused by stress, and resist the occurrence of negative emotions such as depressive symptom (Lee et al., 2014). A large number of studies have proved that social support has a buffer effect on pressure (Cohen and Wills, 1985; Yu et al., 2021). When employees suffered depressive symptoms caused by multiple pressures, understanding from family members, help from colleagues and friends can make employees feel warm and full of hope and expectation for life and the future. The existence of social support can effectively reduce the intensity of the relationship between stressful events and depressive symptoms, so as to prevent or reduce the possibility of depressive symptom.

A survey on employees' social support and interpersonal helping behaviors showed that mutual help among employees can reduce individuals' rejection of colleagues' interpersonal interference, enhance the trust and communication depth between them, and thus reduce the severity of interpersonal sensitivity (Horita and Otsuka, 2014). When employees have difficulties in interpersonal communication, support and tolerance from family and peers can help employees with sensitive interpersonal relationship to find confidence in interpersonal communication, be willing and take the initiative to conduct interpersonal communication, and then change the personality traits of sensitive interpersonal relationship. And good interpersonal relationship can make it easier for individuals to stimulate intrinsic motivation when facing setbacks and pressures, and seek effective ways to deal with challenges, thus effectively preventing the possible mental health problems of individuals.

The study demonstrated that wave 1 depressive symptom significantly predicted wave 2 social support, consistent with previous research (Tao and Li, 2003) and this result confirmed part of Hypothesis 2 employees with depressive symptoms will demonstrate low mood, dull thinking and reduced volitional activity. Consequentially, these individuals will have low self-evaluation, which can create the sense of uselessness and worthlessness in them. Employees begin to become careless about everything around them, avoid and refuse social communications and interactions. Research of Nakayama and Amagasa (2004) found that when an employee looks depressed, some people try to cheer him up, while others simply leave him alone and let him heal himself. Individuals' persistent depressive symptoms can erode the empathy and patience of those around them, reducing the social support that employees can receive. In addition, Beck's cognitive model of depression pointed out that depressed individuals

have cognitive biases, tend to ignore positive information and pay more attention to negative information, and negatively coded and interpreted events (Monsalve et al., 2021). Due to cognitive bias, depressed individuals interpret the help offered by family members or colleagues negatively and give relatively bad responses, which is manifested as the predictive negatively effect of employee depressive symptom on social support. Unlike previous studies (Lin, 2017), this study found that interpersonal sensitivity level from wave 1 did not significantly predict the low level of social support in wave 2. This outcome could be explained by the COVID-19 outbreak in 2019. The pneumonia epidemic forced employees to respond to the national policies like stay-at-home orders, which greatly limited the social contact and communication between People and their colleagues and friends. Even after return to work in 2020, companies took prevention measures, like allowed their employees to work from home and limited group activities at workplace etc. These measures limited the interaction and communication between employees. Interpersonal sensitivity is a type of personality trait, it is a psychological movement which can only be observed as a behavior pattern. When people have less opportunity to interact with each other, they will have less opportunity to observe other's behaviors, and the problem of strong interpersonal sensitivity cannot be shown. Thus, the influence of interpersonal sensitivity on the level of social support was limited.

LIMITATIONS

There were some limitations in this study. First, the depressive symptom and interpersonal sensitivity variables being investigated in this study were all came from the same source, the self-rating symptom scale. Therefore, there may be some deviation in the measurement of the real situation of the surveyor. Moreover, this study only studied the relationships between depressive symptom, interpersonal sensitivity, and social support variables, and lacked the investigation research on the internal influencing factors. Finally, data were collected from self-reported questionnaires, which may have social desirability bias.

CONCLUSION

This study provided longitudinal evidence of temporal interrelationship between depressive symptom, interpersonal sensitivity, and social support. The cross-lag model showed a dynamic relationship between the social supports that employees can receive and their mental health status over time. Social support was a reliable predictor of future individual depressive

symptoms and interpersonal sensitivity. Depressive symptom was an important predictor for social support, whereas, interpersonal sensitivity was considered not a predictor for social support. The results of this study can help clarify the different mechanisms among depressive symptom, interpersonal sensitivity, and social support, and help employees to realize the importance of social support in improving mental health.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because only this research group can carry out related research. Requests to access the datasets should be directed to YaH, hu_yuanchao@sohu.com.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of School of Public Health, Jilin University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SM: conceptualization, data curation, formal analysis, validation, writing—original draft, and writing—review and editing. CM and YeH conceptualization, data curation, and writing—review and editing. XG: conceptualization and writing—review and editing. JL, ZQ, LL, CL, RC, and JF: writing—review and editing. YaH conceptualization, data curation, funding acquisition, supervision, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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Perceived Concerns and Psychological Distress of Healthcare Workers Facing Three Early Stages of COVID-19 Pandemic

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Background: This study analyzed the difference in psychological distress of the healthcare workers in three different periods of the coronavirus disease 2019 (COVID-19) pandemic in Argentina. Specifically, from the third week of the mandatory quarantine through the two following weeks.

Methods: Analysis of the responses of 1,458 members of the health personnel was done on a questionnaire on healthcare workers concerns regarding the care of patients with coronavirus, indicators of depression, anxiety, intolerance of uncertainty, and coping.

Results: The psychological indicators that were considered presented differences between the evaluated periods. Perceived concerns about the possibility of infecting loved ones and infecting themselves were greatest in the periods after the onset of the pandemic. In addition, the perception of how the work environment worsened and how lack of sleep interfered with their work was also higher in periods 2 and 3. The same results were found in the indicators of depression, anxiety, and intolerance of uncertainty. Finally, the indicators of high tension and concurrent lack of emotional control, which was greater in the last periods evaluated, were also expressed in the coping strategies (showing emotional lability, only contained by hypercontrol).

Conclusion: The differences found in the psychological indicators between the evaluated periods support the need for early psychological care of health personnel which should be a priority of public health and a fundamental fact to increase its immediate effectiveness in the care of infected patients.

Keywords: healthcare workers, COVID-19, comparison of perceived concerns according to quarantine stage, psychological distress, mental wellbeing

INTRODUCTION

Mental health in disaster situations, like the current pandemic outbreak of coronavirus disease 2019 (COVID-19), has become an important field for the development of scientific knowledge to face the moments in which a large number of people have their lives severely affected by natural catastrophes and man-made catastrophes (Bolton and Tang, 2004; Silove and Steel, 2006). The impact of the disasters differs according to the type, speed, and scale of the catastrophe and to the social, historical, and cultural context in which they take place (Ozer et al., 2003; Porter and Haslam, 2005). However, disasters have some key elements in common. Particularly, the threat they represent to human survival and adaptation. Moreover, despite the cultural differences, individuals and communities manifest some universal patterns of psychosocial response (Green, 1996; Weiss et al., 2003). Therefore, when planning mental health initiatives after a disaster, it is important to optimize the emergent knowledge about these psychological reactions and how these shape the need for adequate mental health services (Silove, 2005).

In the present COVID-19 pandemic, several psychosocial issues with relevant consequences in terms of world mental health (including depression, anxiety, intolerance of uncertainty, and coping, among others) have progressively emerged throughout time while diseases continue spreading (Satici et al., 2020; Weibelzahl et al., 2021).

Depression is an emotional state that is habitually low, accompanied by the loss of the previous ability to enjoy and be interested in daily activities and things the person used to like and be interested in before the depression. It usually comes with irritability, extreme and persistent fatigue, sleep problems, changes in eating habits, difficulty in focusing and making decisions, and feelings of uselessness and blame. From a cognitive point of view, there is a negative way of thinking that is more or less generalized, regarding the self, others, the world, the future, the environment, and the people who surround them (Grinker et al., 1961; Beck and Bredemeier, 2016). The pandemic and its consequences—quarantine, social distancing, and self-isolation—increased loneliness and reduced social interactions, both of which are well-known risk factors for depression. Concerns about one's own health and that of the beloved ones, along with the uncertainty about the future, can generate or exacerbate fear and depression (Fiorillo and Gorwood, 2020).

Anxiety is a complex emotional response and a fruit of the interaction between individual factors and specific situations (Endler and Parker, 1992). It is expressed through a varying pattern of cognitive, physiological, and motor responses (Lang, 1968). Many specialists agree that experiencing low levels of anxiety is normal and even advisable because the processes that anxiety awakens in the central and peripheral nervous system keep the person alert to face any situation and prone to give an immediate response. However, the problem arises when anxiety is generalized, particularly when it becomes a daily part of a person's life and prevents them from feeling and doing things in a normal way. Apart from the predisposition, anxiety can increase when people face intense situations, strong traumas, or events that surpass their will or the resources to face them, as

what happened to healthcare professionals during the COVID-19 pandemic (Weibelzahl et al., 2021).

Intolerance of uncertainty has a strong impact on mental wellbeing in a pandemic setting. This is significantly mediated by rumination and fear (Satici et al., 2020; Weibelzahl et al., 2021). In its simplest form, uncertainty is a “psychological state of ‘not knowing’” (Kuang, 2017). More specifically, intolerance of uncertainty refers to the tendency to experience situations in which the result is yet unknown (but it is potentially known in the fullness of time as deeply aversive), independently from the valence of the result (Freeston et al., 1994). For Freeston et al. (2020), the coronavirus (COVID-19) is a new disease and an unprecedented challenge for healthcare workers and contemporary society in the broadest sense. Uncertainty distress, defined as “the subjective negative emotions experienced in response to the aspects of a given situation that are yet unknown,” is real and understandable, and the current methods of anxiety can only partially explain the level and the extent of the experienced anxiety. Rather than pathologizing anxiety in the context of a pandemic (Freeston et al., 1994, 2020) propose the concept of uncertainty distress as a normalizing model since it allows the understanding of the variety of factors they are dealing with and how anguish would be a reaction that evidence a normal response to an abnormal experience.

Finally, from a cognitive-behavioral perspective, coping consists of “constantly changing cognitive and behavioral efforts to manage external and/or internal demands that are appraised as taxing or exceeding the resources of a person” (Lazarus and Folkman, 1984, p. 141). Coping strategies point to dealing directly with the stressor (coping centered on the problem) or to regulating the emotions that emerge as a consequence of the stressful encounter (coping centered on the emotions) (Lazarus and Folkman, 1984). Moos and Billings (1982) added to the two general dimensions of Lazarus and Folkman the dimension of coping centered on the assessment. In general terms, coping centered on the emotion is considered to be dysfunctional and ineffective, while the less consistent effects, although generally positive, have been associated with coping centered on the problem (Folkman and Moskowitz, 2004; Taylor and Stanton, 2007; O'Driscoll et al., 2009). Boyd et al. (2009) also proved that coping centered on the emotion was associated with adverse results, such as increase of anxiety, emotional exhaustion, and dissatisfaction, while coping centered on the problem was associated with less emotional exhaustion. According to Folkman and Moskowitz (2004), the need for coping emerges in intensely emotional contexts, and an initial function of coping “is to downregulate negative emotions that are stressful in and of themselves and maybe interfering with instrumental forms of coping” (p. 747). The short-term adoption of coping strategies centered on the emotion may therefore be adaptive when the stressors are evaluated as uncontrollable and when there are insufficient resources, which allow people to amalgamate the necessary resources to participate in future coping strategies focused on the problem (Terry, 1994; Ben-Zur, 2009). Nonetheless, the sole and persistent dependency on coping strategies centered on the emotion or on strategies of avoidance for long periods is not considered beneficial. Behaviors of coping

centered on the emotion encourage the person to disconnect from the problem, which prevents new attempts to face it and minimally contributes to directly approaching the stressor (Semmer, 2006; Ben-Zur, 2009). However, Lazarus and Folkman (1984) suggest that no coping strategy is intrinsically efficient or inefficient. Instead, the effectiveness of a given coping strategy depends on how well it corresponds with the evaluations and the situational conditions (Cummings and Cooper, 1998; Folkman and Moskowitz, 2004; Dewe and Cooper, 2007). Therefore, the crucial components that determine the effectiveness of coping are the adjustment and the context (Biggs et al., 2017).

In this unprecedented crisis of COVID-19 pandemic, healthcare workers are a special group of risk, facing infected patients, being exposed to a context of unpredictable future, and potentially suffering all the psychosocial effects mentioned above in several degrees. There is evidence that shows that the healthcare workers involved in the treatment of patients with COVID-19 develop a series of perceived concerns and threats, such as the fear of contagion, of infecting their loved ones, of making wrong decisions due to sleep deprivation, of having to decide whom to attend and who not to attend, among others, which affect their psychological wellbeing (Lai et al., 2020; Richaud et al., 2021a,b). In an initial study performed during the third week of mandatory quarantine in Argentina and based on the answers of 809 members of the healthcare personnel dedicated to the patients with COVID-19, higher values in the indicators of depression, anxiety, intolerance of uncertainty, and development of dysfunctional coping strategies were observed (Richaud et al., 2021b).

Xiao et al. (2020) also conducted an observational study during the current COVID-19 pandemic with 180 health workers who provided direct assistance to patients with COVID-19 and found significant levels of anxiety and stress which had a negative influence on the worker's quality of sleep and self-efficacy (Xiao et al., 2020). It is important to highlight that in this study, those who informed to have a strong social support network had a lower level of stress and anxiety and had a higher level of self-efficacy. In another study that assessed the impact on mental health and the perceptions of psychological attention among medical and nursing personnel in China during the COVID-19 pandemic (Kang et al., 2020), a rise in the levels of psychological distress was detected, with both the exposure to infected people and the need of psychological assistance being identified as related factors. Although these healthcare workers had access to mental health facilities, though in a limited way, the personnel under distress identified these as important resources to alleviate acute disorders of mental health and improve their perceptions of physical health.

On the other hand, Leung et al. (2005) indicate that in studies performed in previous epidemics, the stability and temporary evolution of the psycho-behavioral responses to an outbreak remained undefined due to the exclusively transversal nature of those studies. Lee et al. (2007) provided information about the potential long-term negative psychological effects of infectious diseases. Based on the impact of the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak, their results showed that instead of decreasing with time, the stress levels were consistently

higher a year after the outbreak. The psychological state of the health personnel involved in the caring of patients with SARS was particularly worrying given its alteration in all the measures of stress and psychological distress as compared to the other non-health professional workers who survived the SARS. At the same time, Chan and Huak (2004) studied the psychological impact of SARS in 661 health workers of a regional hospital 2 months after the outbreak and found that 20% of all the participants presented indicators of post-traumatic stress and that many of them were still emotionally damaged and traumatized by the SARS outbreak.

Another aspect to take into account that could be affected by the passing of time and the perceived concerns and threats mentioned before, i.e., the increased values in the indicators of depression, anxiety, intolerance of uncertainty, and the use of dysfunctional coping strategies (Richaud et al., 2021b) is how it affects the worker's quality of life (QoL). Woon et al. (2021) found that COVID-19-related factors (e.g., stress from loss of daily routine and stress due to annual leave being frozen) and psychological complications (greater severity of depression and stress symptoms) contributed to the lowering of psychological QoL in accordance with previous studies (Çelmeçe and Menekay, 2020; Suryavanshi et al., 2020). Specifically, COVID-19 induced social functional impairment that is strongly associated with depression and poor psychological wellbeing (Dawel et al., 2020). This means that the greater severity of depression and stress predicted lower social relationship QoL (Dawel et al., 2020; Vafaei et al., 2020; Woon et al., 2021). In the opposite manner, QoL among healthcare workers was greater with the higher perceived social support received from friends and significant others (Woon et al., 2021).

With these records, it was considered to be important to analyze how the concerns and the indicators of mental health were different among the health personnel throughout the development of the pandemic in our country.

Therefore, the objective of the present study is to analyze the difference in the psychological distress of healthcare workers in three different stages of the COVID-19 pandemic (first period: April 7–14, second period: April 15–22, third period: April 23–30 of 2020, each lasting 24 days). These periods started after the third week of mandatory quarantine in Argentina, and in each of them, the level of exposure of the health personnel to a larger number of patients under treatment for COVID-19 increased. During this period of time, for several months, the mandatory lockdown of the whole country was absolute. It was forbidden to go out on the street except for basic purchases in nearby stores and the use of public transportation was only for essential workers. This aggravated the already poor economical situation, causing some sectors of the population to not have the means to afford basic necessities of life, such as food. In the meantime, the number of cases was increasing along with the death rates, although in a slower manner compared to other parts of the world. At this point, there were no specific treatments or vaccines for the virus. Hence, the fear of not having enough available hospitals, equipment, and healthcare workers to respond to the high demand was rising.

MATERIALS AND METHODS

Participants

The 1,458 participants of the sample were health personnel (doctors, nurses, physical therapists, biochemists, etc.) involved in the care of patients with COVID-19 from the 32 hospitals of the country. The participants were distributed according to the following regions and provinces: Cuyo (Mendoza, San Juan, San Luis), 115 (7.89%); North (NOA-NEA: Tucumán, Salta, Misiones, Chaco, Corrientes, Santiago del Estero, Jujuy, Formosa, Catamarca, La Rioja), 355 (24.35%); Center (Córdoba, Santa Fe, Entre Ríos), 378 (25.93%); Patagonia (Río Negro, Neuquén, Chubut, La Pampa, Santa Cruz, Tierra del Fuego), 91 (6.24%); and Buenos Aires (AMBA: province of Buenos Aires, Buenos Aires City), 519 (35.6%).

The data were collected through a digitalized questionnaire that was distributed through the online survey tool SurveyHero. We established contact with different health entities of the Argentine government, which allowed access to hospitals in the different provinces of the country. In addition, contact was made with directors of health centers in addition to the use of social networks such as health personnel Facebook groups, Twitter, Instagram, and WhatsApp. This was done to ensure a wider reach within the different provinces that integrate the Argentine Republic. In the cover of the questionnaire, a statement of agreement with an informed consent that was included was placed as a mandatory field to be completed. To protect the privacy of the subjects, the survey was conducted anonymously. The instruction specified that only healthcare workers dedicated to the treatment of patients with COVID-19 responded. In all cases, those patients were treated in isolated areas, ensuring that the health personnel did not treat patients with other pathologies. The questionnaire was answered by 1,458 healthcare workers, 1,159 (79.5%) of which are women and 299 are men, with a mean age of 41.58 ($SD = 10.41$). From the sample, 64.4% worked in state facilities, and 35.6% worked in private institutions. In addition, 630 people (43.2%) worked in the emergency room ($n = 218$, 15.0%); general hospitalization ($n = 255$, 17.5%); intensive care unit (ICU; $n = 133$, 9.1%); and 56.8% in other areas (kinesiology, radiology, laboratory, and ambulance).

The answers of the sample were divided into three periods of 8 days each on April 2020, which encompassed 38.4% of the participants in the first period (April 7–14), 25.4% in the second period (April 15–22), and 36.2% in the third period (April 23–30), respectively. It is important to highlight that this design includes three cross-sectional studies in three independent samples (1, 2, 3) with the following characteristics: size (Period 1: $n = 560$; Period 2: $n = 370$; Period 3: $n = 528$), age (Period 1: $M_{age} = 42.99$; Period 2: $M_{age} = 42.96$; Period 3: $M_{age} = 39.88$), and gender (Period 1: female = 81.4%; Period 2: female = 74.1%; Period 3: female = 81.9%). It was impossible to carry out a longitudinal study due to anonymous participation. Given the sensitive pandemic context in which the assessment was carried out, there was a risk that participants would fear being identified and judged negatively.

Instruments

A questionnaire was created with three sections (Richaud et al., 2021b):

- 1) Sociodemographic data.
- 2) 20 questions related to the concerns of the health personnel regarding the coping of patients with coronavirus extracted from the preliminary interviews and statements given by the health personnel. Due to the pandemic, the interviews were conducted through video calls. We inquired about the main concerns that health professionals had about the pandemic. Subsequently, the responses were transcribed, analyzed, and categorized by 6 expert psychologists. Then, those that had appeared more frequently among the participants were selected. Some of these stressors matched others mentioned in preceding studies (Tan et al., 2020; Windarwati et al., 2021).

The selected questions were as follows:

- a) Answered Never/Almost never, Rarely, Often, Always/Almost always:
Are you worried about the possibility of being infected by COVID-19?
Are you worried about the possibility of infecting your loved ones?
Do you feel stigmatized?
Do you fear having to decide at some point whom to attend and who not to attend?
If so, do you participate in one?
- b) Answered Yes, No:
Does exhaustion interfere with your work?
Did the work environment change with the onset of the pandemic?
If it changed, did it worsen?
Is there a group of support for the health personnel at your workplace?
Do you believe that counting on mental health personnel who supports you would help you cope with your concerns?
Do you have adequate equipment?

Following the guidelines proposed by the World Health Organization (2020), “adequate equipment” is considered to be personal protective equipment that constitutes the most effective preventive measure as a strategy to avoid the transmission of COVID-19. This equipment consists of the following supplies: medical and self-filtering masks, medical gowns, eye-protection glasses, face shields, and gloves (World Health Organization, 2020).

- 3) Questions that referred to depression, anxiety, intolerance of uncertainty, and coping were taken from the short versions (Richaud et al., 2021b) of: (a) the Argentine adaptation of the Beck Depression Inventory (BDI) Questionnaire (Richaud de Minzi and Sacchi, 2001a,b) the Argentine adaptation of the Anxiety Traits and Situations Inventory (ISRA) (Richaud de Minzi and Sacchi, 1995); (c)

the Argentine adaptation of the Intolerance of Uncertainty test (IUS) (Rodríguez, de Behrends and Brenlla, 2015); and (d) the Argentine adaptation of the Ways of Coping Questionnaire (WCQ) (Richaud de Minzi and Sacchi, 2001b). The questions regarding coping specifically referred to the stressor of caring for patients with COVID-19. All the items were presented to be answered using a Likert scale of 4 points, with (1) being Almost never/Never, and (4) being Almost always/Always (Richaud et al., 2021b).

The Cronbach alphas for this study samples were the following: depression, 0.70; anxiety, 0.82; intolerance of uncertainty, 0.80; and coping, 0.70.

Ethical Procedure

The project and questionnaire had the endorsement of the Research Ethics Committee of the Faculty of Health Sciences of the Adventist University of Plata, with No. CE000237 of the National Registry of Research in Health and N° 3999 of Ministerial Resolution of the Ministry of Health of the Province of Entre Ríos, Argentina, Resolution 1.4/2020.

The informed consent was approved by the Research Ethics Committee, created by the ministerial resolution 1002/16 and by the Personal Data Protection Law 25.326.

Statistical Analysis

The following descriptive measures were calculated: percentages, arithmetic means, standard deviations, skewness, and kurtosis. Questions regarding concerns and fears were re-categorized into Yes (Never/Rarely, Few times) and No (Always/Almost always, Many times). Chi-square (X^2) tests were carried out to study the association between the period and the different fears and worries. Multivariate ANOVAs (MANOVAs) for non-repeated measures were conducted (F Hotelling for the general differences and univariate F for the differences in each variable) to analyze the influence of the different concerns in the indicators of depression, anxiety, intolerance of uncertainty, and coping. For all the statistical calculations, the SPSS.24 statistical package was used.

RESULTS

Preliminary Analysis

The skewness and kurtosis values did not exceed the numbers of ± 1.5 recommended for parametric analysis in any variable (Muthen and Kaplan, 1992; Forero et al., 2009). First, we had to analyze whether there was a difference in the indicators of depression, anxiety, intolerance of uncertainty, and coping among health professionals who worked in different areas (emergency room, general hospitalization, ICU, kinesiology, radiology, laboratory, and ambulances) while controlling all three periods. Results indicated that there were no differences between the indicators based on the work area of the health professionals included in the study [indicators of depression, F Hotelling (16, 5,766) = 1.47, $p = 0.10$; indicators of anxiety,

F Hotelling (24, 5,762) = 1.18, $p = 0.25$; indicators of intolerance of uncertainty, F Hotelling (12, 4,431) = 1.13, $p = 0.33$; and indicators of coping, F Hotelling (32, 5,698) = 0.92, $p = 0.60$]. Since no statistically significant differences were found, successive analyzes were carried out with the total study sample without discriminating the work area.

Main Results

The obtained results are presented by drawing from an analysis of the responses that were considered more relevant to the objectives of the study and the indicators of depression, anxiety, intolerance of uncertainty, and coping, according to each period, throughout the time of recording.

Fear of Being Infected by the COVID-19

The fear of getting infected was significantly associated with each period [$X^2(2) = 9.33$; $p = 0.009$], especially in the third period (Table 1), as shown by values going from the 64.5% of participants in the first period to the 71% in the third one.

Concern About Infecting Family and Friends

The fear of infecting their loved ones showed significant association with each period [$X^2(2) = 11.03$; $p = 0.004$], especially during the third period (Table 1), with values going from 83 to 90% of the participants.

Availability of Adequate Equipment

Table 1 also shows that 63.2% of the participants answered that they did not have the appropriate equipment. It is observed that this percentage remains similar throughout the three periods [$X^2(2) = 2.71$; $p = 0.26$], although it somehow decreases in the third period.

Perception of Stigmatization

As seen in Table 1, only 15% of the participants perceived stigmatization. This percentage remains similar throughout the three periods [$X^2(2) = 1.75$; $p = 0.42$].

Fear of Having to Decide Who to Attend and Who Not to Attend

Table 1 also shows that 37% of the participants expressed fear of having to decide who to attend and who not to attend. This percentage remains unchanged throughout the three periods [$X^2(2) = 2.38$; $p = 0.30$].

Interference of Exhaustion at Work

It is observed that 72.4% of the participants expressed interference from exhaustion at work, with a significant difference [$X^2(2) = 20.96$; $p = 0.001$] ranging from 66.8% in the first period to 79.2% in the third (Table 1).

Perception of Differences in the Work Environment

As seen in Table 1, 93.6% of the participants perceived differences in the work environment with a significant association to the three periods [$X^2(2) = 12.20$; $p = 0.002$], as shown by values reaching 96.4% in the last period.

TABLE 1 | Relationship between period and concerns, interference of exhaustion at work, change in work environment, and existence of a psychological support group.

	Period 1		Period 2		Period 3		Total		
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>p</i>
Fear of contagion									
Yes	360	(64.5)	225	(61.1)	372	(70.6)	957	(65.9)	0.009
No	198	(35.5)	143	(38.9)	155	(29.4)	496	(34.1)	
Total	558	(100)	368	(100)	527	(100)	1,453	(100)	
Fear of infecting									
Yes	464	(83.2)	312	(84.8)	474	(89.9)	1,250	(86.0)	0.004
No	94	(16.8)	56	(15.2)	53	(10.01)	203	(14.0)	
Total	558	(100)	368	(100)	527	(100)	1,453	(100)	
Protection equipment									
Yes	196	(38.4)	131	(41.7)	209	(39.3)	536	(36.9)	0.259
No	362	(64.9)	236	(64.3)	318	(60.3)	916	(63.19)	
Total	558	(100)	367	(100)	527	(100)	1,452	(100)	
Stigmatization									
Yes	76	(13.6)	55	(15.0)	87	(16.4)	218	(15.0)	0.420
No	483	(86.4)	312	(85.0)	442	(83.6)	1,237	(85.4)	
Total	559	(100)	367	(100)	529	(100)	1,455	(100)	
Fear of decision									
Yes	204	(36.6)	123	(33.6)	203	(38.7)	530	(36.6)	0.304
No	354	(63.4)	243	(66.4)	322	(61.3)	919	(63.4)	
Total	558	(100)	366	(100)	525	(100)	1,449	(100)	
Exhaustion at work									
Yes	373	(66.8)	263	(71.3)	418	(79.2)	1,054	(72.4)	0.000
No	185	(33.2)	106	(28.7)	110	(20.8)	401	(27.6)	
Total	558	(100)	369	(100)	528	(100)	1,455	(100)	
Change in work environment									
Yes	511	(91.1)	345	(93.2)	511	(96.4)	1,367	(93.6)	0.002
No	50	(8.9)	25	(6.8)	19	(3.6)	94	(6.4)	
Total	561	(100)	370	(100)	530	(100)	1,461	(100)	
Way of change									
Got worse	379	(67.6)	266	(71.9)	421	(79.4)	1,066	(80.5)	0.000
Got better	130	(23.2)	71	(19.2)	84	(15.8)	285	(19.5)	
Total	561	(100)	370	(100)	530	(100)	1,461	(100)	
Support to the health workers									
Yes	167	(29.9)	103	(28.0)	188	(35.7)	458	(31.5)	0.009
No	391	(70.1)	265	(72.0)	338	(64.3)	994	(68.5)	
Total	558	(100)	368	(100)	526	(100)	1,452	(100)	
Participation in a support group									
Yes	65	(23.6)	52	(30.6)	49	(19.4)	166	(23.8)	0.029
No	210	(76.4)	118	(69.4)	204	(80.6)	531	(76.2)	
Total	275	(100)	170	(100)	253	(100)	697	(100)	
Belief in the help of a support group									
Yes	404	(77.8)	257	(77.6)	378	(79.4)	1,039	(78.4)	0.797
No	115	(22.2)	74	(22.4)	98	(20.6)	287	(21.6)	
Total	519	(100)	331	(100)	476	(100)	1,326	(100)	

Bold values highlight significant differences between periods.

Perception of Worsening of Work Environment

Table 1 also shows that 80% of the participants perceived that their work environment worsened. In addition, it is observed that the percentage associated to the worsening had a significant difference [$X^2(4) = 21.64$; $p = 0.001$], with values increasing from 67.6% in the first period to 79.4% in the third.

Existence of and Participation in a Psychological Support Group in the Workplace

As shown in Table 1, 68.5% of the participants expressed no support or containment group for the health personnel at their workplace. At the same time, it is observed that there was a significant difference in the existence of psychological support

groups [$X^2(2) = 13.55$; $p = 0.01$], especially between the first and third periods.

In the question “If so, do you participate in one?” only 24% said that they do it generally, while, in turn, a significant difference of this involvement is observed, going from 24 to 19% as time advances. Although there had been an increase in the number of available groups of psychological support, in the different groups corresponding to each period, the involvement in those support groups significantly decreases [$X^2(2) = 7.06$; $p = 0.03$] (Table 1). At the same time, given that this 24% refers to the 32% who answered that they have a support group, only 8% of the total sample participates in these groups.

When asked “If you do not receive any support, do you believe that counting on mental health personnel (psychologist, psychiatrist) who listens to you and supports you would help you cope with your concerns?” 78% answered positively, without showing significant differences over the periods [$X^2(2) = 0.49$; $p = 0.78$] (Table 1). Once again, it seems curious that if 78% believe they need support, only 8% are receiving said help.

Differences in the Indicators of Depression, Anxiety, Intolerance of Uncertainty, and Coping Strategies Between Groups of Healthcare Workers in the Three Stages

Depression

As the time of exposure advanced, there were differences in all the indicators of depression [$F_{\text{Hotelling}}(8, 2,896) = 14.62$; $p < 0.001$], especially between the groups of the first and the third period and between those of the second and the third, with increased values in *I am more irritated than before* and *I feel sad*. However, the most noticeable one is *I do not sleep as well as before*, which reaches a mean value of 2.85 in the third period (Table 2).

In terms of percentage, irritability goes from 34 to 53% [$X^2(2) = 40.68$; $p < 0.001$] and sleep disorders from 43% in the group of the first period to 67% in that of the third [$X^2(2) = 65.34$; $p < 0.001$] (Table 3).

Anxiety

In the case of anxiety, there was a significant difference in the value of all its indicators [$F_{\text{Hotelling}}(12, 2,894) = 9.17$; $p < 0.001$], reaching scores that are especially high in the group of the third period for the indicators *I feel scared*, *I cry*, or *am moved easily* (lack of emotional control) and particularly *My body is tense* (alertness), which reaches a mean value of 2.97 (see Table 2) and, in terms of a percentage, goes from 53 to 73% [$X^2(2) = 52.58$; $p < 0.001$] (Table 3).

Intolerance of Uncertainty

In the case of intolerance of uncertainty, as the time of exposure advanced, there was also a significant difference among the healthcare groups in all the indicators [$F_{\text{Hotelling}}(6, 2,900) = 8.94$; $p < 0.001$], with the indicators *Unexpected circumstances bother me a lot* and *I feel that even with the best*

planning, a small detail could ruin it all reaching especially high values (Table 2).

Coping Strategies

In the case of coping strategies for which the analysis is different, given that its functionality depends or not on the total profile of strategies, significant differences were also found [$F_{\text{Hotelling}}(16, 2,862) = 6.92$; $p = 0.001$]. It is observed that the strategy *I focus exclusively on what I have to do, step by step*, has kept increased but constant values throughout the periods. A similar trend was also observed in the strategy *I propose a different solution when the protocol fails*, which had significantly different values in the three periods, reaching a maximum value in the third period. This indicated an exclusive focus on solving the problem concerning their job. At the same time, a significant difference in the strategy *I try to bring something positive out of the situation* was observed. Furthermore, there was a significant difference between the three groups in *I burst out over anything* (lack of emotional control), which had been observed in one of the indicators of anxiety and a very high level of emotional control, which remained the same throughout the three periods (Table 2).

Relationship Between Gender and the Indicators of Depression, Anxiety, Intolerance of Uncertainty, and Coping Strategies Throughout the Three Periods Assessed

Since there were more women ($n = 1,159$) than men ($n = 294$), a subsample was randomly extracted from the sample of women. In each period and in proportion to the sample of men, three subsamples of women were extracted: Period 1 $N_{\text{males}} = 103$, $N_{\text{females}} = 193$; Period 2 $N_{\text{males}} = 95$, $N_{\text{females}} = 128$; Period 3 $N_{\text{males}} = 95$, $N_{\text{females}} = 126$. The total N of the subsample of females was 447 so that the size of the women sample and the men sample would be similar. From the comparison by gender, it shows that women obtained, in general, significantly higher values than men in all indicators of depression [$F_{\text{Hotelling}}(8, 1,458) = 4.06$; $p < 0.001$; $F_{\text{Hotelling}}(12, 1,458) = 5.42$; $p < 0.001$]. However, in the case of *I feel sad*, women obtained significantly higher values than men in the first period. Despite this, this distance became smaller until it disappeared in the third period [$F_{\text{Hotelling}}(12, 2,186) = 1.82$; $p < 0.040$], in which men obtained a slightly higher value than women (Table 4).

Regarding **anxiety**, women showed values that were significantly higher than in men [$F_{\text{Hotelling}}(18, 2,180) = 7.96$; $p < 0.001$], but over time, the indicators of anxiety showed significant differences both for women and men [$F_{\text{Hotelling}}(12, 1,454) = 4.33$; $p < 0.001$]. Particularly, the statement *My body is tense* reached especially high values in the third period in both genders. On the other hand, the statement *I cry or am moved easily* also reached high values in women in the third period [$F_{\text{Hotelling}}(18, 2,180) = 1.82$; $p < 0.052$] (Table 4).

Regarding **intolerance of uncertainty**, as compared to men, women obtained higher values in all the indicators [$F_{\text{Hotelling}}(6, 1,460) = 3.00$; $p < 0.006$] in all periods [$F_{\text{Hotelling}}(6,$

TABLE 2 | Differences in indicators of depression, anxiety, intolerance of uncertainty, and coping between periods.

Items	Period 1		Period 2		Period 3		F
	M	SD	M	SD	M	SD	
Depression							
I am more irritated than before	2.19 ^a	0.03	2.34 ^b	0.04	2.54 ^c	0.04	24.14***
I feel sad	2.34 ^a	0.03	2.37 ^a	0.04	2.64 ^b	0.04	20.42***
I do not sleep as well as before	2.29 ^a	0.04	2.45 ^a	0.05	2.85 ^b	0.04	47.41***
I feel guilty when I am resting	1.71 ^a	0.04	1.82 ^a	0.05	2.02 ^b	0.04	15.46***
Anxiety							
I feel insecure	2.16 ^a	0.04	2.29 ^a	0.05	2.47 ^b	0.04	16.69***
I feel scared	2.36 ^a	0.04	2.32 ^a	0.05	2.65 ^b	0.04	20.92***
I feel discomfort in my stomach	1.87 ^a	0.04	1.88 ^a	0.05	2.27 ^b	0.04	28.70***
My body is tense	2.51 ^a	0.04	2.56 ^a	0.05	2.97 ^b	0.04	42.71***
I cry or moved easily	2.38 ^a	0.04	2.40 ^a	0.05	2.69 ^b	0.04	15.97***
I move and do things without and end in themselves	1.87 ^a	0.04	1.89 ^a	0.05	2.13 ^b	0.04	14.9***
Intolerance of uncertainty							
I cannot be at peace if I do not know what will happen tomorrow	2.17 ^a	0.04	2.19 ^a	0.05	2.5 ^b	0.04	19.18***
Unexpected events bother me a lot	2.43 ^a	0.04	2.51 ^a	0.05	2.72 ^b	0.04	15.10***
I feel that even with the best planning, a small detail could ruin it all	2.31 ^a	0.04	2.38 ^a	0.05	2.65 ^b	0.04	19.62***
Coping							
I focus exclusively in what I have to do, step by step	3.31	0.03	3.34	0.04	3.38	0.03	1.19
I propose a different solution when the protocol fails	2.74 ^a	0.03	2.91 ^b	0.04	3.00 ^{bc}	0.04	13.40***
I speak to someone who can help me when the situation overwhelms me	2.94	0.03	3.18	0.04	3.05	0.04	9.20***
I try to bring something positive out of the situation	3.15 ^a	0.03	3.20 ^a	0.04	3.01 ^b	0.03	6.97**
I try not to think about what is happening	2.24 ^a	0.04	2.28 ^a	0.05	2.09 ^b	0.04	5.85**
I accept it since there is nothing I can do about it	2.62 ^a	0.04	2.62 ^a	0.05	2.47 ^b	0.04	4.72**
I burst out over anything	1.88 ^a	0.04	1.99 ^a	0.04	2.20 ^b	0.04	19.83***
I try to control my emotions	3.05	0.04	3.07	0.03	3.02	0.04	0.60

The means with different subscripts indicate between which groups the significant differences are observed. (** $p \leq 0.01$; *** $p \leq 0.001$).

TABLE 3 | Relationship between period and percentage of irritability, sleep disorders, and body tension.

	Period 1		Period 2		Period 3		Total		p
	n	(%)	n	(%)	n	(%)	n	(%)	
Irritability									
Yes	192	(34.4)	148	(40.0)	282	(53.5)	622	(42.7)	0.002
No	366	(65.6)	222	(60.0)	245	(46.5)	833	(57.3)	
Total	558	(100)	370	(100)	527	(100)	1,455	(100)	
Sleep disorders									
Yes	238	(42.7)	182	(49.2)	352	(66.7)	772	(53.1)	0.000
No	319	(35.5)	188	(38.9)	176	(33.3)	683	(46.09)	
Total	557	(100)	370	(100)	528	(100)	1,455	(100)	
Body tension									
Yes	294	(52.7)	204	(55.3)	385	(72.9)	883	(60.7)	0.000
No	264	(47.3)	165	(44.7)	143	(27.1)	572	(39.3)	
Total	558	(100)	369	(100)	528	(100)	1,455	(100)	

Bold values highlight significant differences between periods.

1,460) = 1.93; $p < 0.072$] (Table 4). In this case, the values also reached high scores over time in both genders, with the statement *Unexpected events bother me a lot* and *I feel that even with the best planning a small unexpected event might ruin it all* being especially higher in the third period.

Finally, regarding **coping**, the most important differences were found in the statement *I try to control my emotions*, in which men

obtained significantly higher values than women, and *I burst over anything*, where women obtained higher values. Strict control of emotions was found to be coping strategy that was most frequently used, although it was somehow weaker in women, who, according to the data, lost it more easily [$F_{\text{Hotelling}}(16, 1,436) = 1.64$; $p < 0.050$; $F_{\text{Hotelling}}(24, 2,153) = 3.63$; $p < 0.001$] (Table 4).

TABLE 4 | Differences in indicators of depression, anxiety, intolerance to uncertainty, and coping according to gender and period.

	Period 1				Period 2				Period 3					
Variables	M Female	SD Female	M Male	SD Male	M Female	SD Female	M Male	SD Male	M Female	SD Female	M Male	SD Female	F gender (3,726)	F period (2,726)
Depression														
I am more irritated than before	2.27	0.06	1.87	0.08	2.33	0.07	2.27	0.08	2.44	0.07	1.89	0.08	2.55	12.12***
I feel sad	2.42	0.06	1.89	0.08	2.42	0.07	2.09	0.08	2.50	0.07	2.37	0.09	13.71***	4.71**
I do not sleep as well as before	2.33	0.07	2.01	0.09	2.41	0.08	2.36	0.10	2.75	0.09	2.55	0.10	4.05*	12.05***
I feel guilty when I am resting	1.73	0.06	1.42	0.09	1.82	0.08	1.65	0.09	1.97	0.08	1.81	0.09	5.12**	6.32**
Anxiety														
I feel insecure	2.20	0.07	1.81	0.09	2.44	0.08	1.93	0.09	2.40	0.08	2.16	0.09	11.40***	5.27**
I feel scared	2.46	0.06	2.03	0.09	2.40	0.08	1.96	0.09	2.54	0.08	2.27	0.09	11.72***	2.83*
I feel discomfort in my stomach	1.92	0.07	1.57	0.09	1.98	0.08	1.67	0.09	2.36	0.08	1.86	0.09	11.34***	5.12**
My body is tense	2.59	0.07	2.09	0.09	2.62	0.08	2.41	0.09	2.87	0.08	2.55	0.09	10.22***	8.31***
I cry or moved easily	2.49	0.07	1.55	0.09	2.57	0.08	1.97	0.09	2.70	0.08	1.91	0.09	42.01***	7.65**
I move and do things without and end in themselves	1.89	0.06	1.60	0.08	1.96	0.08	1.74	0.09	2.20	0.08	1.95	0.09	6.12***	6.04**
Intolerance of uncertainty														
I cannot be at peace if I do not know what will happen tomorrow	2.17	0.07	1.92	0.09	2.26	0.08	1.97	0.10	2.40	0.08	2.10	0.10	8.47***	1.870
Unexpected events bother me a lot	2.44	0.07	2.29	0.09	2.50	0.08	2.48	0.10	2.60	0.08	2.47	0.10	1.11	3.138*
I feel that even with the best planning, a small detail could ruin it all	2.31	0.07	2.11	0.09	2.37	0.08	2.28	0.10	2.58	0.08	2.47	0.10	1.74	5.062**
Coping														
I focus exclusively in what I have to do, step by step	3.31	0.06	3.32	0.07	3.35	0.07	3.36	0.08	3.36	0.07	3.38	0.08	3.57*	0.48
I propose a different solution when the protocol fails	2.74	0.06	2.75	0.08	2.96	0.08	2.86	0.09	2.94	0.08	2.96	0.09	0.45	4.06*
I speak to someone who can help me when the situation overwhelms me	2.89	0.06	2.84	0.08	3.26	0.07	3.09	0.09	2.98	0.08	3.09	0.09	3.19*	5.35**
I try to bring something positive out of the situation	3.04	0.06	3.28	0.08	3.17	0.07	3.23	0.08	3.07	0.07	3.05	0.08	1.76	0.37
I try not to think about what is happening	2.22	0.07	2.21	0.09	2.28	0.08	2.22	0.09	2.09	0.08	2.05	0.09	2.17	0.81
I accept it since there is nothing I can do about it	2.22	0.07	2.21	0.09	2.28	0.08	2.22	0.09	2.09	0.08	2.05	0.09	2.17	0.81
I burst out over anything	2.62	0.08	2.59	0.09	2.62	0.08	2.63	0.09	2.40	0.08	2.52	0.09	1.21	0.11
I try to control my emotions	2.96	0.06	3.10	0.08	3.14	0.07	3.11	0.08	2.98	0.07	3.12	0.08	3.19*	0.47

Multivariate Analysis Depression: Period $F_{\text{Hotelling}}$ (8, 1,460) = 5.42; $p < 0.001$, Gender $F_{\text{Hotelling}}$ (8, 1,458) = 4.06; $p < 0.001$, Gender by period $F_{\text{Hotelling}}$ (12, 2,186) = 1.82; $p = 0.040$; Multivariate Analysis Anxiety: Period $F_{\text{Hotelling}}$ (12, 1,454) = 4.33; $p < 0.001$, Gender $F_{\text{Hotelling}}$ (18, 2,180) = 7.94; $p < 0.001$, Gender by Period $F_{\text{Hotelling}}$ (18, 2,180) = 1.60; $p = 0.052$; Multivariate Analysis Intolerance of uncertainty: Period $F_{\text{Hotelling}}$ (6, 1,460) = 1.93; $p = 0.072$, Gender $F_{\text{Hotelling}}$ (6, 1,460) = 3.001; $p = 0.006$, Gender by Period $F_{\text{Hotelling}}$ (9, 2,189) = 473; $p = 0.893$; Multivariate Analysis Coping: Period $F_{\text{Hotelling}}$ (16, 1,436) = 1.64; $p = 0.052$, Gender $F_{\text{Hotelling}}$ (24, 2,153) = 3.63; $p < 0.001$, Gender by Period $F_{\text{Hotelling}}$ (24, 2,153) = 0.565; $p = 0.956$. (* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$).

DISCUSSION

As mentioned above, in a previous study we conducted during the third week of the mandatory quarantine, a preliminary diagnosis was carried out regarding how affected the psychological wellbeing of the health personnel dedicated to the attention of patients with COVID-19 was (Richaud et al., 2021b). In all the cases, it was found that health personnel dedicated to the treatment of patients with COVID-19 presented higher values in the rates of **depression**, **anxiety**, and **intolerance of uncertainty** and informed **dysfunctional coping strategies**, whether through lack of control or avoidance.

The present study analyzed the difference in the psychological situation of three groups of healthcare workers from the third week of the mandatory quarantine in Argentina (first group/period) and through the two following weeks. Based on the responses of 1,458 health workers in public and private environments from the entire country, from different professions, and attending in various areas, the differences in the indicators of psychological distress were analyzed corresponding to what these workers mentioned during the 3-week period. The **main conclusions** are the following:

1-Regarding the **threats to the psychological wellbeing** of the health personnel involved in the attention of patients with coronavirus, the principal concern was the possibility of infecting their loved ones, followed by the concern of infecting themselves, followed in turn by the possibility of having to decide who to attend and who not to attend. In general terms, these results concerning the main threats perceived by health personnel coincide with those of other studies carried out in relation to the SARS pandemic in 2003 and to the COVID-19 pandemic (Maunder et al., 2003; Marjanovic et al., 2007; Liu et al., 2012; Lai et al., 2020) although they did not analyze the differences in the perception of the threat at different moments in time. Only few healthcare workers mentioned feeling stigmatized. In addition, there were non-significant differences through time. This was reflected in accounts such as below:

I do not fear for myself, but for my family. I went to my parents' farm, my wife is asthmatic, but I want the spike to be over so I do not infect her (Administrative employee, Autonomous City of Buenos Aires Hospital).

I fear contagion and being intubated. . . and, logically, death (Intern Medicine specialist in the Autonomous City of Buenos Aires Public Hospital and PAMI; Comprehensive Medical Attention Program, a public health insurance agency for the elderly managed by the Ministry of Health).

It should be noted that this health personnel has not felt stigmatized, contrary to what was reported by other authors who indicated that stigmatization was an important aspect highlighted by healthcare workers (Maunder et al., 2003; Brooks et al., 2020; Wu et al., 2020). Moreover, according to Brooks et al. (2020), "stigma from others" persisted even after the quarantine, and healthcare workers felt more stigmatization than the general public.

2-Regarding their **perception of how they are being taken care of**, it was found that in general, a high percentage of healthcare workers considered that they did not have the

appropriate equipment. This remained similar in the three groups, although it was slightly lower in the last period. This was evident in accounts such as:

The lack of supplies was the first that struck us; we had surgical masks that generally last over 2–3 h, and we were on call 10 h with only one face mask (Head nurse, Mendoza Public Hospital).

In this regard, it should be noted that existing literature has shown that the fear of lack of appropriate equipment greatly increased anxiety among healthcare workers during the COVID-19 pandemic (Woon et al., 2020).

The **perception of how the work environment worsened** was significantly different among the groups. It increased from the first to the third group. The perception that sleep deprivation interfered with their work reached a very high percentage compared with the values reported by other authors (Xia et al., 2021). This was reflected in the following account:

This past week they tried to divide us into teams, and that is when the personnel who was working simultaneously was reduced and I had much more work to do. I am on call every other day, and I have three night shifts. It is a lot of stress and exhaustion (Intern doctor in Entre Rios).

3-The chance of **counting on a psychological support team** was low. Despite this, surprisingly, among those who mentioned having these teams, the participation was significantly lower when comparing the first group/period with the third group/period. Finally, most healthcare workers said that having a support group would help with their problems and fears. Statistically, this did not have significant differences among the groups/periods. This was described by a nurse in Mendoza as follows:

The truth is we are not used to using technology for this. We are not allowed to express ourselves, nor can we expand on what we are feeling at the moment. So much of this leads to failure of that intervention.

4-Due to the fact that the first report showed that **indicators of depression, anxiety, and intolerance of uncertainty** were significantly affected by the concerns manifested by the health personnel (Richaud et al., 2021b) and that the studies carried out in three groups in different periods of time indicated that many of the concerns had increased through the analyzed periods while the psychological help remains in very low levels, it is concluded that the psychological indicators have also been drastically modified.

All had significantly higher values from the first group/period to the third group/period with regard to the indicators of depression. This was particularly observed in the statement *I feel more irritated than before, I feel sad* and in the statement *I do not sleep as well as before*. Noticeably, irritability and sleep disorders significantly increased from the first to the third group/period, surpassing the values of insomnia shown by Lai et al. (2020) and Zhang et al. (2020) in the samples of health personnel involved in the treatment of patients with COVID-19 in China. Regarding irritability, in the present study, it was observed (with some surprise) that its first records showed relatively low values, which were in contrast with some public manifestations of the health personnel (collected during the week of April 20, 2020 through

media). The current results show there has been a significant difference in irritability, especially between the second and the third groups/periods.

All values of the indicators of anxiety have significantly increased from the first to the third group/period, especially in the statement *I feel scared, I cry or am moved easily* (lack of emotional control) and particularly *My body is tense* (alertness). Also, there were significant differences between the three groups/periods in the indicators of intolerance of uncertainty. This was especially observed in the statements *Unexpected events bother me a lot* and *I feel that even with the best planning, a small unexpected event might ruin it all*. In this regard, when studying health personnel during the SARS pandemic of 2003, Maunier et al. (2003) found an increased perception of personal danger due to uncertainty generated by the constant amendment of the procedures and the public health guidelines to control/prevent infection. The same was observed by Di Monte et al. (2020) who pointed out that the impact the COVID-19 emergency had on doctors was partly produced by the uncertainty of the necessary procedures and treatments, along with the immediate saturation of hospitals for the management of critical cases. They observed avoidance of uncertainty and paralysis when it appeared. Furthermore, in reference to the increased values of anxiety, depression, and irritability, these have also been observed by other researchers (e.g., Neto et al., 2020; Wu et al., 2020).

These differences in the indicators of high tension and in the lack of emotional control were also expressed in the coping strategies.

The ways of coping with conflict had differences between the three groups/periods of time. The values for the items *I try to bring something positive out of the situation*, *I try not to think about what is happening*, and *I accept it since there is nothing I can do about it* significantly decreased, indicating less avoidance and less cognitive resignification which would allow for a greater flexibility in the response to the threat by restructuring and turning it into something more manageable. At the same time, *I burst out over anything* increased significantly which, along with the indicators *I cry and am moved easily*, *I feel more irritated than before*, *I feel sad* and *I feel scared*, showed emotional lability only contained by hypercontrol which remained with high values, but without differences, between the three groups/periods of time. Hence, there has been a shift from a very controlled way of coping with a possibility of escape through avoidance and certain flexibility through cognitive redefinition in the first group/period to a strategy of rigid control that considerably increases tension (*I do not sleep as well as before*, *My body is tense*). Ultimately, when it becomes unmanageable, it leads to lack of control in the third group/period.

The strategy *I speak to someone who can help me when the situation overwhelms me* showed high values in the three periods with non-significant differences. It indicated a search for help along with the belief that having a support group and psychological help would help them with their problems, which is probably not found among the groups of psychological support that were offered to them.

Moreover, due to the evidence that shows that women are a higher risk population than men (Lee et al., 2007; Lai et al., 2020), when they have to face this type of threats, the values of

the indicators of depression, anxiety, intolerance of uncertainty, and coping strategies were compared in the two genders and in the three periods. Indeed, women obtained higher values than men in all the indicators of depression, except for *"I feel sad."* For this indicator, although in the first period women obtained significantly higher values than men, this distance between the values of men and women was shortened until it disappeared in the third period, with men obtaining a slightly higher value than women.

Women also obtained higher values on the indicators of anxiety during the three periods, although it is important to note that the indicator *My body is tense* showed very high values in both genders. Women also obtained higher values than men with regard to the indicators of intolerance of uncertainty in all the periods, although the values were increased in both genders in the third period and in items such as: *Unexpected events bother me a lot*, and *I feel that even with the best planning, a small unexpected eventuality might ruin it all*, which also shows a lot of tension and irritability. Along the same line, Di Trani et al. (2021) observed that women scored higher in uncertainty avoidance and paralysis when facing it. These authors hypothesized that intolerance to uncertainty would serve as a moderator in the relationship between resilience and burnout. Finally, the coping profile of men and women has also shown significant differences, especially in *I burst out over anything*, in which women have significantly higher values than men. Despite this, both genders reached high values by the last period. Although both genders reached high values, men obtained significantly higher values than women with regard to the statement *I try to control my emotions*, especially in the third period.

Therefore, by taking gender into account, a coping profile that is similar to the one described for the general sample was found, with men being more hypercontrolled and women being more fragile due to the greater lack of affective control.

Limitations

The present study has some limitations that must be taken into consideration. First, data obtained from self-reported questionnaires could facilitate social desirability rather than what their accurate response would be. Another limitation refers to the anonymity of the answers due to it being impossible to carry out a longitudinal study. Therefore, the type of design was cross-sectional (i.e., successive cross-sectional studies) and results should be interpreted with caution. Particularly, as associations and not as causality findings. Finally, due to the need for social distancing, the psychological evaluation was based on an online survey and self-reports. In future studies, it is recommended to add, if possible, other ways of complimentary evaluation.

CONCLUDING REMARKS

In all cases, health personnel dedicated to the treatment of patients with COVID-19 shows higher rates of depression, anxiety, and intolerance of uncertainty. These values, according to the data collected at three different time periods discussed above, are shown to reach even higher, alarming limits. These differences in the psychological indicators have also

led to differences in coping strategies, which continue to be dysfunctional. In fact, differences in strategies range from a way of coping with high control with mechanisms of avoidance and cognitive redefinition, to one which continues to have high mechanisms of control with rigid, excessive tension that seem to be more fragile due to the lack of flexibility (cognitive restructuring). Thereby, causing emotional outbursts when said coping strategies fail.

The importance of this study lies in the vital information it provides to know more about the mental health needs for the setting up of a large-scale therapeutic response during a sudden crisis. A rapid-response team in situations of crisis must include mental health workers. The medical staff, the nurses, and the personnel of local primary clinics in the epicenter of the crisis are fundamental for the general response (Kang et al., 2020). The effort in the psychological attention of these health personnel is essential to improve its immediate efficacy in the attention of infected patients and to better protect their mental health in the long haul.

The COVID-19 pandemic has revealed many problems regarding the supply of effective psychological interventions for health personnel. Governments should urgently establish active improvements in the intervention system based on solid scientific consultancy to effectively treat mental health problems of healthcare workers.

Finally, political decision-maker in charge of each section in a health agency should prioritize the psychological aspects of healthcare. Mental health should be a public health priority for both healthcare workers and the population in general.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The project and questionnaire had the endorsement of the Research Ethics Committee of the Faculty of Health Sciences

of the Adventist University of Plata, with No. CE000237 of the National Registry of Research in Health, and N° 3999 of Ministerial Resolution of the Ministry of Health of the Province of Entre Ríos, Argentina, Resolution 1.4/2020. The Informed consent was approved by the Research Ethics Committee, created by ministerial resolution 1002/16 and by the Personal Data Protection Law 25.326, which deals with the ethical implications of health research in which human beings participate, so as to protect their fundamental rights weighing, at the same time, the need to promote health research. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MRi and RM: conceptualization, project administration, supervision, writing—original draft, and writing—review and editing. MK and MRo: data curation. MRi, BM, and VL: formal analysis. MK, JV, and MRo: investigation. MRi, RM, BM, VL, JV, and LE: methodology. MRi, RM, LE, JV, VL, BM, MK, and MRo: visualization. All authors contributed to the article and approved the submitted version.

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Psychological Distress, Anxiety, Family Violence, Suicidality, and Wellbeing in Pakistan During the COVID-19 Lockdown: A Cross-Sectional Study

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Background and Objectives: The purpose of this study was to draw the attention toward the implications of COVID-19 and the related restrictions imposed worldwide especially in Pakistan. The primary objective was to highlight the levels of psychological distress, anxiety, family violence, suicidality, and well-being due to COVID-19 and the secondary objective was to associate it to social demographic factors.

Materials and Methods: It is designed as a cross-sectional study by employing an online questionnaire in the English language and obtaining responses using a snowball sampling technique. We used three validated measures including Kessler Psychological Distress Scale (K10), Generalized Anxiety Disorder (GAD-7) index and World Health Organization Well-Being Index (WHO-5).

Results: A sample of 420 participants was recruited from across Pakistan, with most participants were females (79%), students (89.8%) and belonging to Punjab (54%). Nearly one-fourth of the participants (23.8%) scored above the minimum value set for moderate or high psychological distress (K10 > 12). There was a higher prevalence of distress among females and resident of province Punjab. The majority of individuals reported that they were living with their family (94.5%) and more than half (52.6%) were neutral regarding their satisfaction with their living conditions. 40.5% believed that the lockdown has had a negative impact on their mental health. 31.4% have reported that they themselves have experienced abuse from a family member. 48.6% scored high on the GAD-7 scale and low wellbeing score was found among 80.2%. Students were found to be more vulnerable to mental illness and anxiety.

Conclusion: With the lockdown restrictions, psychosocial distress has become prevalent in Pakistan.

Keywords: COVID-19, psychological distress, anxiety, well-being, SARS-CoV-2

INTRODUCTION

Severe Acute Respiratory Syndrome-Coronavirus 2 (SARS-CoV-2) first emerged in Wuhan China, in December 2019 and has since affected 222 countries, with a total of 209,670,370 confirmed cases and 4,399,468 deaths globally as of 18th August 2021 (Worldometer Coronavirus, 2022). The increasing numbers suggest high transmissibility of the virus. Based on the reproductive numbers of novel coronavirus-19 (COVID-19), its estimated transmissibility is 4.1 (Wang et al., 2020). This suggests that with each confirmed case of COVID-19, there will be 4 new confirmed cases and inevitably, on March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic (Wang et al., 2020; World Health Organization [WHO], 2022). Following the declaration, many countries such as New Zealand initiated steps to control the spread of the virus such as implementing a nationwide lockdown. In Pakistan, the first case was confirmed on February 26, 2020, and a nationwide lockdown was imposed on April 1, 2020 (Jawed, 2020). The lockdown helped curtail the spread of the virus and currently Pakistan, despite being densely populated, ranks 33rd in the list of COVID-19 affected countries (Worldometer Coronavirus, 2022). As of 26th November, the total number of confirmed cases reported in Pakistan are 1,283, 886 while the total number of deaths equals 28,704 (Worldometer Coronavirus, 2022).

Although strict nationwide lockdown was strategically effective in limiting the spread of the virus, it had negative implications on the mental well-being of individuals. Many studies have been conducted globally which highlight the impact of COVID-19 pandemic on the mental health and well-being of people, with most of these studies implying a surge in anxiety and depression in individuals due to the pandemic restrictions (Banna et al., 2020; Every-Palmer et al., 2020; Fornili et al., 2021). 30.3% of the 2,010 individuals surveyed in a cross-sectional study conducted in New Zealand reported moderate to severe psychological distress (Every-Palmer et al., 2020). Of these people, the majority had either lost their jobs, had lesser workload due to the pandemic, had previously reported mental illnesses or were at an increased risk of COVID-19 (Every-Palmer et al., 2020). Results of a study conducted in Italy showed an aggravation of all six domains under investigation: anxiety, depression, positive wellbeing, self-control, general health, and vitality. The difference in the index before and after the quarantine due to the pandemic was found out to be 15.1% (Fornili et al., 2021). A study from Bangladesh included 1,447 participants, of whom 59.7% reported to be experiencing stress symptoms, and 33.7% of the individuals reported anxiety symptoms of which 11.6% had severe anxiety symptoms. 59.7% faced depressive symptoms of which 13.2% were having severe symptoms (Banna et al., 2020). Evidently, the pandemic has also significantly affected the mental well-being of health-care workers. An assessment of anxiety and trust levels among Iranian health care workers revealed that 30.4% of health care workers had mild to moderate levels of anxiety while 21.3% had severe levels of anxiety. Regarding trust levels, lowest levels were found for social media users while highest levels were observed for TV viewers (Hasannia et al., 2021). Additionally, based on the

results of another cross-sectional study assessing post-traumatic stress disorder (PTSD) symptoms, insomnia, and psychological distress amongst 500 Taiwanese health care workers, 15.4% had PTSD symptoms, 44.6% faced insomnia, 30.6% had high levels of anxiety, and 23.4% high stress levels (Lu et al., 2021).

Students were also severely affected by the pandemic. Studies conducted amongst students of Taiwan, Indonesia and Thailand revealed increased anxiety levels, the highest levels being observed in Thai students who were also found to have lesser trust in the available COVID-19 protocols to combat the disease. Significantly, amongst Taiwan students, international students were found to have higher anxiety levels compared to local students (Ahorsu et al., 2020, 2021).

The incidence of family violence also increased during the pandemic due to strict lockdowns, increased anxiety, financial instability and decline in provision of support services (Herbert et al., 2021). The United Nations Population Fund (UNFPA) and collaborators have suggested that in a 6-month lockdown due to the pandemic, there would be 31 million added cases of intimate partner violence and further 13 million child marriages by the year of 2030 [United Nations Population Fund, Avenir Health Johns Hopkins University; Victoria University (Australia), 2020]. These results point out the need for increased accessibility of support service providers for the families in lockdown due to COVID-19. Suicidality, which is closely associated with psychological distress, anxiety, family violence and well-being, has also increased significantly during the COVID-19 restrictions. Extrapolating data from previous viral outbreak of severe acute respiratory syndrome (SARS) in 2003, suicide rates are known to increase due to isolation and quarantine (Chan et al., 2006). According to previously conducted studies, the factors contributing toward this increase include the concern of getting the disease, passing the disease to others, mental instability, economic recession, and the absence of food and alcohol (Dsouza et al., 2020; Mamun and Griffiths, 2020; Mamun and Ullah, 2020). The fear of COVID-10 most likely stems from uncertainty of future career, reduced job security and satisfaction (Rajabimajd et al., 2021). Hence, it is not surprising that the suicide rates have increased worldwide during the COVID-19 pandemic. Based on a study conducted in Bangladesh, from 13,654 respondents, 8% reported suicide ideation during the pandemic (Islam et al., 2021).

In Pakistan, although similar events as mentioned above take place, most go unreported since there is a severe lack of awareness. This lack of awareness is basically due to a smaller number of studies conducted in Pakistan which could highlight the impact of COVID-19 on mental health and suicide rates. Extracting data from the limited literature available from Pakistan, a study designed to assess the impact of COVID-19 on mental health showed that increased psychological distress and anxiety are due to the fear of contracting the disease and due to the financial, social, and religious implications of the pandemic (Ali N. A. et al., 2021). The symptoms of anxiety and depression are also increased in people, especially health care workers. In Pakistan, a cross sectional survey results reported that in 1,094 participants, the median depression score was 5.00 and a median anxiety score was 8.00 suggesting that with the progressing state

of the pandemic, there was a rise in mild levels of depression and anxiety among health care workers (Hayat et al., 2021). Furthermore, 90% of the women in Pakistan have reported having faced domestic violence (Baig et al., 2020). In March 2020, during the lockdown, 399 women were killed in Khyber Pakhtunkhwa while the police helpline only received 25 calls for help (Baig et al., 2020). Consequently, with a higher number of people facing mental health issues, financial uncertainty or domestic violence, suicide rates are also high in Pakistan. From January 2020 to May 2020, the number of reported suicide cases in Pakistan was 29, of which 16 were due to COVID-19 related issues (Mamun and Ullah, 2020). This represents the fact that Pakistan has a higher number of suicide cases reported than most other countries due to the stigma associated with suicide and mental health as this results in people not reaching out to service providers for help. This is also because there is a lack of knowledge about telemedicine amongst the population.

Our study draws attention to the implications of COVID-19 and the related restrictions imposed worldwide especially in Pakistan. The primary objective of the study was to highlight the levels of psychological distress, anxiety, family violence, suicidality, and well-being due to COVID-19 in Pakistan. The secondary objective of the study is to associate it to social demographic factors.

MATERIALS AND METHODS

Participants and Recruitment Methods

Our study involved a considerable sample population of Pakistan aged between 18 and 70 years. We designed a cross-sectional study, and the results were obtained by employing an online questionnaire in the English language from 12th March 2021 to 30th July 2021, since it was unfeasible to conduct a nationwide survey on ground during the lockdown. The questionnaires were filled anonymously using a snowball sampling technique where each respondent was encouraged to share the survey with others. The primary focus was to include the general population of Pakistan for which the survey was shared to people of different provinces using the messenger application, WhatsApp, and social groups on Facebook. The total sample size was 420. Confidentiality of all respondents was maintained; they were informed of the purpose of the study in the participant information section of the questionnaire and were requested to provide informed consent on the first page of the survey. They had the freedom to not participate in the study and had the right to deny the use of their data for the research. The exclusion criteria were the completeness of the questionnaires; all incomplete questionnaires were disregarded.

Measures and Outcomes

The questionnaire employed was structured and was divided into two sections: (1) socio demographic characteristics and (2) Self-perceived psychological state during the pandemic with regards to stress, anxiety, and depression. The participants were requested to answer the questions based on their experience in the last 4 weeks. The first section of the questionnaire

included data about gender, age, education, current occupation, marital status, range of household income, province, presence of comorbidities, self-reported health status, and self-reported COVID-19 risk. We also evaluated self-reported body mass index (BMI), in the questionnaire since psychological well-being is related to self-perceived outlook (Schmidt and Martin, 2019). The participants were also requested to answer questions regarding their living conditions such as, who they lived with, satisfaction with their living circumstances, level of contact with people outside their homes and ease of communication and understanding amongst people of the household.

We used the Kessler Psychological Distress Scale (K10) to assess the psychological distress amongst our sample population. K10 scale is a 10-item questionnaire used to evaluate distress based on symptoms of anxiety and depression (Andrews and Slade, 2001). The respondents reported the frequency of their symptoms such as nervousness, fatigue, sadness, and hopelessness, on a 5-point Likert scale which ranged from 1 (none of the time) to 5 (all the time). At the end of their responses, the numbers are all added up for the total score on the K10 scale. The reported scores are in the range of 0–40. The cut off value of total scores was 12; scores above 12 ($K10 > 12$) hinted at the potential of moderate or high psychological distress. We employed the use of the K10 scale because it is a reliable and valid measure with a Cronbach's α of more than 0.88 as seen in previous studies (Brooks et al., 2006; Fassaert et al., 2009; Bu et al., 2017).

The degree of anxiety symptoms was assessed using the Generalized Anxiety (GAD-7) index as it is a well validated and reliable measure, previously used in large sample populations (Spitzer et al., 2006; Every-Palmer et al., 2020). This scale has an exceptional consistency with a Cronbach's α value of 0.92 (Spitzer et al., 2006). The participants were required to answer 7 questions about anxiety symptoms based on a 4-point Likert scale which ranged from 1 (not at all) to 4 (nearly every day). The range of scores for the GAD-7 index were from 0 to 21 and the cut off value was taken as 10; scores higher than 10 indicated severe anxiety.

To get an insight into the subjective well-being of respondents we used the 5-item World Health Organization Well-Being Index (WHO-5), which is widely used within public health and mental health research (Topp et al., 2015; Every-Palmer et al., 2020). The WHO-5 consists of 5 simple statements and the participant is asked how well each of the statements applies to him or her in the past 14 days (Topp et al., 2015). The respondents choose a number ranging from 0 (none of the time) to 5 (all the time). The total well-being score ranges from 0 to 25, with 25 indicating maximum well-being (Topp et al., 2015). For this study, we used 13 as the cut-off value; respondents who scored less than 13 on the WHO-5 scale were regarded as individuals with low mental well-being.

We asked respondents questions regarding family violence, suicidal ideation, and experience of silver linings during the pandemic which were adopted from methods of previous studies conducted. The questions pertained to self-experienced violence, witnessed violence, suicidal thoughts, suicidal plans, suicidal efforts, and any hopeful prospects experienced by the respondents (Ghazizadeh, 2005; Every-Palmer et al., 2020; Mamun, 2021). The only answer choices provided for the

question regarding silver linings during the pandemic were “yes, for me,” “yes, for the society” or a “no.”

The survey was initially tested amongst the public online on a small-scale. Responses from 30 participants were gathered. Based on their feedback, we assessed our questionnaire in order to evaluate the general understanding of the questions by the respondents. This evaluation was considered when making further improvements to the questionnaire. The improved sections of the questionnaire included the use of improved scales of answers (addition of “somewhat better or better and easy/somewhat easy” in certain questions) as well as clear and concise instructions. We then utilized the revised survey for the purpose of our study.

Ethical Approval

The study received ethical approval from the Institution’s Ethics Committee of the Dow University Ojha Hospital. Each participant had the right to withdraw from the study at any time. The possible risks and the purpose of the survey were thoroughly explained. Participants had to provide consent before filling out the questionnaire.

Data Analysis

Microsoft Excel 2016 was used for data collection and assembled into Statistical Package for Social Sciences (SPSS) version 25.0 for data analysis. Categorical variables were assessed using frequencies and percentages, and their respective 95% confidence intervals through univariate analysis. Analytical statistics were performed with odds ratios (OR) and 95% confidence intervals, which were obtained using logistic regression.

RESULTS

Characteristics of Study Participants

A sample of 420 participants was recruited from across Pakistan, with the largest sample being from Punjab ($n = 230$), followed by Sindh ($n = 137$). Demographic characteristics of the population are shown in **Table 1**. Most of the participants (99%) belonged to the 18–29 years age group and a higher number of respondents were females (79%). Prior to lockdown, 70.2% of the participants considered themselves to be of normal weight, while after the lockdown, only 61% of the respondents reported themselves to be of normal weight. The difference is not that significant so one could infer that no such change in self-reported weight gain could have affected the psychological responses. **Supplementary Table 1** summarizes the psychosocial responses of the study participants.

Psychological Distress

Almost one-fourth of the participants (23.8%) scored above the minimum value set for moderate or high psychological distress ($K10 > 12$) (**Table 2**). Prevalence among the females ($p = 0.05$), and presence of comorbidities ($p = 0.021$) were found significant. Correlation is also observed between deteriorating self-reported health and prevalence of psychological distress.

There was a higher prevalence of distress among the participants from Punjab.

Living Circumstances and Interaction With Family

The majority of individuals reported that they were living with their family (94.5%) and more than half (52.6%) were neutral regarding their satisfaction with their living conditions. Regardless of this positive attitude toward their living situation, apart from 37 people (8.8%), the feeling of loneliness and isolation was felt by most of the respondents at some point during the lockdown.

Mental Health and Suicidal Thoughts

Among the participants, 40.5% believed that the lockdown has had a negative impact on their mental health while 32.6% reported that there had not been a significant difference. During the lockdown 21.4% (95% CI: 17.6, 25.7) of the participants had seriously thought about ending their life. Data supports a correlation between worsening mental health and suicidal ideation.

Family Harm

Totally 132 of the 420 participants have reported that they themselves have experienced abuse from a family member (31.4%) and the family harm has mostly been in the form of physical assault (34.8%), sexual assault (4.5%) and insults, harassment, or threatening behavior (33.3%). Worsening mental health and higher anxiety disorder scores were observed in individuals who faced abuse during lockdown.

Silver Linings

Most of the respondents thought that lockdown has had positive impacts either for them personally (42.1%) or for the society as a whole (18.3%).

Anxiety and Wellbeing

Close to half of the respondents (48.6%) scored higher than 10 on the GAD-7 scale, which was the cut-off value for the anxiety score to be regarded as high, whereas a low wellbeing score was found among 80.2% (95% CI 76.1–83.9%) of the individuals. Anxiety and mental wellbeing results are shown in **Tables 3, 4** respectively. Students were more likely to score less on the WHO-5 index ($p = 0.035$). Individuals with history of mental illness scored significantly high on the GAD-7 index.

DISCUSSION

Key Findings and Comparison With Benchmark Data

COVID-19 pandemic and the lockdown restrictions have had a considerable impact on the psychological well-being of individuals. Our study is the first of its kind, conducted in Pakistan, assessing the well-being of individuals in Pakistan compared to other countries.

TABLE 1 | Demographic characteristics of the sample population ($n = 420$).

Variable	Frequency (n)	Percentages (%)	95% confidence interval
Gender			
Male	88	21.0	17.2–25.2%
Female	332	79.0	74.8–82.8%
Age			
18–29 years	416	99.0	97.6–99.7%
30–59 years	3	0.7	0.1–2.1%
> 60 years	1	0.2	0.0–1.3%
Self-reported BMI (before pandemic)			
Underweight	62	14.8	11.5–18.5%
Normal	295	70.2	65.6–74.6%
Overweight	58	13.8	10.7–17.5%
Obese	5	1.2	0.4–2.8%
Self-reported BMI (after pandemic)			
Underweight	76	18.1	14.5–22.1%
Normal	256	61.0	56.1–65.6%
Overweight	77	18.3	14.7–22.4%
Obese	11	2.6	1.3–4.6%
Education			
No formal education	1	0.2	0.0–1.3%
Primary/Secondary education	18	4.3	2.6–6.7%
Higher secondary/College	221	52.6	47.7–57.5%
University graduate	170	40.5	35.7–45.3%
Postgraduate or higher	10	2.4	1.1–4.3%
Occupation			
Unemployed	8	1.9	0.8–3.7%
Government/Private employee	13	3.1	1.7–5.2%
Student	377	89.8	86.5–92.5%
Healthcare worker	22	5.2	3.3–7.8%
Marital status			
Married	7	1.7	0.7–3.4%
Single	413	98.3	96.6–99.3%
Household income			
< 20,000 Rupee	33	7.9	5.5–10.9%
21,000–50,000 Rupee	67	16.0	12.6–19.8%
51,000–100,000 Rupee	119	28.3	24.1–32.9%
101,000–200,000 Rupee	114	27.1	22.9–31.7%
> 200,000 Rupee	87	20.7	16.9–24.9%
Region			
Sindh	137	32.6	28.2–37.3%
Punjab	230	54.8	49.9–59.6%
KPK	47	11.2	8.3–14.6%
Balochistan	6	1.4	0.5–3.1%
Comorbidities			
Present	65	15.5	12.2–19.3%
Absent	355	84.5	80.7–87.8%
Self-reported health status			
Excellent/Very good	78	18.6	15.0–22.6%
Good/Average	245	58.3	53.5–63.1%
Fair/Poor	97	23.1	19.1–27.4%

(Continued)

TABLE 1 | (Continued)

Variable	Frequency (n)	Percentages (%)	95% confidence interval
Self-reported COVID-19 risk			
I have already had the coronavirus	73	17.4	13.9–21.4%
I don't think I will get the coronavirus	172	41.0	36.2–45.8%
I think I will get a mild case of the coronavirus	158	37.6	33.0–42.4%
I think I will get a severe case of the coronavirus	17	4.0	2.4–6.4%

KPK, Khyber Pakhtunkhwa; n, number of subjects.

Based on the results depicting 76.1% of the population with moderate to high psychological distress, and 80.2% of the population with low mental well-being, it can be pronounced that almost three-quarters of the population in Pakistan under study was having difficulty adjusting to the new state of living during the lockdown due to the pandemic. This is almost two times higher when compared to the population of New Zealand with moderate to high psychosocial distress (30.3%) and severe anxiety (38.2%) (Every-Palmer et al., 2020).

The data available suggests significant diversity in the results based on gender. Most of the individuals with moderate to high psychological distress reported to be females (81.3%) compared to males (18.8%). Furthermore, the reported cases of moderate to severe anxiety ($GAD > 10$) were more prevalent in females (82.9%) than males (17.1%). This differs from the results seen for New Zealand reported by Every-Palmer et al. (2020) who reported that the gender gap was minimal. This difference is possibly due to the lower rates of transmission of COVID-19 in New Zealand (Summers et al., 2020), since like Pakistan, a cross sectional study conducted in Bangladesh where COVID-19 cases are higher, reported increased prevalence of psychosocial distress in females compared to males (Mamun and Griffiths, 2020). Similarly, a study from another country with a high number of COVID-19 cases, United Arab Emirates (UAE), also reported increased anxiety in females (51.7%) (Saddik et al., 2021). Our results also show significantly increased values for depression, anxiety and reduced well-being for females because women are generally more prone to diminished mental health as reported by several studies (Albert, 2015; Lim et al., 2018; Özdin and Özdin, 2020). Some plausible reasons for the increased mental health issues in females during the pandemic could be the rise in family quarrels, struggle of working women to execute their growing household responsibilities alongside their professions, having to care for family members, and having concerns about future while their partner is unemployed (Baig et al., 2020; Sigdel et al., 2020). Additionally, family violence (31.4%) being faced by women is also a contributing factor.

Women of Pakistan are facing domestic violence increasingly when compared to other countries; family violence in New Zealand was reported to be 4 times lesser (9%) (Every-Palmer et al., 2020) while that in Nigeria was also 3–4 times less (7.5–13.5%) (Ojeahere et al., 2021). The disparity in the cases of family violence reported in Pakistan and elsewhere is possibly due to the prevailing socio-cultural norms in Pakistan. According to a nationwide survey carried out by the Sustainable Social Development Organization of the government, from

January 2020 to December 2020, domestic violence cases in Pakistan significantly increased during the lockdown; the cases of domestic and sexual abuse have doubled in the second half of 2020 when compared with the first half of the year (SSDO, 2020). There have been 1,422 cases of domestic violence, 9,401 cases of violence against females, and 4,321 cases of sexual abuse. There is a considerable gap between these statistics and the expected number of such cases because cases of workplace are not reported and are dealt within the company while a lot of cases are not reported at all. Hence, we must consider the limitation of this available data (The News International, 2021). Even before the pandemic, based on a study, two thirds of women in Pakistan reported domestic violence and consequently faced depression while staying silent due to their socio-cultural norms (Rabbani et al., 2008). With the implementation of lockdown, as women are forced to live in a confined space with their abuser, they not only face increased violence but also face difficulties contacting social, protective and health care services for help (Baig et al., 2020). The increased family violence reports could also be due to the fact that since mental health is stigmatized in Pakistan (Abdullah et al., 2021), less and less women ask for help (El-Nimr et al., 2021). This is an alarming situation which needs immediate attention because according to Rabbani et al. (2008) the psychosocial results of domestic violence are serious and include the use of drugs, alcohol consumption, depression, and suicidal attempts. It makes women feel vulnerable and diminishes their emotional stability and self-confidence.

Moreover, in the patriarchal society of Pakistan where 90% married women reportedly face physical or sexual abuse (Baig et al., 2020), domestic violence is considered to be a matter of the families rather than impeachment of human rights, which suggests there is a need for counseling on a societal level. Apart from the existing legislations for women's protection based on Sharia law, government of Pakistan needs to adopt the efforts made in other countries. Like in India, Bangladesh and Iran, social service groups which work toward women empowerment, could be introduced. Additionally, health and family planning facilities could be developed to bridge the gap between the vulnerable women and the social service providers (Rabbani et al., 2008).

Some Arab countries, however, have reported even higher cases of family violence than Pakistan. A study involving most of the Arab countries reported that family violence increased from 39.6% before lockdown to 46.9% after lockdown (El-Nimr et al., 2021). This percentage of population is greater than that

TABLE 2 | Logistic regression analysis of moderate/high psychosocial distress scores on K10 index.

Variable	K10 score > 12 (moderate or high)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Gender						
Male	60	18.8	14.6–23.5%	1.000	—	—
Female	260	81.3	76.5–85.4%	1.685	1.003–2.832	0.049
Education						
No formal education*	1	0.3	0.0–1.7%	—	—	—
Primary/Secondary education	10	3.1	1.5–5.7%	1.000	—	—
Higher secondary/College	178	55.6	50.0–61.2%	3.312	1.234–8.891	0.017
University graduate	125	39.1	33.7–44.6%	2.222	0.826–5.982	0.114
Postgraduate or higher	6	1.9	0.7–4.0%	1.200	0.250–5.768	0.820
Occupation						
Unemployed	6	1.9	0.7–4.0%	1.000	—	—
Government/Private employee	9	2.8	1.3–5.3%	0.750	0.103–5.470	0.777
Student	291	90.9	87.2–93.8%	1.128	0.224–5.690	0.884
Healthcare worker	14	4.4	2.4–7.2%	0.583	0.094–3.603	0.562
Marital status						
Married	3	0.9	0.2–2.7%	0.227	0.050–1.033	0.055
Single	317	99.1	97.3–99.8%	1.000	—	—
Household income						
< 20,000 Rupee	23	7.2	4.6–10.6%	0.876	0.364–2.110	0.768
21,000–50,000 Rupee	44	13.8	10.2–18.0%	0.729	0.366–1.452	0.368
51,000–100,000 Rupee	102	31.9	26.8–37.3%	2.286	1.139–4.585	0.020
101,000–200,000 Rupee	88	27.5	22.7–32.7%	1.289	0.678–2.451	0.438
> 200,000 Rupee	63	19.7	15.5–24.5%	1.000	—	—
Region						
Sindh	97	30.3	25.3–35.7%	1.000	—	—
Punjab	184	57.5	51.9–63.0%	1.649	1.011–2.692	0.045
KPK	35	10.9	7.7–14.9%	1.203	0.567–2.551	0.630
Balochistan	4	1.3	0.3–3.2%	0.825	0.145–4.684	0.828
Comorbidities						
Present	57	17.8	13.8–22.5%	2.492	1.146–5.422	0.021
Absent	263	82.2	77.5–86.2%	1.000	—	—
Self-reported health status						
Excellent/Very good	49	15.3	11.5–19.7%	1.000	—	—
Good/Average	185	57.8	52.2–63.3%	1.825	1.059–3.143	0.030
Fair/Poor	86	26.9	22.1–32.1%	4.627	2.126–10.070	< 0.001
Self-reported COVID-19 risk						
I have already had the coronavirus	53	16.6	12.7–21.1%	0.166	0.021–1.289	0.086
I don't think I will get the coronavirus	125	39.1	33.7–44.6%	0.166	0.021–1.332	0.091
I think I will get a mild case of the coronavirus	126	39.4	34.0–45.0%	0.246	0.031–1.925	0.182
I think I will get a severe case of the coronavirus	16	5.0	2.9–8.0%	1.000	—	—
Living circumstances						
With others	314	98.1	96.0–99.3%	1.000	—	—
Alone	6	1.9	0.7–4.0%	1.068	0.212–5.377	0.936

(Continued)

TABLE 2 | (Continued)

Variable	K10 score > 12 (moderate or high)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Satisfaction with living circumstances						
Dissatisfied/Neutral	250	78.1	73.2–82.5%	1.587	0.863–2.919	0.138
Satisfied/Very satisfied	70	21.9	17.5–26.8%	1.000	–	
Lost job during the lockdown						
Yes	12	3.7	2.0–6.5%	1.438	0.716–2.886	0.307
No/Never had a job	308	96.3	93.5–98.0%	1.000	–	
Do you have a medical condition that makes you more vulnerable to COVID-19 infection?						
No/Prefer not to say	217	67.8	62.4–72.9%	1.000	–	
Yes	103	32.2	27.1–37.6%	1.899	1.103–3.269	0.021
History of any mental illness diagnosed by a doctor or psychologist?						
No/Prefer not to say	272	85.0	80.6–88.7%	1.000	–	
Yes	48	15.0	11.3–19.4%	2.029	0.926–4.449	0.077
During the lockdown, have you seriously thought about ending your own life?						
No/Prefer not to say	234	73.1	67.9–77.9%	1.000	–	
Yes	86	26.9	22.1–32.1%	8.821	3.148–24.714	< 0.001
During the lockdown, have you made plans/attempts to end your own life?						
No/Prefer not to say	262	81.9	77.2–85.9%	1.000	–	
Yes	58	18.1	14.1–22.8%	5.313	1.878–15.029	0.002
During lockdown, have you experienced any abuse as a result of an action from a family member?						
No/Prefer not to say	195	60.9	55.4–66.3%	1.000	–	
Yes	125	39.1	33.7–44.6%	8.516	3.825–18.960	< 0.001
During lockdown, have you been a witness to any abuse in your “bubble”?						
No/Prefer not to say	237	74.1	68.9–78.8%	1.000	–	
Yes	83	25.9	21.2–31.1%	17.160	4.139–71.145	< 0.001

*Could not compute because of low number of responses. n, number of subjects; K10, Kessler Psychological Distress Scale.

in Pakistan possibly because of the methodological limitations of our study and selection bias. Most of the women who face domestic violence in Pakistan are from lower socio-economic backgrounds (Rabbani et al., 2008) and hence possibly have lesser access to the internet while most of our population under study was from a better economic background with access to internet and computers or mobile phones.

Our study shows 21.4% people reporting suicide ideation which is higher than the 6% reported in New Zealand, 1.5% in Eswatini and 4.5% reported in Spain during the first lockdown

(Every-Palmer et al., 2020; Mortier et al., 2021; Shongwe and Huang, 2021). Suicide cases are expected to rise further during lockdown as was seen in previous viral outbreaks (The Dawn, 2021). As mentioned earlier, from January 2020 to April 2020, during the early months of lockdown due to the pandemic, 29 suicide cases were reported in Pakistan (Mamun and Ullah, 2020). The plausible reasons for this surge could be that people of Pakistan and elsewhere have faced economic recession increasingly and according to studies there have been suicides possibly due to financial constraints, loss of employment

TABLE 3 | Logistic regression analysis of anxiety disorder on GAD-7 index.

Variable	GAD > 10 (high anxiety score)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Gender						
Male	37	17.1	12.4–22.8%	1.000	—	—
Female	179	82.9	77.2–87.6%	1.613	1.003–2.593	0.049
Education						
No formal education*	0	0.0	—	—	—	—
Primary/Secondary education	6	2.8	1.0–5.9%	1.000	—	—
Higher secondary/College	120	55.6	48.7–62.3%	2.376	0.861–6.558	0.095
University graduate	85	39.4	32.8–46.2%	2.000	0.718–5.575	0.185
Postgraduate or higher	5	2.3	0.8–5.3%	2.000	0.412–9.712	0.390
Occupation						
Unemployed	2	0.9	0.1–3.3%	0.208	0.030–1.467	0.115
Government/Private employee	8	3.7	1.6–7.2%	1.000	—	—
Student	194	89.8	85.0–93.5%	0.663	0.213–2.062	0.687
Healthcare worker	12	5.6	2.9–9.5%	0.750	0.185–3.034	0.750
Marital status						
Married	1	0.5	0.0–2.6%	0.153	0.018–1.286	0.153
Single	215	99.5	97.4–100.0%	1.000	—	—
Household income						
< 20,000 Rupee	18	8.3	5.0–12.9%	1.120	0.501–2.502	0.782
21,000–50,000 Rupee	24	11.1	7.3–16.1%	0.521	0.271–1.001	0.050
51,000–100,000 Rupee	69	31.9	25.8–38.6%	1.288	0.739–2.246	0.372
101,000–200,000 Rupee	60	27.8	21.9–34.3%	1.037	0.593–1.813	0.898
> 200,000 Rupee	45	20.8	15.6–26.9%	1.000	—	—
Region						
Sindh	63	29.2	23.2–35.7%	1.000	—	—
Punjab	131	60.6	53.8–67.2%	1.554	1.016–2.378	0.042
KPK	20	9.3	5.7–13.9%	0.870	0.446–1.698	0.870
Balochistan	2	0.9	0.1–3.3%	0.587	0.104–3.314	0.587
Comorbidities						
Present	44	20.4	15.2–26.4%	2.229	1.273–3.903	0.005
Absent	172	79.6	73.6–84.8%	1.000	—	—
Self-reported health status						
Excellent/Very good	22	10.0	6.5–15.0%	1.000	—	—
Good/Average	125	57.9	51.0–64.5%	2.652	1.525–4.610	0.001
Fair/Poor	69	31.9	25.8–38.6%	4.627	3.241–12.141	< 0.001
Self-reported COVID-19 risk						
I have already had the coronavirus	40	18.5	13.6–24.4%	1.461	0.843–2.532	0.177
I don't think I will get the coronavirus	78	36.1	29.7–42.9%		—	—
I think I will get a mild case of the coronavirus	88	40.7	34.1–47.6%	1.000	0.981–2.339	0.061
I think I will get a severe case of the coronavirus	10	4.6	2.2–8.3%	1.515 1.722	0.626–4.734	0.292
Living circumstances						
With others	212	98.1	95.3–99.5%	1.000	—	
Alone	4	1.9	0.5–4.7%	0.943	0.233–3.823	0.935
Satisfaction with living circumstances						
Dissatisfied/Neutral	172	79.6	73.6–84.8%	1.017	0.632–1.638	0.945

(Continued)

TABLE 3 | (Continued)

Variable	GAD > 10 (high anxiety score)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Satisfied/Very satisfied	44	20.4	15.2–26.4%	1.000	—	
Lost job during the lockdown						
Yes	8	3.7	1.6–7.2%	1.923	0.570–6.487	
No/Never had a job	208	96.3	92.8–98.4%	1.000	—	0.292
Do you have a medical condition that makes you more vulnerable to COVID-19 infection?						
No/Prefer not to say	148	68.5	61.9–74.7%	1.000	—	
Yes	68	31.5	25.3–38.1%	1.245	0.816–1.898	0.309
History of any mental illness diagnosed by a doctor or psychologist?						
No/Prefer not to say	179	82.9	77.2–87.6%	1.000	—	
Yes	37	17.1	12.4–22.8%	2.013	1.116–3.631	0.020
During the lockdown, have you seriously thought about ending your own life?						
No/Prefer not to say	144	66.7	60.0–72.9%	1.000	—	
Yes	72	33.3	27.1–40.0%	5.167	2.950–9.049	< 0.001
During the lockdown, have you made plans/attempt to end your own life?						
No/Prefer not to say	167	77.3	71.1–82.7%	1.000	—	
Yes	49	22.7	17.3–28.9%	4.311	2.260–8.223	< 0.001
During lockdown, have you experienced any abuse as a result of an action from a family member?						
No/Prefer not to say	127	58.8	51.9–65.4%	1.000	—	
Yes	89	41.2	34.6–48.1%	2.624	1.703–4.042	< 0.001
During lockdown, have you been a witness to any abuse in your “bubble”?						
No/Prefer not to say	153	70.8	64.3–76.8%	1.000	—	
Yes	63	29.2	23.2–35.7%	3.406	2.003–5.792	< 0.001

*Could not compute because of low number of responses. n, number of subjects; GAD-7, Generalized Anxiety Disorder Assessment.

during lockdown, media reporting of deaths due to COVID-19, exacerbation of pre-existing mental health issues, and in some cases the migrant's inability to return home (John et al., 2020; Mamun and Ullah, 2020). Some people are even distressed due to their fear of contracting the infection while some are distressed due to the limited food supply during the lockdown (John et al., 2020; Mamun and Ullah, 2020). Additionally, there have been reports of teenagers and young adults attempting suicide due the results of videogames. The study reporting 3 cases of suicide due to a videogame has also reported that the excessive screen time during the lockdown while engaging in such activities has led to reduced mental health, increased suicidal ideation, and consequently increased suicidal attempts

(Mamun et al., 2020). Notably, the difference in reported suicide data of our study and that from other countries could be due to a selection bias in our study which led to a higher percentage of suicidal ideation in the sample population compared to the general public.

Although majority of the effects of isolation were due to the lack of interaction, Osimo et al. (2021) reported that the cascade of negative psychological and behavioral effects triggered by the COVID-19 pandemic, were further regulated by personality traits, alexithymia, and resilience. Participants found to have higher levels of depression were amongst the high scorers during the evaluation for alexithymia. With reference to personality traits, higher

TABLE 4 | Logistic regression analysis of low mental well-being scores on WHO-5 index.

Variable	WHO-5 score < 13 (low mental well-being)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Gender						
Male	68	20.2	16.0–24.9%	1.000	—	—
Female	269	79.8	75.1–84.0%	1.256	0.771–2.219	0.443
Education						
No formal education*	1	0.3	0.0–1.6%	—	—	—
Primary/Secondary education	16	4.7	2.7–7.6%	1.000	—	—
Higher secondary/College	190	56.4	50.9–61.7%	0.766	0.168–3.497	0.731
University graduate	126	37.4	32.2–42.8%	0.358	0.079–1.620	0.182
Post graduate or higher	4	1.2	0.3–3.0%	0.083	0.012–0.580	0.012
Occupation						
Unemployed	4	1.2	0.3–3.0%	1.000	—	—
Government/Private employee	8	2.4	1.0–4.6%	2.667	0.500–14.217	0.251
Student	309	91.7	88.2–94.4%	4.544	1.109–18.623	0.035
Healthcare worker	16	4.7	2.7–7.6%	1.600	0.270–9.490	0.605
Marital status						
Married	2	0.6	0.1–2.1%	0.093	0.018–0.489	0.005
Single	335	99.4	97.9–99.9%	1.000	—	—
Household income						
< 20,000 Rupee	24	7.1	4.6–10.4%	1.000	—	—
21,000–50,000 Rupee	47	13.9	10.4–18.1%	0.881	0.348–2.228	0.789
51,000–100,000 Rupee	99	29.4	24.6–34.6%	1.856	0.751–4.585	0.180
101,000–200,000 Rupee	95	28.2	23.4–33.3%	1.875	0.754–4.662	0.176
> 200,000 Rupee	72	21.4	17.1–26.1%	1.800	0.698–4.639	0.224
Region						
Sindh	110	32.6	27.7–37.9%	1.000	—	—
Punjab	188	55.8	50.3–61.2%	1.099	0.642–1.881	0.732
KPK	36	10.7	7.6–14.5%	0.803	0.363–1.780	0.590
Balochistan	3	0.9	0.2–2.6%	0.245	0.047–1.284	0.096
Comorbidities						
Present	56	16.6	12.8–21.0%	1.639	0.775–3.465	0.196
Absent	281	83.4	79.0–87.2%	1.000	—	—
Self-reported health status						
Excellent/Very good	54	16.0	12.3–20.4%	1.000	—	—
Good/Average	196	58.2	52.7–63.5%	1.778	1.002–3.155	0.049
Fair/Poor	87	25.8	21.2–30.8%	3.867	1.717–8.710	0.001
Self-reported COVID-19 risk						
I have already had the coronavirus	60	17.8	13.9–22.3%	1.000	—	—
I don't think I will get the coronavirus	133	39.5	34.2–44.9%	0.739	0.368–1.485	0.395
I think I will get a mild case of the coronavirus	129	38.3	33.1–43.7%	0.964	0.468–1.985	0.920
I think I will get a severe case of the coronavirus	15	4.5	2.5–7.2%	1.625	0.331–7.989	0.550
Living circumstances						
With others	330	97.9	95.8–99.2%	1.000	—	—
Alone	7	2.1	0.8–4.2%	1.739	0.211–14.335	0.607

(Continued)

TABLE 4 | (Continued)

Variable	WHO-5 score < 13 (low mental well-being)			Odds ratio (OR)	95% Confidence interval (95% CI)	p-value
	Frequency (n)	Percentages (%)	95% confidence interval (95% CI)			
Satisfaction with living circumstances						
Dissatisfied/Neutral	266	78.9	74.2–83.2%	1.316	0.700–2.473	0.395
Satisfied/Very satisfied	71	21.1	16.8–25.8%	1.000	–	
Lost job during the lockdown						
Yes	12	3.6	1.9–6.1%	1.449	0.695–3.020	0.322
No/Never had a job	325	96.4	93.9–98.1%	1.000	–	
Do you have a medical condition that makes you more vulnerable to COVID-19 infection?						
No/Prefer not to say	237	70.3	65.1–75.2%	1.000	–	
Yes	100	29.7	24.8–34.9%	1.101	0.645–1.878	0.725
History of any mental illness diagnosed by a doctor or psychologist?						
No/Prefer not to say	293	86.9	82.9–90.4%	1.000	–	
Yes	44	13.1	9.6–17.1%	0.889	0.446–1.770	0.737
During the lockdown, have you seriously thought about ending your own life?						
No/Prefer not to say	259	76.9	72.0–81.3%	1.000	–	
Yes	78	23.1	18.7–28.0%	1.782	0.919–3.455	0.087
During the lockdown, have you made plans/attempts to end your own life?						
No/Prefer not to say	284	84.3	79.9–88.0%	1.000	–	
Yes	53	15.7	12.0–20.1%	4.356	0.571–33.213	0.156
During lockdown, have you experienced any abuse as a result of an action from a family member?						
No/Prefer not to say	221	65.6	60.2–70.6%	1.000	–	
Yes	116	34.4	29.4–39.8%	2.198	1.219–3.965	0.009
During lockdown, have you been a witness to any abuse in your “bubble”?						
No/Prefer not to say	264	78.3	73.6–82.6%	1.000	–	
Yes	73	21.7	17.4–26.4%	1.636	0.842–3.179	0.146

*Could not compute because of low number of responses. n, number of subjects; WHO-5, World Health Organization Well-Being Index 5.

emotional stability resulted in lower anxiety levels while increased openness to experiences resulted in a higher level of anxiety, indicating a causal relationship between alexithymia, personality traits, resilience, and depression due to confinement (Osimo et al., 2021).

These effects were also correlated with behavioral wellbeing, such as emotional eating, by Cecchetto et al. (2021). According to the results of their study, higher emotional eating was associated with higher BMI, alexithymia score, anxiety, and depression levels. Hence this indicates that the effects of isolation and lockdown include binge eating are directly

modulated by alexithymia, resilience, and personality traits (Cecchetto et al., 2021).

Assessment of Vulnerable Groups

People who are most vulnerable to the declining mental well-being include those who are dissatisfied with their living conditions (78.1%) (whether they live alone or with others), are unemployed, have underlying comorbidities, have a history of mental health issues, have experienced or witnessed domestic violence and people who have had suicidal thoughts.

Amongst people with moderate to high psychological distress, people living alone (1.9%) are most likely distressed due to the feeling of loneliness during quarantine (Seifert and Hassler, 2020) while people who are living along with others (98.1%) are possibly distressed due to the increase in disagreements and quarrels with living partners during the lockdown or increased violence within the family. This might be a result of loss of jobs during the pandemic which has caused additional stress with financial constraints and uncertainty during these unprecedented times (John et al., 2020; Mamun and Ullah, 2020). This makes people especially those with underlying mental health issues extremely vulnerable (Mamun and Ullah, 2020).

With the mental health care being shifted online due to the lockdown, people with past histories of mental health issues are receiving lesser attention and care. Based on a study, online appointments have reduced efficacy because there are mental issues which cannot be treated with online interaction and the health care professional might be unable to accord with the patient and due to the fact that online appointments are prone to technical issues (Feijt et al., 2020). Our study also supports this statement as it showed 13.3% individuals reporting previous mental illness related diagnosis while 40.5% were self-reported cases of deteriorating mental health. This reflects that there was a significant decline in the mental well-being of individuals during the pandemic.

Amongst people who reported comorbidities, 32.2% had moderate to high psychological distress, 31.5% had severe anxiety, and 29.7% had low mental well-being. This is in line with the study by Goodell et al. (2011) which states that medical comorbidities can lead to mental disorders since both have common risk factors including stress, childhood struggles, and socio-economic status. Regardless, when comparing those with low mental well-being in our study, people with underlying illnesses were less than those without, possibly because of people's confidence in their doctor's proficiency at treatment and diagnosis of COVID-19 as seen in a study conducted in Vietnam; it associated lower distress in individuals with increased confidence of patient in their healthcare system (Ngoc et al., 2020). The selection bias in our study also plays a significant role in the results here. Comorbidities are more likely to be prevalent in older individuals (Davis et al., 2011), and since most of our respondents were students aged between 18 and 29 years, less data was available to establish that the presence of comorbidities has no effect on psychosocial distress amongst people.

Students made up a significant portion (90.9%) of individuals among those with moderate or high K10 score. These students also reported comparatively higher scores on the GAD-7 index and lower WHO-5 scores compared to the rest of sample. These findings are consistent with the results seen in Australia; Lyons et al. (2020) reported that the mean K10 score among medical students in Australia during the COVID-19 pandemic was 20.6, which indicates moderate levels of psychological distress. It also highlighted the reasons for this remarkably high incidence of mental health issues among students; the most common concern being the impact COVID-19 pandemic has had on their studies followed by; the uncertainty about a return to normal life, family testing positive for COVID-19, being in self isolation

and financial uncertainty (Lyons et al., 2020). Similar study was conducted on students in Bangladesh and, comparatively less stress and anxiety levels were reported, the reasons for the discrepancy between results of this study and ours could be that this study used a different scale [Depression, Anxiety and Stress Scale—21 Items (DASS-21)] (Khan et al., 2020). Other reasons include different sociodemographic status of students who participated; there were fewer female participants in the sample of this study (37%) compared to ours (79%) and as has already been discussed, females are at a higher risk of domestic violence and abuse which leads to higher psychological distress levels and anxiety (Khan et al., 2020). A study on medical students of a private university from February 2003, found out that prevalence of anxiety and depression was found among 60% of the students. Our study reports significantly higher prevalence of these disorders among students which proves the fact that COVID-19 pandemic has had a serious mental impact on students in Pakistan and it is imperative that concerned authorities cater to this issue (Inam et al., 2003).

Comparison With International Studies

Lockdowns while being effective in curtailing the spread of COVID-19 are also putting the population at risk of deteriorating mental health. Even though Pakistan does not feature in the countries severely affected by the pandemic, the prevalence of mental distress and anxiety is comparable to international studies reporting negative implications of COVID-19 pandemic on mental well-being of general population (Banna et al., 2020; Every-Palmer et al., 2020; El-Nimr et al., 2021; Fornili et al., 2021). Females, students, individuals with underlying comorbidities and a history of mental health issues have shown to be more prone to the negative effects across several studies (Every-Palmer et al., 2020; Khan et al., 2020; Lyons et al., 2020; Özdin and Özdin, 2020; The News International, 2021). Increasing suicide ideation and incidence of domestic violence during the pandemic are also being reported by other studies from New Zealand, Spain, and Arab countries (Every-Palmer et al., 2020; Abdullah et al., 2021; The News International, 2021).

Future Steps

Looking at these statistics, and the ongoing pandemic, it can be accepted that the lockdowns might continue. The decline in family and social contact, lesser entertainment options, job losses and financial uncertainty, and shifting of universities and schools to online platforms have all significantly contributed toward the aggravation in psychological distress, anxiety, family violence, suicidality, and well-being of individuals (Every-Palmer et al., 2020). Hence, there is a need for provision of psychosocial interventions and mass-media campaigns to increase awareness regarding the services available for people dealing with abuse or other mental health issues. Typing the words “Mental Health Pakistan” in PubMed query box gives 494 results in 2020 and 2021 alone, this rapid influx of data should be used by concerned organizations including the governments to counter this epidemic of mental health issues during these challenging times. Further research needs to be done, focused on individuals who are at a higher risk of deteriorating mental

health (students, females, those with pre-existing mental health conditions, socioeconomically challenged families), governments and other international organizations should also play its role by providing incentives for research of this sorts. Newer research conducted must conceptualize the relationship between lockdown, personality traits and behavioral wellbeing to help improve COVID-related assessments.

Awareness campaigns on a national level are imperative to remove the stigma around mental health and these programs should help the public realize the severity of the issue and how it may lead to self-harm and suicide ideation. Sehat Sahulat Program has been launched, by some of the provincial governments in Pakistan, which aims at improving the quality of health care available to low-income households; however, among the treatment packages mental healthcare is not covered. Hence, adequate psychological support must be prioritized by the governments and should not be regarded as secondary compared to other health issues (Sehat Sahulat Program, 2021). Additionally, telehealth centers should be developed particularly in remote areas where people have access to quality e-therapies since most of the public in Pakistan either does not have access to the internet or does not know how to operate it.

Limitations

Our study like any other study is not devoid of limitations. The study was based on an online survey, which creates a population bias, especially since in Pakistan, most people from remote areas and from lower socio demographics have restricted access to smartphones, laptops, or computers through which they could have filled the survey form (Nagra et al., 2021). Hence, our sample population is not representative of the general population. However, in a rapidly evolving pandemic situation, online survey was the most efficient method at hand.

Secondly, most of the respondents of our study are aged between 18 and 29 years and are students or recent graduates. Students and fresh graduates are known to have been highly affected during the pandemic due to closure of institutions and decline of economy due to less available jobs, resulting in a selection bias (Wang et al., 2020; Ali A. et al., 2021). Thirdly, most of the depression and anxiety cases were self-reported. Self-reporting is known to be less accurate for diagnosis of mental health as it generates higher point prevalence compared to a clinical evaluation for depression (Summers et al., 2020; Saddik et al., 2021), resulting in response bias. Lastly, this study is a cross-sectional study rather than a prospective study so it cannot be used to assess the causes of the onset, progress and results of anxiety and low mental well-being among the population of Pakistan.

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CONCLUSION

With the lockdown restrictions, psychosocial distress has become prevalent in Pakistan and elsewhere. The results from Pakistan are mostly along the lines with the results from other countries due to Pakistani government opting for multiple smart lockdowns to reduce pressure on its economy. Regardless, the isolation has had its negative implications which can only be curtailed by timely provision of psychosocial support, other support services to individuals facing abuse and suicide ideations, as well as basic supplies of personal protective equipment required by the healthcare workers.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Dow University Hospital-Ojha Campus. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FY: conceptualization and funding acquisition. HJ, MAb, HN, and AK: data curation. MAs: formal analysis. FY, HJ, and SS: investigation. MAs and AK: methodology. FY, MAI, HJ, and AK: project administration. HJ, MAb, and HN: resources. MAs, SS, and HN: software. MAs, HN, and AK: validation. MAb and HN: visualization. HJ and SS: writing—original draft. FY, MAI, MAs, and AK: writing—review and editing. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.830935/full#supplementary-material>

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On the Parental Influence on Children's Physical Activities and Mental Health During the COVID-19 Pandemic

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Background: While neighborhood safety and stranger danger have been mostly canonized to play a part in parents' physical activity (PA) avoidance, less is known about the impact of parental stress and perceived risk on children's PA avoidance and consequently on children's level of PA and wellbeing. Understanding the contributors to children's wellbeing during pandemic disease is the first critical step in contributing to children's health during epidemic diseases.

Methods: This study employed 276 healthy children, aged 10–12 years, and their parents. Data were collected in October and November 2020, about 9 months after the local closing of schools due to the coronavirus disease 2019 (COVID-19) pandemic. Parents and children answered a separate set of questions. Besides the demographic information, the parents responded to questions on their stress level, perceived risk of COVID-19, and PA avoidance for children. Children responded to questions on their PA and wellbeing in the last week. Data were analyzed using SmartPLS and IBM SPSS 22.

Results: The result of the study supported the four directional research hypotheses of the sequential study model. As hypothesized, parents' stress and perceived risk levels of COVID-19 negatively affected children's PA. The PA level was shown to predict children's wellbeing and mental health. Housing type, parents' job security, number of siblings, number of members living together in-home, and history of death or hospitalization of relatives or family members due to COVID-19 were found to be associated with parents' stress and children's mental health.

Conclusion: This study sheds light on parents' role in children's wellbeing and mental health during the COVID-19 pandemic. Parents with higher stress and high restrictive behaviors might put their children at risk of mental disorders in the end.

Keywords: COVID-19, children mental health, mental health, parental stress, physical activity, perceived risk, physical activity avoidance

INTRODUCTION

Many mental health disorders among adults find their roots in early childhood (Thomson et al., 2019). Studies suggest that mental disorders can affect children's various aspects of life, such as educational outcomes (Patel et al., 2007), attentional function (Vloet et al., 2010), and eating behavior (Hill et al., 2018). Accordingly, understanding factors contributing to children's mental health is vitally important for reducing the risk of mental disorders later in adulthood. Physical activity (PA) has been emphasized repeatedly among various factors that predict children's mental health. Previous studies have covered various benefits of PA on children's life (Christiansen et al., 2018; García-Hermoso et al., 2020a). Studies suggest that PA affects children's health, quality of life (Shoesmith et al., 2020), and sleep quality (Chong et al., 2020). The long-term PA is an essential measure in balancing blood pressure, insulin level, and wellbeing (Leary et al., 2008).

Being aware of its benefits has not guaranteed a high level of PA among children of various ages globally. In studying children's PA, there has been an agreement that compared to the past, children's active transportation participation, such as walking and cycling to school, has decreased significantly (Salmon et al., 2005). Despite the proven benefits of active plays in children's PA level (Chong et al., 2020; García-Hermoso et al., 2020a; Shoesmith et al., 2020), most children in present times show lower outdoor playing activities than previous generations (Valentine and McKendrick, 1997; Hillman, 2006). According to WHO, children and adolescents aged 5–17 years should at least do 1 h of moderate-to-vigorous intensity activities on average.

Children might do not get engaged in recommended weekly PA regularly (Cavill et al., 2001). The level of children's PA is associated with various factors. Previous studies suggest that children's disabilities (Bedell et al., 2013), desire and motivation for physical activities (Wohlfarth et al., 2013), gender (Loucaides and Jago, 2008), and self-perception (Wright et al., 2019) can make a difference in the PA level of children in comparison with their counterparts.

Parents also might prevent or encourage children's PA in various ways and for multiple reasons. For example, children's independent mobility (CIM) is considered an essential source of PA (Carver et al., 2012). CIM is defined as children's freedom and ability to move around public spaces without any adults' absence or supervision. It covers activities such as walking, cycling, or independent playing. Studies suggest that CIM positively affects children's PA and weight status (Schoeppe et al., 2013).

Meanwhile, CIM is mainly dependent on parents' permission. Parental fear and concern about traffic safety and strangers are associated with more constraints on CIM (Carver et al., 2010). Parents' decisions substantially determine the extent and range of independence mobility (Carver et al., 2010). Compared to the past, nowadays, parents do restrict children much more from playing in local parks or streets (Karsten, 2005).

More recently, the coronavirus disease 2019 (COVID-19) pandemic has been an additional reason for reducing children's PA. COVID-19 added to the complexity of managing children's PA. The closing of schools plus online education eliminated

school-based PA from children's life. Before COVID-19, children might spend 5–40% of recommended PA time at school (Ridgers et al., 2006). Besides, parents are aware of the benefits of PA for children; they are also mindful of the negative consequences of a lack of PA on overweight or even obesity (Towns and D'Auria, 2009; Norman A. et al., 2015). Accordingly, the decision-making and managing of children's PA during the COVID-19 pandemic are much more on the parents' side than before the pandemic (at least as long as there are no general curfews on all possible PA modes, of course).

Due to the importance of PA and its demonstrated positive effects on children, the issue is well-covered in the literature, yet less is known about the factors that the parental PA restrictions impact children's perceived wellbeing and mental health during the COVID-19 pandemic. Addressing the impact of the parental decision on PA level of children and their perceived consequences of these decisions provides a piece of valuable information that hardly could be examined in studies that were confined to the pre-COVID-19 era (Timperio et al., 2004; Weir et al., 2006; Schoeppe et al., 2013; Wohlfarth et al., 2013). This study attempts to shed light on the perceived impact of PA level on children's wellbeing and mental health during the COVID-19 pandemic. Such an evaluation has to address the system of parents-children, so we included the perspective of the impact of COVID-19 on parents to gain a complete picture. Such effects can be classified regarding psychological states such as increased stress level (Brown et al., 2020; Xu et al., 2020), anxiety (Drouin et al., 2020), mental health (Limbers et al., 2020; Wu et al., 2020), as well as physical and wellbeing states (Patrick et al., 2020).

The result of this study can fill a part of the gap in previous studies. First, most of our knowledge of factors contributing to children's wellbeing is limited to the pre-COVID-19 pandemic. Second, most studies on parents' PA avoidance factors have emphasized neighborhood safety and stranger danger. Less is known about the impact of parents' stress and perceived risk in this regard. By addressing these issues, we attempted to contribute to studying children's mental health during epidemic diseases. Keeping in mind the effect of mental disorders on other aspects of children's lives and even its consequences on their adult mental health, it is essential to study factors contributing to children's wellbeing and mental health. This study presents pioneering research on parents' role in children's wellbeing and mental health during the COVID-19 pandemic.

THEORETICAL FRAMEWORK

Before COVID-19, mental health was a central and critical topic for research: it is estimated that more than 10% of children and adolescents around the world have a mental disorder (Kato et al., 2015), particularly in a pandemic crisis of this extent such figures and further potential deterioration of this condition, mental disorders have to be focused. People were affected concerning wellbeing and mental health, not only adults (Yeasmin et al., 2020) but also children (Parola et al., 2020). Among various factors contributing to children's mental health, we concentrated on the role of PA. We focused on the parental

role in reducing children's PA during the COVID-19 pandemic and its consequences on children's mental health and wellbeing. We attempted to canonize the role of parents in PA avoidance.

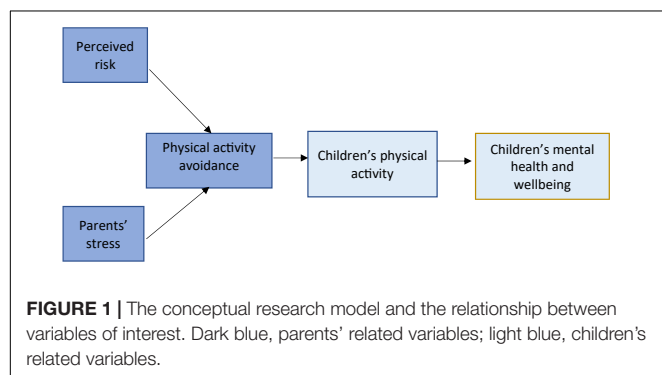
The literature well covers parents' influence on children's PA (Sallis et al., 2000). Stress and perceived risk have been shown to affect parents' avoidance behaviors in urban parks (Khozaei et al., 2021). Previous studies have revealed that PA impacts mental health (Bélanger et al., 2019). Parental influence was shown to substantially affect children's perception and participation in PA (Cheung and Chow, 2010). Besides, parental encouragement (Welk et al., 2003) or involvement (Ornelas et al., 2007), as well as role model factors (Bois et al., 2005) in PA, has proved to predict PA among children. Carver et al. (2012) provided statistical evidence that parents' PA avoidance can affect children's PA level. Moderate-to-vigorous physical activity (MVPA) is correlated with reducing mental disorders such as depression, anxiety, and mental health improvement (Carson et al., 2016). It has been well-established that outdoor physical activities positively affect peoples' mental health more than indoor PA (Thompson Coon et al., 2011; Bailey et al., 2018).

Spending time outdoors has been associated with children's attention improvement (Ulset et al., 2017). Based on these ideas, we raised the following research hypotheses:

- H1. Perceived risk (perceived vulnerability and severity) affects parental PA avoidance.
- H2. Parents' stress affects parental PA avoidance.
- H3. Parental PA avoidance affects children's PA.
- H4. Children's PA affects their mental health and wellbeing.

MATERIALS AND METHODS

In this study, we aimed to examine the impact of parental stress and perceived risk on children's avoidance of PA and, consequently, on children's PA and wellbeing levels. Understanding the contributors to children's wellbeing during pandemic disease is the first critical step in contributing to children's health during epidemic diseases. We defined four hypotheses (H1–H4) addressing the conceptual research model (Figure 1).



Participants

While, currently, several countries have celebrated the end of the COVID-19 pandemic in their countries, Iran is still challenging with a large number of reported death and lockdowns. In October 2021, the school children started their education online for the third year. As Iranian school children are among those who have experienced the most extended lockdowns, examining their PA level and mental health can provide valuable information in developing current literature. Data were collected from primary schools in Kerman city, located southern part of Iran. We selected Kerman city as the capital of one of the largest provinces in Iran, which, alongside the other cities, has experienced the long-term lockdowns and the closing of schools. In total, 306 questionnaires were filled, of which 276 returned online were usable. The responses that either children or their parents left their part blank were removed from the data analysis (30 in total).

Children aged 10–12 years were recruited from eight primary schools in Kerman, Iran. Children of this age generally have permission for independent mobility in short distances from home on parents' consent. The results of the independent-samples Student's *t*-test, $t(274) = 1.25$, $p = 0.211$, indicated that there was not any significant difference between the age of male and female students. As parents' data, we used either the data of the father or the mother of the children, i.e., the parents decided this on their own. In the end, this yields an unbalanced gender ratio with clearly fewer fathers taking part (fathers: $n = 56$; mothers: $n = 220$). The parents aged between 30 and 52 years with a mean age of 42.3 years. The parents had at least one child aged between 10 and 12 years. Those with more than a child of this age were allowed to fill out another questionnaire, respectively. **Table 1** presents the frequencies and percentages of school students' age by their parents' age group levels. The parents lived with their child/children and were considered their guardians. None of the children suffered from any reported disabilities or critical health problems.

Instruments

As was mentioned earlier, this study aimed to examine factors contributing to children's wellbeing during the COVID-19 pandemic. Parents answered questions on the perceived risk of COVID-19, stress, PA avoidance, and children responded with

TABLE 1 | Frequencies and percentages of school students' age crossed by levels of their parents' age group levels.

			School students' age			Total
			10 years	11 years	12 years	
Parents' age group	30–40	Count	43	30	20	93
		%	46.2%	32.3%	21.5%	100.0%
	41–50	Count	66	36	20	122
		%	54.1%	29.5%	16.4%	100.0%
	51 and above	Count	29	18	14	61
		%	47.5%	29.5%	23.0%	100.0%
Total	Count		138	84	54	276
	%		50.0%	30.4%	19.6%	100.0%

questions measuring their PA level and wellbeing. This study explains the measurement scales for each variable.

Perceived Risk

Perceived risk consists of two constructs (i.e., perceived severity and perceived efficacy) (Bults et al., 2011). The perceived risk of pandemic disease and, accordingly, peoples' behavioral response has been examined by some studies during H1N1 influenza waves (e.g., the 2009 swine flu pandemic, the 1977 "Russian" flu pandemic, or the 1918 "Spanish" flu pandemic) or the 2003 severe acute respiratory syndrome (SARS) distribution. To measure the perceived risk, the study relied on the questionnaire by Bults et al. (2011), which was applied to measure knowledge and perceived risk of H1N1 in the Netherlands. Theoretically, the questionnaire relies on the Protection Motivation Theory (PMT) (Norman P. et al., 2015) and the Health Belief Model (HBM) (Champion and Skinner, 2008) for the development of the constructs. The parents were asked to answer three questions on (1) how do they consider the severity of COVID-19 in general, (2) the children getting sick, and (3) its harmfulness for their children. The parents rated the first two questions on a Likert scale from 1 (*not severe*) at all to 5 (*very severe*) and the third question from 1 (*totally disagree*) to 5 (*agree*). Three questions addressed the perceived vulnerability of the COVID-19 pandemic. The parents declared their opinion about the perceived vulnerability of COVID-19 for their children by answering questions addressing the perceived susceptibility of their children against COVID-19, the chance of children getting infected, and the perceived likelihood of them getting infected compared to others on a Likert scale from 1 (*not at all*) to 5 (*very much*). For measuring the perceived risk, the scores of perceived severity and perceived vulnerability were combined.

Avoidance of Physical Activity

Parents might apply constrained behaviors to children's PA when perceiving a possible risk. Constrained behaviors refer to avoidance or defensive actions. This study examines the potential effect of parental stress and perceived risk on children's PA avoidance, in which parents remove the chance of children's outdoor PA. Carver et al.'s (2010) items were adapted in this study for measuring PA avoidance. Seven questions examined various types of outdoor PA avoidance: playing alone or with friends in the neighborhood, spending time outdoors, walking or cycling outdoor with alone or friends, and playing alone or with friends in the neighborhood park. They ranked their answer on a Likert scale from 1 (*totally disagree*) to 5 (*totally agree*).

Parental Stress

We employed the Depression, Anxiety, and Stress Scale (DASS-21) by Park et al. (2020). The parents were asked to read seven questions and declare how much each statement applied to them during the past week. The questions were as follows: (1) I felt I was close to panic, (2) I was unable to become enthusiastic about anything, (3) I felt I was not worth much as a person, (4) I felt that I was rather touchy, (5) I was aware of the action of my heart in the absence of physical exertion, (6) I felt scared without any good reason, and (7) I felt that life was meaningless. The parents

rated their response on a Likert scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*).

Physical Activity

For measuring children's PA level, the International Physical Activity Questionnaire (IPAQ) was used. The short form of the questionnaire contains seven questions addressing the PA level of respondents. The measurement scale has been extensively used worldwide and translated into various languages (refer to "Reliability and validity for 12 countries," Craig et al., 2003). The questionnaire measures children's amount and intensity of physical activities (vigorous, moderate, and walking) in the last 7 days. They were required to declare which of the vigorous, moderate, walking, or even sitting they have had in the previous week and how many times. They were also required to specify each activity's time in one of those days accompanied by information with the respective duration in hours and minutes. The IPAQ has been administered in a series of studies about children's PA level in COVID-19 (e.g., Zhu et al., 2019; Zhang et al., 2020; Daga et al., 2021), which opens the possibility to compare different studies' results across different cultures.

Children's Wellbeing and Mental Health

For measuring children's wellbeing, the KIDSCREEN-10 Index was used in this study (Ravens-Sieberer et al., 2010). The questionnaire has been used widely for measuring children's wellbeing and mental health. Children were asked to answer ten questions and declare their answers on a Likert scale from 1 (*not at all*) to 5 (*very much*). These questions comprise questions about feeling fit and well, full of energy, sad, lonely, having enough time for themselves, being able to do things they wanted to do, had enough time for something they wanted to do, having fun with friends, being able to pay attention, and being treated fairly by their parents. One question addressing doing well at school was emitted due to COVID-19 lockdowns and schools closing at the time of data collection.

Procedure

This study has concentrated on second-part primary school students between 10 and 12 years. Based on the official statistics in 2021, the total population of primary school students aged between 10 and 12 years has been around 2,152. The statistics derived from the office of education and training in Kerman revealed that there are currently 138 primary schools (70 girls' schools and 68 boys' schools), either publicly or privately run. These schools have been distributed within five municipality regions of the city. A probabilistic sample of 276 students was drawn from 25 schools that accepted collaborating in data collection. Upon the approval of the school, the online questionnaire link was distributed in social media groups of parents of students. Each questionnaire consisted of two sections that had to be filled by parents and their children separately. Both parents and children were provided with an online consent form. They have assured the confidentiality of their response and the academic aim of the research. In the online consent form provided at the beginning of the questionnaire, the parents were asked to confirm their interest in attending the survey as well as

giving permission for the participation of their children in the survey. Apart from providing their demographic information, parents were asked to answer questions on the perceived severity of COVID-19, their stress level, and physical activities avoidance.

Similarly, children responded to their age and gender questions, followed by questions on their PA level and perceived health and wellbeing. Children were provided with the definition of vigorous and moderate physical activities with various examples. The questionnaire was piloted in a school with 30 participants in October 2020. After the pilot test, the main data collection started on November 1, 2020, and was completed on December 5, 2020, when the last questionnaire was collected. The survey was online for 35 days. The online questionnaire took around 8–13 min for both parents and children to complete. A token of appreciation was posted to the children who participated in the research with a local post service.

Statistical Analyses (Model Fit)

The proposed model and research hypotheses were tested with the help of SmartPLS 3 (version 3.3.3) software (Ringle et al., 2015). The rationale behind choosing partial least squares (PLS) lies in the exploratory nature of the study. In the proposed model, some variable relationships were not tested previously (e.g., the impact of stress on PA restriction). Besides, PLS is a proper analysis method in examining the indirect effects of variables in the model. For examining the significance of the path coefficient between latent variables, non-parametric bootstrapping with 1,000 replications was applied.

RESULTS

The purpose of this study was four-fold. First, we explored the effect of perceived risk on avoiding parental PA. Second, we investigated the impact of parents' stress on the parental

avoidance of children's PA. Third, we studied the effect of parental PA avoidance on children's PA. Finally, we investigated the effect of children's PA on their mental health and wellbeing. The model studied in this report, along with its parameter estimations, is displayed in **Figure 2**.

Measurement Model Assessment

The proposed model was assessed and employed with a two-stage approach, as Anderson and Gerbing (1988) suggested. Accordingly, we evaluated and presented the Measurement Model and Structural Model. We assessed the measurement model for each latent variable undertaken in the study. We conceptualized it as a reflective measurement model, which allows us to assess its reliability and the convergent and discriminant validity. The reliability of the measurement model was assessed by referring to the Cronbach's alpha Coefficient, and the Composite Reliability (CR) with the cutoff value of 0.70 was acceptable.

Table 2 indicates that the value of CR and Cronbach's alpha exceeded the cutoff value of 0.70, suggesting acceptable or better internal consistency reliability. As displayed in **Table 2**, the Cronbach's alpha reliability indices for the five components of the model were as follows: mental health ($\alpha = 0.962$), PA ($\alpha = 0.975$), PA avoidance ($\alpha = 0.943$), children's PA ($\alpha = 0.808$), mental health ($\alpha = 0.932$), parental stress ($\alpha = 0.968$), and perceived risk ($\alpha = 0.924$). All Cronbach's alpha reliability indices were higher than the minimum acceptable index of 0.70.

As evaluated by the average variance extracted (AVE) value for all constructs, the convergent validity exceeded the cutoff value of 0.50. Besides, the outer loading value of all items of each construct was higher than 0.70. **Table 2** presents the established reliability and convergent validity for research constructs.

In the next step, we examined the discriminant validity of the constructs. We employed the Fornell-Larcker Criterion

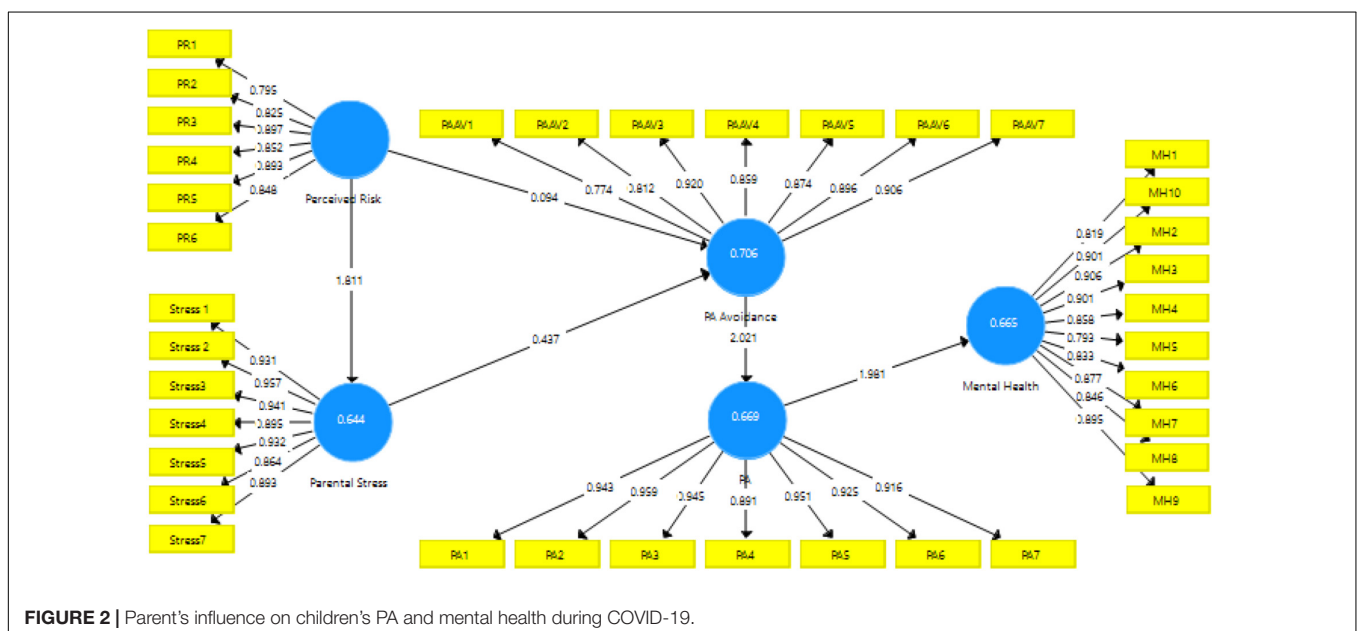


TABLE 2 | Descriptive statistics and reliability and convergent validity for research constructs.

	Respondent	Source	Number of items	Loadings	Cronbach's alpha	Rho_A	CR	AVE	Mean and SD
Physical activity avoidance	Parents	Carver et al., 2010	7		0.943	0.945	0.954	0.747	(<i>M</i> = 18.01, <i>SD</i> = 2.97)
I prevent my child from playing alone outdoors in our neighborhood				0.774					
I prevent my child from playing with friends outdoors in our neighborhood				0.812					
I do not allow my child to spend time outside alone,				0.920					
I do not allow my child to walk/ride a bike on the street alone				0.859					
I prevent my child from walking/cycling with friends in our neighborhood				0.874					
I prevent my child from playing alone in our neighborhood park				0.896					
I prevent my child from playing with friends in our neighborhood park				0.906					
Perceived risk	Parents	Bults et al., 2011	6		0.924	0.927	0.941	0.727	(<i>M</i> = 17.97, <i>SD</i> = 2.99)
<i>Perceived severity</i>									
The severity of the Nobel COVID-19 is				0.796					
The severity of getting the COVID-19 for your child/children in the coming year is				0.824					
The COVID-19 is very harmful to your child/children				0.898					
<i>Perceived vulnerability</i>				0.852					
How much is your Perceived susceptibility against COVID-19				0.893					
Perceived chance of getting infected next year				0.847					
Perceived chance of getting infected compared to others				0.796					
Parental stress	Parents	The (DASS-21)	7		0.968	0.970	0.974	0.840	(<i>M</i> = 17.99, <i>SD</i> = 3.02)
I felt I was close to panic				0.932					
I was unable to become enthusiastic about anything				0.957					
I felt I was not worth much as a person				0.941					
I felt that I was rather touchy				0.896					
I was aware of the action of my heart in the absence of physical exertion.				0.932					
I felt scared without any good reason				0.862					
I felt that life was meaningless				0.893					
Children's physical activity	Children	International Physical Activity (IPAQ)	7		0.975	0.976	0.979	0.871	(<i>M</i> = 17.99, <i>SD</i> = 3.00)
Number of days with vigorous physical activities				0.943					
Amount of time spent on vigorous physical activities during 1 day				0.959					
Number of days with moderate physical activities				0.945					
Amount of time spent on moderate physical activities during one day				0.891					
Number of days with at least 10 min walking				0.951					
Amount of time spent on walking during 1 day				0.925					
Amount of time spent sitting on a week day				0.916					

(Continued)

TABLE 2 | Continued

	Respondent	Source	Number of items	Loadings	Cronbach's alpha	Rho_A	CR	AVE	Mean and SD
Children's wellbeing and mental health	Children	KIDSCREEN-10	10		0.962	0.968	0.967	0.746	(<i>M</i> = 18.02, <i>SD</i> = 3.04)
Have you felt fit and well?				0.819					
Have you felt full of energy?				0.901					
Have you felt sad?				0.906					
Have you felt lonely?				0.901					
Have you had enough time for yourself				0.858					
Have you been able to do the things that you want to do in your free time?				0.793					
Have your parent(s) treated you fairly?				0.833					
Have you had fun with your friends?				0.877					
Have you been able to pay attention?				0.846					
In general, how would you say your health is?				0.895					

and Heterotrait-Monotrait (HTMT) (Voorhees et al., 2016). The accepted HTMT value must be lower than 0.85 or 0.90 (Henseler et al., 2015). **Table 3** reveals that discriminant validity was acceptable in the study data. In addition, the criterion developed by Fornell and Larcker (1981) suggests that the square root of AVEs of each construct must be ensured to be greater than the correlation estimate between constructs. **Table 4** also reveals supporting this criterion and demonstrating the discriminant validity again.

Structural Model Assessment

To examine the structural model, two preliminary criteria should be checked: the significance of path coefficients and the value of R^2 coefficients for endogenous constructs. Chin (1998) suggested that the values of 0.67, 0.33, and 0.19 suggest substantial, moderate, and weak measures of R^2 , respectively. In this study, R^2 for perceived parental stress, PA avoidance, PA, and mental health were 0.644, 0.706, 0.669, and 0.655, respectively, which are relatively high and acceptable values.

Table 5 presents the evaluation of the research hypothesis and path coefficients. There are four hypotheses in this study addressing the measurement model.

A: The first hypothesis examined the impact of perceived risk on PA avoidance. The result of the study revealed that parents' perceived risk significantly affected parental PA avoidance ($\beta = 0.279$, $t = 4.704$, $p < 0.001$). Thus, the first directional hypothesis "Perceived risk affected parental avoidance of PA" was supported. Hence, it was statistically shown that the perceived severity and vulnerability of pandemic diseases such as COVID-19 could significantly affect parents' constrained behaviors.

B: The second hypothesis examined if parents' stress significantly affected parental PA avoidance ($\beta = 0.600$, $t = 11.322$, $p < 0.004$). Thus, the second directional hypothesis "Parents' stress affected parental PA avoidance" was supported. It suggests that during the COVID-19 pandemic, the higher stress parents experience, the more they might prevent their children from spending time outdoors.

TABLE 3 | Fornell-Larcker criterion.

	Mental health	PA	PA avoidance	Parental stress	Perceived risk
Mental health	0.864				
PA	0.815	0.933			
PA avoidance	0.818	0.818	0.864		
Parental stress	0.811	0.959	0.824	0.917	
Perceived risk	0.791	0.814	0.760	0.802	0.852

TABLE 4 | Heterotrait-Monotrait (HTMT) ratio.

	Mental health	PA	PA avoidance	Parental stress	Perceived risk
Mental health					
PA	0.827				
PA avoidance	0.847	0.851			
Parental stress	0.826	0.987	0.860		
Perceived risk	0.823	0.855	0.812	0.846	

TABLE 5 | Standardized regression weights (along with the 95% confidence interval).

	Paths	<i>M</i>	<i>SD</i>	<i>t</i> -value	<i>p</i>	Standardized regression weight	
						2.5%	97.5%
PA→Mental health	0.815	0.819	0.017	47.958	<0.001	0.783	0.848
PA avoidance→PA	−0.818	0.820	0.020	41.301	<0.001	0.778	0.855
Parental stress→PA avoidance	0.600	0.591	0.053	11.322	0.004	0.483	0.689
Perceived risk→PA avoidance	0.279	0.291	0.059	4.704	<0.001	0.183	0.402

Parents' influence on children's PA and wellbeing during COVID-19.

TABLE 6 | Recommended physical activity (PA) based on age group.

Age group	Physical activity duration
Preschool-aged children (3–5 years)	Physical activity every day throughout the day. Active play through a variety of enjoyable physical activities.
Children and adolescents (6–17 years)	60 min (1 h) or more of moderate-to-vigorous intensity physical activity daily. A variety of enjoyable physical activities.
Adults (18–64 years)	At least 150 min a week of moderate intensity activity such as brisk walking. At least 2 days a week of activities that strengthen muscles.

C: The third hypothesis tested the effect of parental PA avoidance on the total level of PA among children aged 10–12 years during the COVID-19 pandemic. Parental PA avoidance had a negative and significant effect on children's PA ($\beta = -0.818$, $t = 41.301$, $p < 0.001$). Thus, the third directional hypothesis "Parental PA avoidance affected children's PA" was supported.

D: The fourth hypothesis examined the impact of children's PA on their perceived wellbeing. Children's PA significantly affected their mental health and wellbeing ($\beta = 0.815$, $t = 47.958$, $p = 0.001$). Thus, the fourth directional hypothesis "Children's PA affected their mental health and wellbeing" was supported. This finding is significant as it suggests that the long-term lockdowns and the lack of PA have affected them negatively, although families stayed at home given the parents' perception that the home is the safest place to keep children healthy. Children who had the chance of higher PA perceived themselves as healthier.

Model Fit Indices

The Standardized Root Mean Square Residual (SRMR), which "measures the difference between the observed correlation matrix and the model-implied correlation matrix" (Garson, 2016, p. 68), should be ≤ 0.8 to infer the model's fit. Our study's SRMR of 0.075 indicated that this model enjoyed a good fit. The Squared Euclidean Distance (d_ULS) and Geodesic Distance (d_G) are exact fit indices that, similar to SRMR, measure any significant difference between the observed and model-implied correlation matrices. However, unlike SRMR, which measures the residuals, d_ULS and d_G compute the distances between the two matrices (Hair et al., 2017). Overall, this model enjoyed a good fit.

Differences in Parental Stress and Children's Mental Health

The housing type in this research was confined to the apartment and single-story houses, which generally have a private yard used by a single family, i.e., all located in Kerman/Iran. Except for Afghan migrants, these types of accommodation are typically occupied by a single-family. However, in some other

cases, extra members of families might coexist in the same house. An independent samples *t*-test analysis was conducted, yielding significant differences between the mental health of children living in an apartment and the single-story homes, $t(276) = 19.84$, $p < 0.02$, Cohen's $d = 0.435$. The children living in single-story houses ($M = 31$, $SD = 10.92$) considered themselves healthier compared to those living in the apartments ($M = 12.11$, $SD = 4.81$), all measured during COVID-19 pandemic lockdowns. Interestingly, parental stress of those living in apartments ($M = 15.08$, $SD = 8.28$) was also significantly [$t(276) = 13.46$, $p < 0.01$, Cohen's $d = 0.643$] higher than those who lived in single-story homes ($M = 4.25$, $SD = 4.83$).

Besides, we revealed a significant difference in the stated mental health of children whose parents had job security compared with those who did not have $t(276) = 13.66$, $p < 0.07$, *n.s.*, Cohen's $d = 0.821$. Children whose parents had a secure job during COVID-19 had a far better mental health ($M = 29.67$, $SD = 11.89$) comparing their counterparts ($M = 13.51$, $SD = 7.26$). Job security was also significantly associated with parents' perceived stress, $t(276) = 21.88$, $p < 0.00$, Cohen's $d = 0.621$. Those with insecure jobs experienced higher stress ($M = 17.53$, $SD = 6.05$) comparing with parents with secure jobs ($M = 3.59$, $SD = 4.10$). Through running a series of ANOVA tests, we found that children's mental health might differ when they do not have or have other siblings, $F(4,272) = 20.52$, $p = 0.03$, Cohen's $d = 0.321$. Those with one brother or sister reported the best mental health status ($M = 22.54$, $SD = 1.00$), and children with four or more siblings were reported with the poorest mental health status ($M = 10.00$, $SD = 2.04$) during the COVID-19 lockdowns.

The children's mental health status was also significantly different between those residing in more or less crowded living environments, $F(4,272) = 41.48$, $p = 0.02$, Cohen's $d = 0.468$. Children who were living in a family of four members were associated with the best mental health ($M = 34.13$, $SD = 12.53$). Living in populated families was also associated with a significant rise in parents' stress, $F(4,272) = 24.42$, $p < 0.0001$, Cohen's $d = 0.786$. The highest reported stress was associated with those

living in families with 6+ members ($M = 17.06$, $SD = 7.12$). History of death or hospitalization of relatives or family members due to COVID-19 was significantly associated with parents' stress $t(276) = 15.60$, $p < 0.0001$, Cohen's $d = 0.587$. Children with no history of such personal experiences with COVID-19-related health issues in their families and relatives showed a much more balanced mental health status ($M = 27.80$, $SD = 11.93$) than their counterparts ($M = 14.67$, $SD = 9.05$).

DISCUSSION AND CONCLUSION

It was late 2019 that people worldwide heard about an unknown, deadly virus that presumably originated from China for the first time. It did not take long that the transmitted virus outside the China borders brought about similar symptoms, death, and fear globally. Accordingly, staying home and keeping social distancing turned into a worldwide slogan, and attitude and respective measures were implemented all over the world. Coping with the lengthy lockdowns and curfews, fear of death, losing the job, and uncertainty about the future greatly stressed people on a global scale.

COVID-19 posed numerous challenges for people confronted with restrictions, lockdowns, and quarantine situations (Grossman et al., 2020; Picaza Gorrochategi et al., 2020; Zhu et al., 2020).

Parenting is taken as concerns about financial support of family, training, and taking care of children's education, concerns about job stability, and tolerating working conditions. Parenting has always been considered a difficult task, yet the burden of COVID-19 faced parents with a more significant challenge (Cluver et al., 2020; Griffith, 2020). Job insecurity concerns during COVID-19, providing children with proper mobile electrical devices for online learning, responding to children's new demands, working from home have been all-new aspects of parenting for children. There is no wonder that several studies have canonized the parents' stress during COVID-19 (Brown et al., 2020; Calvano et al., 2021; Chung et al., 2020; Xu et al., 2020). The impact of parents' emphasis on various aspects of children's life is becoming increasingly difficult to ignore.

In this study, we aimed to investigate the relationship between five latent constructs: perceived risk of COVID-19, avoidance of PA, parental stress, children's PA, and children's mental health. Four hypotheses were developed and tested using SmartPLS 3. Through a consequential model, we examined some factors contributing to children's mental health. Results of the study provided empirical evidence for the hypothesized relationship between the supposed latent constructs.

The findings supported the first hypothesis. Similar to Carver et al. (2012), it appears that perceived risk affects parental PA avoidance. Based on the literature, parents prefer to avoid their adolescent or children's PA outdoor in any risky conditions such as neighborhood safety (Weir et al., 2006), traffic (Timperio et al., 2004; Carver et al., 2010), and danger of strangers (Carver et al., 2010). Notably, for the PA level, we referred to a well-established instrument (IPAQ) for which we could not rely on Persian norms as this instrument is not yet validated for Iran. However, a

posteriori analyses for our sample revealed a reliable scale also for our adapted version for the Persian language.

Parents' stress was revealed to affect children's PA avoidance significantly. Accordingly, the second hypothesis was also supported. There might be several explanations for this result. First, previous studies have already shown the negative impact of stress on ones' PA. For example, Salmon (2001) asserted that "people who are less disturbed by stress might simply be more ready to take up exercise training" (p. 46). Hence, the inactivity of stressed parents might influence PA restrictions for their children. Second, parents with higher stress levels might have more negative thoughts and will likely expect bad events. This might explain the higher probabilities of restrictive behaviors on children's spending time outdoor.

Our findings supported the third hypothesis as well. Parents' PA avoidance proved to have a strong negative effect on children's overall PA level. We could demonstrate that children with parents who applied more restriction rules on children's PA also showed lower PA levels. Previous studies argue that spending time outdoor can positively affect youth's level of PA (Schaefer et al., 2014; Gray et al., 2015). Accordingly, they also justify that avoidance of children from the time of expenditures' outdoor leads to the low level of children's PA. This result is consistent with the findings of other studies (Timperio et al., 2004; Weir et al., 2006).

The fourth hypothesis examined the impact of children's PA on their mental health and wellbeing. The result of the study supported the research hypothesis. Children with less PA level considered themselves less healthy, and their overall wellbeing was less than those with higher PA levels. It is widely accepted that PA is associated with children's health (Christiansen et al., 2018; Bélanger et al., 2019; García-Hermoso et al., 2020b) and children's activity limitation increases the chance of being overweight (Holderness et al., 2017). The current findings support those previous findings.

Taken as a whole, the result of this study highlights the importance of PA on children's mental health. It also canonizes the role of parents on children's PA level during pandemic disease. Before COVID-19, children were performing PA in various, freely choosing contexts. Structured activities and sports courses in the school or walking and cycling to get to the school are all essential measures to add active hours to children's lifestyle. Physical playing indoors or outdoors and engaging in group games are typically also part of children's PA. COVID-19 made many children's routine PA impossible or even explicitly prohibited them. Parents, as the most critical gatekeepers, significantly controlled children's PA, especially in pandemic times. Nowadays, the children's average physical activities might not even meet the recommended PA daily level (Table 6). This study intriguingly demonstrates the adverse effects of children's less PA during the long-term stressful periods such as epidemic diseases. It shed light on an essential fact that the children who had less PA in the last 7 days also perceived themselves as less healthy. As the current pandemic situation has limited the children's average time to spend time outdoors, it is essential to facilitate access to good physical playing

possibilities, e.g., providing gaming devices to encourage physical play on safe outdoor fields. All these issues should be taken very seriously by parents, by caring institutions, and, of course, by state officials.

In canonizing the parental stress and children's mental health, we further compared the respondents regarding the demographic background and living environment. We found that housing type, parents' job security, number of siblings, number of members living together in-home, and history of death or hospitalization of relatives or family members due to COVID-19 were associated with parents' stress and children's mental health. Further studies might consider other factors such as neighborhood condition, housing area and the number of rooms, and the possible connection with nature as factors that can affect the parents' stress and children's mental health. Besides, the comparative study of children's mental health in rural areas and urban environments might provide valuable information.

Our study is among the very first research approaches examining the impact of parents' stress on PA restrictions. We believe that understanding factors contributing to children's mental health and wellbeing is essential in times of continuing lockdowns. Of course, future research has to test also the developments and adaptations taking place during such a long-term crisis similar to COVID-19 because our present study only provides a single-shot measurement of the target variables. Further studies might also canonize the role of parenting strategies and the management of children's PA during such critical periods of life on children's overall wellbeing. Insights generated from such studies will be an important learning lesson for other crises to come in the future.

RESEARCH LIMITATIONS

Due to the closing of schools, we did not have access to an extremely large number of participants. We were confined to

schools that had social media groups for students and parents. Some of the school principals also disagreed in distributing the required online link among the students and respective explanations of research aims for their parents. These are challenges that increase the difficulties in conducting such studies in this area under the circumstances of a pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

FK analyzed the data. Both authors were involved in the research design, manuscript preparation, and approved the submitted version.

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Worker Stress, Burnout, and Wellbeing Before and During the COVID-19 Restrictions in the United Kingdom

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COVID-19 created a transformational shift in the working environment for much of the labour force, yet its impact on workers is unclear. This study uses longitudinal data to examine the wellbeing of 621 full-time workers assessed before (November 2019–February 2020) and during (May–June 2020) the first lockdown in the United Kingdom. We employ fixed effects analyses to investigate the impact of the restrictions and mandatory homeworking on cognitive, emotional, and psychological wellbeing. Within the sample, the rate of full-time homeworking increased from 2 to 74% between waves. We identify significant changes in 9 of the 15 measures assessed, with a general pattern of improvements in wellbeing during lockdown. Overall levels of stress, self-rated mental health, positive emotions and life and job satisfaction are not adversely affected by the restrictions. There is a reduction in the burnout symptoms of disengagement (−0.13 sd) and exhaustion (−0.20 sd) and in the frequency with which negative emotions are experienced at work (−0.15 sd). Workers feel more autonomous (+0.09 sd), closer to their co-workers (+0.10 sd), and more attached to their organisations (+0.19 sd). However, homelife satisfaction declines (−0.11 sd). These findings highlight the possibility that the COVID-19 pandemic and large-scale transition to homeworking was associated with unchanged or improved worker wellbeing. This study has important implications for governments and employers regarding a global shift to homeworking.

Keywords: COVID-19 restrictions, lockdown, homeworking, subjective wellbeing, stress, burnout, mental health

INTRODUCTION

The COVID-19 restrictions have resulted in a major restructuring of work and home lives, with potential consequences for mental health and wellbeing. A burgeoning interdisciplinary literature has begun to examine the impact of this unprecedented shock, yet many studies are limited to data collected after the onset of the pandemic and/or utilise a narrow set of outcome measures. The current study contributes to this literature by producing a rich account of the lived experiences of United Kingdom workers, surveyed before and during the imposition of the COVID-19

restrictions. Specifically, a pre-post pandemic design is used to estimate the effects of “lockdown” and mandatory homeworking on general and work-related stress, burnout and wellbeing across a wide range of measures.

On the 23rd of March 2020, the United Kingdom Prime Minister announced a statutory ban on leaving the home, including commuting to work, unless “absolutely necessary.” The United Kingdom remained in lockdown for 11 weeks, with a phased re-opening commencing in June 2020. **Figure 1** depicts this timeline. The mental health and wellbeing effects of pandemics, including COVID-19, have been examined across an extensive set of studies (e.g., Lau et al., 2008; Brooks et al., 2020), however, these studies rely predominantly on cross-sectional designs, without pre-shock baseline assessments. Prior studies have also tended to use narrow, single-item measures of subjective wellbeing. While some longitudinal studies initiated during COVID-19 have investigated changes in mental health among the general population (e.g., Daly et al., 2020; Pierce et al., 2020) or on groups of interest such as frontline workers (e.g., Cabarkapa et al., 2020), the psychological impact of COVID-19 on general workers has not been investigated in depth. Where workers have been the primary focus (e.g., Bell and Blanchflower, 2020), the emphasis is often on the distributional effects of COVID-19 in terms of unemployment and income losses, rather than on subjective wellbeing. In this study, we examine full-time workers who were subjected to a dual shock—the impact of COVID-19 in communities across the United Kingdom and, for many workers, a radical change in where and how they work.

This study makes a unique contribution to the COVID-19 literature by investigating multiple facets of wellbeing including general and work-related cognitive, emotional and psychological dimensions. We also explore heterogeneity and investigate whether the restrictions differentially impact the wellbeing of homeworkers (77%), women (64%), and parents of young children (24%). The study also contributes to the homeworking literature by using the Day Reconstruction Method (“DRM”) (Kahneman et al., 2004) to capture, for the first time, the lived reality of homeworking before and during the pandemic. In doing so, it sheds light on the homeworking experiences of workers who may not have chosen to work from home and who may be combining work, alongside increased caring and/or home-schooling responsibilities.

COVID-19 and Life Satisfaction, Happiness and Stress

Since the onset of COVID-19, a number of studies have examined its potential psychological effects on distress and mental health symptoms. Depression, anxiety and stress are common global reactions to the early stages of the pandemic (Rajkumar, 2020; Wang et al., 2020), with women and young adults faring particularly adversely (Pierce et al., 2020). There is, however, emerging evidence of psychological adaptation in the aftermath of the first wave in the United Kingdom (Fancourt et al., 2020; Daly and Robinson, 2021a), with mental health symptoms spiking sharply at the start of lockdown, before recovering in June

and July 2020. Daly and Robinson (2021b) reveal similar findings using nationally representative United States data.

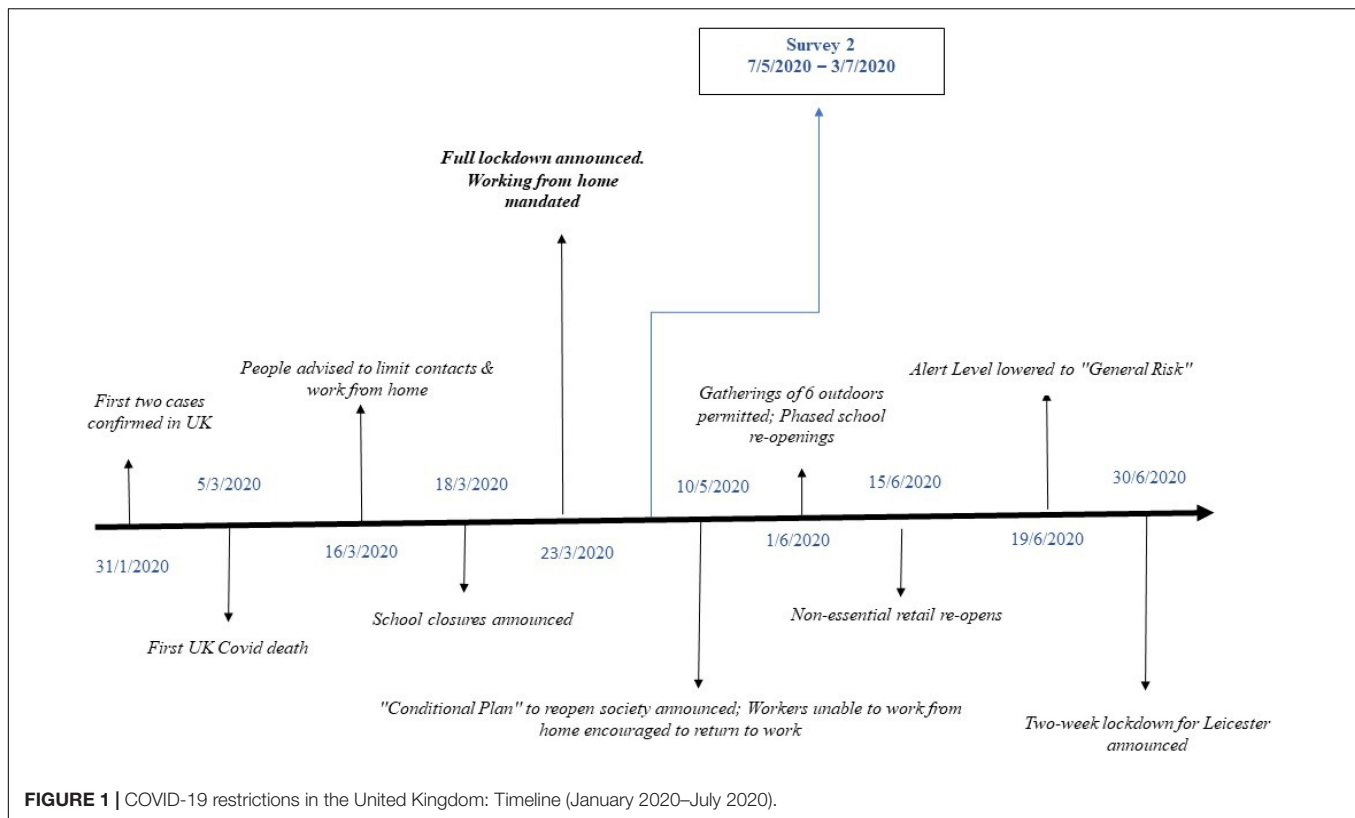
A limited number of pre-post pandemic studies examine the trajectory of wellbeing outcomes other than psychological distress. Entering lockdown is associated with reduced life satisfaction in Italy (e.g., Ruggieri et al., 2021). In the United Kingdom, Fancourt et al. (2021) show that, while average life satisfaction dips prior to lockdown, it increases after lockdown is announced and stabilises by the end of May 2020, albeit at a lower level. This lends support to an adaptation theory (Diener et al., 2009). Globig et al. (2020) show that the happiness of United States respondents surveyed at the start of the pandemic returns to baseline levels within 1 month. Fancourt et al. (2020) suggest that lockdown is not necessarily a negative experience for everyone, with 33% of respondents (mainly higher earners or people living with others) “enjoying” it. Similarly, De Vries et al. (2021) use longitudinal data to show that 15% of Dutch respondents feel more optimistic and find life more meaningful during lockdown, a finding they attribute to the “simplifying” effect of the pandemic. Recchi et al. (2020) report higher wellbeing for French respondents from higher socioeconomic backgrounds, a finding they attribute to favourable social comparisons. Lockdown is, however, also associated with increased domestic discord (e.g., Luetke et al., 2020) and stress (Beland et al., 2020) and reduced wellbeing of parents and women (Huebener et al., 2021).

Very few studies focus exclusively on the impact of the COVID-19 restrictions on *worker* wellbeing. One notable exception is Zacher and Rudolph’s (2021) study which reveals a decrease in life satisfaction and happiness (global positive affect) amongst German workers during the early stages of the pandemic. Against expectations, they also find a reduction in negative affect, a finding they attribute to coping strategies, particularly the use of social supports. They speculate that this result may be driven by their reliance on measures of high-activation negative emotions (e.g., “upset”) and that unobserved low-activation negative emotions (e.g., “despondent”) may have increased during lockdown. The present study advances this work by analysing both high and low activation emotions, allowing us to provide a more nuanced insight into the affective mechanisms at work.

COVID-19 and Homeworking

For a large portion of United Kingdom workers, lockdown triggered a sudden switch to homeworking for the first time. While homeworking is usually positively associated with higher job satisfaction and organisational commitment under “normal” circumstances, the links between homeworking, stress, emotional wellbeing, and burnout remain contested (e.g., Charalampous et al., 2019; Oakman et al., 2020).

In the context of COVID-19, the results are inconclusive. Ipsen et al. (2021), using cross-sectional data on the early lockdown experiences of 5,748 knowledge workers from 29 European countries, shows that, on balance, homeworking during lockdown was experienced positively. Weitzer et al. (2021) find that homeworking during lockdown in Austria is associated with improved quality of life for workers of all age



groups and levels of education. In total, 39% of Moretti et al.'s (2020) respondents report feeling less stressed when working from home relative to their pre-lockdown place of work. While Kunze et al. (2020) find that most participants wish to continue homeworking, they also report a significant association between homeworking during the pandemic and excessive workloads, resulting in increased exhaustion. Sato et al. (2021) find a negative association between switching to homeworking and developing depressive symptoms for women, whereas Lyttelton et al. (2020) find that homeworking mothers feel anxious and depressed more often than homeworking fathers. Xiao et al. (2021) report an association between transitioning to homeworking and decreased physical and mental wellbeing in the United States. Finally, Möhring et al. (2021) find no changes in homelife or job satisfaction amongst German workers who switch to homeworking during COVID-19. Whilst these studies provide an important insight into the experience of homeworking during the pandemic, they rely exclusively on cross-sectional data collected after the onset of COVID-19. The present study addresses this limitation.

Measuring COVID-19 Related Changes in Stress, Burnout, and Wellbeing

The multi-dimensionality of worker wellbeing is well documented (see Linley et al., 2009; De Simone, 2014). Thus, rather than relying on measures of general psychological distress or life satisfaction, we utilise a wide range of measures which capture changes in general wellbeing, as well as changes

in work-related satisfaction, emotions, sense of purpose and meaning, stress, burnout and psychological wellbeing associated with entering lockdown. In doing so, we acknowledge the documented need for workers to feel close to their colleagues (relatedness) and to achieve "mastery" over their working environment through goals consistent with their sense of self (autonomy) and ability (competence) (Ryff, 1989; Reis et al., 2000), in order to fulfil their potential. Optimal performance also requires workers to feel engaged, a state which arises when they experience high-activation positive emotions and find their work absorbing (Csikszentmihalyi, 1990), worthwhile (Seligman, 2018), and positively challenging (Bakker and Demerouti, 2008). Workers who experience low pleasure and activation may experience occupational burnout, a state characterised by physical and emotional exhaustion and by disconnectedness. A recent meta-analysis by Shoman et al. (2021) highlights excessive job demands and negative work attitudes as key predictors of occupational burnout. There is also evidence that workers from particular sectors (e.g., teachers) are more likely to experience burnout and that training courses and policies aimed at boosting workers' internal resources and abilities to cope with work-related stress and emotional demands (adaptive coping strategies) may render them less susceptible to burnout (Pishghadam et al., 2021; Shoman et al., 2021).¹

¹Personality profile may also play a mitigating role. For example, Pishghadam and Sahebjam (2012) find that high neuroticism and low extraversion scores predict a higher incidence of emotional exhaustion and depersonalisation, both key aspects of burnout, amongst teachers.

While worker wellbeing studies predominantly rely on single-item job satisfaction scales, emotional wellbeing (affective) measures can be “global” or “experiential.” Global measures capture workers’ beliefs about the typical, overall patterns of emotions experienced at work on a remembered basis (Bakker and Oerlemans, 2011), whereas experiential measures capture momentary affective states triggered by changes in external circumstances as they occur (e.g., who the worker is with at the time). Despite evidence that these measures are differentially determined (Hudson et al., 2016), global measures dominate the COVID-19 studies discussed above. Given the potential for the restrictions to temporarily disrupt the work context, we assess experiential affective measures as well as global measures in order to fully capture COVID-19 related changes in emotional wellbeing.

In contrast to the majority of COVID-19 studies, we examine within-person changes in cognitive, emotional, and psychological measures of wellbeing. Our use of pre- and during pandemic data enables us to control for individual differences in workers’ pre-pandemic wellbeing levels and to capture variations in patterns of wellbeing changes associated with entering the first period of COVID-19 restrictions. Given emerging evidence of significant heterogeneity in how lockdown is experienced by different categories of workers, we also examine between-person differences, focusing on women, parents of young children and workers who worked from home during lockdown.

In line with existing COVID-19 research, we expect the imposition of pandemic related restrictions to be associated with a reduction in life and home-life satisfaction and with an average overall decrease in positive emotions and an increase in negative emotions, in particular anxiety and stress. Given the well-documented links between global measures and enduring life circumstances and the relatively short gap between the two surveys, we hypothesise that experiential affective measures will be more sensitive to COVID-19 induced changes than global measures of wellbeing. In line with existing research, we expect mental health to be adversely affected by COVID-19 restrictions, with women and parents likely to be worse affected given the imposition of additional caring and home-schooling burdens. Given that non-homeworkers are mostly essential front-line workers and that many homeworkers may have been forced to switch to a new (and not necessarily, preferred) way of working for which they were ill-prepared, we also expect to see decreases in job satisfaction and increases in work-related stress and psychological distress. However, while we expect the overall impact of COVID-19-related restrictions on our sample to be detrimental, we acknowledge the potential mitigating factor of sample composition, which we hypothesise may partially offset the anticipated overall average negative effect of the pandemic on the sample.

The remainder of the paper is organised as follows: Section “Materials and Methods” describes the data and outlines the empirical strategy and robustness checks. Section “Results” presents the results. Section “Discussion” discusses the results and concludes.

MATERIALS AND METHODS

Data and Sample

We collected longitudinal panel data from 621 full-time workers. Participants were sourced through Prolific Academic, a specialist academic research survey-panel provider, and were compensated for their time.² The wave one survey was completed online by 994 workers based in the United Kingdom between 25/11/2019 and the 19/2/2020.³ 1,514 Prolific panel members met the pre-screening criteria and were invited by Prolific to participate in the survey. Of these, 994 panel members elected to participate in the survey, corresponding to a response rate of 65.6%. The wave two survey was restricted to workers who had participated in wave one. Matched data was collected from 741 respondents between 7/5/2020 and 3/7/2020 (response rate of 75%).

The time period between the two data collection points ranged from approximately two and a half to 7 months, with an average gap of approximately four and a half months. The distribution of responses by month is graphed in **Supplementary Figure 1**. **Figure 1** provides some additional background context on the pandemic situation in the United Kingdom at the time of the study in the form of a ‘COVID timeline’. While the majority (84%) of wave one responses were collected between November 2020 and January 2021, a period in which the virus had not yet reached the United Kingdom, 97 (16%) wave one responses were collected in February 2020, after the first two cases had been confirmed in the United Kingdom on January 31 but prior to the announcement of the first COVID death in the United Kingdom on March 5. All of the wave two responses were collected after full lockdown and mandatory homeworking was announced on March 23. 94% of wave two responses were obtained in May, 5% in June and just one response in July. The majority of wave two responses were collected during full lockdown, on the 7th–8th of May, prior to the publishing of the Conditional Plan to re-open society on May 10. Twenty-five responses were obtained between the 1st and 19th of June, a period which coincides with lockdown easing, including phased school and non-essential retail re-openings. Just eight responses were obtained on the 19th of June after the risk alert level was lowered to “general risk.”⁴

The sample intentionally targets full-time workers. Pre-screening criteria were used to recruit participants between 18 and 65 years old, who were engaged in full-time paid employment for more than 2 months, in organisations with 5 or more workers, for at least 21 hours per week. Shift-/part-time and self-employed workers were excluded to reflect our focus on full-time workers and due to evidence that these groups experience systematically different health patterns (Reutrakul and Knutson, 2015). We

²The Prolific United Kingdom database includes participants who are mainly white, full-time workers. In total, 55% of the panel are female. A total of 75% are in the 20–40 age bracket and 50% hold university degrees. Participants were paid an hourly rate of £8.20.

³During wave two, three workers are based in Ireland. Excluding these workers does not materially affect the results.

⁴While we cannot rule out the possibility that non-COVID-19 related seasonality may have influenced our results, previous research has found minimal effects of seasonality in relation to measures of emotional distress during the pandemic (e.g., Daly et al., 2020).

excluded 120 participants from the final estimation sample as they were no longer engaged in paid work in wave two.⁵ Thus, the final estimation sample comprises 621 full-time workers who were present and employed in wave one and two. Wheatley's (2021) study of the United Kingdom homeworking population using the Understanding Society dataset suggests that our sample is representative of the pre-COVID-19 homeworking population, which is more likely to be middle-aged, highly qualified, living with children and on a permanent contract. However, our sample contains a higher proportion of females and university graduates. **Supplementary Table 2** compares the key demographic variables of our sample to that used by Wheatley (2021).

The descriptive statistics are set out in **Table 1**. Prior to COVID-19, just 2% of the sample worked from home full-time, which is in line with Wheatley (2021). In total, 17% homeworked "frequently" (at least 4 days per month), 13% homeworked "sometimes" (less than 1 day per month but more than 4 days per year), and 18% homeworked "occasionally" (less than 4 days per year). In total, 50% of participants "never" worked from home. By wave two, a dramatic shift to homeworking had occurred, with 74% homeworking on a full-time basis and 3% on a part-time basis. A total of 23% continued to work from their pre-COVID-19 location. In line with recent research (e.g., Adams-Prassl et al., 2020), workers on high (>£3,000 per month) salaries (86% vs. 72%; $p = 0.014$) and university graduates (82% vs. 59%, $p < 0.001$) are more likely to work from home during wave two.

Measures

We employ 15 outcome variables to estimate the effect of the COVID-19 restrictions on worker wellbeing. Given that only two independent variables contain more than 31 missing observations, we adopt a complete case approach to missing values.⁶ A description of all variables is provided in **Supplementary Table 3**.

Cognitive Measures (3 Outcomes)

Life satisfaction is a global evaluative judgement made by an individual about the overall state of her/his life using a 0–10 scale. An identical format is used to measure workers' *homelife satisfaction* and *job satisfaction*.⁷

Emotional Measures (5 Outcomes)

Global emotional wellbeing is measured using the **Institute of Work Psychology (IWP) Multiaffect Indicator** (Warr and Parker, 2010). Respondents indicate the extent to which they experienced 16 emotions (8 negative, 8 positive) at work during the past month (1 = "Never" and 7 = "Always"). For ease of comparison with the DRM, scores are recoded

⁵Six workers were on maternity leave. The remaining 114 were furloughed or unemployed. Unemployed workers are excluded due to an extensive literature linking unemployment with systematically lower wellbeing, e.g., Winkelmann and Winkelmann (1998) and Lucas et al. (2004).

⁶Disengagement and Exhaustion contain 83 and 72 incomplete observations, respectively, which are excluded from the analysis.

⁷While single-item measures correlate highly with longer life-satisfaction scales (Cheung and Lucas, 2014), as a robustness check we also use a multi-faceted domain measures of job satisfaction—the Abridged Job Descriptive Index (AJDI) (Stanton et al., 2002).

TABLE 1 | Personal and work-related characteristics.

	% Mean (N = 610–621)
Gender	
Female	64.0%
Male	35.5%
Other/Prefer not to say	0.5%
Citizenship	
British	93.7%
Northern Irish	1.9%
Other	4.4%
Ethnicity	
White	91.7%
Asian	3.5%
Black	2.4%
Other	2.4%
Relationship status	
Single/Divorced/Widowed	25.6%
In a relationship	74.4%
Education	
No formal education/Lower secondary	6.1%
Higher secondary	13.9%
Cert/Diploma	6.6%
Technical/Vocational	10.7%
Undergraduate	41.6%
Post-graduate	21.1%
Age	38.3
Parental status	
Parent	50.3%
Non-parent	49.7%
Parent by age category	
Under 5s	17.8%
5–12	20.4%
13–18	23.1%
Over 18	19.7%
Living on their own	
Yes	13.1%
No	86.9%
Living with children	
Yes	52.2%
No	47.8%
Net monthly household income	
<£1,000	1.5%
£1,000–£2,000	25.4%
£2,000–£3,000	30.8%
£3,000–£4,000	32.6%
>£4,000	9.7%
Physical health (1 = "Very bad"; 5 = "Very good")	"Good" (53.4%)
Effect of COVID-19 on income	
No effect	56.7%
Financially worse off	31.3%
Financially better off	12.0%
Physical health condition (Wave 1 only)	
Yes	23.1%
No	76.9%

(Continued)

TABLE 1 | (Continued)

	% Mean (N = 610–621)
Contracted COVID-19	0.8%
Quarantining or showing COVID-19 symptoms	5.8%
Mental health (1 = “Very Bad”; 5 = “Very Good”)	“Good” (40.9%)
Mental health condition (Wave 1 only)	
Yes	23.6%
No	76.4%
Contract type	
Permanent	95.6%
Temporary/Fixed-term	4.4%
Seniority (0 = “Most junior”; 5 = “Most senior”)	3 (32.7%)
Tenure	
<5 years	50.6%
5–10 years	22.7%
> 10 years	26.7%
Pay-rise in the previous 12 months	
Yes	53.9%
No	46.1%
Net monthly salary	
<£1,000	4.2%
£1,000–£2,000	52.6%
£2,000–£3,000	30.1%
£3,000–£4,000	8.7%
>£4,000	4.4%
Hours worked previous month	
Wave 1	158
Wave 2	142
Sector	
Private	60.3%
Public	39.7%
Industry	
Admin, IT, and Telecoms	12.0%
Arts/Entertainment/Tourism	2.6%
Construction	3.1%
Education and Childcare	14.3%
Food	2.4%
Healthcare	10.6%
Manufacturing	9.7%
Civil Service and Local Government	2.3%
Other Services	3.2%
Professional Services/Finance and Insurance	18.0%
Publishing/Media	1.8%
Retail	8.8%
Social Services and Law Enforcement	4.4%
Agriculture/Forestry/Fishing	0.5%
Transportation/Wholesale and Warehousing	3.3%
Utilities	2.3%
Organisation size	
Micro (<10 employees)	3.7%
Small (<50)	12.0%
Medium (<250)	19.0%
Large (>250)	63.8%
Dont Know	1.5%

using a 0–6 scale Emotions are evenly split between high activation (e.g., “excited”) and low activation (e.g., “depressed”) emotions. Global positive (negative) affect is the mean of the

8 positive (negative) feeling scores. Cronbach’s alpha for wave one/wave two positive and negative affect are 0.894/0.903 and 0.926/0.923, respectively.

Experiential emotional wellbeing is measured using the **Day Reconstruction Method (DRM)** (Kahneman et al., 2004). Workers use diary entries to “reconstruct” 3 consecutive “episodes” from the previous working day. The time-of-day starting point for the episodes is randomly generated. Participants record when each episode started and ended; where they were; who they were with and what they were doing. They then rate the extent to which they experienced 16 emotions (the same used to measure global affect) during this episode, where 0 = “Did not experience that feeling at all” and 6 = “That feeling was an important part of the experience.” Average experiential positive and negative affect are the mean positive and negative scores for the 3 combined episodes, after 27 observations containing missing values are excluded. Cronbach’s alpha scores for wave one/wave two positive and negative experiential affect are 0.757/0.910 and 0.841/0.845, respectively.

Affective commitment, or the extent to which workers feel emotionally bound to their organisations, is measured using Meyer and Allen’s (1997) 6-item **Affective Commitment Scale**. Workers rate their agreement with 6 statements (3 positive, 3 negative), e.g., “I do not feel like ‘part of the family’ at my organisation,” where 1 = “Strongly Disagree”; 5 = “Strongly Agree.” Average commitment is the mean of the 6 scores, with reverse scoring applied to negative items. Cronbach’s alpha is 0.886/0.895 (wave one/wave two).

Psychological Measures (7 Outcomes)

Burnout (disengagement and exhaustion) is measured using Demerouti and Bakker’s (2008) validated (Halbesleben and Demerouti, 2005) 16-item **Oldenburg-Burnout Inventory (OLBI)**.⁸ Respondents use a 1–4 scale to rate their level of agreement with 8 negative and 8 positive statements, e.g., “During my work, I often feel emotionally drained.” Cronbach’s alpha is 0.898/0.894 (wave one/wave two). *Work-related stress* is measured using a 1–5 scale, where 1 = “Not at all Stressful”; 5 = “Extremely Stressful.” Workers also detail sources of work-related stress (e.g., “job security”). The extent to which workers’ needs for *relatedness* (feeling connected to co-workers), *competence* (feeling capable of attaining desired work-related goals) and *autonomy* (feeling that work is compatible with self-identity) are met is assessed using the 21-item **Basic Psychological Needs Satisfaction at Work Scale** (Deci et al., 2001). Respondents use a 1–7 scale to rank the trueness of statements, e.g., “I really like the people I work with.” Cronbach’s alpha is 0.873/0.874 (relatedness), 0.728/0.703 (competence), and 0.678/0.659 (autonomy). Finally, mental health is measured using a single item five-point scale (1 = “Very Bad”; 5 = “Very good”).

⁸We employ the scoring system used in Demerouti et al. (2010) in this study (see **Supplementary Table 3**).

Analyses

Using an approach similar to Pierce et al. (2020), we estimate changes in the wellbeing of worker i at time t (Y_{it}) associated with entering lockdown using the equation:

$$Y_{it} = \beta_0 + \beta_1 \text{wave}_i + u_i + \varepsilon_{it} \quad (1)$$

where β_0 is the time-invariant intercept which is correlated with observed explanatory variables; wave_i is a dummy variable that takes the value 1 for wave two (May–June 2020) and 0 for wave one (November 2019–February 2020); u_i captures the individual fixed effects and ε_{it} denotes independent and identically distributed time-varying random shocks. The parameter β_1 captures the baseline difference in Y_i between wave one (pre-lockdown) and wave two (during-lockdown). A fixed effects model is used given the high probability of unobserved characteristics confounding the relationship between COVID-19 restrictions and wellbeing (e.g., gender differences in the division of childcare). Sensitivity analyses, where the main analysis is re-estimated using OLS and a random effects models, reveal no material differences between the fixed effects and alternative approaches. These results are reported in **Supplementary Table 4**.

We first estimate within-person changes in wellbeing between wave one and two. Time-varying control variables are not included due to the short time gap between the two surveys which limits variation over time (e.g., education, number of children). In addition, many of the time-varying variables (e.g., income or physical health) are potential mechanisms or outcomes of the COVID-19 restrictions in their own right, therefore it is not appropriate to control for them in the wellbeing equations (cf. Pearl, 1999, 2014). We also investigate heterogeneity regarding the impact of entering the period of COVID-19 restrictions by interacting the wave variable with homeworking status (Eq. 2), gender (Eq. 3), and parental (young child) status (Eq. 4). Thus, we estimate the following three equations:

$$Y_{it} = \beta_0 + \beta_1 \text{wave}_i + \beta_2 \text{WFH}_i + \beta_3 \text{wave}_i * \text{WFH}_i + u_i + \varepsilon_{it} \quad (2)$$

$$Y_{it} = \beta_0 + \beta_1 \text{wave}_i + \beta_2 \text{Gender}_i + \beta_3 \text{wave}_i * \text{Gender}_i + u_i + \varepsilon_{it} \quad (3)$$

$$Y_{it} = \beta_0 + \beta_1 \text{wave}_i + \beta_2 \text{Parent}_i + \beta_3 \text{wave}_i * \text{ParentU13}_i + u_i + \varepsilon_{it} \quad (4)$$

where WFH_i is a binary variable that captures homeworking status. “Non-homeworkers” (coded 0) comprise workers who report working outside the home during lockdown and “homeworkers” (coded 1) comprise workers who work from home to any extent during lockdown.⁹ β_2 captures the baseline difference in Y_i between workers who are homeworking or not during lockdown. β_3 captures the interaction between entering lockdown and homeworking. Equation 3 examines heterogeneity by gender. Gender_i is a binary variable, coded 0 for women and 1

for men. Six participants who identify as “non-binary/other” are omitted. β_3 captures the interaction between entering lockdown and gender. Finally, Eq. 4 examines the extent to which lockdown differentially impacts parents of young children. ParentU13_i is coded 0 for non-parents/parents of older children and 1 for parents who have at least one child in the 0–12 age bracket. We focus on this age range as parents of primary school age children are more likely to be impacted by a loss of childcare and by home schooling. β_3 captures the interaction between entering lockdown and parental status.

All outcomes are measured using ordinal scales but are treated as cardinal in line with the generally accepted approach to measuring subjective wellbeing in the empirical literature which assumes that Likert scales may be treated as continuous once individual fixed effects are accounted for.¹⁰ By way of robustness check, we re-estimate Eq. 1 using an ordered logit fixed effects model in **Supplementary Table 5** and find no material differences in the results. Robust standard errors, clustered at the individual level, are employed throughout in accordance with Moulton (1990).

The Benjamini–Hochberg (1995) method is used to control for the false discovery rate (the proportion of significant results that represent false positives). P -values controlling for multiple testing are generated as follows: (1) The p -values from the 60 tests conducted for the analysis (see **Table 3**; 15 main effect analyses and 45 interaction analyses) are ranked from smallest to largest; (2) each p -value is compared to a critical value ($[i/m]*Q$), where i is the rank, m the total number of tests, and Q is the false discovery rate of 0.10; (3) p -values are deemed significant if they are smaller than the p -value Benjamini–Hochberg critical value at the relevant threshold (i.e., $p < 0.05$, $p < 0.01$, and $p < 0.001$).

RESULTS

Descriptives

Bivariate correlations between the dependent variables are presented in **Supplementary Table 6**. The means of the raw outcome scores are presented in **Table 2**. The descriptives suggest that, on balance, entering lockdown does not appear to adversely affect worker wellbeing. The fixed effects models which are summarised in **Table 3** formally tests this hypothesis.

Fixed Effects Model of Within-Worker Changes

A linear fixed-effect model is estimated to examine changes in within-worker wellbeing associated with the COVID-19 restrictions. The main effect for each outcome is presented in Column 2 of **Table 3**. Effect sizes range from just under 0.1 standard deviations to just over 0.3 standard deviations. The results show that, on average, the impact of the

⁹Just 3% of workers report working from home on a part-time basis during lockdown.

¹⁰Ferrer-i-Carbonell and Frijters (2004) show that results are not sensitive to the choice of OLS method—a finding replicated in several studies. Recent COVID-19 studies treat wellbeing cardinally (e.g., Zacher and Rudolph, 2021). Baetschmann et al. (2015 p. 685) point out that “there is no consensus in the past literature on how to implement a fixed effects estimator for the ordered logit model.”

TABLE 2 | Mean outcome scores (standard deviation in parentheses).

Outcome	Wave 1 (n: 574–621)	Wave 2 (n: 585–620)
Cognitive wellbeing		
Life satisfaction (0–10)	6.62 (1.81)	6.56 (1.87)
Homelife satisfaction (0–10)	7.17 (2.04)	6.95 (2.05)
Job satisfaction (0–10)	5.97 (2.15)	6.11 (2.21)
Emotional wellbeing		
Global positive affect (0–6)	2.54 (1.08)	2.51 (1.13)
Global negative affect (0–6)	1.55 (1.15)	1.49 (1.16)
Experiential positive affect (0–6)	2.90 (0.92)	2.97 (0.99)
Experiential negative affect (0–6)	2.11 (0.761)	2.00 (0.697)
Affective commitment (1–5)	2.98 (1.01)	3.17 (1.02)
Psychological wellbeing		
Work stress (1–5)	3.08 (1.02)	3.06 (1.01)
Disengagement (1–4)	2.47 (0.57)	2.39 (0.58)
Exhaustion (1–4)	2.52 (0.56)	2.41 (0.54)
Relatedness (1–7)	4.95 (1.08)	5.06 (1.04)
Competence (1–7)	4.97 (1.03)	5.01 (0.99)
Autonomy (1–7)	4.43 (1.10)	4.53 (1.02)
Mental health (1–5)	3.61 (0.89)	3.64 (0.87)

COVID-19 restrictions on worker wellbeing is moderately positive. Adjusting for multiple hypothesis testing, we find that 9 of the 15 outcomes reach conventional levels of significance, with the restrictions having a negative impact on just one outcome (home life satisfaction) and a positive impact on 6 outcomes (experiential negative affect, disengagement, exhaustion, relatedness, autonomy, and affective commitment).

Although lockdown is associated with a moderate reduction in home life satisfaction, life satisfaction and global affect are relatively unaffected by the restrictions. The significant reduction in the frequency of negative emotions experienced at work the previous day suggests that experiential measures may be more sensitive to changes in contextual cues. Analysing each emotion individually (see **Supplementary Tables 7, 8**) indicates that the reduction is driven by a moderate decrease in high activation negative emotions, in particular anxiety (-0.120 sd; $p = 0.026$), tension (-0.149 sd; $p = 0.008$), and nervousness (-0.103 sd; $p = 0.058$).

Table 3 also shows that, somewhat surprisingly, the COVID-19 restrictions do not affect stress levels. Analysing the individual sources of stress cited by workers (see **Supplementary Tables 9, 10**), shows that the number of workers who are stressed by their *commute* (-0.38 sd; $p < 0.001$) or work-related *travel* (-0.17 sd; $p = 0.008$) falls sharply relative to the pre-COVID-19 period. *Personnel* issues are also less of a problem, with fewer workers citing their *bosses* (Beta = -0.10 sd; $p = 0.045$), *clients* (-0.15 sd; $p < 0.001$), or *co-workers* (-0.23 sd; $p < 0.001$) as a source of stress compared to before lockdown. Interestingly, fewer workers are stressed out by meeting *deadlines* (-0.26 sd; $p < 0.001$) or long *working hours* (-0.12 sd; $p = 0.008$) during lockdown, a result which aligns with the increased tendency to feel “relaxed” and “laidback” at work during lockdown as reported in **Supplementary Tables 7, 8**.

However, the proportion of workers stressed about job security rises by 0.20 sd ($p < 0.001$).

Contrary to our priors, there is no evidence that lockdown is associated with increased psychological distress. Self-rated mental health remains stable, while the risk of burnout (captured by the disengagement and exhaustion outcomes) diminishes significantly. **Supplementary Table 11** shows the standardised coefficients for each of the disengagement and exhaustion sub-scale items, of which 11 out of 16 improve significantly during lockdown. The largest improvements are found for exhaustion, with workers reporting significant reductions in the extent to which they feel tired before arriving at work (-0.21 sd; $p < 0.001$), need more time to relax after work (-0.22 ; $p < 0.001$) and feel emotionally drained during work (-0.12 sd; $p < 0.001$). They also report an improvement in the extent to which they feel energised at work (-0.14 sd; $p < 0.001$) and have sufficient energy for leisure activities ($+0.22$ sd; $p < 0.001$) relative to pre-COVID-19. The decrease in disengagement during lockdown reported in **Table 3**, is largely driven by a reduction in the extent to which workers speak negatively about their work (-0.22 sd; $p < 0.001$) or feel disconnected from it (-0.14 sd; $p < 0.001$) and increased levels of engagement in the work itself ($+0.13$ sd; $p < 0.001$) as reported in **Supplementary Table 11**.

Table 3 also shows that workers report improvements in the extent to which their basic psychological needs of relatedness and autonomy are met at work during lockdown, although the effect sizes are generally small. An analysis of sub-scale items (see **Supplementary Table 12**) reveals that the improvement in relatedness is driven by an increased sense of co-workers as friends ($+0.09$ sd; $p < 0.001$), who care about the worker ($+0.16$ sd; $p < 0.001$) and who take his/her feelings into consideration ($+0.28$ sd; $p < 0.001$). The improved autonomy score reflects greater freedom to express opinions ($+0.11$ sd; $p < 0.001$) and make inputs ($+0.08$ sd; $p < 0.001$) at work. **Table 3** also shows that entering lockdown is associated with a moderate strengthening of the emotional bond between workers and their organisations, as measured by affective commitment.

Next, we estimate Eq. 2 to ascertain whether the COVID-19 restrictions differentially impact workers who worked from home during lockdown or continued to work from their usual workplace. The standardised coefficients for the wave*WFH interaction are set out in Column 3 of **Table 3** (base = non-homeworker) and the marginal effects are depicted in **Supplementary Table 13**. We find just one main effect. Homeworkers report a greater decline in negative emotions experienced the previous day during lockdown than non-homeworkers. As **Supplementary Table 9** shows, this is driven by homeworkers’ experiencing larger reductions in 5 (of 8) negative emotions than non-homeworkers, with the largest effects found for “despondent” (-0.44 sd; $p < 0.001$), “nervous” (-0.44 sd; $p < 0.001$), and “dejected” (-0.33 sd; $p < 0.001$).

We next investigate heterogeneity by gender by estimating Eq. 3. Column 4 of **Table 3** contains the standardised coefficients for the wave*gender interaction (base = female). The marginal effects are set out in **Supplementary Table 14**. We find one main effect. Contrary to expectations, women do not appear to cope worse with the COVID-19 restrictions than men and

TABLE 3 | Fixed effects regression—standardised coefficients.

Variable	Whole sample (n: 1,159–1,241)	Wave*Homeworker (n: 1,152–1,233)	Wave*Gender (n: 1,149–1,231)	Wave*ParentU13 (n: 1,159–1,241)
Cognitive wellbeing				
Life satisfaction	−0.035 (0.036)	0.020 (0.094)	−0.051 (0.072)	−0.002 (0.088)
Homelife satisfaction	−0.108** (0.035)	−0.017 (0.094)	−0.010 (0.072)	0.040 (0.080)
Job satisfaction	0.059 (0.036)	0.092 (0.101)	−0.133 (0.073)	0.095 (0.093)
Emotional wellbeing				
Global positive affect	−0.025 (0.035)	−0.009 (0.091)	−0.130 (0.071)	−0.015 (0.088)
Global negative affect	−0.051 (0.032)	0.019 (0.077)	0.138 (0.063)	−0.014 (0.075)
Experiential positive affect	0.066 (0.042)	−0.002 (0.104)	0.032 (0.086)	0.038 (0.105)
Experiential negative affect	−0.150** (0.053)	−0.336** (0.121)	−0.023 (0.108)	0.097 (0.128)
Psychological wellbeing				
Work stress	−0.014 (0.032)	0.040 (0.083)	0.048 (0.066)	−0.070 (0.077)
Disengagement	−0.135*** (0.032)	0.006 (0.084)	0.180** (0.064)	0.047 (0.080)
Exhaustion	−0.198*** (0.030)	0.039 (0.073)	0.077 (0.061)	0.030 (0.069)
Relatedness	0.099*** (0.028)	−0.031 (0.072)	0.059 (0.057)	−0.057 (0.065)
Competence	0.043 (0.032)	−0.033 (0.076)	−0.094 (0.065)	0.037 (0.078)
Autonomy	0.093** (0.030)	0.055 (0.076)	−0.118 (0.058)	−0.016 (0.072)
Affective commitment	0.190*** (0.031)	0.052 (0.073)	−0.073 (0.061)	0.110 (0.074)
Mental health	0.029 (0.034)	−0.148 (0.084)	0.152 (0.072)	−0.017 (0.017)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Adjusted p -values are significant at the threshold identified ($p < 0.05$, $p < 0.01$, $p < 0.001$) after controlling for multiple testing (Benjamini–Hochberg procedure); Standardised variables used throughout. Robust clustered standard errors in parentheses; Wave coded 0 for Wave 1 and 1 for Wave 2. Homeworker coded 0 for non-homeworkers and 1 for homeworkers. Binary gender variable is employed which codes females 0 and males 1 and omits “non-binary/other” responses (6 respondents). Parent is coded 0 for non-parents or parents who do not have a child in the 0–12 age bracket and 1 for parents with at least one child in the 0–12 age bracket.

women experience a larger reduction in disengagement during lockdown than men.

Finally, we estimate Eq. 4 to test the hypothesis that parents of young children (<13 years old)¹¹ are more likely to experience adverse wellbeing consequences during lockdown due to the imposition of additional childcare or home-schooling burdens. Column 5 of **Table 3** depicts the standardised coefficients for the wave*parentU13 interaction (base = non-parent of U13 child). For marginal effects see **Supplementary Table 15**. Contrary to our priors, we find no evidence that lockdown is experienced significantly differently by parents of young children.¹² In sum, the heterogeneity analyses reveal few significant differences by homeworking, gender or parental status.

DISCUSSION

In contrast to other COVID-19 wellbeing studies, this study demonstrates that lockdown is not necessarily a negative experience for full-time workers with a high level of job security, income protection, and low physical exposure to the virus.¹³

¹¹23.4% of the sample or 145 workers have children under the age of 13.

¹²To investigate whether this finding is related to sample size effects, we re-estimate the regression using (i) all parents (49.7% of the sample) and (ii) whether or not workers live in a house containing children (52.2% of the sample). The results do not change materially.

¹³Just 31% of the sample are financially negatively impacted by COVID-19 and only 6% have contracted COVID-19 or had to quarantine. The sample contains a high number of highly educated, full-time workers, 96% of whom are on permanent contracts.

Life satisfaction and overall emotional wellbeing are relatively unaffected by the first wave of COVID-19 restrictions. This may reflect relatively low baseline scores in this sample, which may dilute the impact of the COVID-19 shock.¹⁴ It may also reflect a data collection window which is too narrow to register lockdown-induced wellbeing changes using global measures which are more suited to capturing the effects of more enduring life events, such as parental death or unemployment.

Sample composition may also play a role. Employed individuals are likely, on average, to be healthier, both in terms of physical and mental health, than individuals who are out of the labour force (Egan et al., 2016). This may reduce the susceptibility of employed individuals to COVID-19 and lockdown related stress.¹⁵ However, while our sample may, on average, be healthier than the general population, there is evidence of considerable intra-sample physical and mental health heterogeneity, which mitigates against the possibility of overly positive findings.¹⁶ We excluded self-employed and part-time workers, as well as those no longer working due to COVID-19, are from our sample, thus eliminating groups of workers who may have been

¹⁴Average life satisfaction in the United Kingdom is 7.7 versus a baseline level of 6.6 in this sample. Layard et al. (2020) also report a substantial decrease in life satisfaction in their United Kingdom sample prior to lockdown. Hudson et al. (2019) report average global positive and negative affect of approximately 4 and 2.5, respectively, versus our baseline levels of 2.5 and 1.5.

¹⁵For example, Robinson et al. (2022) found that those with pre-existing physical (but not mental) health conditions were at greater risk of adverse mental health effects associated with the pandemic.

¹⁶Just under one quarter of the sample reported having a chronic physical or mental health condition at wave one.

economically impacted by the pandemic. Furthermore, 87% of the respondents live with someone, a factor which has been found to increase the likelihood of “enjoying” lockdown (Fancourt et al., 2020).

An alternative explanation for the lack of significant changes in life satisfaction or global affect between the two periods is psychological adaptation. Research on “adaptive preferences” shows that individuals scale down their expectations to avoid disappointment when faced with adverse conditions (White, 2009). The timing of the wave two survey (6–11 weeks into lockdown) may have given workers sufficient time to adapt to the initial shock of lockdown. The relative stability in satisfaction and global affect may therefore mask a previous dip and subsequent reversion to pre-pandemic “set point” levels (Lykken and Tellegen, 1996).

The results provide some limited evidence that COVID-19 restrictions may not affect all workers equally. Contrary to other studies (e.g., Lyttelton et al., 2020), we find no evidence that parents of young children or women fare worse during lockdown. In fact, women report a larger decrease in disengagement than men. Similar to Zacher and Rudolph (2021), we find that homeworkers cope better emotionally with lockdown compared to non-homeworkers. Despite the sudden, largely involuntary shift to homeworking and the extraordinary pandemic-related backdrop of school closures, homeworkers report a larger decrease in the frequency with which they experience negative emotions at work. Zacher and Rudolph (2021) caution that the reduction in high-activation negative emotions that they identify could be off-set by an increase in (unmeasured) low-activation negative emotions. However, utilising measures of both high and low activation emotions, we find no evidence that entering lockdown is associated with a significant increase in low-activation emotions for homeworkers, raising the possibility that the decrease in negative affect revealed by both studies is not a measurement artefact but may instead reveal something more fundamental about the lived experience of homeworking during the pandemic. Finally, we find that entering lockdown is associated with a moderate drop in homelife satisfaction. Unlike Möhring et al. (2021), however, this finding holds for the entire sample, not just homeworkers.

In relation to psychological distress, somewhat surprisingly, we find no evidence of a deterioration in self-rated mental health during lockdown. This may reflect sample composition. The sample contains a low share of young adults, ethnic minorities and less educated workers, all of whom have been shown to be particularly vulnerable to COVID-19-induced mental health issues (e.g., Fancourt et al., 2020). The results also reveal a significant reduction in burnout symptoms, which is largely driven by reduced levels of exhaustion. Workers report feeling less tired before arriving at work and having more energy for leisure activities after work, findings which likely reflect reduced commuting time, but which may also signal pre-existing high levels of adaptive coping skills in our sample or a perceived reduction in job demands and/or increase in leisure opportunities on the part of respondents during the period of COVID-19 restrictions (Shoman et al., 2021). Workers are more engaged in their

work and have a more positive attitude towards it. There is, however, limited evidence of heterogeneity, with men reporting significantly lower reductions in disengagement during lockdown than women.

To the best of our knowledge this is the first study to examine the impact of the COVID-19 restrictions on work-related psychological wellbeing. On the whole, we find positive effects. Workers feel more able to express their opinions during lockdown. They feel they have a greater input into their jobs and report feeling a greater sense of accomplishment from working and learning new skills during lockdown. Somewhat counterintuitively, workers feel closer to their colleagues and feel more cared for and listened to during lockdown, a finding which may reflect the “we’re all in this together” message propagated by the United Kingdom government at the start of COVID-19. Workers also report a stronger sense of emotional attachment to their organisations relative to the pre-COVID-19 period.

The study has some limitations which could be addressed by future research. The first area of potential concern relates to the selective nature of our sample. While the evidence that “professional” survey participants differ demographically and attitudinally from other survey participants is mixed (Hillygus et al., 2014; Huff and Tingley, 2015), our participants may differ systematically from the “average” worker (e.g., higher proportion of women and graduates), which detracts from wider generalisability. An obvious direction for future research is to target a more ethnically and socioeconomically diverse online sample and/or to extend our survey to a field setting. Secondly, the use of a fixed effects model, while econometrically appropriate, eliminates potentially policy-relevant sources of heterogeneity. Future research could tease out the relationship between additional covariates and homeworking preferences and/or effectiveness. Finally, the outcome variables are subjective, self-rated scales, which may raise concerns about self-report and recall bias. While including additional time points would partially address this, combining objective measures with self-rated data, would strengthen validity. The study would also benefit from the inclusion of additional waves of data to examine the longer-term impact of the pandemic and involuntary homeworking on wellbeing.

Decisions around appropriate pandemic responses require high-quality information on the potential psychological and emotional cost for society (Layard et al., 2020). Thus, this study has important implications for governments and employers. By utilising multiple measures to capture the lived reality of one such policy response (lockdown) for full-time workers and by demonstrating the heterogeneity in experiences, this study makes a valuable contribution to this debate. For example, the significant reduction in negative emotions suggests that experiential affective measures may play a role in assessing the wellbeing effects of pandemic response policies.

One by-product of the COVID-19 restrictions, which is likely to outlive the pandemic, is the global shift to homeworking. This study is one of few that captures the lived experience of homeworking and in particular, the lived experience

of workers who have no prior experience of homeworking and who may not otherwise have chosen to do so. The results suggest that homeworkers may, on balance, feel less unhappy at work. Whether this wellbeing improvement is a novelty effect which will erode over time as workers adapt to the “new normal” or whether it is a feature of homeworking under “normal” circumstances, is an important policy question which is currently unknown and which warrants further investigation. Our study represents an important first step in this direction.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by UCD Human Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

DP: conceptualisation, investigation, formal analysis, and writing—original draft preparation. MD and OD: conceptualisation, methodology, and writing—review and editing. LD: conceptualisation, methodology, writing—review and editing, and funding acquisition. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.823080/full#supplementary-material>

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Parenting and Children's Behavior During the COVID 19 Pandemic: Mother's Perspective

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Since the onset of the COVID-19 pandemic, many parents have felt anxious, overwhelmed, and stressed out due to the changes in education and family and working routines. This work aimed to (a) describe three dimensions of perceived parenting (positive parenting, parenting stress, and parental school support) in the COVID-19 pandemic context, (b) describe possible changes perceived by mothers in their children's behavior during the social isolation phase, (c) analyze if behavioral changes vary according to the dimension of perceived parenting, and (d) analyze whether the characteristics of perceived parenting dimensions vary with mother's age, number of children and number of work hours. The purposive sample consisted of 646 mothers of school-aged children in Argentina. Questionnaires on sociodemographic and work-related data, and on children's behavior were administered, as well as an instrument (Vargas Rubilar et al., 2021) that assessed the three parenting dimensions (positive parenting, parenting stress, and parent-school support). The sociodemographic and work-related variables of the study were described using descriptive statistics: measures of central tendency, frequencies, and percentages. The changes perceived in children's behavior according to the reports given by the mothers regarding positive parenting, parenting stress, and school support were compared using the Mann Whitney's *U* test, respecting the qualitative nature of the evaluated indicators. A factorial MANOVA was conducted to analyze the effect of mother's age, a number of children, and the number of work hours on parenting perceived by mothers. Parenting dimensions influenced the perceived children's behavior. Mothers with higher positive parenting perceived more changes in their children's behavior. In addition, those mothers who were more stressed out perceived more problems in almost all the measured behaviors than less stressed mothers. The mothers who reported to have provided more school support to their children perceived that they adapted better to online classes. Finally, mothers' age and the number of children I parenting, particularly on parenting stress and school support, whereas work hours did not. A number of children affected stress and school support, and age only affected parenting stress. The only significant interaction regarding parenting was observed between the number of children and the number of work hours, which specifically affected parenting stress. Although social isolation due to COVID-19 affected children's behavior, according to mothers, this might be partially

linked to the number of children, mothers' age, and the mothers' parenting style. These initial findings may allow the identification of some protective factors and some risk factors of parenting in the Argentine context of a pandemic, and the design of preventive psychoeducational interventions to optimize the psychological wellbeing of families.

Keywords: parenting, children's behavior, mothers, pandemic, telework, stress

INTRODUCTION

The coronavirus disease (COVID-19) pandemic has rapidly extended throughout the world and continues to affect people's physical and mental health. On March 11, 2020, the World Health Organization declared the COVID-19 outbreak a global pandemic. A few days later, the national government of Argentina ordered compulsory social isolation to prevent contagion and mitigate the virus spread, while strengthening the health system; social isolation was prolonged for several months (from late March to December 2020). However, the healthcare workers knew that trained human resources were not enough and that it was not possible to train them in such a short period. All of this, combined with a very fragile economic situation, aggravated by social isolation that could hardly be implemented by people who needed to go out to work, the added precarious living conditions in a large part of the population (Ernst and López Mourelo, 2020), concentrated in Buenos Aires city and its surroundings (Metropolitan Area of Buenos Aires), where the coronavirus did not take long to spread, led the healthcare workers to believe the numbers of infections would increase significantly and the health system could collapse (Richaud et al., 2021).

During that period, there was no antiviral treatment or vaccines available in Argentina; therefore, isolation and social distancing measures were essential to mitigate the sanitary impact of COVID-19. There was general closure of schools, and classes were given online. Because of these conditions, several teachers and professors reported stress and burnout indicators (Vargas Rubilar and Oros, 2021). Displacement was allowed only for essential workers (i.e., health personnel, security forces, personnel of wholesalers, and retailer food shops, among others). This lockdown lasted approximately eight months, causing an emotional (Canet-Juric et al., 2020) and economic impact on the general population (Ernst and López Mourelo, 2020).

Regarding parenting, for many months an important number of parents felt anxious, overloaded, and stressed out (Almeida et al., 2020; Brown et al., 2020; Olhaberry et al., 2021; Roos et al., 2021), partly due to the changes involved in online education, and in the new family and working routines (e.g., home working) (Almeida et al., 2020; Cluver et al., 2020; UNICEF, 2020). In this sense, a few recent studies (e.g., Brown et al., 2020; Griffith, 2020; Roos et al., 2021) have warned about psychosocial changes generated by the COVID-19 pandemic and their possible mid-and long-term negative impact on children and families. Therefore, becoming aware of the impact of stress associated with the pandemic helps to better understand how the external and internal stressors of families may increase the risk of negative parenting practices for children's development. In this line, some

studies show that high levels of cumulative stress favor rigid and abusive parenting behaviors (Yang, 2015; Hutchison et al., 2016; Liu and Merritt, 2018). In the current context, the closure of schools and the social isolation measures due to the pandemic predisposed to higher parenting stress and parental burnout, which indirectly turned into a potential risk factor for child maltreatment (Griffith, 2020; Ramaswamy and Seshadri, 2020; Lee et al., 2021).

A research conducted in the United States of America (Pew Research Center, 2020) indicates that, of those parents who continue working, over a third (35%) report to be "struggling" to handle the responsibilities of caring for children adequately. Many have had to deal with a new balance between full-time parenting and online education while simultaneously working from their homes (i.e., working from home). The same is true for those parents who perform essential tasks in their workplaces (e.g., hospitals, clinics, supermarkets, and pharmacies), which has exposed them to high levels of risk. All these factors likely contribute to high levels of intrafamily stress. Socioeconomic problems derived from the pandemic also increased the feelings of fear and uncertainty in parents (Pew Research Center, 2020).

Education was also negatively affected by school closure, as it happened in other similar critical public health situations (Braunack-Mayer et al., 2013) or natural disasters (Shavers, 2005). For example, during the outbreak of severe acute respiratory syndrome (SARS) and influenza A (H1N1), some studies reported that parents had work problems and children had school problems, as well as difficulties in communication between school and parents (O'Sullivan et al., 2009; Boon et al., 2011; Braunack-Mayer et al., 2013). In particular, during the COVID-19 pandemic, the lack of face-to-face school activities interrupted the direct contact of children with other adults, such as teachers, counselors, and social workers (Sacks and Jones, 2020). For this reason, the role of parents in terms of school support has been essential, especially for elementary school students, who require more supervision and support to study and do schoolwork. The positive effects of school support by parents have been indicated (Perkins et al., 2016), particularly during the COVID-19 pandemic (e.g., Klootwijk et al., 2021; Lee et al., 2021).

There are records in the literature (e.g., Sprang and Silman, 2013) indicating that social isolation measures during pandemics or natural disasters may be traumatic both for parents and children. Specifically, 30% of children and 25% of parents were found to meet the criteria of post-traumatic stress disorder (e.g., Sprang and Silman, 2013). In this line, a recent longitudinal study (Westrupp et al., 2021) involving Australian parents showed significantly worse mental health in family members due to the consequences of the COVID-19 pandemic. In comparison with

the pre-pandemic estimates, fathers had higher rates of symptoms of mental health problems, higher parenting irritability, lower positive family expressiveness, and higher alcohol consumption during the pandemic.

The pandemic seems to have had a more negative impact on maternal parenting (UNICEF, 2020). Mothers have suffered from a greater load of unpaid work and the demand of multitasking concerning their jobs, housework and children care, especially in Latin American cultures (Almeida et al., 2020).

Additionally, there is evidence (Wang et al., 2020) showing that the changes induced by isolation might have a negative impact on children's physical and mental health, due to the lack of outdoor activities, frustration, and boredom (Olhaberry et al., 2021). In this line, a study that analyzed the impact of quarantine on Italian and Spanish children and adolescents (Orgilés et al., 2020) reported that 85.7% of parents perceived changes in their children's emotional state and behavior during quarantine. The most frequent symptoms were difficult to focus (76.6%), boredom (52%), irritability (39%), restlessness (38.8%), nervousness (38%), feeling of loneliness (31–3%), uneasiness (30.4%) and worries (30.1%). Children of both nationalities used screens more frequently spent less time doing physical activity and slept more hours during quarantine. Moreover, family coexistence during quarantine was perceived as more difficult. When the pandemic situation became more severe (i.e., a higher number of COVID-19 cases and deaths), the level of stress was higher and parents tended to report more emotional problems in their children (Wang et al., 2020).

On the other hand, type of parenting may favor or negatively affect the children's response to a stressful event (Bornstein, 2007; Sanders and Turner, 2018). Indeed, positive parenting is characterized by parental practices that promote healthy family relationships and optimize the potential development and wellbeing of children, even under adverse situations (Bornstein, 2007; Rodrigo, 2010; Vargas-Rubilar et al., 2020). From this perspective, positive parenting might be considered an important protective and facilitating factor of parent and family resilience (Walsh, 2004; Miller-Graff et al., 2020) in the pandemic context. In this line, Yamaoka et al. (2021) found that positive parental behaviors, especially those showing empathy, were associated with a lower risk of abusive behavior during the pandemic. By contrast, abusive parent behaviors were associated with greater use of screens, mental health problems of mothers, and intrafamily violence. However, other studies indicated the reciprocal nature of interaction processes between parents and children, i.e., parents may be influenced by children's attitudes and behaviors as well (Biglan, 2015). For example, children that are more irritable, or have sleep or behavior problems usually elicit more negative responses from their parents (McQuillan and Bates, 2017).

Furthermore, some sociodemographic and work-related characteristics of parents might affect parenting. For instance, a study involving Spanish parents showed that being the father or mother of multiple children favors the perception of higher parenting stress (Pérez et al., 2010). Likewise, although a high number of hours dedicated to work may be viewed as negative to parenting, Hughes and Parkes (2007) showed that this relation is

mediated by different protective factors, such as social support. Working longer hours could interfere with family satisfaction only when employees have little or no control over their working schedule (Hughes and Parkes, 2007).

Regarding the effect of age on parenting, some studies about parenting styles in young mothers (i.e., under age 21 at childbirth) suggest that many are not sufficiently prepared to provide sensitive and positive parenting (Easterbrooks et al., 2011). Another study points out that parents between 30 and 40 years of age are more likely to adequately satisfy the needs of their children (e.g., Bezeveggis, 2012).

Overall, most of the studies about parenting conducted in different countries during the pandemic have focused on the parenting stress and burnout generated by this phenomenon (e.g., Azhari et al., 2020; Brown et al., 2020; Griffith, 2020; Westrupp et al., 2021). Other works analyzed the mental health problems of parents and children (e.g., Almeida et al., 2020; Wang et al., 2020; Escobar et al., 2021; Roos et al., 2021; Westrupp et al., 2021). Some reports addressed changes in children's behavior (Jiao et al., 2020; Orgilés et al., 2020; Oliveira et al., 2021) or the role of parenting in online education (e.g., Klootwijk et al., 2021; Lee et al., 2021).

However, few works have addressed the potential protective role of positive parenting practices (e.g., expression of affection, communication, and school support) in such an adverse context. To our knowledge, there are no works, especially for Argentina, that analyze the perceived parenting in mothers of schoolchildren considering the education conditions in the pandemic context. Finally, to date, no studies dealing with both the family characteristics as protective factors (i.e., positive parenting and school support) and risk factors (parenting stress, specific work, and sociodemographic characteristics) have been conducted in the pandemic context in Argentina.

Therefore, this study aims to: (a) describe three dimensions of perceived parenting (positive parenting, parenting stress, and parental school support) in the context of the COVID-19 pandemic, (b) describe possible changes perceived by mothers in their children's behavior during the phase of social isolation, (c) analyze if changes in behavior vary as a function of the perceived parenting dimensions, and (d) analyze whether the three dimensions of perceived parenting vary according to mother's age, number of children and the number of work hours.

For the latter two aims, which require inferential analyses, we formulate the following hypotheses:

Hypothesis 1: Changes in children's behavior varies depending on the parenting perceived by the mother.

Hypothesis 2: Perceived parenting varies depending on the age of the mothers, the number of children, and the number of hours of work.

MATERIALS AND METHODS

Type of Study and Design

The conducted study was quantitative, descriptive, and cross-sectional (Bickman and Rog, 1998).

Participants

Sampling was conducted using a non-probabilistic availability sampling method (Otzen and Manterola, 2017). The final sample consisted of 646 mothers, aged between 22 and 59 years ($M = 37.62$; $SD = 5.50$) from different regions of Argentina. Inclusion criteria were that mothers were over 18 years of age and that had school-age children (between 5 and 12 years old). Mothers of children with psychological, developmental, or learning disorders were not included in the study.

Of the whole sample, 84% of the mothers were married or had a partner, 9% were separated or divorced, and 7% were single. Concerning educational level, 48% had university studies, 27% had tertiary studies, 15% had high school studies, and 3% mentioned not having primary education or academic training. Lastly, 7% were pursuing or had completed postgraduate studies (see Table 1).

Instruments

Questionnaire about sociodemographic and work-related characteristics. Data on the sociodemographic and work-related characteristics of the participants were collected using an *ad hoc* semi-structured questionnaire that included questions about age, civil status, educational level, number of children, and number of work hours.

Questionnaire about children behavior as perceived by mothers. To know children's behavior as perceived by mothers during the quarantine due to COVID-19, an *ad hoc* structured questionnaire was created. Firstly, mothers were asked whether

they had observed changes in their children's behavior. The answer options were "yes" or "no." The following question was: Have you observed that those changes in the behavior of your children were...? The answer options were: "less," "the same as" or "more" than before (e.g., *He/She sleeps less than before*, *He/She sleeps the same as before*, *He/She sleeps more than before*). As detailed in Table 2, the analyzed behaviors included: (a) children's behaviors observed in the family environment to sleep, eating habits, mood, relationship with peers, and (b) children's behaviors observed in the current school situation: online classes, relationship with classmates, compliance with school assignments.

The dimensions of perceived parenting during the pandemic were evaluated using the *Brief scale of perceived parenting during the pandemic* provided by Vargas Rubilar et al. (2021). The instrument operationalizes three dimensions of perceived parenting in the pandemic context: (a) positive parenting (e.g., *I have managed to maintain a family atmosphere that is good for the development of my children, despite everything that has happened*), (b) parenting stress (e.g., *Keeping an eye on my children's classes and assignments stress me out.*), and (c) parental school support (e.g., *I keep frequent contact-communicate with school during online education so I am up to date on how my children are doing*), through 17 statements (see Table 1) that were answered utilizing a 4-point Likert scale (*Never, Seldom, Very often, Always*). The previous study of the instrument involving Argentine mothers indicated suitable psychometric properties (Vargas Rubilar et al., 2021). The confirmatory study of factorial structure of three factors of the scale showed satisfactory fit indexes ($\chi^2/dg = 1.22$; NFI = 0.93; NNFI = 0.99; CFI = 0.99; IFI = 0.99; GFI = 0.99) and an acceptable error (RMSEA = 0.02). Similarly, internal consistency was adequate for the three dimensions: positive parenting ($\omega = 0.79$), parenting stress ($\omega = 0.77$), and parental school support ($\omega = 0.75$) (Vargas Rubilar et al., 2021).

Ethical Procedures and Data Collection

Mothers participated anonymously and gave their consent before answering the questionnaire. The collected information was handled with confidentiality and no access was given to people outside the research. The actions performed in the setting of this study complied with the international ethic recommendations for research with human subjects (American Psychological Association, 2017). To prevent survey fatigue, a reduced number of questions was used, estimating a span of no longer than 10 min for participants to answer.

Data were collected between September and December 2020, during the quarantine phase, 5 months after compulsory social isolation was mandated in Argentina. During this period, all the schools were closed and classes were given only online. Due to the particular conditions of social isolation under which the study was conducted, mothers of primary school children were invited to participate through social networks (Facebook, Instagram, etc.), e-mail (Gmail, Outlook, etc.), and chat groups of mothers of school grades in digital messaging services (e.g., WhatsApp, Telegram, etc.). The mothers that voluntarily agreed to participate signed the informed consent and then received a link to the questionnaire. The evaluation was

TABLE 1 | Demographic and work-related characteristics of the participants.

		N	%
Civil status	Married	381	59.0
	In consensual union	162	25.0
	Separated/Divorced	53	8.2
	Single	44	6.8
	Other	6	1.0
Occupation	Homemaker	123	19.0
	Unemployed	23	3.6
	Employed	148	22.9
	Self-employed	352	54.5
Number of work hours	Less than 6 h	257	39.8
	Between 6 and 10 h	272	42.1
	More than 10 h	117	18.1
Academic studies	No academic studies	2	0.3
	Primary school	14	2.2
	Secondary school	97	15.0
	Tertiary education (non-university level)	178	27.5
	University degree	309	47.8
	Postgraduate studies (incomplete)	23	3.6
	Postgraduate studies (complete)	23	3.6
Number of children	1	148	22.9
	2	350	54.2
	3	118	18.3
	4 or more	30	4.6

TABLE 2 | Frequency of behaviors behavior compared to pre-pandemic times and percentage of change in children's behavior.

	Less than before		The same as before		More than before	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sleeps	121	18.7	283	43.8	242	37.5
Is sad	89	13.8	244	37.8	313	48.5
Eats	60	9.3	321	49.7	265	41.0
Disobeys	66	10.2	230	35.6	350	54.2
Fights with siblings	77	11.9	292	45.2	277	42.9
Is anxious/nervous	54	8.4	167	25.9	425	65.8
Screams	67	10.4	236	36.5	343	53.1
Wants to sleep in my/our bed	105	16.3	280	43.3	261	40.4
Shows dependent behavior	82	12.7	267	41.3	297	46.0
Shows defiant behavior	68	10.5	201	31.1	377	58.4
Plays with friends (now online)	265	41.0	179	27.7	202	31.3
Once asleep, he/she wakes up confused in the middle of the night	222	34.4	320	49.5	104	16.1
Has nightmares	226	35.0	304	47.1	116	18.0

made online through a form (*Google Forms*) that included the described instruments.

Procedures for Data Analysis

The sociodemographic and work-related variables of the study were analyzed using descriptive statistics: measures of central tendency (mean, standard deviation), frequencies, and percentages.

The changes perceived in the behavior of children as reported by the mothers in terms of positive parenting, parenting stress, and parental school support were compared using the Mann Whitney's *U* test, respecting the qualitative nature of the evaluated indicators.

For this analysis, each parenting dimension was previously categorized into three groups (i.e., high, medium, and low, with two cut-off points at the 33 and 66 percentiles, following the criterion of homogeneous frequencies per group). Then the high and low groups of each dimension (i.e., positive parenting, parental school support, and parenting stress) were selected to analyze the perceived children's behavior relative to those dimensions.

A factorial MANOVA was conducted to analyze the effect of age, the number of children, and the number of work hours in the parenting perceived by mothers.

Data were analyzed using the software *SPSS* version 25.

RESULTS

Description of Parenting Perceived by Mothers

Mean and standard deviation values of each dimension and indicator that was included to assess parenting perceived by mothers are presented in **Table 3**. The item that obtained the highest value was *I genuinely express my love to my children*, of the positive parenting dimension. The item that presented the lowest rating was *The main source of stress in my life is my children*, of parental stress dimension.

Description of the Behavior Observed in Children

The different behaviors that mothers observed in their children are presented in **Table 2**, with their corresponding frequency (less than, the same as or more than before) of observation during the period of mandatory isolation enacted due to the COVID-19 pandemic. The children's behaviors that had the greatest increase during the isolation, as perceived by more than 50% of mothers, were *Is anxious/nervous*, *Shows defiant behavior*, *Disobeys*.

The Behavior of Children According to Perceived Parenting

The analysis of **Tables 4–6** shows the variation in children's behaviors according to the level of positive parenting, parenting stress, and parental school support informed by mothers, respectively.

As can be observed in **Table 4**, the behaviors in which that differed between high and low positive parenting groups were: *He/She is disobedient*, *He/She fights with siblings*, *He/She is anxious*, *He/She screams*, *He/She shows dependent behavior*, *He/She shows defiant behavior*. For all these behaviors, the mean range was higher in mothers who perceived low positive parenting.

Differences observed in the behavior of children between high and low parenting stress groups were detected in the following behaviors: *He/She is sad*, *He/She disobeys*, *He/She fights with siblings*, *He/She is anxious/nervous*, *He/She screams*, *He/She wants to sleep in my/our bed*, *He/She shows dependent behavior*, *He/She shows defiant behavior*, *Once he/she falls asleep, he/she wakes up confused in the middle of the night*, and *He/She has nightmares*. In all cases, as can be observed in **Table 5**, the mean range was higher in mothers who perceived a high level of parenting stress.

Lastly, the behavior of children showing differences regarding the level of parental school support was: *He/She logs in to take online classes*, *He/She does the homework*, *He/She enjoys online classes*, *He/She gets easily frustrated when completing school assignments*. In this case, the positive behaviors were linked to

TABLE 3 | Scores of the Perceived Parenting Scale items and dimensions (expressed as Mean and Standard Deviation).

	<i>M</i>	<i>SD</i>
Positive parenting	3.40	0.42
I try that each member of the family expresses their opinions and/or encourages them to do. so	3.47	0.62
I genuinely express my love to my children.	3.68	0.54
I talk with my children about their mistakes.	3.63	0.57
I help my children build a daily hygiene routine.	3.40	0.66
I have managed to maintain a family atmosphere that is good for the development of my children, despite everything that has happened.	3.08	0.69
I dedicate some time during the day to speak to my children.	3.17	0.71
I take time to meet my children's needs.	3.46	0.63
I stimulate my children to do recreational and artistic activities away from the screens.	3.30	0.71
Parenting stress	2.56	0.64
Keeping an eye on my children's classes and assignments stresses me out.	3.12	0.86
The main source of stress in my life is my children.	2.14	0.89
I don't have enough time, as I used to do, to fulfill all my responsibilities.	2.79	0.95
Because of my children, I find it difficult to balance different responsibilities.	2.39	0.94
I have had trouble sleeping during the pandemic.	2.33	0.98
I am more irritable during the pandemic.	2.57	0.90
Parental school support	3.35	0.64
I know which homework and assignments are given to my children in online education.	3.51	0.72
I keep in frequent contact- communicate with school during online education, so I am up to date on how my children are doing.	3.28	0.84
I help get my children organized regarding daily study time.	3.27	0.77

M, mean; *SD*, standard deviation.

high levels of parental support, and the behavior of frustration regarding the compliance with school assignments was more often observed in mothers with lower parental school support (see Table 6).

Influence of Sociodemographic and Work-Related Variables on Perceived Parenting

The effect of the mothers' age, the number of children, and the number of work hours (i.e., independent variables) on the parenting (i.e., positive parenting, parenting stress, and parental support school: dependent variables) perceived by mothers was analyzed using a factorial MANOVA. The results indicate that the number of children had an impact on parenting [*Hotelling's* $F_{(6,1232)} = 4.63$; $p < 0.001$]. Mothers' age also had a significant effect [*Hotelling's* $F_{(6,1232)} = 4.24$; $p < 0.001$]. However, the number of work hours did not have a significant effect on parenting [*Hotelling's* $F_{(6,1232)} = 0.62$; $p = 0.714$].

The univariate analyses show that the number of children specifically affects parenting stress [$F_{(2,619)} = 4.99$; $p = 0.007$]. Mothers who had 3 or more children presented higher values

of the parental stress dimension than those with 1 or 2 children. The school support dimension also showed differences [$F_{(2,619)} = 8.55$; $p < 0.001$]. Mothers with 2 children had higher values in the school support dimension than mothers with 3 or more children. Mother's age only affected parenting stress [$F_{(2,619)} = 7.25$; $p = 0.001$]. Indeed, younger mothers (between 22 and 34 years old) had higher values of parenting stress dimensions than 35 to 45 year-old mothers and between 46 and 59-year-old mothers (see Tables 7, 8).

The only significant interaction regarding parenting (after removing non-significant ones from the model) was observed among the factors: number of children by the number of working hours [*Hotelling's* $F_{(12,1895)} = 2.72$; $p = 0.001$]. This interaction had specific influence on parenting stress [$F_{(4,635)} = 3.11$; $p = 0.015$]. Differences in parenting stress were found in the group of mothers who worked over 10 h, between mothers who have a single child ($M = 2.48$; $SD = 0.12$) and those who have 3 or more children ($M = 2.94$; $SD = 0.10$) ($p = 0.014$), and between those who have 2 ($M = 2.43$; $SD = 0.08$) and 3 or more children ($p = 0.001$); as expected, there was a higher perception of stress in those mothers who work over 10 h and have 3 or more children.

DISCUSSION

The COVID-19 pandemic has had a worldwide impact on the population in general, forcing families to restrict physical contact with their loved ones, and affecting the perception of closeness and affection of some family members (Newkirk, 2020). In particular, parents have undergone an increase in parenting stress and vulnerability (Brown et al., 2020; Griffith, 2020). Furthermore, children have been affected by the pandemic at the psychological, social, and family levels (Jiao et al., 2020). Wang et al. (2020) indicate that, during the pandemic, children have done less physical activity and have spent more time using screens; they have had irregular sleeping patterns and less healthy eating habits, while, according to Jiao et al. (2020), they are more irritable and have more difficulty in paying attention and concentrating.

In this context, this study attempted to describe some dimensions of parenting, as well as behavioral changes in children as perceived by mothers in Argentina during the social isolation period. It also attempted to analyze whether certain pre-pandemic characteristics, such as positive parenting, mothers' age or number of children, as well as work-related characteristics, such as number of work hours during the social isolation (i.e., working from home) or the need to support children to do schoolwork, have been protective or risk factors.

Regarding the first objective (to describe the three dimensions of perceived parenting: positive parenting, parenting stress, and parental school support in the context of the COVID-19 pandemic), the results indicated the predominance of positive parenting. Mothers are characterized by: genuinely expressing their love to their children, speaking to their children about their mistakes, knowing about which homework and assignments are given to their children in online education, try that each member of the family expresses their opinions and/or encourage them

TABLE 4 | Change in children's behavior according to the level of positive parenting.

Variable	Low parenting		High parenting		Statistics	
	Mean range	Range addition	Mean range	Range addition	<i>U</i>	<i>p</i>
Sleeps	214.66	53021.50	220.10	40939.50	22393.50	0.631
Is sad	224.87	55543.50	206.54	38417.50	21026.50	0.109
Eats	214.53	52990.50	220.27	40970.50	22362.50	0.606
Disobeys	229.06	56577.00	200.99	37384.00	19993.00	0.015
Fights with siblings	231.17	57099.50	198.18	36861.50	19470.50	0.004
Is anxious/nervous	230.01	56812.50	199.72	37148.50	19757.50	0.008
Screams	236.39	58388.50	191.25	35572.50	18181.50	0.000
Wants to sleep in my/our bed	221.02	54591.50	211.66	39369.50	21978.50	0.417
Shows dependent behavior	229.27	56630.00	200.70	37331.00	19940.00	0.013
Shows defiant behavior	228.53	56446.00	201.69	37515.00	20124.00	0.021
Plays with friends (now online)	213.99	52855.00	221.00	41106.00	22227.00	0.554
Once asleep, he/she wakes up confused in the middle of the night	212.05	52376.50	223.57	41584.50	21748.50	0.304
Has nightmares	214.36	52946.50	220.51	41014.50	22318.50	0.588

TABLE 5 | Change in children's behavior according to the level of parenting stress.

Variable	Low stress		High stress		Statistics	
	Mean range	Range addition	Mean range	Range addition	<i>U</i>	<i>p</i>
Sleeps	225.71	46721.50	229.00	56563.50	25193.50	0.778
Is sad	186.94	38696.50	261.49	64588.50	17168.50	0.000
Eats	220.39	45621.00	233.46	57664.00	24093.00	0.251
Disobeys	184.14	38116.50	263.84	65168.50	16588.50	0.000
Fights with siblings	192.42	39831.00	256.90	63454.00	18303.00	0.000
Is anxious/nervous	178.50	36949.50	268.56	66335.50	15421.50	0.000
Screams	178.49	36947.00	268.57	66338.00	15419.00	0.000
Wants to sleep in my/our bed	196.54	40684.00	253.45	62601.00	19156.00	0.000
Shows dependent behavior	193.44	40043.00	256.04	63242.00	18515.00	0.000
Shows defiant behavior	176.43	36520.50	270.30	66764.50	14992.50	0.000
Plays with friends (now online)	234.99	48643.50	221.22	54641.50	24013.50	0.253
Once asleep, he/she wakes up confused in the middle of the night	207.01	42851.50	244.67	60433.50	21323.50	0.001
Has nightmares	206.18	42679.50	245.37	60605.50	21151.50	0.001

TABLE 6 | Change in children's behavior according to the level of parental school support.

Variable	Low support		High support		Statistics	
	Mean range	Range addition	Mean range	Range addition	<i>U</i>	<i>p</i>
Logs in to take online classes	174.11	39870.50	259.29	51080.50	13535.50	0.000
Does the homework	161.72	37033.00	273.70	53918.00	10698.00	0.000
Joins classmates online to do the schoolwork and/or study	209.40	47953.50	217.20	42571.50	21618.50	0.467
Enjoys online classes	185.29	42432.50	246.29	48518.50	16097.50	0.000
Gets easily frustrated when doing school assignments	228.09	52232.00	196.54	38719.00	19216.00	0.006

to do so, and *take time to meet their children's needs*. These behaviors summarize an authoritative parenting style (Baumrind, 1966) or a positive parenting style (Bornstein, 2007), implying high acceptance and moderate control. In general, these mothers showed fewer behaviors denoting stress, although some were more outstanding, such as *keeping an eye on my children's classes and assignments stress me out, I don't have enough time, as I used to do, to fulfill all my responsibilities, I am more irritable during the pandemic*. The latter is in agreement with what was

claimed by Almeida et al. (2020) about the overload experienced by mothers during the pandemic, due to the multiple tasks they must perform when trying to balance housework, the care and the school support given to children, and the paid work that is now done from home. By contrast, the behaviors reflecting positive parenting would be based on a more stable pre-pandemic characteristic. At the same time, it should be noted that most of the mothers included in this study have high education levels, and people with this education level would appreciate positive

TABLE 7 | Effect of number of children on perceived parenting.

	Number of children						<i>F</i>	<i>ETA</i>	<i>M</i> ₁ - <i>M</i> ₂	<i>M</i> ₁ - <i>M</i> ₃	<i>M</i> ₂ - <i>M</i> ₃
	1 child		2 children		3 or more						
	<i>M</i> ¹	<i>SD</i> ¹	<i>M</i> ²	<i>SD</i> ²	<i>M</i> ³	<i>SD</i> ³					
Positive parenting	3.41	0.05	3.41	0.03	3.30	0.04	2.35	0.01	0.37	0.02	0.17
Parenting stress	2.49	0.07	2.48	0.05	2.71	0.06	5.00**	0.02	0.49	0.03	0.16
School support	3.36	0.07	3.46	0.05	3.14	0.06	8.55***	0.03	0.14	0.19	0.00

***p* < 0.01 *** *p* < 0.001 Generalized linear model Hotelling's $F_{(6,1232)} = 4.63$; *p* = 0.00.

TABLE 8 | Effect of age on perceived parenting.

	Age						<i>F</i>	<i>ETA</i>	<i>M</i> ₁ – <i>M</i> ₂	<i>M</i> ₁ – <i>M</i> ₃	<i>M</i> ₂ – <i>M</i> ₃
	22–34		35–45		46–59						
	<i>M</i> ¹	<i>SD</i> ¹	<i>M</i> ²	<i>SD</i> ²	<i>M</i> ³	<i>SD</i> ³					
Positive parenting	3.36	0.04	3.42	0.03	3.34	0.05	1.38	0.00	0.99	0.85	0.78
Parenting stress	2.72	0.06	2.56	0.04	2.39	0.08	7.25***	0.02	0.14	0.00	0.05
School support	3.23	0.06	3.31	0.04	3.42	0.08	1.96	0.01	0.91	0.71	0.86

*** *p* < 0.001 Generalized linear model Hotelling's $F_{(6,1232)} = 4.24$; *p* = 0.00.

parenting characteristics more than people with lower education (Richaud et al., 2014), which might have influenced our results.

Regarding the second objective (to describe possible changes perceived by mothers in their children's behavior during the social isolation phase), they usually appear in almost all the studied behaviors, except *He/She has nightmares* and *He/She wakes up confused*. However, sleep is precisely the behavior that showed the greatest differences –either sleeping less or more than usual–, affecting more than half of the children. The most significant differences that were observed by more than half of the mothers were the increase in anxiety and nervousness, followed by the presence of more defiant behavior, more aggressiveness, and difficulties in eating –eating more or less than before the pandemic. These results agree with those of Escobar et al. (2021), who conducted a study involving 5,997 mothers and fathers in the first weeks of quarantine and found that 73.4% of the participants perceived that children were more demanding, as well as an increase in mood-related symptoms (22.8%), disruptive behaviors (49.8%), anxiety symptoms (39.2%), low tolerance to frustration (38%), sleeping problems (52.5%) and symptoms associated with attention deficit and hyperactivity (70.8%). In addition, parents noticed that their children were more defiant (51%) and fought more (32%).

Cabana et al. (2021) conducted work after 8 months of quarantine, involving 4,500 children and adolescents from Argentina. The authors found that almost 77% of children were “angry” and 68% exhibited different degrees of sadness, 7 every 10 children and adolescents (6 to 18 years of age) expressed negative feelings such as low interest and boredom, and 6 every 10 individuals recognized having fear, either for themselves (24%) or for others (21%). Among those that were “annoyed” with the quarantine, the main reason was school work (45%), followed by quarantine-derived measures, especially for the 6-to-9-year-old group (21%). The study found that children felt a high burden in

the extraordinary situation they were living and that they were overwhelmed; they perceived a reduction in education quality, in the subject contents; that education was socially unequal and had made use of a “fun and entertainment tool” –online connection through different devices– turning it into part of their duties. Of the activities performed before the quarantine, 60% of the children missed outdoor activities, recreation in general, and sports, especially children between 6 and 9 years old (Cabana et al., 2021).

Although they are “digital natives,” children missed in-person contact with their friends, since digital communication does not replace face-to-face contact. Grandparents appeared as very important actors: they provide support and affection and share special experiences with their grandchildren. These feelings can be easily understood in the Argentine culture, in which face-to-face relationships are highly valued, kissing and hugging among relatives and friends are common, and grandparents are very important in family life (Richaud et al., 2014).

Regarding objective 3, since changes in children's behavior were reported by mothers, we may hypothesize that their perception might be partially influenced by their perceptions about parenting. For this reason, analyzing whether this perception varied according to the parenting style was an interesting point. When comparing the answers given by mothers with high and low positive parenting, we found differences in their perception of children's behavior. Mothers with low positive parenting perceived that their children screamed more, fought more with their siblings, were more anxious and disobedient, and showed more defiant and dependent behaviors. This is in agreement with previous findings (Bornstein et al., 1998; Johnston et al., 2018), in that self-assessments (i.e., cognitions, ideas, or beliefs) about parenting of mothers, fathers or caregivers influence their behavior and their children's beliefs and behaviors. Parents' thoughts about their children and

parenting are an integral aspect of family interactions. Various cognitions of parents, including both stable and general beliefs, expectations, and attributional patterns related to children, child behavior, and parenting, as well as more dynamic cognitions that frequently occur in the context of ongoing parent-child interactions influence his/her perception of his/her children behavior (Johnston et al., 2018).

On the other hand, the comparison between mothers with high and low parenting stress showed that those who were more stressed out perceived more negative changes in the behavior of their children and that those changes usually coincide with those perceived by mothers with low positive parenting, as is the case of disobedience, fighting with siblings, anxiety, and nervousness, screaming and showing defiant behaviors. However, it is worth noting that these more stressed mothers, unlike the other cases, perceive more internalizing behaviors, such as children being sadder, and regressive behaviors (i.e., more dependency, desire to co-sleep or share a bed with parents, having nightmares, and waking up confused). These results agree with those of Olhaverri et al. (2021), who highlight the association between the deterioration in parents' daily functioning and the perception of deterioration in their children's daily functioning. This shows the mutual influence among mothers, fathers, and children (Ponnet et al., 2013; Azhari et al., 2020), as well as the tendency to perceive children's behavior in a more negative way, which stems from their discomfort related to confinement and health restrictions.

However, despite the previous considerations about how the particular mothers' beliefs, cognitions, feelings, and moods might influence their statements about the change in behavior in children, in general, the reported changes agree with another study conducted in Argentina (Cabana et al., 2021), in which the source of information was the children themselves. Therefore, our results agree with those findings.

Concerning the perception of school support, the mothers who gave more support perceived that their children logged in to online classes more often, completed their assignments, enjoyed their classes, and were less frustrated when doing schoolwork at home. These results agree with previous findings indicating that family support is an important predictor of the children's bonding and good school performance (Perkins et al., 2016). Likewise, another recent study showed that the lowest levels of parental school support were related to the lower academic motivation of students during the pandemic (Klootwijk et al., 2021).

Based on the results discussed concerning objective 3, it is possible to confirm hypothesis 1: "Changes in children's behavior varies depending on the parenting perceived by the mother."

Regarding the last objective, the analysis of the effect of the number of children on positive parenting, parenting stress, and school support showed significant differences between groups of high and low parenting stress, which increases significantly when comparing mothers with 1 and 3 children, and in-school support, which decreases significantly between 2 and 3 children, as previously suggested (Pérez et al., 2010). The number of children might be considered a pre-pandemic stressor. This factor might increase the stress of mothers that have to meet the needs of several children at the same time in a context of greater demand inside the home (e.g., *I don't have enough time,*

as I used to do, to fulfill all my responsibilities). This situation would lead mothers to perceive a higher number of negative behaviors in children; in turn, children perceive greater tension and therefore will exhibit more behavioral problems. As already stated, previous works (Yang, 2015; Hutchison et al., 2016; Liu and Merritt, 2018) found that the accumulation of stressors makes parents' behavior rigid, which in turn would lead to greater irritability and behavioral problems in children, eliciting more negative responses by their parents (McQuillan and Bates, 2017).

Mothers' age, had an influence only on parenting stress, decreasing as age increases, especially and significantly between groups 1 (22–34 years old) and 3 (46–59 years old), and between groups 2 (35–45 years old) and 3. These results coincide with those found by Bezeveggis (2012), who indicates that older parents (30–40 years old) are more mature and more likely to meet the needs of their children. Mothers over 30 years old adapt better and are happier in their maternity role (Bezeveggis, 2012) than younger mothers, who have more difficulty in exhibiting positive parenting (Easterbrooks et al., 2011). This situation might also be a pre-pandemic variable that influences maternal stress.

Although the number of work hours did not have a direct impact on parenting, the analysis of the effect of the interaction between work hours and the number of children showed that mothers with three or more children who work more than 10 h a day have higher perceived stress. As previously reported, the relationship between work and family life in women might be mediated by diverse moderating factors, such as flexibility and control of work hours (Hughes and Parkes, 2007). Indeed, a study conducted during the pandemic showed that parents that perceived themselves as more productive reported a higher level of positive emotions (Ilari et al., 2021). In our study, working a high number of hours (more than 10 a day) and having more than three children would seem to increase stress in mothers during the pandemic. Our results agree with previous studies that found that certain socio-demographic factors moderate the psychological impact of quarantine. A particular study (Taylor et al., 2008) found that gender, age, number of children, and educational level were aspects associated with the psychological effect of the quarantine.

Our findings partially confirm hypothesis 2 of this study, since perceived parenting varied depending on mothers' age and the number of children, but not with the number of work hours.

In summary, during the pandemic, social isolation conditions had a negative effect on mental health and children's behavior. This impact, however, has been influenced either positively by protective factors, such as positive parenting and school support, or negatively by risk factors, such as younger age and a high number of children, which existed before the pandemic. At the same time, there have been contextual factors, such as lack of social contact or online classes, which have influenced parenting. Therefore, the analysis of the effect of quarantine during COVID 19 on parenting and children's behavior needs to consider family dynamics, characteristics of parents and parents-children interactions, and sociodemographic and context variables, to be able to determine protective and risk factors that can enhance or reduce the effect.

Limitations and Strengths

One of the limitations of the work was that it involved self-reports, which may be affected by social desirability. Secondly, a cross-sectional evaluation was conducted which, unlike a longitudinal study, does not allow the accurate detection of changes in the mothers' parenting and the children's behavior. Thirdly, the study involved only mothers; possibly, the assessed changes may have different results in mothers with children of other age ranges and social strata. Additionally, only a reduced number of variables have been evaluated, since many relevant families, parental and working characteristics that affect parenting have not been included in this study. Finally, the study of children's behavior was conducted only from the mother's perspective. Further studies should analyze and compare the perceptions of both parents as well as of children about parenting and behavior. For this reason, our results cannot be generalized to other samples with different conditions and family characteristics.

On the other hand, the analyses conducted did not consider the following variables, which might have influenced the results: children gender or age, data on parenting before the pandemic, grief due to the loss of a family member during the health emergency, or possible school difficulties that children might have. The effect of children's behavioral changes on parental stress was also not analyzed, considering that the mother-children interaction is reciprocal or bidirectional (Biglan, 2015). Therefore, future works should include these data.

The main strength of this study lies in the contribution of evidence regarding some dimensions of parenting and the changes in children's behavior observed by Argentine mothers during the COVID-19 pandemic. In addition, the study has shown a relationship between parenting and the changes perceived by mothers in their children's behavior, which probably produces negative feedback on the children's behavior and their parenting. Lastly, the impact of some sociodemographic and work-related factors interacting and having an effect on perceived parenting is highlighted. It is estimated that these initial findings may allow the identification of some protective factors as well as some risk factors to parenting in the context of a pandemic, and the design of preventive psychoeducational interventions to optimize the psychological wellbeing of families.

Implications

As suggested by Provenzi and Tronick (2020), the evidence obtained from the research should be used to generate strategies promoting psychological reparation and reduce the generated damage, mainly social disconnection during the pandemic. The present results, as well as previous studies (e.g., Roos et al., 2021), evidence the need to generate psychosocial intervention strategies to support parents during and after the pandemic. Specifically, group and individual interventions might be performed to strengthen positive parenting practices, i.e., healthy, protective, and stable emotional relations that provide school support, recreational activities, and high-quality time to children. Moreover, a positive familiar environment, with suitable management of stress and free of verbal, physical, and

emotional abuse should be promoted. Intervention programs based on a positive parenting approach have shown encouraging results in adverse contexts and conditions (e.g., Rodrigo, 2010; Pickering and Sanders, 2016; Vargas Rubilar et al., 2018; Turner et al., 2020), and promising results were reported to address management of parenting stress during the COVID-19 pandemic (e.g., James Riegler et al., 2020).

CONCLUSION

During the pandemic, the Argentine mothers included in this work perceived adequate positive parenting and moderate stress due to the need to support children learning, as well as to the greater responsibility of having to perform multiple tasks. However, the level of maternal stress was found to depend not only on the pandemic but also on contextual variables, such as the number of children, mother's age, and the interaction between the number of work hours and the number of children. The mothers that perceived the highest stress were those that perceived more sadness and more dependent behaviors in their children.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Universidad Adventista del Plata. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JVR: study design and questionnaire, data collection, introduction, methodology, and discussion. MR: study design, questionnaire, methodology, and discussion. VL: methodology, data analysis, and results. CB: form design, data collection, and results. All authors reviewed the draft and contributed to the final version of the manuscript.

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Psychosocial Effects of COVID-19 in the Ecuadorian and Spanish Populations: A Cross-Cultural Study

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The world's population is currently overcoming one of the worst pandemics, and the psychological and social effects of this are becoming more apparent. We will present an analysis of the psychosocial effects of COVID-19: first, a cross-sectional study in an Ecuadorian sample ($n = 301$) and second, a comparative study between two samples from the Ecuadorian and Spanish populations ($n = 83$ each one). Participants completed an online survey to (1) describe how they felt (depression, anxiety, and stress) before and after confinement; (2) analyze which emotional and behavioral variables predict depressive symptoms, anxiety, and stress perceived after the confinement; (3) carry out a comparative study in a sample of Ecuadorian and Spanish surveys. Results indicate, first, that Ecuadorians experience significantly more depressive symptoms, anxiety, and stress after confinement. Second, variables which predict depressive symptoms and anxiety are greater public prosocial tendency, less stress as a challenge, and greater stress as a threat, as well as an empathetic tendency that implies greater emotional regulation. Experienced stress after confinement was predicted by a greater public prosocial tendency, as well as an empathetic tendency. Finally, scores for depression, anxiety, and stress are higher after confinement in both countries. However, results reveal the similarity of the psychosocial effects that are being experienced, regardless of the country, and the differences in the variables that can help explain these effects. This can contribute to the constitution of intervention plans which aim to soften and alleviate the effects produced by a situation such as that experienced with COVID-19.

Keywords: psychosocial effects, COVID-19, Ecuadorian, Spanish, cross-cultural

INTRODUCTION

The confinement due to SARS CoV-2 (COVID-19) caused the suspension of economic, scholarly, social, cultural, and political activities. This extraordinary situation has generated a great deal of biopsychosocial damage due to the loss of habits and routines that today can be seen as physical and psychological problems (Wang et al., 2020).

According to several studies, during the COVID-19 pandemic, events that generate stress, like fear of infection, having feelings of frustration, boredom, uncertainty, economic difficulties, psychological problems, or stigma and rejection toward infected people, physical and/or mental conditions, among others, have caused high levels of psychological, emotional, cognitive, and

social imbalance to all age groups. Some human groups present a higher vulnerability when facing this extraordinary stressor. Such is the case with adolescent and young people, who require an additional effort to adapt. This population has suffered the highest impact of the restrictive measures due to lack of socialization (Balluerka et al., 2020; Orte et al., 2020).

This lack of contact, and the particular situations triggered by the pandemic, increases the probability of psychological difficulties related to behavioral and emotional problems which manifest as stress, anxiety, or depression (Gómez-Becerra et al., 2020; Wang et al., 2020); therefore, big changes become vital stressors. Because of this, the COVID-19 pandemic and the lack of adequate psychological resources caused mental health problems and disorders (Sandín, 2003; Veytia et al., 2012; Villalobos et al., 2019).

During the months from March to June 2020 it was known that children and young people were showing a low infection risk from COVID-19. However, research shows that they are the most vulnerable to emotional discomfort (Orgilés et al., 2020). There is conclusive data showing that in this population there has been a great increase of psychiatric disorders such as anxiety, depression, and insomnia, especially in women who are close to infected people (Martínez-Taboas, 2020).

Nevertheless, this extraordinary vital situation has also brought prosocial behaviors. Carlo (2014) stated that these behaviors are related to voluntary behaviors like sharing, comforting, and helping. The mentioned behaviors occur in specific scenarios or situations and therefore different examples of prosocial behavior exist (Mestre et al., 2015). For some researchers, the situational and dispositional factors modulate prosocial behavior, explaining that, the higher the ambiguity and severity is in a specific situation, the higher the probability of the appearance of helping behaviors (Batson and Powell, 2003; Galen, 2012). This is the case, for example, of studies such as the one by van de Groep et al. (2020) who investigated the effect of the first weeks of the Covid-19 pandemic on mood, empathy, and prosocial behavior; the results suggest that need and deservedness had a greater influence on adolescent giving than familiarity in the ecologically valid context of the COVID-19 pandemic. Other studies had shown that after and during the early stage of the pandemic, individuals' general prosociality changed toward increased prosociality (Hellman et al., 2021; Yue and Yang, 2021).

Diverse research has shown that prosocial behavior has a highly significant relation to empathy. In fact, studies that empirically evaluate directly the psychological processes related to prosocial development highlight the important role of empathy as a motivator of prosocial behavior (Batson, 1998; Hoffman, 2000; Richaud and Mesurado, 2016), in its cognitive (perspective taking: ability to put oneself in the place of the other) and affective dimension (empathic concern: feelings oriented to the problem or need of another individual) (Knight et al., 2014; Van der Graaff et al., 2014). Research shows a consistent relationship between empathy and prosocial behavior as growth in empathy is associated with individual differences in prosocial behaviors in childhood (Eisenberg et al., 2014). According to Hoffman (1992), from the multidimensional perspective of empathy, prosociality has a psychological dimension to

it, which generates an altruistic attitude in a person to help another in need. This dimension, combined with others such as the cognitive, affective, motivational, and spiritual dimension, contributes to respecting life, co-responsibility, solidarity, support, and resiliency in times of crisis (Boies, 2020). In this sense, studies have shown that empathy was positively associated with prosociality during the pandemic; this reveals that individuals with higher levels of empathy show more prosocial behaviors during the pandemic (Cho et al., 2021).

We can say then that an essential component in the development and appearance of thoughts and behaviors which are socially appropriate is empathy (Ventura, 2020). In fact, several authors maintain the idea that prosocial behaviors have an important function in social relations. Prosocial behavior and the related cognitive and emotional variables facilitate social interaction and adaptation. These behaviors have important consequences on health and social adjustment of individuals, especially adolescents and young people (Taylor et al., 2013; Llorca et al., 2017).

On the other hand, the way that a person assesses stressful events, as is the case of the pandemic, also has a direct impact over psychological adjustment. The assessment made of a stressful event can determine the consequences over mental health even more than the stressful event itself (Lazarus and Folkman, 1984). According to cognitive-relational theory, for an event to be stressful, first it must be perceived as such (Lazarus and Folkman, 1984). This theory is the process of evaluating the personal significance of events (Peacock and Wong, 1990). Primary appraisal involves an assessment of the importance of a transaction for one's wellbeing and include assessments of events and interactions as threats, challenges, and as central to oneself (Zacher and Rudolph, 2021). Threat appraisals involve the potential for harm/loss in the future and challenge appraisals reflect the anticipation of gain or growth from the experience. Challenge appraisals do not have the same negative implications that harm/loss or threat appraisals have, and can be positive or exciting for individuals (Oliver and Brough, 2002). Several studies have explored the different implications that experiencing stress as a challenge vs. as a threat has on other variables since the beginning of cognitive-relational theory such as, for example, that individuals with high levels of negative affectivity were more likely to appraise events as threatening, whereas that those with low levels of negative affectivity appraise them as a challenge (Gallager, 1990; Hemenover and Dienstbier, 1996) or most recently, that positive affect is positively related to challenge appraisals, and negatively related to threat appraisal and humor, and negative affect is positively related to threat appraisals, among other variables (Zacher and Rudolph, 2021). Furthermore, numerous studies show that there is a strong correlation between the assessment of a threat and the coping mechanisms which lead to a poor adaptation to the stressful situation. Whereas, the assessment of a challenge relates to a kind of efficient coping which allows the individual a greater state of wellbeing (Ramírez et al., 2008; Samper, 2014; Szkody and McKinney, 2020).

This pandemic situation has allowed us to consider values such as solidarity and cooperation and ethical and moral

principles which specify that other people are important in our daily actions. In fact, the World Health Organization (WHO), to achieve its implicit objectives, affirms that mental health requires the gregarious character of humanity, that capacity to contribute to the community from the understanding that only together we will manage to reduce social inequalities and reach a good collective mental health. The voluntary acts of helping, sharing, and of commitment to others, actions that are distinctly human, become evident during crisis. These acts cause wellbeing (Villalobos, 2020).

Moreover, empirical studies conclude that prosociality and the ability to put oneself in the place of another are protective factors against impulsive responses and emotional instability when facing difficult situations that require from the subject a solution to a problem (Samper et al., 2015; Mestre et al., 2019). The capacity to discriminate and regulate emotions and to repair one's mood relates significantly with anxiety, anger, and depression (Salguero and Iruarrizaga, 2006). On the contrary, some authors have pointed out that the lack or the lessening of empathy has an influence on depression and anxiety (Caprara et al., 2010; Llorca et al., 2017). Emotional changes and mood changes are related to what is happening to us and to our experiences. That is why certain situations can lead to depression, anxiety, and other symptoms of distress (Moya, 2013; Llorca et al., 2014, 2017; Saladino et al., 2020). Therefore, these moments of crisis bring about the possibility to perform helping behaviors aimed to prevent and reduce the collective crisis. That is why with the present study we want to analyze the psychosocial effects of COVID-19, firstly, by presenting a cross-sectional study in an Ecuadorian population and secondly, a comparative study with two samples, namely an Ecuadorian population and Spanish population.

Hofstede (1980) considered Latin American countries to be more collectivist than European countries. Ecuador ranks amongst the most collectivistic cultures in the world, beaten only by Guatemala. Ecuadorians can show a lot of solidarity toward members of their in-groups. In comparison with other countries in Europe, Spain appears as collectivist. This has made Spaniards quite easy to relate with certain cultures -mainly non-European. However, compared with other areas of the world, Spanish culture clearly classes as individualistic (Mesurado et al., 2014). We have considered in our study these two countries because in April 2020, Ecuador had the highest levels of people infected by COVID-19 in South America, followed by Uruguay, Peru, Brazil, and Argentina, and was above the world average (Inca-Ruiz and Inca-León, 2020). That same month, Spain was, after the USA, the country with higher infection levels (Orte et al., 2020). With the declaration of the state of emergency due to the COVID-19 pandemic, commercial, educational, tourist, and land and air transport activities, among others, were closed. In Ecuador, intervention in health emergencies was inadequate and this was reflected in the mental health of Ecuadorians (Tusev et al., 2020). Existing research shows significant percentages of the prevalence of mental disorders in the population (adolescents and adults), with confinement due to COVID-19 being one of the causes of this situation (Velastegui et al., 2020; Catagua-Meza and Escobar-Delgado, 2021; Cifuentes-Carcelén and Navas-Cajamarca, 2021).

Similarly in Spain, studies show that the confinement and the absence of schooling had a negative impact on the mental health of the child and adolescent population (Gatell-Carbó et al., 2021). Furthermore, the physical and mental health of the elderly was also being negatively affected, with an increase of sleep problems, sedentary lifestyle, and disorders due to anxiety and depression (Buitrago et al., 2021). With this comparative study we hope to be able to progress the understanding of the variable which helps to predict certain internalized problems across countries and cultures.

The objectives of the study are to describe how the Ecuadorian population felt (depression, anxiety, and stress) before and after confinement; analyze the effects that certain emotional and behavioral variables, such as prosocial tendencies, empathy, and experiencing stress as a challenge or as a threat, taken into consideration before confinement, have over depressive symptoms, anxiety, and stress perceived after confinement; and carry out a comparative study in a sample of the Ecuadorian and Spanish general populations.

Based on the literature and regarding the first objective, we hypothesize (hypothesis 1) that the levels of depression, anxiety, and stress will be higher after confinement (Orgilés et al., 2020; Xiang et al., 2020; Breau et al., 2021; Rogers et al., 2021). Regarding the second objective, we hypothesize (hypothesis 2) that behaving in a prosocial manner, having a higher level of empathy, and experiencing stress as a challenge (not as a threat) will become a protector from depression symptoms, anxiety, and stress (Caprara et al., 2010; Llorca et al., 2014; Davis et al., 2016; Alarcón and Forbes, 2017). Finally, regarding the third objective, we hypothesize (hypothesis 3) that there will be no differences between the two countries in the effects of COVID-19 on depression symptoms, anxiety, and stress (Samji et al., 2021) but there will be differences regarding the effect that prosocial behavior, empathy, and assessing stress as a challenge or a threat will have on depressive symptoms, anxiety, and stress.

MATERIALS AND METHODS

Participants

We present an analysis of the psychosocial effects of COVID-19 in two populations: first, a cross-sectional study in the Ecuadorian population ($n = 301$) and second, a comparative study between two samples from the Ecuadorian and Spanish populations ($n = 83$ each one). In the cross-sectional study, the Ecuadorian sample consisted of adolescents between 12 and 19 years of age ($M = 16.14$; $SD = 1.93$). As to gender, the sample consisted of 115 boys (38.2%) and 182 girls (60.5%). In relation to educational attainment, most of the students were studying baccalaureate and NVQ2 and Obligatory Secondary Education. They mostly indicate that they lived in a house in the center of the town, other lived in the outskirts of the city, or in the country or a village, in turn they perceived that they lived in a normal to very big space ($71\text{--}120\text{ m}^2$) in a greater percentage, while the rest lived in a reduced space. Only 2.0% were living with a person who had had the virus, but 23.9% declared that a person close to them had had the virus (see **Table 1** for details).

TABLE 1 | Descriptive statistics.

	Cross-sectional study		Comparative study			
	Ecuadorian sample (<i>n</i> = 301)		Ecuadorian sample (<i>n</i> = 83)		Spanish sample (<i>n</i> = 83)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender						
Men	115	38.2	22	26.5	14	16.9
Women	182	60.5	59	71.1	67	80.7
Other	4	1.3	2	2.4		
Educational attainment						
Baccalaureate and NVQ2	118	39.2	21	25.3	20	24.1
Obligatory secondary education	94	31.2	27	32.5	15	18.1
NVQ1	8	2.7	2	2.4	4	4.8
University degrees	64	21.3	29	34.9	41	49.3
Geographic location						
In a house in the center of the town with a great number of neighbors	81	27.5	21	25.3	17	20.5
In a house in the center of the town with a few neighbors	46	15.3	12	14.5	24	28.9
In the outskirts of the city	93	30.9	28	33.8	14	16.8
In the country or a village	66	22.0	17	20.5	24	28.9
Space						
In a normal to very big space (70–120 m ²)	213	70.8	57	68.7	42	50.6
In a very big house	36	12.0	12	14.5	26	31.3
In a reduced or very reduced space	46	15.3	12	14.5	13	15.6
Relation with people with COVID-19						
Participants who lived with a person with COVID-19	6	2.0	2	2.4	19	22.9
Participants who had close contact with a person with COVID-19	72	23.9	1	1.2	23	27.7

In the comparative study, the sample from Ecuador consisted of 83 subjects from 12 to 65 years of age ($M = 34.41$; $SD = 15.17$). Of this sample, 26.5% were men and 72.3% were women. The level of education comprises Baccalaureate and NVQs, secondary education, and university degrees. A majority of respondents indicated that they lived in a house in the center of the town, others lived in the outskirts of the city, while the rest lived in the country or a village. Most cases perceived that they lived in a normal to very big space (71–120 m²), while the rest lived in a reduced or very reduced space. Only 2.4% were living with a person who had had the virus, but 23.8% declared that a person close to them had had the virus. Furthermore, 83 subjects between 12 and 72 years old ($M = 36.26$; $SD = 16.56$) participated from Valencia, Spain, of which 16.9% were men and 80.7% were women. As with the Ecuadorian sample, the level of education comprises Baccalaureate and NVQs, secondary education, and university degrees. They mostly indicate that they lived in a house in the center of the town, and in the village. The rest live in the outskirts and in the country. However, the population evaluated mostly perceives that they live in a normal to very big space (71–120 m²), while the rest live in a reduced space. Moreover, only 1.2% of the sample evaluated lived with a person who had had COVID-19. However, 28.7% declared that a person close to them had had it (see **Table 1** for details).

Research Procedure

Participants completed an online survey through the Limey Survey platform which was available from May to June, 2020 (first wave of covid-19). First of all, the tests were selected based on the variables required and the psychometric properties. The procedure was changed to an online evaluation protocol through the LimeSurvey platform. Next, the pertinent licenses were obtained from the Ecuadorian Educational Coordination Zone 6 and the North District of the Cuenca canton, and the data collection process was carried out in some of the fiscal educational institutions of the City of Cuenca, motivating participants through the Zoom platform. At this time, it was indicated that the survey has three parts to be considered: in the first one they would find the signed consent; in the second one, they would find questions they should answer by thinking about how they were before the pandemic; and in the third, the same questions, but they should consider the actual extraordinary situation. Regarding the assessment of the Spanish sample, after obtaining the pertinent licenses, the battery of tests was sent through the LimeSurvey platform to public and private schools in the city of Valencia (Spain), as well as the public in general. We used different tactics to reach participants, relying on the social networks of the researchers, who reached out to social media audiences to broadcast and share the survey. The link was sent by email and two platforms (Facebook and WhatsApp) were used

to disseminate the survey. A standardized general description about the survey was given in the email and messaging/social media postings. The participation was voluntary and anonymous, taking into consideration all ethical principles pertaining to research with human beings included in the Helsinki Declaration, under the current regulations.

Measures

For the study of the selected variables, different batteries of questionnaires were used with an online format. Participants responded by thinking about the situation before and during/after confinement. The different items of the questionnaires were written using the appropriate verb tense to obtain answers in the two assessed times.

The assessment of the *sociodemographic questions* was carried out through an *ad hoc* questionnaire with questions related to gender, age, country of residence, level of studies, marital status, family socioeconomic situation, change in socioeconomic situation due to COVID-19, people in the household, place of residence, size of the dwelling, and finally, two questions to identify if any of the people in the household or close to the participant has had the virus.

Prosocial tendencies were evaluated with the Prosocial Tendencies Measure Revised (PTM-R) of Carlo et al. (2003) (Spanish adaptation by Mestre et al., 2015). This questionnaire evaluated different forms of prosocial behavior. It was composed of six subscales through 21 items, one for each of the following prosocial behaviors: public, emotional, altruism, anonymous, compliant, and dire. Participants responded to the items by choosing a response from a scale ranging from 1 (does not describe me at all) to 5 (describes me very well). The subject must describe their own behavior in a variety of situations that reflect different kinds of prosocial behavior: the subscale emotional (5 items) evaluated prosocial tendencies to help others in emotive situations ("It makes me feel good when I can comfort someone who is really distressed"); the subscale altruism (4 items) related to helping others when there is little or no chance of receiving an explicit, direct reward ("I believe that giving things or money is better if I obtain some benefit from it"); the subscale compliance (2 items) evaluated the tendency to help others when they ask for assistance ("I do not hesitate in helping people when they ask me to"); the subscale dire (3 items) measured prosocial behavior in dire situations or situations of crisis ("I have a tendency to help people in dire need"); the subscale public (3 items) measured behavior driven by an intention to behave prosocially in the presence of others ("I can help people better when others are looking at me"); finally, the subscale anonymous addressed the prosocial tendency to help strangers ("I have a tendency to help those in need when they do not know who is helping them"). Cronbach's alpha for all the main measures in the scale for this study, in both samples were: public: 0.75 Ecuador, 0.70 Spain; emotional: 0.81 Ecuador, 0.73 Spain; dire: 0.71 Ecuador, 0.70 Spain; anonymous: 0.81 Ecuador, 0.80 Spain; altruistic: 0.76 Ecuador, 0.74 Spain; and compliant: 0.71 Ecuador, 0.70 Spain.

To evaluate *Depression*, *Anxiety*, and *Stress*, DASS-21 (Spanish adaptation by Daza et al., 2002; Norton, 2007) has been used in its abbreviated version (originally 42 items). Each of the three

scales contain seven items. The subscale *depression*, characterized by the loss of self-esteem and the incentive to reach vital goals, is evaluated through items like: "I couldn't/I haven't been able to feel any positive feelings" (depression; $\alpha = 0.83$); *anxiety* was evaluated through descriptions related to physical symptoms of excitement, panic attack, muscle tension, and fear through statements like: "I noticed/I have noticed that my mouth was dry" (anxiety; $\alpha = 0.79$); stress, the tendency to react with tension, irritability, and persistent activation when facing stressful situations was evaluated through descriptions like: "I found/I have found it very difficult to relax" (stress; $\alpha = 0.84$). The answers were evaluated with a 4-point scale from 0 (It did not occur to me) to 3 (It occurred most of the time). The participants were asked to answer with what frequency they experienced these sensations before the pandemic and during/after the pandemic. Cronbach's alpha for all the main measures in the scale for this study, in both samples were: depression: 0.84 Ecuador, 0.83 Spain; anxiety: 0.90 Ecuador, 0.86 Spain; and stress: 0.90 Ecuador, 0.88 Spain.

The Stress Appraisal Measure (SAM-A) was used to assess stress (Rowley et al., 2005; Spanish adaptation by our research team). Rowley et al. (2005) affirm that in their day-to-day life, people show certain dispositional tendencies to evaluate stressful factors and therefore respond to them in a particular way. The instrument consists of two subscales that assess *stress as a challenge* (4 items), which refers to the person's ability to assess either the harm or the potential benefit that may result from a particular situation and the person tends to overcome it and achieve their goals, with items like: "I considered I have/have had the ability to overcome stress;" and *stress as a threat* (7 items), which is related to the tendency to normally evaluate stressful events as threatening, which paralyzes the positive action of the subject. This tendency is measured with items like: "I perceived/Have perceived stress as a threat." Moreover, this instrument includes three items that represent a *secondary assessment*, namely, the ability to assess what can be done in order to face or benefit from a situation which is causing distress so that the subject is able to bring to bear their personal resources to reduce the potential harm or improve the possibility of benefit (Folkman et al., 1986). This is measured with items like: "I considered that/There are people I can/I have been able to ask for help." The answers were assessed with a 5-point scale: 0 = nothing; 1 = a little; 2 = some; 3 = enough; 4 = a lot (Rowley et al., 2005). Cronbach's alpha for all the main measures in the scale for this study in both samples were: stress as a challenge: 0.86 Ecuador, 0.85 Spain; stress as a threat: 0.88 Ecuador, 0.90 Spain.

The Multidimensional Evaluation of Sympathy for adolescents by Richaud et al. (2017) was used to evaluate *empathy* from a social-cognitive perspective which represents three components which show: (1) the affective response to others' emotions and actions, (2) the cognitive process to the affective response, and (3) the conscious decision making to undertake an empathetic or prosocial action (Decety and Jackson, 2004; Decety and Lamm, 2006). According to the model subjacent in the instrument, the coincidence of the distress the other person is experiencing leads to solidarity and/or altruism

TABLE 2 | Repeated measure analysis of depression, anxiety, and stress according to the situation before and during/after confinement.

	Before confinement		After confinement		<i>F</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>DT</i>	<i>M</i>	<i>DT</i>			
Depression	0.97	0.88	1.10	0.78	13.79	0.000	0.16
Anxiety	0.82	0.80	0.89	0.78	4.48	0.035	0.08
Stress	1.04	0.83	1.26	0.81	37.19	0.000	0.27
Public	2.40	1.13	2.86	1.04	74.20	0.000	0.42
Emotional	3.63	0.98	3.87	0.83	25.46	0.000	0.26
Altruistic	3.77	1.08	3.49	1.10	31.60	0.000	0.25
Dire	3.49	1.02	3.43	0.94	0.91	0.338	0.06
Compliant	3.81	1.06	3.87	1.03	0.76	0.380	0.05
Anonymous	3.23	1.11	3.32	1.02	3.48	0.063	0.08
Stress challenge	2.15	1.16	2.20	1.03	0.67	0.412	0.04
Stress threat	1.78	1.11	1.84	1.09	1.02	0.311	0.05
Secondary assessment	2.35	1.21	1.99	1.22	28.46	0.000	0.29
Emotional contagion	2.51	0.78	2.56	0.72	1.05	0.312	0.04
Empathetic action	3.04	0.78	3.25	0.62	30.39	0.000	0.62
Perspective taking	2.82	0.79	2.93	0.69	8.28	0.004	0.14
Emotional regulation	2.13	0.87	2.43	0.88	48.97	0.000	0.34
Self-awareness	3.00	0.83	3.06	0.72	2.15	0.143	0.07

(Lietz et al., 2011). Each factor is assessed through three items. The *self-awareness* factor was measured through items such as: “I noticed/I have noticed quickly when someone *felt*/ has felt badly” ($\alpha = 0.75$). This refers to the ability to identify what the subject felt at the moment of affective excitement and at the same time evoke thoughts and feelings of others (Lamm et al., 2007). *Perspective taking* was evaluated through items like: “Even if another person thinks differently to me, I *could*/have been able to understand them” ($\alpha = 0.72$). This implies noticing that another person exists. *Emotional regulation*, a complex cognitive process, is related to the ability to change one’s way of thinking which influences the way of feeling, and is analyzed through items like: “I *had*/have had outbursts of anger” ($\alpha = 0.72$). *Emotional contagion*, the dimension that allows one to emotionally respond due to the recognition and understanding of the emotional state of another person, is evaluated with questions like: “*When I saw someone crying*/When I have seen someone, I don’t know crying, I have felt like crying” ($\alpha = 0.78$). *Empathetic action* as the ability to carry out empathetic behaviors is assessed through: “I *thought* / I have thought that everyone should help those in need” ($\alpha = 0.70$). The answers are assessed with a 5-point scale (1 = never; 2 = a few times; 3 = many times; and 4 = always). Cronbach’s alpha for all the main measures in the scale for this study, in both samples, were: *self-awareness*: 0.72 Ecuador, 0.70 Spain; *Perspective taking*: 0.62 Ecuador, 0.76 Spain; *Emotional regulation*: 0.79 Ecuador, 0.83 Spain; *Emotional contagion*: 0.76 Ecuador, 0.68 Spain; *Empathetic action*: 0.75 Ecuador, 0.81 Spain.

Statistical Procedure

Firstly, SPSS 26 was used to estimate means and standard deviations and to calculate repeated measures analysis of variance (ANOVA) to test for mean differences across waves (before and

during/after confinement) and countries, Ecuador and Spain. Secondly, multiple linear regressions in steps were carried out with the Ecuadorian population and according to the country, Ecuador and Spain, to analyze the predictive value of the different psychological variables studied. The dependent variables are depression, anxiety, and stress during/after confinement, and the independent variables are prosocial behaviors, depression, anxiety, stress, stress challenge, stress threat, and reactive and proactive aggression. Collinearity analysis reveals that the data is free from problems of this nature. The condition index stands at values of <30 and the proportion of decomposition of variance in proportions of <0.5 (Belsley, 1991).

RESULTS

Firstly, to answer the first objective, a repeated measures analysis was carried out with the finality to study the differences among the variables assessed in the situation before and during/after confinement. The variables analyzed were depression, anxiety, and stress in Ecuadorian adolescents. **Table 2** presents means, standard deviations, and results for the repeated measures analysis of variance (ANOVA) testing mean differences across the two time points (before and after confinement).

The differences were significant for all dependent variables: depression ($F = 13.79$, $p = 0.000$), anxiety ($F = 4.48$, $p = 0.035$), and stress ($F = 37.19$, $p = 0.000$). The scores increased significantly after the pandemic. The effect size in stress is medium (Cohen’s $d = 0.27$), whereas in depression and anxiety, the effect size of both variables is small (Cohen’s $d = 0.16$, and 0.08 , respectively) (Cohen, 1988). In relation to the independent variables, the differences were significant for public ($F = 74.20$, $p = 0.000$), emotional ($F = 25.46$, $p =$

TABLE 3 | Correlation matrix for the study variables in the ecuadorian sample ($n = 301$).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Depression (A)	–																														
2. Anxiety (A)	0.82**	–																													
3. Stress (A)	0.82**	0.86**	–																												
4. Public (B)	0.17**	0.24**	0.19**	–																											
5. Emotional (B)	0.13*	0.16**	0.18**	0.30**	–																										
6. Altruistic (B)	–0.16**	–0.16**	–0.11*	–0.75**	–0.15**	–																									
7. Dire (B)	0.08	0.14*	0.13*	0.31**	0.72**	–0.18**	–																								
8. Compliant (B)	0.09	0.11	0.16**	0.10	0.67**	0.02	0.66**	–																							
9. Anonymous (B)	0.04	0.06	0.09	0.20**	0.52**	–0.16**	0.60**	0.50**	–																						
10. Public (A)	0.10	0.13*	0.10	0.63**	0.25**	–0.53**	0.23**	0.00	0.08	–																					
11. Emotional (A)	0.14*	0.16**	0.18**	0.21**	0.58**	–0.14*	0.46**	0.35**	0.25**	0.35**	–																				
12. Altruistic (A)	–0.16**	–0.09	–0.05	–0.61**	–0.03	0.68**	–0.06	0.11*	–0.00	–0.58**	–0.13*	–																			
13. Dire (A)	0.05	0.13*	0.09	0.22**	0.37**	–0.19**	0.49**	0.35**	0.37**	0.37**	0.50**	–0.18**	–																		
14. Compliant (A)	–0.01	0.05	0.09	0.09	0.35**	–0.02	0.35**	0.45**	0.19**	0.18**	0.52**	0.07	0.35**	–																	
15. Anonymous (A)	0.04	0.09	0.10	0.09	0.29**	–0.07	0.37**	0.31**	0.65**	0.08	0.39**	–0.01	0.49**	0.36**	–																
16. Stress challenge (B)	–0.11	–0.03	0.01	0.02	0.25**	0.03	0.23**	0.27**	0.24**	–0.03	0.03	0.15**	0.04	0.16**	0.11	–															
17. Stress threat (B)	0.48**	0.50**	0.56**	0.19**	0.16**	–0.05	0.12*	0.18**	0.16**	0.01	0.07	0.01	0.09	0.09	0.12*	0.27**	–														
18. Secondary assessment (B)	–0.12*	–0.05	–0.00	0.04	0.24**	0.02	0.23**	0.23**	0.22**	0.03	0.05	0.08	0.13*	0.10	0.11	0.68**	0.25**	–													
19. Stress challenge (A)	–0.16**	–0.06	–0.05	–0.00	0.18**	–0.04	0.26**	0.24**	0.21**	0.06	0.07	0.06	0.12*	0.20**	0.15**	0.51**	0.02	0.43**	–												
20. Stress threat (A)	0.64**	0.64**	0.72**	0.15**	0.20**	–0.07	0.12*	0.19**	0.15**	–0.02	0.17**	0.01	0.09	0.09	0.13*	0.09	0.68**	0.10	–0.00	–											
21. Secondary assessment (A)	–0.11	0.01	0.02	0.04	0.22**	–0.02	0.29**	0.23**	0.23**	0.09	0.19**	0.04	0.24**	0.18**	0.19**	0.35**	0.10	0.53**	0.48**	0.11*	–										
22. Emotional contagion (B)	0.29**	0.34**	0.35**	0.15**	0.36**	–0.03	0.28**	0.29**	0.22**	0.15**	0.27**	–0.04	0.17**	0.16**	0.15**	0.09	0.32**	0.15**	0.13*	0.34**	0.23**	–									
23. Empathetic action (B)	0.06	0.081	0.13*	0.08	0.55**	0.09	0.49**	0.53**	0.38**	0.02	0.32**	0.11*	0.20**	0.29**	0.19**	0.41**	0.20**	0.36**	0.22**	0.16**	0.15**	0.28**	–								
24. Perspective taking (B)	0.12*	0.13*	0.19**	0.06	0.42**	0.04	0.38**	0.43**	0.30**	0.02	0.19**	0.13*	0.17**	0.24**	0.13*	0.46**	0.26**	0.41**	0.30**	0.17**	0.25**	0.36**	0.60**	–							
25. Emotional regulation (B)	0.55**	0.54**	0.58**	0.27**	0.20**	–0.23**	0.16**	0.05	0.15**	0.19**	0.17**	–0.16**	0.16**	0.02	0.15**	–0.04	0.53**	–0.01	–0.06	0.48**	–0.05	0.31**	0.19**	0.16**	–						
26. Self-Awareness (B)	0.14**	0.12*	0.17**	0.04	0.48**	0.08	0.39**	0.46**	0.33**	–0.01	0.24**	0.17**	0.14*	0.24**	0.17**	0.40**	0.28**	0.39**	0.23**	0.22**	0.15**	0.25**	0.67**	0.64**	0.20**	–					
27. Emotional contagion (A)	0.29**	0.34**	0.35**	0.15**	0.36**	–0.03	0.28**	0.29**	0.22**	0.15**	0.27**	–0.04	0.17**	0.16**	0.15**	0.09	0.32**	0.15**	0.13*	0.34**	0.23**	0.66**	0.28**	0.36**	0.31**	0.25**	–				
28. Empathetic action (A)	0.06	0.13*	0.15**	0.14*	0.54**	0.05	0.51**	0.54**	0.34**	0.14*	0.43**	0.06	0.31**	0.39**	0.27**	0.16**	0.16**	0.24**	0.21**	0.12*	0.23**	0.40**	0.58**	0.36**	0.10	0.37**	0.40**	–			
29. Perspective taking (A)	0.08	0.17**	0.19**	0.10	0.37**	–0.06	0.37**	0.37**	0.22**	0.15**	0.26**	0.04	0.24**	0.32**	0.15**	0.30**	0.18**	0.30**	0.37**	0.16**	0.31**	0.24**	0.35**	0.62**	0.07	0.40**	0.24**	0.44**	–		
30. Emotional regulation (A)	0.59**	0.56**	0.63**	0.23**	0.19**	–0.19**	0.14*	0.12*	0.11*	0.12*	0.19**	–0.15**	0.10	0.00	0.12*	–0.12*	0.43**	–0.08	–0.11*	0.56**	–0.08	0.37**	0.11*	0.08	0.62**	0.11*	0.37**	0.18**	0.04	–	
31. Self-Awareness (A)	0.25**	0.22**	0.27**	0.03	0.40**	0.06	0.37**	0.36**	0.27**	0.07	0.28**	0.09	0.20**	0.21**	0.20**	0.27**	0.29**	0.31**	0.20**	0.29**	0.27**	0.37**	0.43**	0.53**	0.18**	0.64**	0.37**	0.49**	0.51**	0.28**	–

B, before confinement; A, after confinement. * $p < 0.05$; ** $p < 0.01$.

TABLE 4 | Correlation matrix for the study variables by country, Ecuador ($n = 83$) and Spain ($n = 83$).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Depression (A)	–	0.75**	0.72**	0.13	0.01	–0.30**	0.03	–0.13	0.08	0.09	0.10	–0.36**	0.17	–0.05	0.03	–0.27*	0.32**	–0.18	–0.28**	0.61**	–0.05	0.29**	–0.08	–0.02	0.35**	0.00	0.29**	0.04	0.03	0.61**	0.04
2. Anxiety (A)	0.87**	–	0.78**	0.16	0.13	–0.22*	0.12	–0.05	0.10	0.05	0.08	–0.22*	0.22*	–0.04	0.03	–0.19	0.31**	–0.03	–0.09	0.61**	0.02	0.31**	0.08	0.06	0.33**	0.13	0.31**	0.04	0.04	0.59**	0.08
3. Stress (A)	0.84**	0.87**	–	–0.04	0.18	–0.15	0.06	0.04	0.20	–0.13	0.03	–0.05	0.03	0.01	0.07	–0.14	0.45**	–0.07	–0.11	0.67**	–0.08	0.28*	–0.03	0.04	0.42**	0.06	0.28*	–0.01	0.00	0.65**	0.07
4. Public (B)	0.32**	0.32**	0.31**	–	–0.02	–0.70**	0.15	–0.12	–0.06	0.28**	0.03	–0.55**	0.12	–0.12	0.03	–0.04	–0.09	–0.01	–0.09	–0.01	0.03	–0.16	–0.10	–0.11	0.25*	0.02	–0.16	–0.10	–0.08	0.06	–0.14
5. Emotional (B)	0.24*	0.21	0.21	0.33**	–	0.04	0.67**	0.75**	0.39**	–0.11	0.72**	–0.11	0.29**	0.42**	0.45**	0.44**	0.28*	0.48**	0.40**	0.20	0.32**	0.45**	0.59**	0.23*	0.17	0.45**	0.45**	0.49**	0.31**	0.21	0.42**
6. Altruistic (B)	–0.21	–0.23*	–0.21	–0.81**	–0.24*	–	–0.12	0.25*	–0.09	–0.33**	–0.03	0.59**	–0.08	0.14	–0.08	0.29**	0.01	0.25*	0.28**	–0.13	0.21	0.11	0.22*	0.21	–0.39**	0.09	0.11	0.234	0.24*	–0.25*	0.20
7. Dire (B)	0.15	0.20	0.18	0.32**	0.79**	–0.22*	–	0.58**	0.41**	0.06	0.46**	–0.26*	0.30**	0.28*	0.47**	0.35**	0.17	0.50**	0.24*	0.20	0.29**	0.18	0.49**	0.22*	0.23*	0.39**	0.18	0.32**	0.17	0.09	0.34**
8. Compliant (B)	0.17	0.13	0.16	0.14	0.61**	–0.09	0.68**	–	0.22*	–0.15	0.49**	0.03	0.11	0.51**	0.21	0.62**	0.18	0.54**	0.48**	0.09	0.31**	0.43**	0.66**	0.39**	0.08	0.52**	0.43**	0.60**	0.41**	0.07	0.63**
9. Anonymous (B)	0.13	0.05	0.10	0.15	0.51**	–0.11	0.60**	0.54**	–	0.07	0.30**	–0.14	0.19	–0.02	0.63**	0.07	0.47**	0.11	0.11	0.20	0.03	–0.08	0.18	0.16	0.18	0.14	–0.08	0.15	0.08	0.24*	0.17
10. Public (A)	0.17	0.21	0.21	0.66**	0.21	–0.59**	0.22*	–0.04	0.01	–	0.10	–0.51**	0.17	–0.05	0.08	–0.08	–0.12	–0.12	–0.30**	–0.10	–0.09	–0.13	–0.13	–0.12	0.06	–0.08	–0.13	–0.12	–0.05	–0.03	0.02
11. Emotional (A)	0.24*	0.28**	0.22*	0.30**	0.62**	–0.26*	0.55**	0.24*	0.29**	0.40**	–	–0.22*	0.49**	0.41**	0.37**	0.33**	0.12	0.31**	0.25*	0.09	0.34**	0.29**	0.40**	0.15	0.10	0.36**	0.29**	0.41**	0.39**	0.19	0.33**
12. Altruistic (A)	–0.27*	–0.21	–0.21*	–0.71**	–0.13	0.68**	–0.12	0.03	0.01	–0.68**	–0.26*	–	–0.12	0.19	–0.20	0.03	–0.05	0.01	0.22*	–0.05	–0.02	0.10	0.04	0.10	–0.25*	–0.11	0.10	0.06	0.00	–0.17	–0.10
13. Dire (A)	0.13	0.22*	0.21	0.23*	0.45**	–0.22*	0.59**	0.27*	0.37**	0.42**	0.68**	–0.19	–	0.23*	0.42**	0.08	0.08	0.16	0.09	0.21	0.16	0.15	0.28**	0.18	0.15	0.29**	0.15	0.30**	0.21	0.10	0.15
14. Compliant (A)	0.08	0.21	0.17	0.02	0.21	–0.07	0.39**	0.35**	0.17	0.20	0.49**	–0.02	0.56**	–	–0.08	0.44**	–0.01	0.36**	0.23*	0.04	0.07	0.26*	0.37**	0.21	0.08	0.27*	0.26*	0.43**	0.33**	0.11	0.35**
15. Anonymous (A)	0.07	0.10	0.07	0.13	0.29**	–0.09	0.44**	0.28**	0.64**	0.08	0.50**	–0.03	0.57**	0.46**	–	0.16	0.44**	0.19	0.25*	0.13	0.10	–0.04	0.35**	0.29**	0.19	0.27*	–0.04	0.34**	0.12	–0.02	0.21
16. Stress challenge (B)	–0.11	0.03	0.00	0.04	0.18	–0.06	0.31**	0.33**	0.23*	0.04	0.02	0.02	0.13	0.13	0.08	–	0.06	0.83**	0.63**	–0.08	0.45**	0.16	0.57**	0.54**	–0.16	0.63**	0.16	0.41**	0.45**	–0.19	0.60**
17. Stress threat (B)	0.52**	0.55**	0.54**	0.34**	0.28**	–0.26*	0.28**	0.33**	0.21	0.12	0.25*	–0.18	0.23*	0.16	0.21*	0.21	–	0.11	0.17	0.57**	0.10	0.20	0.20	0.29**	0.33**	0.21*	0.20	0.22*	0.30**	0.47**	0.25*
18. Secondary assessment (B)	–0.11	0.03	0.08	0.17	0.31**	–0.13	0.42**	0.41**	0.31**	0.05	0.09	0.02	0.23*	0.10	0.16	0.77**	0.24*	–	0.59**	–0.02	0.65**	0.23*	0.57**	0.52**	–0.17	0.58**	0.23*	0.37**	0.42**	–0.17	0.51**
19. Stress challenge (A)	–0.23*	–0.08	–0.16	0.01	0.13	–0.08	0.29**	0.25*	0.18	0.14	–0.02	0.06	0.21	0.24*	0.16	0.54**	0.01	0.51**	–	0.03	0.37**	0.24*	0.42**	0.45**	–0.13	0.39**	0.24*	0.45**	0.34**	–0.18	0.37**
20. Stress threat (A)	0.69**	0.68**	0.69**	0.19	0.17	–0.18	0.13	0.22*	0.12	–0.04	0.21	–0.09	0.12	0.17	0.21*	0.01	0.66**	0.06	–0.15	–	0.07	0.46**	0.04	0.07	0.33**	0.18	0.46**	0.17	0.21	0.65**	0.21
21. Secondary assessment (A)	–0.03	0.19	0.15	0.05	0.22*	–0.04	0.39**	0.20	0.27*	0.13	0.26*	0.13	0.37**	0.27*	0.32**	0.41**	0.21	0.57**	0.44**	0.22*	–	0.29**	0.34**	0.28**	–0.21	0.40**	0.29**	0.31**	0.46**	–0.07	0.36**
22. Emotional contagion (B)	0.40**	0.49**	0.41**	0.30**	0.35**	–0.22*	0.33**	0.34**	0.25*	0.20	0.21*	–0.24*	0.07	0.06	0.17	0.15	0.40**	0.14	0.08	0.37**	0.20	–	0.41**	0.23*	0.15	0.35**	0.70**	0.47**	0.41**	0.40**	0.39**
23. Empathetic action (B)	0.16	0.14	0.21	0.10	0.53**	0.07	0.54**	0.70**	0.44**	–0.06	0.18	0.06	0.17	0.21*	0.19	0.36**	0.28**	0.42**	0.21	0.19	0.19	0.25*	–	0.60**	0.02	0.71**	0.41**	0.68**	0.43**	0.05	0.58**
24. Perspective taking (B)	0.04	0.13	0.17	0.15	0.42**	–0.02	0.49**	0.58**	0.35**	0.05	0.16	0.09	0.21	0.21*	0.13	0.52**	0.24*	0.59**	0.31**	0.12	0.36**	0.34**	0.69**	–	0.00	0.60**	0.23*	0.40**	0.65**	0.01	0.49**
25. Emotional regulation (B)	0.57**	0.53**	0.56**	0.33**	0.23*	–0.34**	0.12	0.09	0.17	0.21	0.20	–0.25*	0.20	–0.03	0.12	–0.11	0.56**	–0.02	–0.21*	0.42**	0.03	0.27*	0.16	0.08	–	0.13	0.15	0.08	0.07	0.55**	0.05
26. Self-Awareness (B)	0.11	0.10	0.21	0.10	0.51**	0.03	0.54**	0.58**	0.48**	–0.09	0.24*	0.19	0.24*	0.22*	0.31**	0.24*	0.29**	0.45**	0.20	0.22*	0.24*	0.23*	0.71**	0.62**	0.27*	–	0.35**	0.52**	0.48**	0.15	0.74**
27. Emotional contagion (A)	0.40**	0.49**	0.41**	0.30**	0.35**	–0.22*	0.33**	0.34**	0.25*	0.20	0.21*	–0.24*	0.07	0.06	0.17	0.15	0.40**	0.14	0.08	0.37**	0.20	0.66**	0.25*	0.34**	0.27*	0.23*	–	0.47**	0.41**	0.40**	0.39**
28. Empathetic action (A)	0.23*	0.21	0.25*	0.20	0.60**	–0.08	0.63**	0.69**	0.54**	0.13	0.33**	–0.07	0.28**	0.31**	0.35**	0.18	0.30**	0.29**	0.25*	0.21	0.29**	0.41**	0.71**	0.54**	0.18	0.53**	0.41**	–	0.54**	0.12	0.68**
29. Perspective taking (A)	–0.01	0.16	0.13	0.04	0.33**	–0.04	0.40**	0.35**	0.16	0.15	0.08	0.15	0.25*	0.22*	0.09	0.31**	0.13	0.41**	0.49**	0.07	0.45**	0.34**	0.44**	0.69**	0.01	0.42**	0.34**	0.48**	–	0.24*	0.60**
30. Emotional regulation (A)	0.61**	0.53**	0.60**	0.32**	0.244	–0.33**	0.13	0.17	0.09	0.18	0.24*	–0.32**	0.10	0.06	0.10	–0.12	0.45**	–0.06	–0.24*	0.53**	–0.03	0.36**	0.17	–0.02	0.60**	0.17	0.36**	0.22*	–0.09	–	0.15
31. Self-Awareness (A)	0.24*	0.25*	0.33**	0.04	0.50**	0.01	0.51**	0.45**	0.40**	0.15	0.24*	0.10	0.29**	0.25*	0.26*	0.24*	0.26*	0.37**	0.24*	0.28*	0.48**	0.42**	0.44**	0.51**	0.27*	0.61**	0.42**	0.56**	0.58**	0.24*	–

B, before confinement; A, after confinement. * $p < 0.05$; ** $p < 0.01$. Spanish sample = in bold.

TABLE 5 | Multiple linear regression analysis in Ecuador.

	<i>R squared</i>	<i>B</i>	Standard error	Beta	<i>t</i>	Sig.
Depression after confinement						
Constant		−0.146	0.127		−1.155	
Public (B)	0.031	0.003	0.029	0.005	0.118	0.002
Stress threat (A)	0.425	0.307	0.043	0.427	7.097	0.000
Stress challenge (B)	0.454	−0.082	0.029	−0.122	−2.817	0.000
Stress threat (B)	0.464	0.020	0.043	0.028	0.461	0.019
Emotional regulation (B)	0.518	0.186	0.050	0.208	3.749	0.000
Emotional regulation (A)	0.537	0.175	0.050	0.196	3.478	0.001
Anxiety after confinement						
Constant		−0.73	0.17		−0.4.27	
Public (B)	0.05	0.04	0.03	0.07	1.66	0.000
Stress threat (A)	0.43	0.30	0.04	0.42	6.84	0.000
Stress challenge (B)	0.44	−0.05	0.03	−0.07	−1.70	0.036
Stress threat (B)	0.45	0.02	0.04	0.03	0.52	0.023
Emotional regulation (B)	0.50	0.17	0.05	0.19	3.50	0.000
Emotional regulation (A)	0.51	0.14	0.05	0.15	2.78	0.007
Perspective taking (A)	0.52	0.10	0.04	0.09	2.12	0.035
Stress after confinement						
Constant		−0.60	0.17		−3.44	
Public (B)	0.03	0.00	0.02	0.00	0.11	0.001
Emotional (A)	0.05	−0.00	0.03	−0.00	−0.23	0.013
Stress threat (A)	0.53	0.36	0.03	0.48	10.92	0.000
Emotional regulation (A)	0.60	0.21	0.04	0.23	4.64	0.000
Emotional regulation (B)	0.62	0.18	0.04	0.19	4.20	0.000
Perspective taking (A)	0.63	0.10	0.04	0.09	2.44	0.015

B, before confinement; *A*, after confinement.

0.000), and altruistic ($F = 31.60$, $p = 0.000$) prosocial behaviors, secondary assessment ($F = 28.46$, $p = 0.000$), empathetic action ($F = 30.39$, $p = 0.000$), perspective taking ($F = 8.28$, $p = 0.000$), and emotional regulation ($F = 48.97$, $p = 0.000$). The scores raised significantly after the pandemic for public and emotional prosocial behaviors and for all variables related to empathy. Furthermore, the scores diminished significantly after the pandemic for altruistic prosocial behavior and secondary assessment. The effect size in empathic action is large (Cohen's $d = 0.62$), in public, emotional, and altruistic prosocial behaviors, secondary assessment and emotional regulation is medium (Cohen's $d = 0.42$, 0.26 , 0.25 , 0.29 , and 0.34 , respectively), whereas in perspective taking (Cohen's $d = 0.14$), the effect size is small (Cohen, 1988). Bivariate correlations for all study variables are shown in **Tables 3, 4**; see *Supplementary materials* for details.

Secondly, to answer the second objective, we computed three multiple linear regressions to gain insight into the predictive variables of depression, anxiety, and stress during/after confinement, from Ecuadorian adolescents. In addition, we analyzed how all variables were inter-correlated with each other by computing Pearson correlations (see **Tables 3, 4**).

The pattern of correlations observed in all samples indicates that, in general, depression, anxiety, and stress experienced by participants of all three samples after confinement correlate directly and significantly with stress threat and with emotional

contagion and emotional regulation (experienced before and after confinement). Conversely, the correlation is inverse and significant in all three samples with altruistic prosocial behavior. Furthermore, with the two Ecuadorians samples, the correlation is positive and significant with public and emotional prosocial behavior and with self-awareness, while depression correlates inversely and significantly with stress challenge.

Regression analysis for Ecuadorian adolescents (**Table 5**) showed that for depression, 53.7% of the variance was explained by public prosocial behavior ($B = 0.003$), stress challenge ($B = -0.08$), and threat ($B = 0.020$) and emotional regulation (before confinement) ($B = 0.18$), and stress threat ($B = 0.30$) and emotional regulation (after confinement) ($B = 0.17$). For anxiety, 52.2% ($R^2 = 0.52$) was explained by the variables relating to public prosocial behavior ($B = 0.04$), stress challenge ($B = -0.05$) and threat ($B = 0.02$), and emotional regulation (before confinement) ($B = 0.17$), and stress threat ($B = 0.30$), emotional regulation ($B = 0.14$), and perspective taking ($B = 0.10$) (after confinement). Finally, for stress, 63% ($R^2 = 0.63$) is explained by the variables relating to public prosocial behavior ($B = 0.003$) and emotional regulation ($B = 0.18$) (before confinement), and emotional prosocial behavior ($B = -0.001$), stress threat ($B = 0.36$), emotional regulation ($B = 0.21$), and perspective taking ($B = 0.10$) (after confinement). The variables

TABLE 6 | Multiple linear regression analysis by country, Ecuador and Spain.

	<i>R squared</i>	<i>B</i>	<i>Standard error</i>	<i>Beta</i>	<i>t</i>	<i>Sig.</i>
Depression after confinement						
Ecuador						
Constant		−0.30	0.17		−1.71	
Public (B)	0.10	0.08	0.04	0.12	1.66	0.003
Stress threat (A)	0.52	0.41	0.05	0.58	7.34	0.000
Secondary assessment (A)	0.55	−0.10	0.04	−0.17	−2.39	0.014
Emotional regulation (B)	0.61	0.27	0.07	0.28	3.54	0.001
Spain						
Constant		1.07	0.33		3.25	
Altruistic (A)	0.13	−0.21	0.06	−0.25	−0.3.34	0.001
Stress threat (A)	0.48	0.28	0.06	0.44	4.46	0.000
Stress challenge (B)	0.54	−0.13	0.05	−0.19	−0.2.52	0.003
Emotional regulation (B)	0.57	0.19	0.08	0.24	2.40	0.018
Anxiety after confinement						
Ecuador						
Constant		−0.71	0.28		1.06	
Public (B)	0.10	0.05	0.05	0.08	5.99	0.003
Stress threat (A)	0.50	0.37	0.06	0.49	3.29	0.000
Emotional regulation (B)	0.55	0.28	0.08	0.27	3.12	0.004
Emotional contagion (A)	0.59	0.24	0.07	0.24	−2.00	0.006
Self-Awareness (B)	0.61	−0.16	0.08	−0.14	1.06	0.049
Spain						
Constant		−0.59	0.23		−2.535	
Dire (A)	0.05	0.22	0.07	0.35	3.199	0.037
Stress threat (A)	0.38	0.08	0.05	0.119	1.406	0.000
Emotional regulation (A)	0.45	0.27	0.08	0.352	3.207	0.002
Stress after confinement						
Ecuador						
Constant		−0.36	0.18		−2.04	
Public (B)	0.09	0.07	0.05	0.10	1.40	0.004
Stress threat (A)	0.51	0.42	0.06	0.54	6.83	0.000
Emotional regulation (B)	0.58	0.31	0.08	0.29	3.55	0.001
Spain						
Constant		0.098	0.331		0.296	
Stress threat (A)	0.46	0.32	0.06	0.44	4.73	0.000
Emotional regulation (B)	0.53	0.39	0.08	0.44	4.54	0.001
Perspective taking (A)	0.57	−0.45	0.12	−0.35	−3.60	0.012
Perspective taking (B)	0.60	0.30	0.12	0.23	2.43	0.017

B, before confinement; *A*, after confinement.

stress challenge and emotional prosocial behavior have negative relations with the dependent variables, while all other variables have positive relations.

Thirdly, to answer the third objective, repeated measures analyses were carried out according to country, Ecuador and Spain, as well as multiple linear regressions analysis. The results show that there were no significant differences in the analyzed variables according to the country before and after confinement (depression: $F = 0.84$, $p = 0.35$; anxiety: $F = 0.01$, $p = 0.91$; stress: $F = 0.39$, $p = 0.52$; public: $F = 2.35$, $p = 0.09$; emotional: $F = 2.74$, $p = 0.06$; altruistic: $F = 1.54$, $p = 0.21$; dire: $F = 1.72$,

$p = 0.18$; compliant: $F = 1.32$, $p = 0.26$; anonymous: $F = 0.37$, $p = 0.68$; stress challenge: $F = 0.04$, $p = 0.82$; stress threat: $F = 0.02$, $p = 0.86$; secondary assessment: $F = 2.41$, $p = 0.12$; emotional contagion: $F = 0.65$, $p = 0.54$; empathetic action: $F = 1.70$, $p = 0.19$; perspective taking: $F = 1.62$, $p = 0.20$; emotional regulation: $F = 0.41$, $p = 0.52$; and self-awareness: $F = 31$, $p = 0.58$).

We computed six multiple linear regressions to gain insight into the predictive variables of depression, anxiety, and stress during-after confinement according to the country, from Ecuador and Spain.

The multiple linear regression analysis was performed separately for Ecuadorian and Spanish populations (Table 6). For depression, in the group from Ecuador, 61.8% ($R^2 = 0.61$) of the variance is explained by the variables: public prosocial behavior ($B = 0.08$) and emotional regulation ($B = 0.27$) (before confinement), and stress threat ($B = 0.41$) and secondary assessment ($B = -0.10$) (after confinement). As regards to the group of Spanish population, 57.4% ($R^2 = 0.57$) of the variance is explained by the variables: altruistic prosocial behavior ($B = -0.21$) and stress threat ($B = 0.28$) (after confinement), and stress challenge ($B = -0.13$) and emotional regulation ($B = 0.19$) (before confinement). The variable related to empathy, secondary assessment, altruistic prosocial behavior, and stress challenge had negative relations with depression. All other variables have positive relations.

Furthermore, for anxiety, in the Ecuadorian population, 61.7% ($R^2 = 0.61$) of the variance is explained by the variables: public prosocial behavior ($B = 0.05$), emotional regulation ($B = 0.28$) and self-awareness ($B = -0.16$) (before confinement), and stress threat ($B = 0.37$) and emotional contagion ($B = 0.24$) (after confinement). In the Spanish population, 45.6% ($R^2 = 0.45$) of the variance is explained by the variables: dire prosocial behavior ($B = 0.22$), stress threat ($B = 0.08$), and emotional regulation ($B = 0.27$), after confinement. Only the variable related to empathy, self-awareness, had a negative link with anxiety. All other variables had positive relations.

Finally, for stress, in the group of Ecuadorian population, 58.5% ($R^2 = 0.58$) of the variance is explained by the variables: public prosocial behavior ($B = 0.07$) and emotional regulation ($B = 0.31$) (before confinement), and stress threat ($B = 0.42$) (after confinement). As regards to the group of Spanish population, 60.2% ($R^2 = 0.60$) of the variance is explained by the variables emotional regulation ($B = 0.39$) and perspective taking ($B = 0.30$) (before confinement), and stress threat ($B = 0.32$) and perspective taking ($B = -0.45$) (after confinement). All these variables had positive relations with stress except for perspective taking after confinement, which was negatively related.

DISCUSSION

The present study intended to analyze the psychosocial effect of COVID-19, first by presenting a cross-sectional study in the Ecuadorian population and then through a comparative study between two samples of Ecuadorian and Spanish populations. Our study provides some important preliminary results regarding predictive relation that prosocial behavior, empathy, and the assessment of stress as a challenge has on depression, anxiety, and stress experienced by both the Ecuadorian and Spanish populations. It contributes to explain the variables and psychological processes that occur in adolescents as well as in the general population in the pandemic situation, especially the effects that the restrictions and control measures applied have had on the psychological adjustment to them.

As to the first objective of our study, the results have shown that the Ecuadorian adolescent population in general experienced significantly more depressive symptoms, anxiety, and stress after

the confinement, as has also been shown in other recent studies [e.g., Orgilés et al., 2020; Breaux et al., 2021; Catagua-Meza and Escobar-Delgado, 2021; Echeverría Espinosa, 2021; Rogers et al., 2021; Sama et al., 2021]. As we have indicated before, the confinement and absence of schooling as a result of the pandemic has provoked social isolation and a breakup in interpersonal relationships, social, and physical interactions which, in the majority of the cases, has meant a negative effect on the mental health of children and young people at a worldwide level (Gatell-Carbó et al., 2021; Samji et al., 2021). There was a significant increase in behavioral and emotional problems, as well as sleep disorders, and a higher problematic use of the internet during and after confinement, which has contributed to this raise in depressive symptoms, anxiety, and stress (Chen et al., 2020; Moore et al., 2020; Pietrobello et al., 2020; Xiang et al., 2020).

Regarding the second objective, our hypothesis was that prosocial behavior, together with a higher level of empathy and experiencing stress as a challenge (not as a threat), would act as a protector from depression symptoms, anxiety, and stress. Our results indicate that variables which help predict higher depression symptoms, higher anxiety, and stress in general experienced after confinement are: a higher public prosocial tendency; an empathetic tendency which implies a higher emotional regulation and, in the case of anxiety and stress, also, a higher perspective taking; and finally, a higher rate of assessing stress as a threat. Conversely, the variable stress assessed as a challenge contributes to predicting lesser depression symptoms and lesser anxiety while an emotional prosocial tendency contributes to predicting less stress in general experienced after confinement. Seeing these results, we can verify that our hypothesis has been fulfilled in part and in certain aspects.

First of all, and in relation to prosocial behavior, self-informed *emotional* prosocial tendency before confinement is what contributes to protecting from stress in general after confinement. This prosocial tendency refers to the prosocial action that the subject carries out in emotionally evoking situations, such as the health crisis, in which they can find themselves immersed (Carlo et al., 2003; Mestre et al., 2015). This result follows the same line as other research that, as indicated previously, has highlighted how situational and dispositional factors modulate prosocial behavior, explaining that the higher the ambiguity and gravity a specific situation presents the higher the probability exists of the appearance of helping behaviors (Batson and Powell, 2003; Galen, 2012; Hellman et al., 2021; Yue and Yang, 2021). When the motivation of the prosocial behavior is the emotionally evoking situation, we can affirm in base of our results, that this helping behavior protects from stress.

However, a tendency to behave prosocially with the intention to benefit others but in the presence of witnesses (*public*), meaning, when the prosocial motivation is the presence of others, predicts higher depression symptoms and higher anxiety. This result could be explained by a higher concern about the disapproval of others, by the prosocial motivation oriented to the desire to maintain a positive social image or to obtain the approval of others; it could also be explained by a motivation

oriented to oneself, to self-satisfaction in front of others (Carlo and Randall, 2002; Eberly-Lewis and Coetzee, 2015; Davis et al., 2016; Alarcón and Forbes, 2017). They are prosocial behaviors, but they are motivated in a more selfish way (Davis et al., 2016).

Second of all, in our study, a higher empathetic emotional regulation and perspective taking perceived both before and after confinement has provoked a higher reporting of depressive symptoms, anxiety, and stress after confinement. These results are consistent with other studies (Schreiter et al., 2013; Tully et al., 2016; Calandri et al., 2019; van de Groep et al., 2020) in which the possible role of high levels of empathy in internalizing problems is analyzed, finding that high empathy could be a risk factor of depression. As in other studies, in our study it is not established that the lack or reduction of empathy is related to depression and anxiety (Llorca et al., 2014, 2017) but rather the opposite. In those studies, even though empathy does not appear directly related to depression, it is indirectly related to it through prosocial behavior. This could be due to empathy needing the modulator role of other variables, like the parenting styles of the father or mother, which contribute to channel and mediate between adequate levels of empathy and depression, anxiety, and stress (Mathews et al., 2016; Llorca et al., 2017). It can also be explained by the close relationship existing between empathy and depression. As indicated by some studies, the empathetic reaction to the distress of others, experienced during the situation of the pandemic, can result in personal distress. This can raise the risk of internalizing problems like depression (Tone and Tully, 2014; Yan et al., 2021). In any case, the results in this line are inconsistent in general.

Third of all, our hypothesis in regards to the variable of stress assessed as a threat and as a challenge is fulfilled. In this sense, when the subject assesses the stress perceived as a threat in situations prior to confinement, after it, the subject experiences higher levels of depression, anxiety, and stress in general. Conversely, when it is assessed as a challenge, the subject experiences less depression after confinement. These results follow the lines of those studies which show that the assessment of challenge works as a kind of efficient coping mechanism which allows the subject a higher level of wellbeing (Ramírez et al., 2008; Samper, 2014; Szkody and McKinney, 2020), experiencing fewer depressive symptoms.

In regards to the final objective, the analyses carried out show that in both countries the scores in depression, anxiety, and stress are higher after confinement, as was expected following the more recent related literature (Orgilés et al., 2020; Breux et al., 2021; Catagua-Meza and Escobar-Delgado, 2021; Echeverría Espinosa, 2021; Rogers et al., 2021). However, there are differences in variables that help predict depression symptoms, anxiety, and stress.

First, in relation to the predictor effect of the self-informed prosocial behavior before confinement, results show that in Ecuador, the *public* prosocial tendency, meaning, the prosocial behavior carried out in the presence of others, is what predicts depression symptoms, as well as anxiety and stress experienced after confinement. As we have indicated previously, this kind of prosocial behavior looks for or needs for its execution a public recognition, thus distancing itself from the altruistic concept

of prosociality. They are prosocial behaviors motivated in a more selfish way (Davis et al., 2016). In addition, this need for public approval has generated tension and anxiety which has manifested in internalized problems after the confinement period. Conversely, in Spain it has been the *altruistic* prosocial tendency which predicts fewer depression symptoms together with the *emergency* prosocial tendency, which predicts higher anxiety. The altruistic prosocial behaviors, as opposed to the public and emergency ones, are helping behaviors that are carried out with little or no expectation of reward for oneself (Carlo and Randall, 2002). They are mainly oriented to benefit others and they are motivated selflessly. These results are consistent with those found in other studies (e.g., Wilson and Musick, 1999; Chen et al., 2000; Davis et al., 2016) in which taking part in helping behaviors, in particular the altruistic kind, can induce a positive state of mind in whoever carries them out (Gueguen and De Gail, 2003), which could reduce negative emotional states like depression symptoms. In fact, it can help as a protective factor against depression symptoms.

Our results show, therefore, the differential predictive effects both prosocial tendencies have among both populations (Ecuadorian and Spanish) and suggest that those who help selflessly can obtain more benefits than those who help to benefit themselves.

Second, in relation to the predictor effect of self-informed empathy before confinement, the results have shown that there are no differences between Ecuador and Spain in the prediction of depression being a greater emotional regulation, which predicts, to a greater extent, higher depression symptoms. With regards to anxiety, empathy has more weight as a predictor in Ecuador. The dimensions of empathy which predict a higher anxiety has been a higher emotional regulation together with a higher emotional contagion, which allows to respond emotionally due to recognizing and understanding the emotional state of the other person, and a lesser self-awareness, defined as the ability to identify what the subject felt in the moment of affective excitement and at the same time evoking thoughts and feelings of others (Lamm et al., 2007; Richaud et al., 2017). In any case, and despite the fact that there have been more dimensions that evaluate empathy as predictors of anxiety in the population of Ecuador, the results of both populations indicate that high levels of empathy predict higher anxiety. These results can be explained due to the harmful effects of the pandemic, in particular, of the confinement, as other studies show (e.g., van de Groep et al., 2020), in which it was confirmed that the confinement had provoked a reduction of empathetic concern but a raise in perspective taking. In these studies, the harmful effects of the first weeks of confinement on empathetic response and on the opportunities for prosocial actions are shown, which are important predictors of a healthy socioemotional development. Other studies have shown that high levels of empathy in crisis situations are related to a higher level of support among the members of the family unit, which is generated especially in those who do more work or assistance (Siedlecki et al., 2014; Quílez-Robres et al., 2021) and can in turn develop higher anxiety.

Finally, as to the predictor effect of self-informed stress assessed as a threat or as a challenge before confinement by

both populations, the results have shown that the stress assessed as a threat is a predictor variable in Ecuador as well as in Spain of depression, anxiety, and stress. But in Spain, stress assessed as a challenge aids in predicting depression. Therefore, in both populations, stress assessed as a threat fosters depression symptoms, while in the Spanish population, stress assessed as a challenge protects against them. That is, this situation of health crisis, which prolongs the experience of stress, can involve anxiety, depression, and the inability to manage traumatic and negative emotions as we have stated. Furthermore, the constant fear of infection affects daily life and leads to social isolation, modifying human relations (Saladino et al., 2020).

This study has some limitations. The first limitation is that it was based on subjects' self-reported data. In future studies, it could be interesting to use alternative information sources to provide data on prosocial behavior, empathy, and the other variables. Another limitation is the type of sample that includes adolescents and young adults, which may have introduced some bias in the results. Finally, we have not included sociodemographic data, such as gender, age, and socioeconomic conditions, in the regressions analysis as covariates. These variables might be influencing the dependent variable. Future research might include them to evaluate their effect.

CONCLUSION

The health actions against COVID-19 have brought about a rebirth of self-care, not only from the perspective of the individual who looks at their own survival, but also as an important member of society who needs to feel valued and accepted by it and in which society must show an interest (Villalobos, 2020). In this sense, sharing, helping, and having concern for others has been shown, in view of the results, as an important factor in this process. The population in general, but above all adolescents, have been deprived of a period of growth and personal development and of interpersonal relationships vital to this development and behavior and emotional self-regulation. It has been verified that taking part in altruistic prosocial behaviors leads to a better psychological adjustment. These results illustrate the potentially protective effects of the selfless helping behaviors against depression symptoms, anxiety, and stress.

The results bring to light, on the one hand, the similarities of the psychosocial effects that are being experienced independently

of the country and, on the other hand, the differences in variables that can help explain these effects in the adolescent as well as the general Ecuadorian and Spanish populations. This can contribute to the creation of intervention plans which aim to soften and alleviate the effects produced by a situation like COVID-19, but also variables that should be taken into consideration in the prevention of depression and anxiety symptoms in the Ecuadorian and Spanish populations. Prosocial behaviors are not only indicators of morality and care for others, but are also an indicator of health and wellbeing (Carlo, 2014; Randall and Wenner, 2014; Davis et al., 2016). The development of prosociality with the related processes, empathy and emotional self-control when confronting situations that produce tension or before conflicts that require a solution from the subject, control or inhibit anxiety, aid in the development of an empathetic disposition, especially in the dimension of putting oneself in the place of another and to direct emotions to finding a solution, and are processes that should be taught and developed early to contribute to good emotional balance and psychological wellbeing.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Azuay and University of Valencia. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

ÁC-O, PS-G, and EM-V made substantial contributions to the conception of the work. PS-G, EM-V, and AL-M selected the scales. ÁC-O was responsible for the data acquisition in Ecuador. PS-G, EM-V, AL-M, and AZ-A participated in the data collection in Spain. ÁC-O, PS-G, and VM-E wrote the manuscript, which all authors helped revise. AL-M and AZ-A revised references. All authors contributed to and approved the final manuscript.

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What Is the Support for Conspiracy Beliefs About COVID-19 Vaccines in Latin America? A Prospective Exploratory Study in 13 Countries

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Conspiracy theories about COVID-19 began to emerge immediately after the first news about the disease and threaten to prolong the negative impact of the COVID-19 pandemic by limiting people's willingness of receiving a life-saving vaccine. In this context, this study aimed to explore the variation of conspiracy beliefs regarding COVID-19 and the vaccine against it in 5779 people living in 13 Latin American countries (Argentina, Bolivia, Chile, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Paraguay, Peru, Uruguay and Venezuela) according to sociodemographic variables such as gender, age, educational level and source of information about COVID-19. The study was conducted during the COVID-19 pandemic between September 15 and October 25, 2021. The Spanish-language COVID-19 Vaccine Conspiracy Beliefs Scale (ECCV-COVID) and a sociodemographic survey were used. The results indicate that, in most countries, women, people with a lower educational level and those who receive information about the vaccine and COVID-19 from family/friends are more

supportive of conspiracy ideas regarding the COVID-19 vaccine. In the case of age, the results vary by country. The analysis of the responses to each of the questions of the ECCV-COVID reveals that, in general, the countries evaluated are mostly in some degree of disagreement or indecision regarding conspiratorial beliefs about COVID-19 vaccines. The findings could help open further study which could support prevention and treatment efforts during the COVID-19 pandemic.

Keywords: beliefs, conspiracy, COVID-19, vaccine, Latin America

INTRODUCTION

Since the end of 2019, the COVID-19 pandemic has become the most serious public health problem of the 21st century that has affected every country in the world (Xiao and Torok, 2020). In this regard, the control of COVID-19 depends on the effective acceptance of vaccines against the disease (Chou and Budenz, 2020). According to Our World in Data (2021), as of December 16, 2021, 56.6% of the world's population received at least one dose of COVID-19 vaccine, 8.63 billion doses were administered, and currently, 37.22 million vaccines are administered per day; however, only 7.6% of people living in low-income countries have received at least one dose. While it generally takes approximately 10 years to develop an effective vaccine, in the case of COVID-19, 10 vaccines have been developed and tested in clinical trials since June 2020 and in December 2020, two were licensed for emergency use (Mullard, 2020).

Despite the success in the development of vaccines against COVID-19, convincing people to accept them is still a public health challenge (Al-Amer et al., 2021). Acceptance of vaccination by the general population is one of the most important factors for the success of immunization programs (DeRoo et al., 2020). In several countries, rejection and hesitancy about COVID-19 vaccines are still widespread (Yang et al., 2021). A review study indicated that the acceptance of COVID-19 vaccination was over 70% in the general population, where the highest acceptance rates were found in Ecuador (97.0%), Malaysia (94.3%), Indonesia (93.3%), and China (91.3%); whereas the lowest rates were found in Kuwait (23.6%), Jordan (28.4%), Italy (53.7%), Russia (54.9%), Poland (56.3%), the United States (56.9%), and France (58.9%) (Sallam, 2021). In contrast to developed countries, refusal or hesitation to accept vaccination is more common in developing countries (Arshad et al., 2021). In this regard, in Latin America, a study in six countries (Argentina, Brazil, Chile, Colombia, Mexico, and Peru) indicated that only 59% of respondents would accept a COVID-19 vaccine (Argote et al., 2021). In another study conducted in Latin America and the Caribbean, although 80% intended to be vaccinated, 81.2% also feared adverse effects (Urrunaga-Pastor et al., 2021). While these results are initial and may vary as the pandemic and vaccination processes progress, refusal or hesitation to be vaccinated against COVID-19 may jeopardize herd immunity, which would substantially limit the spread of COVID-19 (Randolph and Barreiro, 2020).

Latin American citizens tend to be less informed about public health issues (Guzman-Holst et al., 2020) and have less trust in

science (Argote et al., 2021). This could be contributing to one of the main difficulties faced by vaccination programs in Latin America, which is vaccine hesitancy due to conspiracy beliefs. The emergence of conspiracy beliefs may also be associated with unnecessarily alarming and sensationalist media reports (Rovetta, 2021). Conspiracy theories about COVID-19 began to emerge immediately after the first news about the disease (Douglas, 2021) and threaten to prolong the negative impact of the COVID-19 pandemic by limiting people's willingness to receive a vaccine that could save their lives (Jensen et al., 2021). Conspiracy beliefs are attempts to explain social and political events or situations on the basis of ideas of secret plots led by two or more powerful actors (Douglas et al., 2019). These types of beliefs usually appear in situations of social crisis, which generate greater uncertainty and collective fear (van Prooijen and Douglas, 2017), and which are responses to psychological needs to try to understand complex threatening situations in a simple and predictable way (Franks et al., 2013; Douglas et al., 2017). In this sense, it is not surprising that conspiracy beliefs emerged during the COVID-19 pandemic and that misinformation about the disease and vaccines spread rapidly (Kouzy et al., 2020). This phenomenon was also observed during the Spanish flu pandemic (Spinney, 2017) and the H1N1 outbreak (Bangerter et al., 2012).

Conspiracy beliefs related to the COVID-19 vaccine have negatively affected intentions to be vaccinated against COVID-19 (Bertin et al., 2020; Freeman et al., 2020a), to a much greater extent than belief in more general theories about COVID-19 (Yang et al., 2021). With the development of COVID-19 vaccines, different conspiracy theories have been proposed, where the most widely accepted ones refer to the installation of 5G chips in people, the generation of infertility, or death from inoculation with the COVID-19 vaccine (Chou and Budenz, 2020; Romer and Jamieson, 2020; Uscinski et al., 2020). People who believe in conspiracies tend to resist preventive measures and vaccination proposed by scientists or health experts (Douglas et al., 2017, 2019). Likewise, belief in conspiracy theories can trigger negative public emotions, which generate vaccine hesitancy and decreased vaccine acceptance (Yang et al., 2021).

Different studies have shown that people with greater scientific knowledge about a topic were less likely to believe in these conspiracy theories and thus reduce negative consequences on vaccine adoption (Swami et al., 2014; Sallam et al., 2020a; Yang et al., 2021). Likewise, conspiracy beliefs lead to the rejection of, or hesitancy in receiving, vaccines, due to the fact that they generate distrust in governments, health care institutions and the pharmaceutical industry

(Bertin et al., 2020; Hornsey et al., 2020). Likewise, there are different sociodemographic variables that are associated in some way with conspiracy beliefs. Thus, it has been suggested that approximately 30% of people between 30 and 39 years of age agreed with conspiracy ideas, such as that the pandemic is a global effort to force everyone to comply with mandatory vaccination, while only 8% of those older than 80 agreed with this type of beliefs; however, gender does not seem to play an important role in conspiracy ideas, which only explained 3% of the variation in conspiracy beliefs (Jensen et al., 2021). Similarly, because social networks are the main source of dissemination of conspiracy beliefs, users of this information medium are more likely to believe in these ideas (Arshad et al., 2021; Suarez-Lledo and Alvarez-Galvez, 2021). Another study differed to a degree by reported that women, people with lower educational levels, and those who relied on social networking platforms as the main source of information presented higher conspiracy beliefs about COVID-19 vaccines (Romer and Jamieson, 2020; Sallam et al., 2021a).

Despite the number of studies which have established negative correlations between conspiracy belief and intentions to be vaccinated before and during the COVID-19 pandemic, the effect size remains moderate (Jolley and Douglas, 2014; Bertin et al., 2020; Roozenbeek et al., 2020; Salali and Uysal, 2020). Therefore, the variation in conspiracy beliefs about the COVID-19 vaccine among different countries needs to be explained. Furthermore, a review of the current scientific literature indicated that the topic has not been sufficiently investigated in a large sample of Latin American countries. It is important to fill this knowledge gap, even more so at a time when conspiracy beliefs are openly discussed by the general population (Jensen et al., 2021). Also, this study will provide further information to elucidate the variation in conspiracy beliefs about the COVID-19 vaccine according to certain sociodemographic variables, given that previous findings are sometimes contradictory (Eberhardt and Ling, 2021). In this context, the current study aimed to explore the variation of conspiracy beliefs against COVID-19 vaccines in a group of people residing in 13 Latin American countries according to sociodemographic variables such as gender, age, educational level, and source of information about COVID-19. The findings obtained in this study could contribute to effectively combat the dissemination of erroneous information about the vaccines, design strategies to generate confidence in the general population, and increase the acceptance rate of the vaccine against COVID-19.

MATERIALS AND METHODS

Participants

A total of 5779 people residing in 13 Spanish-speaking Latin American countries (Argentina, Bolivia, Chile, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Paraguay, Peru, Uruguay, and Venezuela) participated in the study, selected through non-probability snowball sampling, where each respondent was encouraged to invite family and friends to participate in the study (Naderifar et al., 2017). It has been

suggested that the use of this type of sampling in mental health surveys during the current pandemic might introduce some type of bias that is difficult to control for Pierce et al. (2020). However, snowball sampling through social networks has proven to be an effective and rapid strategy to engage a larger number of people (Baltar and Brunet, 2012). In addition, due to social interaction limitations during the pandemic, which did not allow for in-person data collection, snowball sampling was an appropriate way to reach participants. Recent studies during the COVID-19 pandemic have also successfully used this type of sampling in multinational studies (for example, Öcal et al., 2020; Kolakowsky-Hayner et al., 2021) as well as in studies referring to conspiracy beliefs about the pandemic (such as Khokhlova et al., 2021).

All participants had to be of legal age and give informed consent to participate in the study. The number of participants in each country varied between 322 (Peru) and 746 (El Salvador). A total of 4092 women and 1687 men participated, with a mean age of 33.28 years old ($SD = 13.48$), with the Mexican sample being the youngest ($M = 24.66$, $SD = 8.65$) and the Guatemalan sample having the highest mean age ($M = 44.04$, $SD = 13.62$). In addition, 4893 participants had higher education (84.67%) and 1871 (32.38%) reported that their main source of information about the COVID-19 vaccine was social networks (Facebook, Instagram or others). **Table 1** shows, in more detail, the sociodemographic information for each country.

Instruments

Sociodemographic Variables

Participants completed initial sociodemographic questions, which included information on gender (binary variable: male and female), age (three categories: <23 years old, 23 to 42 years old, >42 years old), which was recoded into quartiles to summarize the large amount of age-related data, educational level (binary variable: basic studies and higher education), and sources of information about COVID-19 (four categories: television, radio, and print media; official government sources; social networks; family members/friends).

Conspiracy Beliefs About COVID-19 Vaccines

The Vaccine Conspiracy Beliefs Scale-COVID-19 (VCBS-COVID-19; Caycho-Rodríguez et al., 2022) was used. The ECCV-COVID was developed from the Vaccine Conspiracy Beliefs Scale (VCBS; Shapiro et al., 2016) and assesses conspiratorial thinking about COVID-19 immunizations through 7 items. Respondents indicate how much they agree or disagree with each item on a scale of 7 response alternatives ranging from “strongly disagree” (1) to “strongly agree” (7).

For the development of the ECCV-COVID, the original VCBS was first translated using the back-translation method. Second, two independent investigators, one a subject matter specialist familiar with COVID-19 vaccination and bilingual in English and Spanish, and the other an English language specialist, translated the VCBS from English to Spanish. Subsequently, two other investigators, one a subject matter expert and the other a language expert, who were not familiar with the first translation, translated the Spanish version back into English. Then, both versions were compared looking for possible inconsistencies

TABLE 1 | Sociodemographic information of the participants.

Variables/ Countries	Argentina (n = 363)	Bolivia (n = 564)	Chile (n = 453)	Colombia (n = 461)	Cuba (n = 334)	Ecuador (n = 438)	El Salvador (n = 746)	Guatemala (n = 420)	Mexico (n = 484)	Paraguay (n = 417)	Peru (n = 322)	Uruguay (n = 392)	Venezuela (n = 385)
Gender (%)													
Female	255 (70.25)	421 (74.65)	314 (69.32)	322 (69.85)	231 (69.16)	311 (71)	546 (73.19)	297 (70.71)	331 (68.39)	292 (70.02)	224 (69.57)	272 (69.39)	276 (71.69)
Male	108 (29.75)	143 (25.35)	139 (30.68)	139 (30.15)	103 (30.84)	127 (29)	200 (26.81)	123 (29.29)	153 (31.61)	125 (29.98)	98 (30.43)	120 (30.61)	109 (28.31)
Age (%)													
<23	54 (14.88)	31 (5.5)	60 (13.25)	266 (57.7)	143 (42.81)	146 (33.33)	170 (22.79)	14 (3.33)	282 (58.26)	30 (7.19)	112 (34.78)	40 (10.2)	66 (17.14)
23–42	192 (52.89)	333 (59.04)	267 (58.94)	125 (27.11)	156 (46.71)	227 (51.83)	426 (57.1)	198 (47.14)	171 (35.33)	323 (77.46)	191 (59.32)	264 (67.35)	92 (23.9)
>42	117 (32.23)	200 (35.46)	126 (27.81)	70 (15.18)	35 (10.48)	65 (14.84)	150 (20.11)	208 (49.52)	31 (6.4)	64 (15.35)	19 (5.9)	88 (22.45)	227 (58.96)
Highest level of education (%)													
Primary	48 (13.22)	19 (3.37)	32 (7.06)	159 (34.49)	6 (1.8)	93 (21.23)	282 (37.8)	36 (8.57)	44 (9.09)	28 (6.71)	46 (14.29)	60 (15.31)	33 (8.57)
University	315 (86.78)	545 (96.63)	421 (92.94)	302 (65.51)	328 (98.2)	345 (78.77)	464 (62.2)	384 (91.43)	440 (90.91)	389 (93.29)	276 (85.71)	332 (84.69)	352 (91.43)
Sources of information (%)													
Government,	105 (28.93)	79 (14.01)	165 (36.42)	104 (22.56)	104 (31.14)	144 (32.88)	262 (35.12)	110 (26.19)	183 (37.81)	176 (42.21)	115 (35.71)	148 (37.76)	36 (9.35)
Family/friends, etc.	19 (5.23)	24 (4.26)	20 (4.42)	58 (12.58)	27 (8.08)	34 (7.76)	43 (5.76)	43 (10.24)	50 (10.33)	21 (5.04)	18 (5.59)	37 (9.44)	42 (10.91)
Social networks	77 (21.21)	214 (37.94)	137 (30.24)	149 (32.32)	51 (15.27)	146 (33.33)	298 (39.95)	147 (35)	143 (29.55)	118 (28.3)	93 (28.88)	69 (17.6)	229 (59.48)
Television, radio and newspapers	162 (44.63)	247 (43.79)	131 (28.92)	150 (32.54)	152 (45.51)	114 (26.03)	143 (19.17)	120 (28.57)	108 (22.31)	102 (24.46)	96 (29.81)	138 (35.2)	78 (20.26)

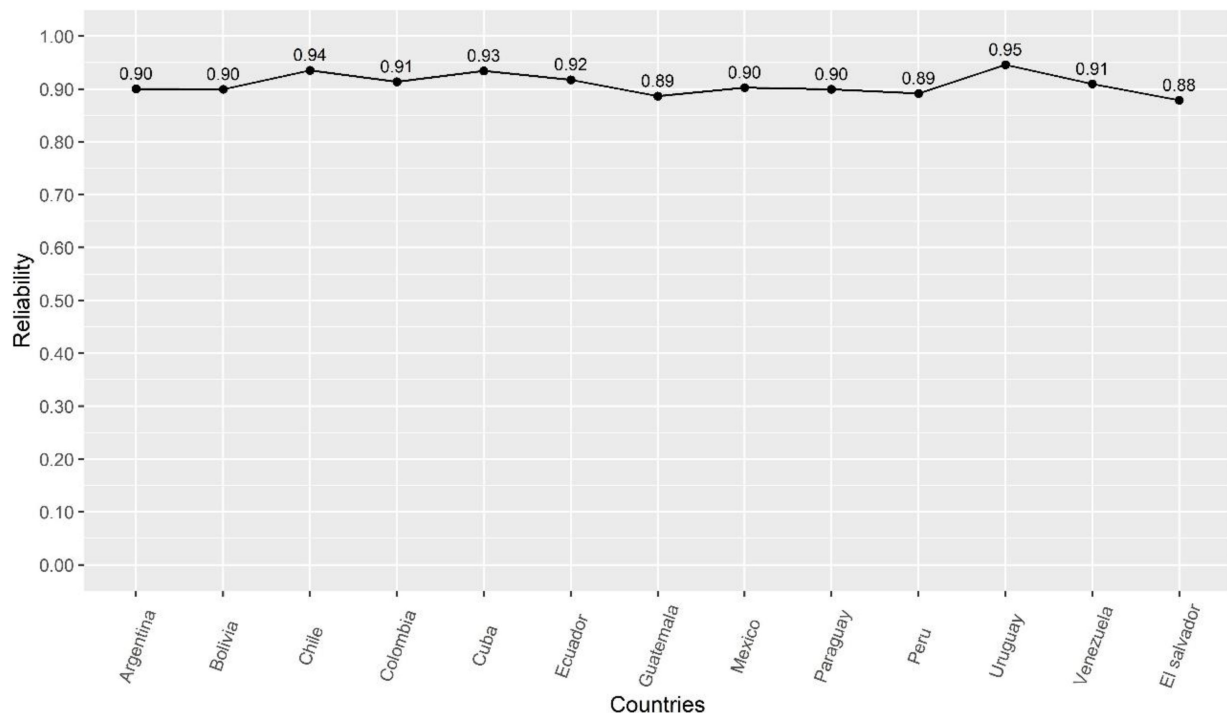


FIGURE 1 | Reliability of the ECCV-COVID in the 13 Latin American countries.

in order to generate a harmonized version. An example of the items is: “Vaccine safety information is often made up.” To assess conspiracy beliefs about COVID-19 vaccines, the term “COVID-19” was added to each of the VCBS items. For example, “Information about the safety of COVID-19 vaccines is often made up.” The ECCV-COVID has been shown to be unidimensional, reliable (with alpha and omega coefficient values ranging from 0.87 to 0.94) and invariant across 13 Latin American countries (Caycho-Rodríguez et al., 2022). The reliability of the ECCV-COVID for each country is shown in **Figure 1**. The total score of the ECCV-COVID ranges from 7 to 49, where higher values indicate a higher degree of agreement with conspiracy beliefs. The ECCV-COVID can be found in **Appendix 1**.

Procedure

The study was part of a larger project and was conducted during the COVID-19 pandemic between September 15 and October 25, 2021. During this time period, between 29 and 87% of people residing in the countries evaluated were fully or partially vaccinated against COVID-19. According to **Figure 2**, Chile (77%) and Uruguay (75%) had the highest proportion of people fully vaccinated against COVID-19, while Guatemala had the lowest proportion of people fully or partially vaccinated (17%).

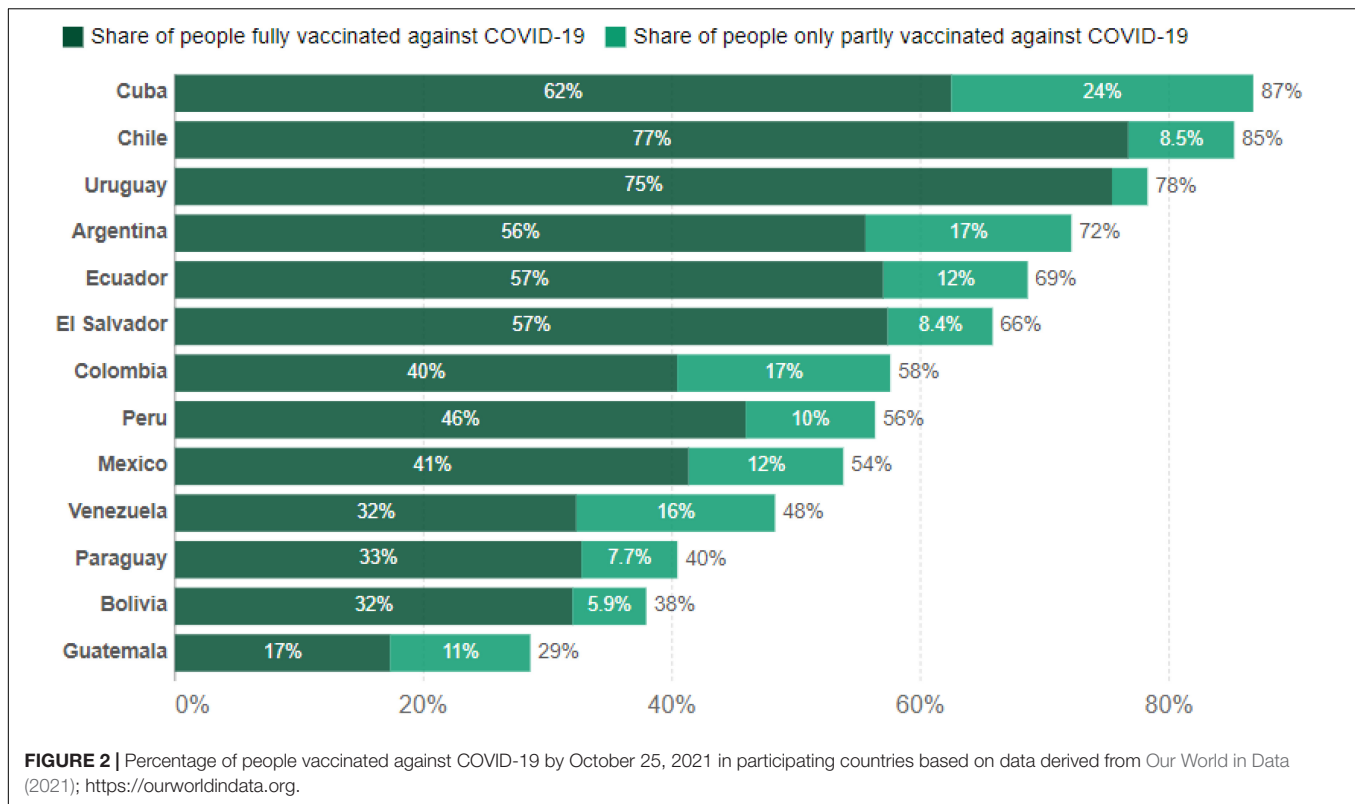
Data were collected simultaneously in the 13 participating countries and the collection procedure was the same in each country. An online questionnaire was created using Google Forms, which was distributed by email and on different social media platforms (Facebook, Instagram, and

WhatsApp). The online questionnaire included questions related to sociodemographic data, conspiracy beliefs about COVID-19 vaccines, and other associated variables. The online survey allows for easy data collection, maintains respondent anonymity, reduces bias, and helps to obtain complete responses as participants answer all required questions (Andrews et al., 2003). Finally, online surveys allow participants' responses to be saved directly to a file, reducing the work of data entry and thus avoiding transcription errors (Evans and Mathur, 2005). Participants completed the online survey in approximately 10 min. Participation in the study was voluntary, participants gave informed consent after reading the study objectives before continuing with the survey, and no financial compensation was received for participation. Participants were asked to answer all questions in the questionnaire before submitting their responses. The study was approved by the Ethics Committee of the Universidad Privada del Norte in Peru (registration number: 20213002).

Data Analysis

Data analysis was performed with the R programming language in its RStudio environment. The libraries used were 'ggplot2' version 3.3.5 (Wickham et al., 2020) for plotting, 'tidyverse' version 1.1.4 (Wickham, 2019) for organizing and estimating statistics and 'effectsize' version 0.6.0.1 (Ben-Shachar et al., 2020) for calculating effect sizes.

Given that the presence of outliers was preliminarily verified through the box plot (see **Supplementary Figure 1**), we opted to use the median, which is robust in handling outliers, and



the interquartile ranges, which are by antonomasia its measure of dispersion. The median was calculated by country and comparison variable (gender, age ranges, educational levels, COVID-19 information sources) and displayed in a dot and line graph (Figure 3), which allows for a quick visualization of the conspiracy scores. For interpretation, the position of the point (median) should be considered. Points positioned to the right indicate a higher degree of support for conspiratorial ideas, while points positioned to the left indicate a lower degree. It is important to note that statistical significance tests (p -value, α) or probabilistic models (Shapiro-Wilk, Q-Q plots) are not used in this study for two reasons: (a) it requires random sampling (Hirschauer et al., 2020) and the present study used non-probability convenience sampling which is usual in psychology (Kline, 2015) and (b) when there is a lot of data ($n = 5779$) these models are sensitive to reject the null hypothesis (Lin et al., 2013). In this sense, this study has a descriptive rather than inferential intent. This does not detract from the importance, but rather informs the scope of the research and limitations in the external validity of the study.

Since the presence of outliers was found, the ordinary Cohen's d was not used as a measure of comparison (Rousselet et al., 2017), but rather a robust version (δ), which has as its central characteristic that it works quite well in unequal sample sizes (Wilcox and Tian, 2011) and unequal variances (Algina et al., 2005). Its interpretation is similar to its standard version where: $\delta \geq 0.30$, small; $\delta \geq 0.50$, medium; $\delta \geq 0.80$ is large (Cohen, 1988). In the case of variables with

more than two categories (age range, COVID-19 information sources) explanatory measure of effect size (ζ) was used, which also presents robustness for variance inequality and groups (Wilcox, 2017). Its interpretation is that 0.10, 0.30, and 0.50 correspond to small, medium and large effect sizes (Mair and Wilcox, 2020).

RESULTS

Table 2 presents the arithmetic means and standard deviations grouped by country and each of the comparison variables (gender, age ranges, educational levels, sources of COVID-19 information). It is worth noting that, in most countries, women, people with lower educational levels, those who receive information about COVID-19 and the vaccines from family and friends are those people who are more supportive of conspiracy ideas against the COVID-19 vaccine. In the case of age, the results vary greatly. However, Cuba and Venezuela present noteworthy variations. In addition, Figure 3 summarizes this information visually and gives an overview of the results, where the points indicate the value of the median obtained in that country and in the comparison group. In relation to the effect sizes, in most countries the differences between the comparison variables that can be attributed to the scores of the conspiracy scale are minimal; although it is worth highlighting the variations in the sources of information in countries such as Cuba ($\zeta = 0.43$) and Ecuador ($\zeta = 0.31$) as well as age ranges ($\zeta = 0.43$) that occurred in Cuba.

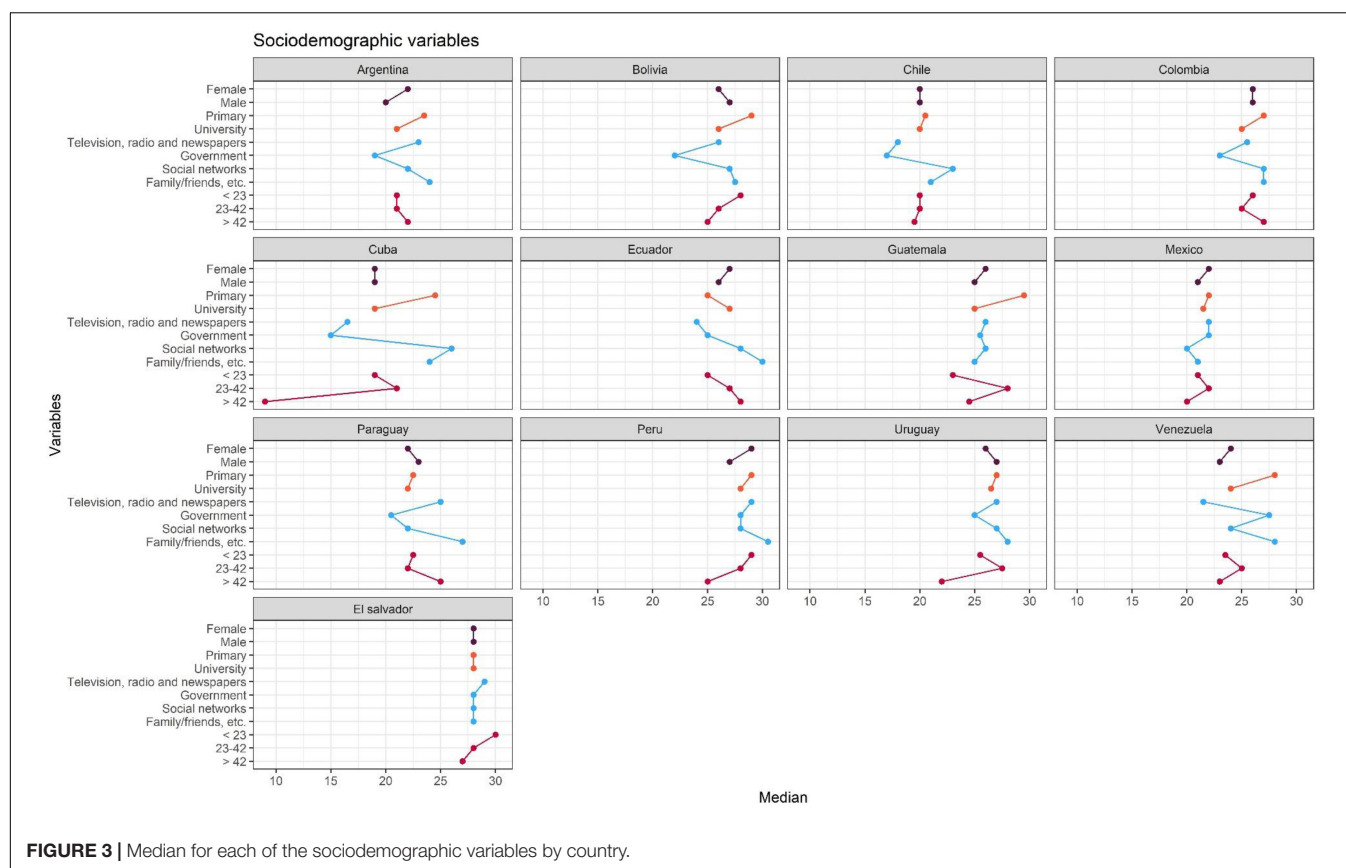


Table 3 shows the response rates for each of the ECCV items by country. For each item, the categories with the highest response rates are 1 (“Strongly Disagree”) and 4 (“Neutral”). In order to decide which countries have more of these alternatives, a cut-off of greater than 30% was established in some of them. Thus, Chile, Cuba, Mexico, and Argentina have the highest response rates in alternative 1 and El Salvador, Peru and Colombia in alternative 4 in almost all the items; with the exception of item 2 (“*Vaccinating children against COVID-19 is harmful and this fact is hidden.*”) where there is a higher percentage of both response alternatives (1 and 4) in 9 out of 13 countries. Specifically, Cuba and Argentina show response rates higher than 40% for alternative 1. Likewise, vcbs2 presents the largest effect size ($\zeta^2 = 0.31$).

DISCUSSION

The study was conducted during the second half of 2021, when Latin American countries were in the midst of the vaccination process against COVID-19, but there was still an important percentage of the population that refused to be vaccinated. In this sense, we sought to provide a quick overview of the variations in conspiracy beliefs about COVID-19 vaccines, which have proliferated rapidly during the pandemic, according to some sociodemographic variables in 13 Latin American countries. Thus, the findings could provide information to

support prevention and treatment efforts during the COVID-19 pandemic.

First, in most countries, women have the highest support for conspiracy beliefs against a COVID-19 vaccine, which is consistent with other studies (Sallam et al., 2020a, 2021a,b; Wang and Kim, 2021). This suggests that women tend to be more hesitant and fearful about COVID-19 vaccines (Lin et al., 2021; Murphy et al., 2021). This has been associated with men being less likely to believe in conspiratorial ideas about the origin of vaccines and viruses, because they mostly trust doctors, scientists and findings published in scientific journals, unlike women, who tended to trust information disseminated in social networks (Sallam et al., 2021a). Likewise, it was suggested that the lower perceived risk of COVID-19 by women could be associated with greater acceptance of conspiracy beliefs about the pandemic compared to men (Sallam et al., 2020b). Furthermore, the greater likelihood of women making decisions about children’s health would make them more likely to seek information about vaccines and be more exposed to anti-vaccine content (Smith and Graham, 2019). Similarly, women tend to score higher on disgust sensitivity, which is associated with greater vaccine hesitancy (Hornsey et al., 2018). However, in Uruguay and Venezuela, it is men who present greater support for conspiratorial beliefs, although these differences are insignificant. Studies suggest that higher levels of learned helplessness and uncertainty could explain this greater acceptance of conspiracy beliefs in

TABLE 2 | Descriptive statistics and effect size.

Variables/Countries	Argentina	Bolivia	Chile	Colombia	Cuba	Ecuador	El salvador	Guatemala	Mexico	Paraguay	Peru	Uruguay	Venezuela
Gender [Md (IQR)]													
Female	14 (22)	12 (26)	16 (20)	14 (26)	15 (19)	16 (27)	12 (28)	12 (26)	15 (22)	14.25 (22)	11 (29)	15 (26)	15 (24)
Male	13 (20)	14 (27)	17 (20)	14 (26)	16 (19)	14 (26)	12 (28)	13 (25)	15 (21)	11 (23)	11 (27)	17 (27)	15 (23)
δ	−0.18	0.04	−0.03	0.00	0.00	−0.03	0.04	−0.10	0.09	−0.24	0.03	0.03	−0.05
Age [Md (IQR)]													
<23	21 (15)	28 (13)	20 (16.25)	26 (13)	19 (13)	25 (14)	30 (11)	23 (7)	21 (15)	22.5 (13)	29 (10)	25.5 (13.25)	23.5 (14)
23–42	21 (13)	26 (12)	20 (16)	25 (14)	21 (15.25)	27 (14)	28 (12)	28 (13)	22 (16)	22 (14)	28 (11)	27.5 (15)	25 (15.25)
> 42	15 (22)	13 (25)	16.25 (19.5)	13 (27)	13 (9)	14 (28)	11 (27)	7 (24.5)	15 (20)	13 (25)	10 (25)	13.25 (22)	14 (23)
ξ	0.10	0.20	0.06	0.08	0.46	0.09	0.21	0.16	0.13	0.26	0.16	0.10	0.18
Highest level of education [Md (IQR)]													
Primary	23.5 (13)	29 (12)	20.5 (17)	27 (12)	24.5 (20)	25 (13)	28 (11)	29.5 (10.5)	22 (17.5)	22.5 (15.75)	29 (9)	27 (15.5)	28 (8)
University	21 (14)	26 (12)	20 (16)	25 (14)	19 (15)	27 (15)	28 (12)	25 (13)	21.5 (15)	22 (14)	28 (12)	26.5 (15)	24 (15)
δ	0.07	0.27	0.05	0.13	0.24	0.07	0.27	0.06	0.06	0.10	0.06	0.21	0.02
Sources of information [Md (IQR)]													
Government,	19 (14)	22 (19)	17 (14)	23 (14)	15 (15.25)	25 (14.5)	28 (14)	25.5 (15)	22 (15)	20.5 (14)	28 (12)	25 (16)	27.5 (21.5)
Family/friends, etc.	24 (10)	27.5 (5.25)	2 (15.25)	27 (12)	24 (12)	30 (11)	28 (20)	25 (12)	21 (16)	27 (10)	30.5 (10)	28 (17)	28 (18)
Social networks,	22 (13)	27 (13)	23 (15)	27 (15)	26 (18)	28 (14)	28 (11)	26 (12)	20 (16)	22 (13)	28 (13)	27 (14)	24 (14)
Television, radio and newspapers	23 (13)	26 (12)	18 (16)	25.5 (14)	16.5 (13)	24 (15)	29 (10)	26 (13.25)	22 (16)	25 (13)	29 (8)	27 (13)	21.5 (17)
ξ	0.29	0.20	0.19	0.14	0.43	0.31	0.09	0.10	0.28	0.17	0.20	0.19	0.10

TABLE 3 | Response rates for each item and by country.

Items/countries	Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	ξ
Item 1 n (%)								
Argentina	69 (19.01)	43 (11.85)	34 (9.37)	104 (28.65)	45 (12.4)	35 (9.64)	33 (9.09)	0.20
Bolivia	74 (13.12)	83 (14.72)	70 (12.41)	165 (29.26)	80 (14.18)	48 (8.51)	44 (7.8)	
Chile	138 (30.46)	65 (14.35)	55 (12.14)	83 (18.32)	47 (10.38)	30 (6.62)	35 (7.73)	
Colombia	77 (16.7)	34 (7.38)	47 (10.2)	148 (32.1)	69 (14.97)	37 (8.03)	49 (10.63)	
Cuba	95 (28.44)	32 (9.58)	51 (15.27)	72 (21.56)	37 (11.08)	29 (8.68)	18 (5.39)	
Ecuador	65 (14.84)	37 (8.45)	50 (11.42)	113 (25.8)	68 (15.53)	43 (9.82)	62 (14.16)	
El Salvador	104 (13.94)	57 (7.64)	67 (8.98)	216 (28.95)	108 (14.48)	89 (11.93)	105 (14.08)	
Guatemala	59 (14.05)	37 (8.81)	47 (11.19)	87 (20.71)	77 (18.33)	57 (13.57)	56 (13.33)	
Mexico	98 (20.25)	58 (11.98)	44 (9.09)	136 (28.1)	62 (12.81)	38 (7.85)	48 (9.92)	
Paraguay	81 (19.42)	53 (12.71)	57 (13.67)	85 (20.38)	53 (12.71)	38 (9.11)	50 (11.99)	
Peru	42 (13.04)	21 (6.52)	33 (10.25)	94 (29.19)	52 (16.15)	39 (12.11)	41 (12.73)	
Uruguay	57 (14.54)	43 (10.97)	55 (14.03)	105 (26.79)	40 (10.2)	35 (8.93)	57 (14.54)	
Venezuela	81 (21.04)	59 (15.32)	40 (10.39)	83 (21.56)	46 (11.95)	32 (8.31)	44 (11.43)	
Item 2 (%)								
Argentina	162 (44.63)	49 (13.5)	49 (13.5)	69 (19.01)	8 (2.2)	10 (2.75)	16 (4.41)	0.31
Bolivia	130 (23.05)	77 (13.65)	85 (15.07)	170 (30.14)	35 (6.21)	34 (6.03)	33 (5.85)	
Chile	178 (39.29)	78 (17.22)	59 (13.02)	84 (18.54)	17 (3.75)	13 (2.87)	24 (5.3)	
Colombia	138 (29.93)	59 (12.8)	79 (17.14)	126 (27.33)	25 (5.42)	20 (4.34)	14 (3.04)	
Cuba	207 (61.98)	27 (8.08)	47 (14.07)	37 (11.08)	5 (1.5)	4 (1.2)	7 (2.1)	
Ecuador	118 (26.94)	64 (14.61)	56 (12.79)	102 (23.29)	43 (9.82)	20 (4.57)	35 (7.99)	
El Salvador	143 (19.17)	74 (9.92)	67 (8.98)	238 (31.9)	83 (11.13)	71 (9.52)	70 (9.38)	
Guatemala	134 (31.9)	39 (9.29)	60 (14.29)	109 (25.95)	31 (7.38)	22 (5.24)	25 (5.95)	
Mexico	183 (37.81)	69 (14.26)	56 (11.57)	124 (25.62)	21 (4.34)	16 (3.31)	15 (3.1)	
Paraguay	143 (34.29)	61 (14.63)	70 (16.79)	99 (23.74)	12 (2.88)	14 (3.36)	18 (4.32)	
Peru	70 (21.74)	22 (6.83)	57 (17.7)	96 (29.81)	36 (11.18)	21 (6.52)	20 (6.21)	
Uruguay	72 (18.37)	51 (13.01)	52 (13.27)	136 (34.69)	27 (6.89)	20 (5.1)	34 (8.67)	
Venezuela	100 (25.97)	46 (11.95)	51 (13.25)	100 (25.97)	26 (6.75)	27 (7.01)	35 (9.09)	
Item 3 n (%)								
Argentina	81 (22.31)	62 (17.08)	48 (13.22)	101 (27.82)	24 (6.61)	26 (7.16)	21 (5.79)	0.26
Bolivia	77 (13.65)	57 (10.11)	78 (13.83)	166 (29.43)	79 (14.01)	44 (7.8)	63 (11.17)	
Chile	95 (20.97)	74 (16.34)	79 (17.44)	102 (22.52)	40 (8.83)	28 (6.18)	35 (7.73)	
Colombia	81 (17.57)	55 (11.93)	70 (15.18)	126 (27.33)	65 (14.1)	31 (6.72)	33 (7.16)	
Cuba	107 (32.04)	42 (12.57)	54 (16.17)	81 (24.25)	18 (5.39)	19 (5.69)	13 (3.89)	
Ecuador	65 (14.84)	44 (10.05)	61 (13.93)	116 (26.48)	51 (11.64)	40 (9.13)	61 (13.93)	
El Salvador	86 (11.53)	65 (8.71)	83 (11.13)	240 (32.17)	104 (13.94)	84 (11.26)	84 (11.26)	
Guatemala	62 (14.76)	46 (10.95)	55 (13.1)	112 (26.67)	60 (14.29)	34 (8.1)	51 (12.14)	
Mexico	127 (26.24)	72 (14.88)	66 (13.64)	135 (27.89)	40 (8.26)	22 (4.55)	22 (4.55)	
Paraguay	97 (23.26)	54 (12.95)	82 (19.66)	101 (24.22)	36 (8.63)	24 (5.76)	23 (5.52)	
Peru	41 (12.73)	24 (7.45)	45 (13.98)	93 (28.88)	52 (16.15)	40 (12.42)	27 (8.39)	
Uruguay	46 (11.73)	35 (8.93)	62 (15.82)	106 (27.04)	55 (14.03)	33 (8.42)	55 (14.03)	
Venezuela	66 (17.14)	52 (13.51)	53 (13.77)	88 (22.86)	40 (10.39)	40 (10.39)	46 (11.95)	
Item 4 n (%)								
Argentina	98 (27)	64 (17.63)	62 (17.08)	79 (21.76)	28 (7.71)	19 (5.23)	13 (3.58)	0.22
Bolivia	79 (14.01)	69 (12.23)	100 (17.73)	134 (23.76)	72 (12.77)	53 (9.4)	57 (10.11)	
Chile	136 (30.02)	87 (19.21)	71 (15.67)	75 (16.56)	35 (7.73)	27 (5.96)	22 (4.86)	
Colombia	87 (18.87)	62 (13.45)	72 (15.62)	110 (23.86)	59 (12.8)	34 (7.38)	37 (8.03)	
Cuba	111 (33.23)	46 (13.77)	56 (16.77)	62 (18.56)	17 (5.09)	29 (8.68)	13 (3.89)	
Ecuador	87 (19.86)	49 (11.19)	65 (14.84)	98 (22.37)	47 (10.73)	47 (10.73)	45 (10.27)	
El Salvador	117 (15.68)	71 (9.52)	99 (13.27)	226 (30.29)	80 (10.72)	78 (10.46)	75 (10.05)	
Guatemala	83 (19.76)	53 (12.62)	64 (15.24)	97 (23.1)	55 (13.1)	32 (7.62)	36 (8.57)	
Mexico	158 (32.64)	63 (13.02)	64 (13.22)	115 (23.76)	37 (7.64)	21 (4.34)	26 (5.37)	

(Continued)

TABLE 3 | (Continued)

Items/countries	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Somewhat Disagree</i>	<i>Neutral</i>	<i>Somewhat Agree</i>	<i>Agree</i>	<i>Strongly Agree</i>	ξ
Paraguay	104 (24.94)	67 (16.07)	90 (21.58)	81 (19.42)	31 (7.43)	19 (4.56)	25 (6)	
Peru	50 (15.53)	19 (5.9)	51 (15.84)	81 (25.16)	56 (17.39)	33 (10.25)	32 (9.94)	
Uruguay	63 (16.07)	57 (14.54)	56 (14.29)	107 (27.3)	33 (8.42)	31 (7.91)	45 (11.48)	
Venezuela	83 (21.56)	67 (17.4)	70 (18.18)	67 (17.4)	42 (10.91)	21 (5.45)	35 (9.09)	
Item 5 n (%)								
Argentina	96 (26.45)	57 (15.7)	59 (16.25)	80 (22.04)	30 (8.26)	28 (7.71)	13 (3.58)	0.21
Bolivia	80 (14.18)	91 (16.13)	93 (16.49)	154 (27.3)	63 (11.17)	42 (7.45)	41 (7.27)	
Chile	139 (30.68)	100 (22.08)	70 (15.45)	76 (16.78)	23 (5.08)	29 (6.4)	16 (3.53)	
Colombia	79 (17.14)	67 (14.53)	69 (14.97)	126 (27.33)	61 (13.23)	31 (6.72)	28 (6.07)	
Cuba	102 (30.54)	48 (14.37)	64 (19.16)	57 (17.07)	22 (6.59)	29 (8.68)	12 (3.59)	
Ecuador	81 (18.49)	48 (10.96)	71 (16.21)	106 (24.2)	48 (10.96)	37 (8.45)	47 (10.73)	
El Salvador	108 (14.48)	67 (8.98)	91 (12.2)	239 (32.04)	95 (12.73)	77 (10.32)	69 (9.25)	
Guatemala	70 (16.67)	50 (11.9)	64 (15.24)	105 (25)	50 (11.9)	34 (8.1)	47 (11.19)	
Mexico	141 (29.13)	74 (15.29)	68 (14.05)	122 (25.21)	33 (6.82)	27 (5.58)	19 (3.93)	
Paraguay	101 (24.22)	59 (14.15)	81 (19.42)	98 (23.5)	30 (7.19)	23 (5.52)	25 (6)	
Peru	43 (13.35)	19 (5.9)	55 (17.08)	85 (26.4)	59 (18.32)	42 (13.04)	19 (5.9)	
Uruguay	69 (17.6)	56 (14.29)	63 (16.07)	101 (25.77)	40 (10.2)	25 (6.38)	38 (9.69)	
Venezuela	89 (23.12)	53 (13.77)	66 (17.14)	81 (21.04)	30 (7.79)	35 (9.09)	31 (8.05)	
Item 6 n (%)								
Argentina	92 (25.34)	62 (17.08)	71 (19.56)	81 (22.31)	25 (6.89)	20 (5.51)	12 (3.31)	0.22
Bolivia	80 (14.18)	87 (15.43)	93 (16.49)	155 (27.48)	64 (11.35)	46 (8.16)	39 (6.91)	
Chile	138 (30.46)	86 (18.98)	68 (15.01)	73 (16.11)	41 (9.05)	23 (5.08)	24 (5.3)	
Colombia	83 (18)	67 (14.53)	71 (15.4)	123 (26.68)	54 (11.71)	33 (7.16)	30 (6.51)	
Cuba	111 (33.23)	58 (17.37)	61 (18.26)	51 (15.27)	23 (6.89)	23 (6.89)	7 (2.1)	
Ecuador	83 (18.95)	53 (12.1)	66 (15.07)	113 (25.8)	40 (9.13)	32 (7.31)	51 (11.64)	
El Salvador	114 (15.28)	66 (8.85)	91 (12.2)	230 (30.83)	99 (13.27)	72 (9.65)	74 (9.92)	
Guatemala	72 (17.14)	54 (12.86)	66 (15.71)	107 (25.48)	52 (12.38)	27 (6.43)	42 (10)	
Mexico	155 (32.02)	62 (12.81)	78 (16.12)	118 (24.38)	35 (7.23)	18 (3.72)	18 (3.72)	
Paraguay	101 (24.22)	62 (14.87)	87 (20.86)	96 (23.02)	25 (6)	18 (4.32)	28 (6.71)	
Peru	43 (13.35)	20 (6.21)	50 (15.53)	85 (26.4)	60 (18.63)	41 (12.73)	23 (7.14)	
Uruguay	66 (16.84)	55 (14.03)	55 (14.03)	93 (23.72)	44 (11.22)	34 (8.67)	45 (11.48)	
Venezuela	91 (23.64)	52 (13.51)	70 (18.18)	75 (19.48)	29 (7.53)	30 (7.79)	38 (9.87)	
Item 7 n (%)								
Argentina	121 (33.33)	46 (12.67)	60 (16.53)	88 (24.24)	17 (4.68)	17 (4.68)	14 (3.86)	0.22
Bolivia	98 (17.38)	79 (14.01)	73 (12.94)	167 (29.61)	64 (11.35)	43 (7.62)	40 (7.09)	
Chile	123 (27.15)	89 (19.65)	58 (12.8)	76 (16.78)	48 (10.6)	22 (4.86)	37 (8.17)	
Colombia	80 (17.35)	56 (12.15)	59 (12.8)	126 (27.33)	54 (11.71)	41 (8.89)	45 (9.76)	
Cuba	127 (38.02)	46 (13.77)	59 (17.66)	62 (18.56)	14 (4.19)	12 (3.59)	14 (4.19)	
Ecuador	78 (17.81)	45 (10.27)	61 (13.93)	122 (27.85)	49 (11.19)	37 (8.45)	46 (10.5)	
El Salvador	111 (14.88)	67 (8.98)	72 (9.65)	222 (29.76)	102 (13.67)	76 (10.19)	96 (12.87)	
Guatemala	79 (18.81)	57 (13.57)	65 (15.48)	112 (26.67)	38 (9.05)	25 (5.95)	44 (10.48)	
Mexico	140 (28.93)	62 (12.81)	53 (10.95)	131 (27.07)	49 (10.12)	29 (5.99)	20 (4.13)	
Paraguay	96 (23.02)	45 (10.79)	70 (16.79)	125 (29.98)	39 (9.35)	17 (4.08)	25 (6)	
Peru	48 (14.91)	26 (8.07)	39 (12.11)	98 (30.43)	53 (16.46)	31 (9.63)	27 (8.39)	
Uruguay	78 (19.9)	48 (12.24)	51 (13.01)	106 (27.04)	44 (11.22)	30 (7.65)	35 (8.93)	
Venezuela	69 (17.92)	48 (12.47)	52 (13.51)	96 (24.94)	37 (9.61)	33 (8.57)	50 (12.99)	

ξ^2 : Epsilon squared (non-parametric effect size).

males (Cassese et al., 2020). Other studies have suggested that beliefs in vaccine conspiracies did not differ by gender (Shapiro et al., 2016; Freeman et al., 2020b). Overall, then, the different results regarding COVID-19 vaccine conspiracy theories according to different genders seem to be mixed without a fully defined pattern (Tonkoviæ et al., 2021). In this

regard, more research is needed on the role of gender in the acceptance or rejection of COVID-19 vaccine conspiracy beliefs considering other factors such as COVID-19 risk perception, health literacy, differential vulnerability to COVID-19, gender-associated comorbidity, and pre-existing doubts about vaccines in general (Khubchandani et al., 2021).

Another finding in this study was that less educated people are more likely to believe in conspiracies against COVID-19 vaccines, which is to be expected based on previous scientific literature (Allington et al., 2021a; Sallam et al., 2021a). This can be explained in part because less educated people tend to have less access to information about COVID-19 vaccines, which generates less certainty about their development, effectiveness and consequences (Omar and Hani, 2021). In this sense, it has been suggested that people with a university level education would be more likely to believe in the vaccine providing protection to those who receive it (Cordina and Lauri, 2021). However, in countries such as Chile and Ecuador, it was people with higher levels of education who were more in agreement with conspiracy beliefs about vaccines. It is possible that people with higher education consider that newer vaccines, such as those against COVID-19, may have more risk than older vaccines and therefore need more accurate information than less educated people (Smith, 2017). A study in Venezuela suggested that educational level was not a significant predictor in the acceptance of conspiracy theories (Andrade, 2021). Based on these results, governments need to strengthen and adapt communication strategies about the development and efficacy of vaccines, regardless of people's educational level (French et al., 2020).

Some studies point out that, among demographic variables, age has shown the strongest association with vaccine hesitancy (Allington et al., 2021a); while others point out that it has little correlation with acceptance of conspiracy beliefs about the COVID-19 vaccine (Buturoiu et al., 2021; Jensen et al., 2021). Regarding age, the findings of the present study do not follow the same pattern. In fact, in Argentina, Colombia, and Paraguay, people older than 42 are the ones who agree more with conspiracy ideas; while in Cuba, Guatemala, Mexico, Uruguay, and Venezuela, people between 23 and 42 years old are the ones who support those beliefs the most. The latter is in agreement with studies which suggest that the adult population is particularly susceptible to believe in conspiracy ideas (Đorđević et al., 2021; Jensen et al., 2021). In the case of Bolivia, Chile, Peru and El Salvador, people under 23 years of age are those who agree most strongly with conspiracy beliefs. Recent studies assessing conspiracy beliefs related to COVID-19 support this finding (Romer and Jamieson, 2020; Allington et al., 2021b). This is associated with youth's increased consumption of social media, which is the channel where vaccine-related conspiracy theories are most widely disseminated (Pew Research Center, 2021). The findings of the present study seem to suggest that people of all ages are vulnerable to conspiracy beliefs about COVID-19 vaccines. Therefore, it would be useful to further investigate the interactions between age and conspiracy beliefs to design solutions against misinformation among people of all ages.

Similarly, in countries such as Chile and Cuba, it was reported that people who use Facebook or social networks as sources of information about the vaccine and COVID-19 have a higher degree of agreement with conspiracy beliefs about vaccines. This is expected since people who tend to believe more in conspiracies and reject vaccines get more information from social networks and not from health professionals or verified health websites (Danielson et al., 2019). Moreover, about 52% of people who

use the Internet consider it a reliable means of obtaining health information (Kata, 2010). The novelty of COVID-19 has led to the rapid spread of false news about the origin of the disease and its treatment. This type of information can confuse the population and generate a danger to their health, as is the case of news about the non-existence of the virus or that vaccines contain a microchip to control people (Ortiz-Sánchez et al., 2020). In the case of Chile, the finding is to be expected since Chile is one of the Latin American countries with the highest participation in the #yonomevacuno trend, where users expressed a diversity of opinions about the vaccine, the vaccination process or the COVID-19 pandemic (Herrera-Peco et al., 2021). Regarding Cuba, the finding is important considering that 7.1 million people (63%) have access to the Internet and 6.27 million (55%) are active in social networks (Alemañy-Castilla, 2020). Thus, the efforts of health professionals, health organizations, and social networks should be united to prevent the spread of false information (Ortiz-Sánchez et al., 2020). However, in most countries participants indicated that their main source of information about COVID-19 vaccines was family and friends. While there are efforts to discredit conspiracy theories or persuade people who believe in them (Earnshaw et al., 2020), this finding could suggest a need for developing complementary intervention strategies. Thus, for example, when these close people (friends or family members) convey the idea that getting vaccinated is a behavior that should be performed, conspiracy beliefs seem to stop predicting vaccination intentions (Earnshaw et al., 2020). This is important, even more so if one takes into consideration that attempts to influence people who believe in conspiracy ideas, based on communication coming from authorities, have failed (Lamberty and Imhoff, 2018). Thus, personalized health communication and coming from family and friends might be more successful (Sassenrath et al., 2018). Finally, less reliance on obtaining information from official sources of information may put people at risk of contracting the disease. This form of "system avoidance" could therefore have negative and paradoxical implications for individuals, and even increase susceptibility to disease in some social groups.

The analysis of the responses to each of the ECCV-COVID questions shows that, in general, the countries evaluated are mostly in some degree of disagreement or indecision with respect to the conspiratorial beliefs about the COVID-19 vaccines. However, there are also a number of people who support the conspiracy theories surrounding vaccination against COVID-19. For example, when adding up the positive responses (somewhat agree, agree, strongly agree) to question 1 alone, the results range from 24% in Chile and 25% in Cuba to 40% in Peru and 45% in Guatemala. In part, these differences can be explained on the basis of the construct level theory, which indicates that different beliefs can be interpreted differently and can also generate different degrees of impact on people. The different interpretations will depend on the psychological distance of the cognitive objects perceived by people. In this sense, when people perceive that the psychological distance between the belief and their behavior is large, then the belief has a smaller impact on their behavior (Trope and Liberman, 2010). In the present study, it appeared that conspiracy beliefs about the COVID-19 vaccine

and vaccine-related knowledge were closer to the target behavior of the population in the Latin American countries evaluated (referring to the COVID-19 vaccination that was already in process) at the psychological level.

Another possible explanation for the observed differences could be associated with the political domain, which is an important area where conspiracy beliefs in general play a prominent role (Imhoff and Lamberty, 2018). Thus, for example, it has been suggested that conspiracy theories are closely related to the discourses of populist political leaders who tend to use conspiracy theories for strategic political management purposes (Bergmann, 2018). Likewise, other studies have reported a linear relationship between self-reported political orientation and the acceptance of conspiracy beliefs (Dieguez et al., 2015; Imhoff and Lamberty, 2018), suggesting that the presence of conspiracy beliefs is less common in people with a left-wing political orientation compared to those with a right-wing political orientation (Miller et al., 2016; Jost et al., 2018; Van der Linden et al., 2021). For example, in the case of Chile, since 1993 there has been a significant increase in people who identify with a left-wing orientation and a decrease in those identified with right-wing, center and center-right political orientations (Titelman, 2019). The increase in identification with left-wing politics has been reflected in the demand for economic, health and education changes which have occurred since 2019, which led to the installation of a new constitution as a path to a new society of rights. In the case of Peru, with a greater acceptance of conspiracy beliefs, it has been suggested that there is no political party system that allows people to identify the values that are associated with one political stance or another (Silva, 2018). In this sense, it has been indicated that in Peru there is a high perception of transgression of norms in society and a perceived lack of legitimacy in official institutions, such as those referring to the health system, which paints a picture of a weak and fragile normative system (Janos et al., 2018). Negatively perceived normative systems are characteristic of societies where corruption and transgression are recurrent practices (Beramendi and Zubieta, 2013) and considered normal or inevitable (Janos et al., 2018). In Peru, the vaccination program against COVID-19 was compromised in a political scandal linked to the application of vaccines to people outside the clinical trial being carried out in the country, an event called “Vacunagate” (Chauvin, 2021; Mayta-Tristán and Aparco, 2021). This has possibly helped to undermine confidence in vaccines and vaccination, leading to a greater proliferation of misinformation on the subject. The current study does not allow us to test this explanatory hypothesis, but future studies could focus on considering beliefs in specific conspiracy theories, such as those related to vaccination, as a product of latent political orientations.

Likewise, the health systems in place to face the pandemic vary among countries. For example, in Chile, there was an increase from 1,698 ICU beds in the National Health Services System before the pandemic to 38,571 total beds (2.2 per thousand inhabitants) (Arteaga Herrera, 2020) during the pandemic. In Cuba, at the beginning of the pandemic, 11 hospitals were designated for the care of COVID-19 patients, with an availability

of 3,468 beds. As the number of patients increased, a greater number of hospitals, isolation and monitoring centers were set up, reaching a total of 20 institutions, and the availability of 7,471 beds, of which 477 were Intensive Care Units (ICUs). In Peru, at the beginning of the pandemic (April 2020), the country had only 133 ICU beds at the national level, which was increased during the pandemic to more than 2,000 beds (Ponce de León, 2021). However, the efforts of the Peruvian health system have not had adequate results, leading Peru to become one of the countries with the highest number of deaths in the Americas (Ramos, 2020). The inadequate management of the pandemic in different Latin American countries may have contributed to different levels of fear of the pandemic. It has been suggested that people with a greater fear of COVID-19 would direct their thoughts toward conspiracy theories about vaccines in order to diminish their fears by providing a justification for the difficulties (Stephens, 2020). The precariousness of health systems is not the only explanation for the acuteness of the pandemic in Latin America. There are other important factors that are associated with different responses to the pandemic and its outcomes in the different countries of the region, such as high levels of informality, unequal access to basic services, overcrowding and high population density, inadequate hospital infrastructure, inability of health systems to develop testing processes and early identification of cases, or lack of political leadership (Ramos, 2020). Future studies could provide objective clarification of these possible explanations.

Similarly, it is noteworthy that countries with a lower acceptance of conspiracy beliefs about vaccines against COVID-19, such as Chile or Cuba, are also those that show the greatest progress in the complete vaccination of the majority of their citizens at the time of the study (see **Figure 2**), while participants in Guatemala seem to have problems of confidence in vaccination, with only 17% of the population fully vaccinated at the time of data collection. In this sense, it appears that confidence in vaccines may also be a factor explaining the differences in the vaccination coverage (Jovančević and Miličević, 2020). It has been suggested that lower levels of general trust predict greater acceptance of conspiracy beliefs (Wood and Douglas, 2013). The spread of trust about COVID-19 vaccines depends on the content of vaccination messages and the medium from which they come. People have more trust and quickly adopt the behaviors of those closest to them. Thus, information about COVID-19 vaccines from a family member may be more effective than information from an outsider (Anderson et al., 2020). However, it has also been reported that reliance on information provided by experts would affect safety behavior regarding COVID-19 vaccines. This could be observed, for example, in the case of Cuba, where people presented the highest levels of satisfaction and trust with the information on COVID-19 provided by health experts (Meda-Lara et al., 2021). In the case of Chile, the low acceptance of conspiracy beliefs about COVID-19 vaccines was likely related to the fact that only 23% of the population completely refused to be vaccinated (Cerdeña and García, 2021). Chile, together with Brazil, had the highest acceptance rates compared to other Latin American countries (Rosiello et al., 2021).

However, if we observe the percentages of acceptance of conspiracy beliefs in countries such as Peru, El Salvador or Uruguay, the association with vaccination rates is not entirely evident. Despite this, in Peru, the lack of trust in scientific information on COVID-19 and vaccines has fostered conspiracy ideas in different scenarios. For example, a group of people kidnapped workers performing maintenance on 5G cell phone antennas, based on the idea that they spread the SARS-CoV-2 virus (Vega-Dienstmaier, 2020). On the political side, Peruvian congressmen requested the creation of a commission that would evaluate the effects of chlorine dioxide in the treatment of COVID-19, for which they invited advocates of this product to present their ideas (Mostajo-Radji, 2021). It appears that the association is not fully defined and it is possible that other variables, such as accessibility, fear of adverse reactions, safety concerns and lack of motivation, may explain these differences (Sallam et al., 2021a). Still, the possible association between conspiracy beliefs about vaccines and vaccination rates should alert country health authorities and the various media to the negative effects of misinformation dissemination.

Misinformation associated with, for example, the death of children after receiving the COVID-19 vaccine in several countries have circulated widely; one such story that was spread on Facebook indicated the death of seven children after receiving the COVID-19 vaccine in Senegal (Islam et al., 2021). This has also been observed with conspiracy beliefs referring to other vaccines, such as those developed against mumps, measles, and rubella, which are erroneously thought to cause autism in children and autoimmune disorders in adolescents (Maglione et al., 2014). In the present study, among the different conspiracy beliefs showing agreement or disagreement, the one referring to “Vaccinating children against COVID-19 is harmful and this fact is hidden” shows the greatest difference. Similar results were observed previously (Romer and Jamieson, 2020; Yang et al., 2021). It has even been suggested that while about 92% of the world’s population believes that vaccines are important for children, there is also a large variation in support for this belief in some countries, ranging from 76% in France to 98% in India and Mexico; however, the causes of these variations are not entirely clear (Vanderslott et al., 2019). In addition, believing in conspiracies against vaccines, regarding their undisclosed harmful health effects, was related to lower willingness to vaccinate children (Jolley and Douglas, 2014). Later, direct arguments against conspiracy beliefs were shown to increase intentions to vaccinate a child when these arguments were presented prior to the emergence of conspiracy theories (Jolley and Douglas, 2017). However, once conspiracy theories became established, it was more difficult to correct them with arguments against these types of beliefs (Douglas, 2021). While the rates of hospitalization and death from COVID-19 in children are significantly lower than in adults, it is important for children to be vaccinated against the disease as well. However, having some degree of agreement with beliefs about the negative consequences of vaccination in children could affect their health. Although the priority for vaccination is high-risk groups in the adult population, it has been recommended that children at higher risk of severe and fatal disease should be vaccinated

first, and then vaccination should be extended to other groups of children (Wong et al., 2021). Differences in the degrees of agreement or disagreement about erroneous beliefs about vaccination in children may be related to a lack of confidence and lack of knowledge about the importance of vaccination (Benin et al., 2006).

The study has some limitations. First, although the highest percentage of responses, in most countries, are in low response alternatives (1 and 4), it is recognized that the findings of the study may not be generalized to all populations in the countries evaluated, since an online form and non-probability convenience sampling were used. This method implied that all participants were volunteers and felt motivated to participate (Simione et al., 2021). However, this method was the only feasible one at the time of data collection, when most of the population in all participating countries had limited social interactions. Similarly, due to the type of sampling, the participants were mostly women and university-educated, which led to the presence of a sampling bias. Therefore, subsequent studies should have more homogeneous samples in each of the gender, age and educational level groups. Likewise, the use of a self-report questionnaire to assess conspiracy beliefs could also generate a social desirability bias. Furthermore, although the study was cross-sectional, the sample size in each country was relatively small compared to the total population. Given that this is a cross-sectional study, the present data do not allow us to draw conclusions about the variability of conspiracy beliefs throughout the pandemic as vaccination processes progress across countries. Thus, longitudinal studies are needed to detect any variation involved with conspiracy beliefs (Winter et al., 2021). For example, many conspiracy beliefs and misinformation have been debunked by international health agencies and, therefore, it is not known whether corrected information has led to changes in people’s original perceptions of vaccines (Islam et al., 2021). In addition, as scientific evidence on COVID-19 has advanced, information about vaccines has also changed and, therefore, some beliefs have also changed. Due to its exploratory and introductory nature, this study did not consider additional analyses on other sociodemographic or psychosocial variables that may contribute to the acceptance of conspiracy beliefs about COVID-19 vaccines. Thus, future studies may decide to address this limitation. Finally, it is possible that this study did not cover all the conspiracy beliefs circulating about COVID-19 vaccines. Therefore, the beliefs assessed may have underestimated the true prevalence.

The large amount of misinformation about COVID-19 vaccines currently circulating negatively impacts the vaccination process. The circulation of this type of information can be misinterpreted as credible information (Bontcheva et al., 2020). In this context, it is important to consider that the dissemination of misinformation, the increase of multimedia information manipulated by artificial intelligence, and the appearance of different harmful content issued by media and individuals (including health professionals) are some of the dangers to public health that people can find on social networks (Ferrara et al., 2020). Thus, it is important to also have collective immunity against misinformation and conspiracy beliefs to ensure collective immunity against COVID-19

(World Health Organization, 2020). This preliminary study suggests that, in most countries, women, people with a lower educational level and those who receive information about the vaccine and COVID-19 from family and friends are generally more supportive of conspiracy ideas against COVID-19 vaccines. In the case of age, the results are very mixed. Likewise, the belief referring to “Vaccinating children against COVID-19 is harmful and this fact is hidden” is the one that shows the greatest difference in agreement or disagreement between countries.

Despite the limitations, the findings in this study have important implications, some of which have already been suggested above. Thus, groups of people at increased risk for conspiracy beliefs about COVID-19 vaccines could be identified, in addition to preventing the development of new conspiracy beliefs and dispelling existing beliefs with the goal of promoting intervention strategies against COVID-19. Risk communication and community engagement should be emphasized to track and identify misinformation about vaccines as a way to address these concerns with evidence-based information and ‘immunize’ people against misinformation (Bontcheva et al., 2020). On the other hand, although there is scant information on cultural differences in COVID-19 vaccine conspiracy beliefs, that possible cultural differences are attributable to variations in the levels of uncertainty and fear experienced across cultures (van Prooijen and Douglas, 2017). Regarding the latter, a recent study concluded that there are differences in levels of fear of COVID-19 in Latin American countries (Caycho-Rodríguez et al., 2021). Furthermore, cultural differences in susceptibility to conspiracy beliefs are related to variations in trust, particularly in contexts of inequality where there is a variable distance between power elites and the masses, as occurs in many Latin American countries (van Prooijen and Van Vugt, 2018).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

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ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of the Universidad Privada del Norte in Peru (registration number: 20213002). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TC-R and JV-L provided initial conception, organization, and main writing of the text. JV-L analyzed the data and prepared all figures and tables. LWV, PV, CC-L, MR-B, MW, CR-J, RP-C, MG, MC, PM, DP, RM-H, AS-P, ML, AB, DP-C, IEC-R, RC, BP, WA, and OP were involved in data collection for their respective countries and acted as consultants and contributors to research design, data analysis, and text writing. All authors read and approved the draft.

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SUPPLEMENTARY MATERIAL

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APPENDIX 1

Vaccine Conspiracy Beliefs Scale-COVID-19 (VCBS-COVID-19)

Spanish Version

1. La información sobre la seguridad de las vacunas contra la COVID-19 a menudo se inventan.
(*COVID-19 Vaccine safety data is often fabricated*)
2. Vacunar a los niños contra la COVID-19 es perjudicial y este hecho está oculto.
(*Vaccinating children against COVID-19 is harmful and this fact is covered up*)
3. Las empresas farmacéuticas ocultan los peligros de las vacunas contra la COVID-19.
(*Pharmaceutical companies cover up the dangers of COVID-19 vaccines*)
4. Se engaña a las personas sobre la eficacia de las vacunas contra la COVID-19.
(*People are deceived about COVID-19 vaccine efficacy*)
5. La información sobre la eficacia de las vacunas contra la COVID-19 a menudo se inventan.
(*COVID-19 Vaccine efficacy data is often fabricated*)
6. Se engaña a las personas sobre la seguridad de las vacunas contra la COVID-19.
(*People are deceived about COVID-19 vaccine safety*)
7. El gobierno está tratando de ocultar el vínculo entre las vacunas contra la COVID-19 y la aparición de otras enfermedades.
(*The government is trying to hide the link between COVID-19 vaccines and the appearance of other diseases*)



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Factors Associated With Highest Symptoms of Anxiety During COVID-19: Cross-Cultural Study of 23 Countries

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The COVID-19 restrictions have impacted people's lifestyles in all spheres (social, psychological, political, economic, and others). This study explored which factors affected the level of anxiety during the time of the first wave of COVID-19 and subsequent quarantine in a substantial proportion of 23 countries, included in this study. The data was collected from May to August 2020 (5 June 2020). The sample included 15,375 participants from 23 countries: (seven from Europe: Belarus, Bulgaria, Croatia, Hungary, Italy, Romania, Russia; 11 from West, South and Southeast Asia: Armenia, India, Indonesia, Iran, Iraq, Jordan, Malaysia, Pakistan, Saudi Arabia, Thailand, Turkey; two African: Nigeria and Tanzania; and three from North, South, and Central America: Brazil, Canada, United States). Level of anxiety was measured by means of the 7-item Generalized Anxiety Disorder Scale (GAD-7) and the 20-item first part of The State-Trait Anxiety Inventory (STAI)—State Anxiety Inventory (SAI). Respondents were also asked about their personal experiences with COVID-19, attitudes toward measures introduced by governments, changes in attitudes toward migrants during a pandemic, family income, isolation conditions, etc. The factor analysis revealed that four factors explained 45.08% of variance in increase of anxiety, and these components were interpreted as follows: (1) personal awareness of the threat of COVID-19, (2) personal reaction toward officially undertaken measures and attitudes to foreigners, (3) personal trust in official sources, (4) personal experience with COVID-19. Three out of four factors demonstrated strong associations with both scales of anxiety: high level of anxiety was significantly correlated with high level of personal awareness of the threat of COVID-19, low level of personal reaction toward officially undertaken measures and attitudes to foreigners, and high level of presence of personal experience with COVID-19. Our study revealed significant main effects of sex, country, and all four factors on the level of anxiety. It was demonstrated that countries with higher levels of anxiety assessed the real danger of a pandemic as higher, and had more personal experience with COVID-19. Respondents who trusted the government demonstrated lower levels of anxiety. Finally, foreigners were perceived as the cause of epidemic spread.

Keywords: anxiety, COVID-19, cross-cultural, personal experience, personal awareness, personal trust in official sources

"We have realized that we are on the same boat, all of us fragile and disoriented, but at the same time important and needed, all of us called to row together, each of us in need of comforting the other. On this boat, are all of us."

Pope Francis, 2020

INTRODUCTION

The COVID-19 pandemic has been a global challenge and has come to change the population's daily life. Data using a sample of adults from different countries from 2020 to 2021 showed that social isolation, loneliness, and limitations are associated

with worse mental and physical health (Berta et al., 2020; Brooks et al., 2020; Cao C. et al., 2020; Chen et al., 2020; Kowal et al., 2020; Mækelæ et al., 2020; van Bavel et al., 2020; Burkova et al., 2021; Butovskaya et al., 2021; Rodríguez et al., 2021; etc.). The negative psychological impact of the epidemic was demonstrated on the general population, as well as on children and the elderly (Cao C. et al., 2020; Chen et al., 2020; Fedenok and Burkova, 2020; Li et al., 2020; Yang et al., 2020). The negative psychological impact of the epidemic was demonstrated also in specific populations, i.e., health care workers (Zhang et al., 2020; Brailovskaia et al., 2021; Mansueto et al., 2021).

Studies observing the impact of epidemics have shown that a significant part of the population is subject to anxiety due

to health threats and people's desire to protect themselves and their loved ones (Jones and Salathe, 2009; Main et al., 2011; Jalloh et al., 2018; Bults et al., 2020; Burkova et al., 2021; Butovskaya et al., 2021; Semenova et al., 2021; Uehara et al., 2021). Past epidemics have shown that during their long pandemic (including quarantine) we are dealing with prolonged stress that can lead to immune system dysregulation and increased susceptibility to viral infections (Cohen et al., 2012), psychological distress and diagnostic symptoms of post-traumatic stress disorder (Reynolds et al., 2008; Taylor et al., 2008; Berta et al., 2020), depression and greater levels of stress (DiGiovanni et al., 2004; Hawryluck et al., 2004; Mak et al., 2009; Burkova et al., 2021; Rodríguez et al., 2021), insomnia, irritability, and low mood (Lee et al., 2005), and emotions of nervousness, fear, sadness, and guilt (Reynolds et al., 2008). Data from China confirm the high prevalence of post-traumatic stress disorder among the survivors of COVID-19 (Bo et al., 2020) and mental illness among the general population (Gao et al., 2020).

Scientists from different countries want to understand how the population responds to the social conditions imposed by the new coronavirus pandemic. A significant pool of studies from different countries showed the impact of the pandemic on increased anxiety, depression, post-traumatic stress, and even suicides (for example, Canada – Nwachukwu et al., 2020; Best et al., 2021; China – Bo et al., 2020; Cao C. et al., 2020; Gao et al., 2020; Huang and Zhao, 2020; etc.; France – Chaix et al., 2020; Husky et al., 2020; Greece – Voitsidis et al., 2020; Italy – Mazza et al., 2020; Japan – Tanoue et al., 2020; Malaysia – Kassim et al., 2021; Russia – Karpenko et al., 2020; Zinchenko et al., 2021; Spain – González-Sanguino et al., 2020; Rodríguez et al., 2021; United States – Czeisler et al., 2020; Khubchandani et al., 2021; etc.). The negative effects of COVID-19 on human psychological wellbeing and mental states worldwide have been demonstrated in more than 21,600 papers recently published according to the platform Scholar-google. This concerns both the stress associated with fear of illness (Abuhammad et al., 2021; Koçak et al., 2021; Luo et al., 2021), as well as governmental measures undertaken to stop the epidemic, such as lockdowns, social distancing, threat of or actual job loss and reduction of general internal and international mobility, etc. (Berta et al., 2020; Brooks et al., 2020; Fedenok and Burkova, 2020; Limcaoco et al., 2020; Mækelæ et al., 2020).

During 2020–2021, a number of cross-cultural studies were released that make a significant contribution to the understanding of major stress factors in different cultures¹ (Berta et al., 2020; Kowal et al., 2020; Limcaoco et al., 2020; Mækelæ et al., 2020; Burkova et al., 2021; Butovskaya et al., 2021). The study of Limcaoco et al. (2020), which gathered data across 41 countries during the first wave of COVID-19 showed increasing levels of anxiety. Kowal et al. (2020) collected data from 26 countries and demonstrated associations of higher levels of stress from COVID-19 with younger age, being a single woman, lower level of education, staying with more children, and living in a country that has been severely

affected by COVID-19. The same correlation of anxiety with younger age was found in our cross-cultural study conducted in 23 countries (Burkova et al., 2021). Mækelæ et al. (2020) assessed effectiveness of introduced restrictions, their impact on daily life, and general distress and paranoia during the first outbreak in five countries – Brazil, Colombia, Germany, Israel, Norway, and the United States. Participants from Brazil, Colombia, and the United States reported the highest level of distress, whereas people from Israel, Norway and Germany had comparatively lower levels of distress (Mækelæ et al., 2020). Data from Russia and Spain demonstrated that for the Russian sample's perceived social support from the family was the only predictor for a reduced rate of anxiety, whereas for the Spanish sample it was social support from three sources: significant others, family, and friends (Berta et al., 2020). The same results were found among Chinese students – social support had a negative relationship with anxiety (Cao C. et al., 2020). Cross-cultural comparisons of psychosocial distress in the United States, South Korea, France, and Hong Kong during the initial phase of COVID-19 showed that younger age, greater concern for COVID-19, and more severe loneliness predicted worse psychological outcome; and the magnitudes of these effects varied across the four regions (Dean et al., 2021). The association between depression symptoms, psychological burden caused by COVID-19 and physical activity were found in Germany, Italy, Russia, and Spain – burden by COVID-19 was significantly positively associated with depression symptoms, while it was significantly negatively linked to physical activity, and physical activity buffered the association between depression symptoms and burden (Brailovskaia et al., 2021). Earlier it was demonstrated by our research team that cultural dimensions, such as individualism/collectivism, power distance and looseness/tightness may function as protective adaptive mechanisms against the development of anxiety disorders in a pandemic situation – participants from countries with the highest ratings of anxiety were also highest on individualism and looseness, and lowest ratings on power distance (Burkova et al., 2021). It was also revealed that factors of cohabitation/loneliness somehow produced different effects on anxiety in different countries. While in a majority of countries, people who lived with someone reported the highest level of aggression, in such countries as Belarus, Bulgaria, and Malaysia, whereas Pakistan showed the opposite effect (Burkova et al., 2021).

Despite a great number of studies, conducted on stress and distress, as well as coping strategies in the time of COVID-19, it remained far from being obvious, which cultural differences worsen the situation or on the contrary reduce the citizens' anxiety. We have already demonstrated the gender differences in stress levels during the first wave of a pandemic in 23 countries, as well as the effects of age and living condition on decrease or increase of stress levels (Burkova et al., 2021). The goals of the present study are to examine possible factors that may be associated with self-reported levels of anxiety during the time of the first wave COVID-19 quarantine in a large sample from 23 countries. Also, we are planning to analyze the effects of personal awareness of the threat of COVID-19, personal reaction toward officially undertaken measures and attitudes to foreigners, personal trust toward official sources,

¹In this research we used term "culture" as social norms and moral institutions, social distancing rules and social network structure of society.

and personal experience with COVID-19 on stress levels in a cultural-specific perspective.

MATERIALS AND METHODS

The survey was conducted during the first wave of the pandemic COVID-19 from May to August 2020 (Median 5 June 2020). According to the WHO, on this date worldwide there were registered 6,515,796 confirmed cases of COVID-19 and 387,298 confirmed deaths² (see country details in **Table 1**). All coauthors collected data in their home countries for this study. The questionnaire was generated on the Google Forms service hosted by the principal investigator. The original questionnaire was developed in Russian and English. In all non-English speaking countries (except Russia), colleagues translated the measures into their native languages using a back-translation procedure (Sousa and Rojjanasrirat, 2011).

Participants in each country were recruited from various university listservs and social networking sites. Inclusion criteria were: (1) being more than 18 years of age; (2) responding no to having a chronic disease and/or predisposition for depression or having received treatment (based on self-assessments of participants). People with chronic diseases and a predisposition to/or depression/treatment were excluded from the sample, as such respondents already have an increased level of anxiety due to illness/depression, and it would be more difficult to isolate the influence of COVID factors. If eligible, participants were directed to complete the self-report survey on Google forms to provide informed consent, and were asked to take a survey, described below, which took approximately 20 min to complete. Participants were not compensated for their participation.

The study was conducted according to the principles expressed in the Declaration of Helsinki. The Scientific Council of the Institute of Ethnology and Anthropology of the Russian Academy of Sciences (protocol No01, dated April 9, 2020) approved the protocols used to recruit participants and to collect data before conducting this study. All participants provided written informed consent before completing the survey.

The sample is made up of 15,375 participants from 23 countries (7 European: Belarus, Bulgaria, Croatia, Hungary, Italy, Romania, Russia; 11 Asian: Armenia, India, Indonesia, Iran, Iraq, Jordan, Malaysia, Pakistan, Saudi Arabia, Thailand, Turkey; 2 African: Nigeria and Tanzania; and 3 from North, South, and Central America: Brazil, Canada, United States). The mean age of the total sample was 29 years old and mean scores of ages in each country are presented in **Table 1**.

The variables and instruments included in the assessment were the following:

Sociodemographic information: sex, region, marital status, number of children, religion, place of residence, age, origin, educational level, family income, and chronic diseases.

Variables related to COVID-19: personal experiences with COVID-19, reaction toward measures introduced by governments, changes in attitudes toward migrants during a pandemic, isolation conditions, etc. (see questions in **Table 2**).

Anxiety measurements: two questionnaires for measurement of anxiety level were used in this study - Generalized Anxiety Disorder Scale (GAD-7) created by Spitzer et al. (2006) and State Anxiety Inventory (SAI) created by Spielberger (1983). We chose two scales of anxiety, because each of them targets different aspects of this phenomenon. GAD-7 screens for the presence of anxiety and related disorders (difficulties in controlling concerns, restlessness, mild fatigue, difficulty concentrating, irritability, muscle tension and sleep problems), while SAI evaluates anxiety as a reaction to stress ("in the moment" anxiety). Validated measures of the GAD-7 and SAI were used when available (Hanin and Spielberger, 1980; Sipos and Sipos, 1980; Spielberger, 1983; Spitzer et al., 2006; Sidik et al., 2012; Bozokluğlu et al., 2013; Bahammam Maha, 2016; Esipenko et al., 2018; Musumari et al., 2018; Silva et al., 2018; Dzhambov et al., 2019; Al-Rabiaah et al., 2020).

The GAD-7 consists of seven items based on seven main symptoms and examines their frequency over the past 2 weeks (Toussaint et al., 2020). Respondents report their symptoms using a 4-point Likert rating scale ranging from 0 (not at all) to 3 (almost every day) with a total score ranging from 0 to 21. Total scores across the seven items were calculated, and anxiety symptoms were classified as norm (0–4), mild (5–9), moderate (10–14), and severe (15–21) (Toussaint et al., 2020). Alpha reliability coefficients in the present study for GAD-7 were 0.895.

Anxiety as an emotional state was measured with the first part of The State-Trait Anxiety Inventory (STAI) – State Anxiety Inventory (SAI). It consists of a 20-item scale for measuring the intensity of anxiety as an emotional state. People report the intensity of their feelings of anxiety right now, at this moment by rating themselves on the following 4-point Likert scale from 1 (not at all) to 4 (very much so). Total scores of anxiety symptoms were classified as norm/low (0–30), moderate (31–45), and high (46 and above) (Spielberger, 1983). Alpha reliability coefficients in the present study for SAI were 0.766.

Data Analysis

SPSS (Version 27.0) was employed for data evaluation. Data was evaluated for missingness, and the final sample included those questionnaires in which sociodemographic information and anxiety scale responses were fully completed. The alpha reliability coefficient in the present study for GAD-7 was 0.90. The alpha reliability coefficient in the present study for SAI was 0.77.

An analysis of descriptive statistics was illustrating the country differences on anxiety scales. GLM ANOVA was used for analysis of the GAD-7 and SAI to estimate the association between sex and country on levels of anxiety. In order to explore the relationship between the questionnaires of this study and anxiety scales, factor analysis was used (factor analysis with Varimax rotation). The analysis included all questions for which loadings were higher than 0.30. We assessed statistically meaningful loadings by using the criteria of 0.32 ("poor"), 0.45 ("fair"), 0.55 ("good"), 0.63

²WHO Weekly operational update on COVID-19 on 5 June 2020 https://cdn.who.int/media/docs/default-source/sri-lanka-documents/20200605-covid-19-sitrep-137.pdf?sfvrsn=a13df572_2.

TABLE 1 | Sample characteristics and distribution by country, sex, and age.

Country	Language of survey	Total	Sex		Mean age (\pm SD)	Total confirmed cases/death on 5 June 2020*
			Male	Female		
Armenia	Armenian	33	27	6	20.45 (\pm 2.37)	11,817/183
Belarus	Russian	338	143	195	19.20 (\pm 2.85)	45,981/253
Brazil	Portuguese	515	82	430	38.80 (\pm 13.78)	584,016/32,548
Bulgaria	Bulgarian	322	129	193	28.34 (\pm 8.75)	2,585/147
Canada	English	692	446	246	30.33 (\pm 8.74)	93,441/7,543
Croatia	English	275	71	204	24.10 (\pm 8.40)	2,247/103
Hungary	Hungarian	235	35	198	31.95 (\pm 11.84)	3,954/539
India	English	383	213	170	29.95 (\pm 9.85)	226,770/6,348
Indonesia	Indonesian	930	504	424	32.05 (\pm 12.09)	28,818/1,721
Iran	Persian	306	88	217	33.68 (\pm 7.34)	164,270/8,071
Iraq	Arabic	173	88	85	35.03 (\pm 10.63)	8,840/271
Italy	Italian	253	44	208	23.50 (\pm 4.15)	234,013/33,689
Jordan	Arabic	449	121	328	33.68 (\pm 10.52)	765/9
Malaysia	Malay	1087	478	609	33.19 (\pm 11.12)	8,247/115
Nigeria	English	316	214	102	34.09 (\pm 11.24)	11 516/323
Pakistan	English	484	212	272	27.06 (\pm 11.11)	89,249/1,838
Romania	Romanian	269	42	226	36.22 (\pm 10.94)	19,907/1,299
Russia	Russian	1903	486	1417	20.99 (\pm 4.72)	449,834/5,528
Saudi Arabia	Arabic	414	98	316	26.76 (\pm 9.72)	93,157/611
Tanzania	English	341	185	156	23.95 (\pm 4.25)	509/21
Turkey	Turkish	4717	1609	3093	27.57 (\pm 10.84)	167,410/4,630
Thailand	Thai	300	49	250	32.82 (\pm 13.00)	3,102/58
United States	English	666	189	477	45.16 (\pm 17.15)	1,837 803/106,876
Total		15375	5553	9822	29.15 (\pm11.80)	

(“very good”), and 0.71 (“excellent”) (Tabachnick et al., 2007). Linear regression was used to test the associations between the GAD-7, SAI scales and four factors.

RESULTS

Country Differences on Anxiety Scales

Means and medians of GAD-7 and SAI scores across countries are represented in **Table 3** and **Figures 1, 2**. Our data revealed that the highest level of anxiety during restrictions and lockdown of the first wave of COVID-19 were in participants from Iraq, Canada, Brazil, Croatia and Italy when looking at the GAD-7 scale (**Figure 1**). Most of the highest levels of state anxiety (SAI) were in Brazil, Italy, and Iran (**Figure 2**). Lowest anxiety countries were Malaysia, Indonesia, Thailand (measured by GAD-7), Romania and Nigeria (measured by SAI) (**Figures 1, 2** and **Table 3**).

In the total sample 7045 participants (45.84%) had no symptoms of anxiety on GAD-7 (norm level), whereas people with mild anxiety were 31.43% (4830), moderate – 15.40% (2366), and severe – 7.33% (1127). Cross-cultural differences of levels of GAD-7 anxiety scales are demonstrated in **Figure 3**. The largest percentage of people with the highest levels of anxiety (red color) was in Brazil (17%), Iraq (15%), Canada (12%), and the United States (11%) (**Figure 3**). The lowest percentage of

people with the highest levels of anxiety was in Malaysia (2%) and Thailand (2%) (**Figure 3**).

As for the level of state anxiety SAI, low values were observed in 43.08% (6589) of respondents, moderate – 49.42% (7560), and high – 7.50% (1147). Cross-cultural differences of levels of SAI anxiety scales are demonstrated in **Figure 4**. The largest percentage of people with the highest levels of anxiety (red color) were found in Brazil (34%) and Italy (26%) (**Figure 4**). The lowest percentage of people with the highest levels of anxiety were detected in Iran (1%) and Tanzania (1%) (**Figure 4**).

The results of GLM ANOVAs with GAD-7 as the dependent variable, sex and country as fixed factors and significant main effects of sex ($F_{1,15340} = 298.885$, $p < 0.001$, $\eta^2 = 0.019$) and country ($F_{22,15345} = 53.758$, $p < 0.001$, $\eta^2 = 0.072$), showed small and medium effect sizes accordingly. In the case of SAI as the dependent variable we found main effects of sex ($F_{1,15268} = 157.504$, $p < 0.001$, $\eta^2 = 0.010$) and country ($F_{22,15273} = 67.872$, $p < 0.001$, $\eta^2 = 0.089$), both with medium effect sizes. Sex differences across countries were already discussed in our early paper (see more details in Burkova et al., 2021).

Anxiety Scales and Personal Experiences With COVID-19

In order to explore the relationship between the questionnaires of this study and anxiety scales, factor analysis was used (Varimax

TABLE 2 | Factor loadings for the 12 questions about personal experiences with COVID-19 and conditions in total sample.

Questions	Factor loadings			
	PC1: personal awareness of the threat of COVID-19	PC2: personal reaction toward officially undertaken measures and attitudes to foreigners	PC3: personal trust to official sources	PC4: personal experience with COVID-19
Do you think the coronavirus pandemic poses a real threat for you personally? 0 = NO, 1 = YES	0.749			
Do you think the coronavirus pandemic poses a real threat for your relatives? 0 = NO, 1 = YES	0.692			
Do you have COVID-19 infected people in your close environment? 0 = NO, 1 = YES				0.633
Have you been diagnosed with COVID-19? 0 = NO, 1 = I have had symptoms, but have not been tested, 2 = YES				0.594
Do you include in risk group of COVID-19 (returned from countries unfavorable for epidemic situations, had close contact with patients?) 0 = NO, 1 = YES				0.725
Has your family income changed after restrictions during COVID-19? 1 = DECREASED, 2 = NOT CHANGE, 3 = INCREASED			0.329	
Have you become more hostile and suspicious toward foreigners (total)? 0 = NO, 1 = YES		0.549		
Are the actions of the authorities on the regime of self-isolation legitimate? 0 = NO, 1 = YES			0.736	
Are these measures, undertaken by authorities on the lock down, self-isolation sufficient? 0 = NO, 1 = YES		0.713		
Are these measures introduced: too early? in time? too late?		-0.673		
Do you trust information coming from official sources (i.e., the government)? 0 = NO, 1 = YES			0.719	

rotation). As seen in **Table 2**, the factor loadings of the ten items ranged between 0.55 and 0.75, suggesting that each item substantially contributes to the factor at good and excellent levels. The four factors explained 45.08% of total variance. The first factor (PC1), interpreted as personal awareness of the threat of COVID-19, accounted for 13.48% of variance. The second factor (PC2) explained 11.60% of variance and reflected personal reaction toward officially undertaken measures and attitudes to foreigners. The third factor (PC3) revealed that 10.47% of total variance was associated with personal trust in official sources. Finally, the fourth factor (PC4) explained 9.53% of variance and was interpreted as personal experience with COVID-19.

Three factors correlated significantly with both scales of anxiety; however, the correlations were not high, and this was especially evident for positive correlation between the level of anxiety and personal awareness of the threat of COVID-19 (PC1) (**Table 4**). High levels of anxiety were significantly correlated with low levels of personal trust in official sources (PC3) and with high levels of presence of personal experience with COVID-19 (PC4) (**Table 4**).

The results of GLM ANOVA with GAD-7 as the dependent variable, sex and country as fixed factors, and four selected factors as covariates, revealed significant main effects of sex [$F_{(1)} = 303.748$, $p = 2.3405E-67$, $\eta_p^2 = 0.020$], country [$F_{(21)} = 49.830$, $p = 8.0322E-201$, $\eta_p^2 = 0.066$], and all factors – PC1 [personal awareness of the threat of COVID-19: $F_{(1)} = 67.639$, $p = 2.1259E-16$, $\eta_p^2 = 0.005$], PC2 [personal reaction

toward officially undertaken measures and attitudes to foreigners: $F_{(1)} = 16.289$, $p = 0.000055$, $\eta_p^2 = 0.001$], PC3 [personal trust in official sources: $F_{(1)} = 197.176$, $p = 1.6598E-44$, $\eta_p^2 = 0.013$], and PC4 [personal experience with COVID-19: $F_{(1)} = 113.777$, $p = 1.8172E-26$, $\eta_p^2 = 0.008$], with small effect sizes.

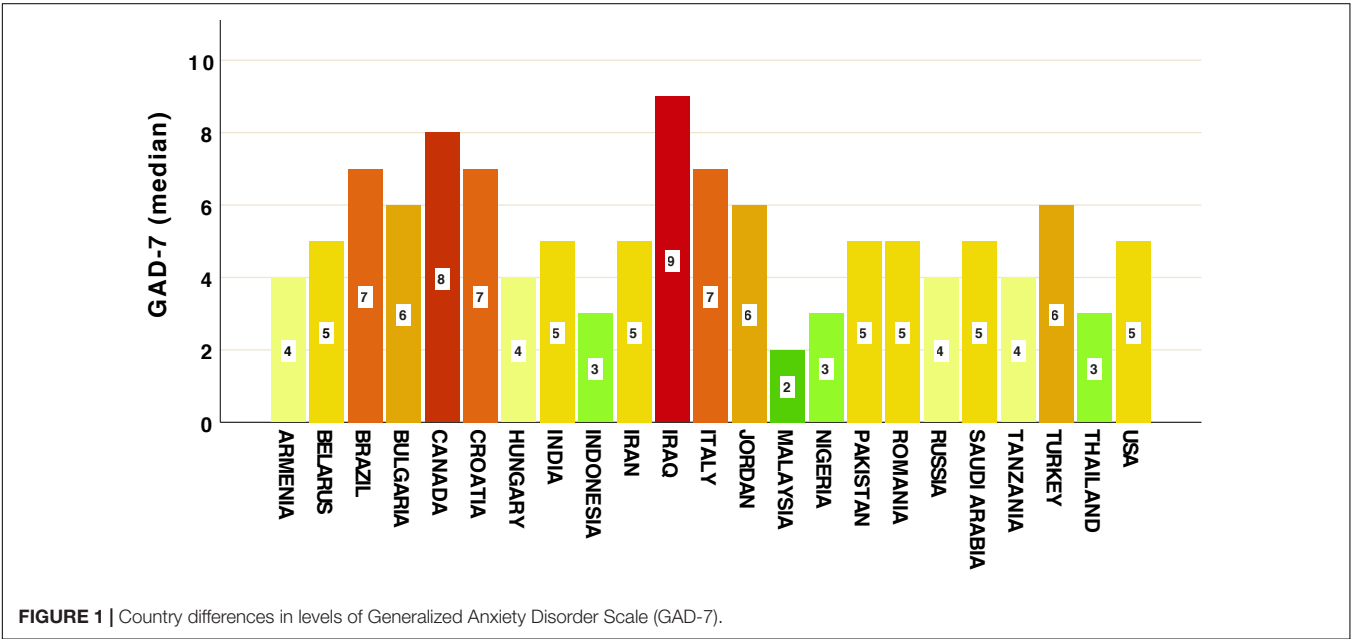
The results of GLM ANOVA with SAI as the dependent variable, sex and country as fixed factors, and four selected factors as covariates, revealed significant main effects of sex [$F_{(1)} = 154.202$, $p = 3.1302E-35$, $\eta_p^2 = 0.010$], country [$F_{(21)} = 58.630$, $p = 1.8862E-237$, $\eta_p^2 = 0.077$], and all factors – PC1 [personal awareness of the threat of COVID-19: $F_{(1)} = 234.853$, $p = 1.3168E-52$, $\eta_p^2 = 0.016$], PC2 [personal reaction toward officially undertaken measures and attitudes to foreigners: $F_{(1)} = 106.979$, $p = 5.4706E-25$, $\eta_p^2 = 0.007$], PC3 [personal trust in official sources: $F_{(1)} = 193.724$, $p = 9.211E-44$, $\eta_p^2 = 0.013$], and PC4 [personal experience with COVID-19: $F_{(1)} = 154.202$, $p = 3.1302E-35$, $\eta_p^2 = 0.010$], with small effect sizes.

In the next step we estimated the relationship between anxiety scales and four factors using regression analysis. Significant linear effects on GAD-7 were demonstrated with PC1, PC3, and PC4 in the total sample (**Table 5**). Countries with high levels of anxiety assessed the more real personal awareness of the threat of COVID-19 (PC1) and had more personal experience with COVID-19 (PC4). Low levels of anxiety were observed in those people who personally trusted official sources (PC3).

Strong significant linear effects on SAI have been demonstrated for all four factors (**Table 6**). Personal

TABLE 3 | Descriptive statistics of GAD-7 and SAI scales by country.

Country	N	GAD-7 scale		SAI scale	
		Mean (±SD)		Mean (±SD)	
6.01	Armenia	33	5.48 (±4.95)	30.06 (±12.39)	
	Belarus	338	5.89 (±4.60)	30.99 (±10.28)	
	Brazil	515	8.43 (±5.73)	39.33 (±12.18)	
	Bulgaria	322	6.74 (±4.76)	28.75 (±12.14)	
	Canada	692	8.10 (±5.38)	31.83 (±10.70)	
	Croatia	275	7.43 (±4.73)	28.32 (±12.10)	
	Hungary	235	4.91 (±4.51)	28.19 (±12.18)	
	India	383	6.00 (±4.94)	31.70 (±9.21)	
	Indonesia	930	4.34 (±4.61)	28.33 (±10.95)	
	Iran	306	5.71 (±4.36)	34.94 (±3.07)	
	Iraq	173	9.16 (±4.95)	32.43 (±9.89)	
	Italy	253	7.69 (±4.28)	38.44 (±10.88)	
	Jordan	449	6.54 (±4.84)	28.35 (±10.78)	
	Malaysia	1087	3.16 (±4.10)	28.19 (±10.31)	
	Nigeria	316	4.40 (±4.85)	25.01 (±10.72)	
	Pakistan	484	6.16 (±5.20)	30.73 (±11.72)	
	Romania	269	5.52 (±4.67)	23.71 (±11.73)	
	Russia	1903	5.22 (±4.91)	28.41 (±11.77)	
	Saudi Arabia	414	5.52 (±4.64)	27.06 (±12.16)	
	Tanzania	341	4.96 (±5.06)	32.80 (±6.01)	
	Turkey	4717	6.86 (±4.90)	33.21 (±8.03)	
	Thailand	300	4.09 (±4.12)	30.69 (±8.42)	
	United States	666	6.33 (±5.42)	27.18 (±13.61)	
Total		15375	6.04 (±5.039)	30.83 (±10.69)	



trust in official sources (public trust that the measures introduced by government are sufficient and introduced in a timely manner) correlated significantly with lower self-reported anxiety. Also, personal reaction toward officially undertaken measures and attitudes to foreigners correlated significantly with lower self-reported anxiety.

The results of a regression analysis with GAD-7 as tested variable and the four factors as independent variables per each country are presented in Table 7.

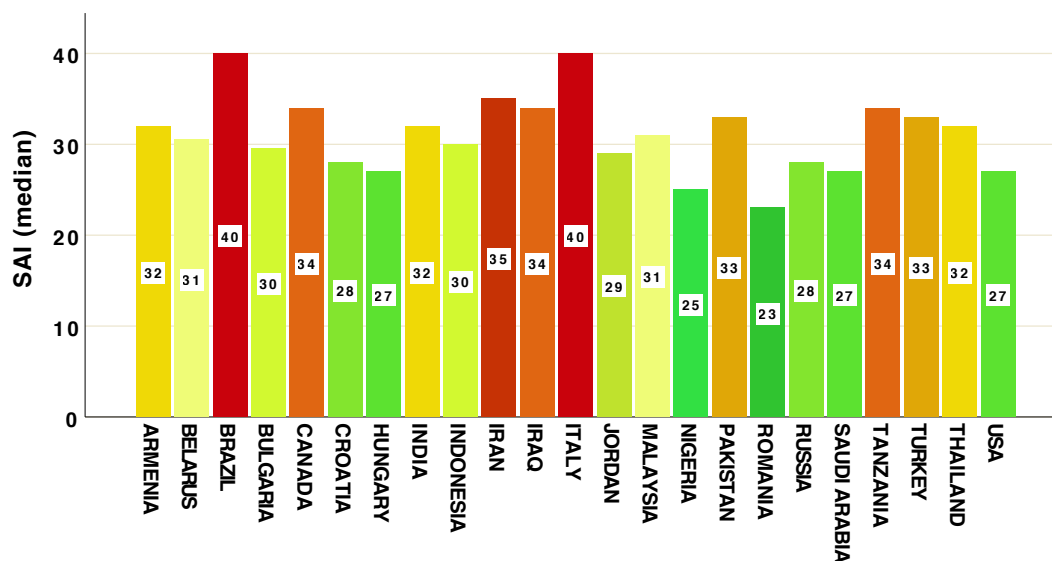


FIGURE 2 | Country differences in levels of State Anxiety Inventory (SAI).

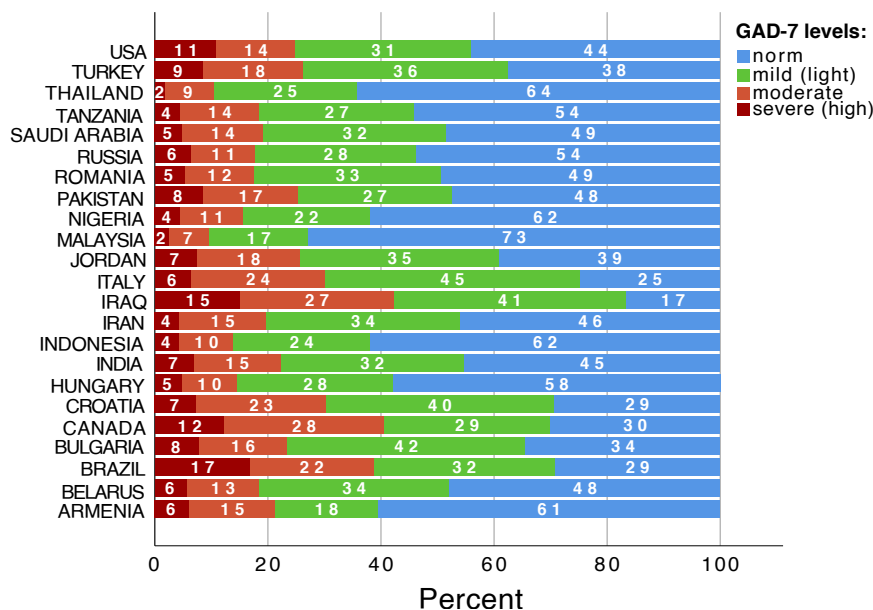


FIGURE 3 | Country differences of levels of Generalized Anxiety Disorder Scale (GAD-7).

We excluded Tanzania from analysis, as some questions were not completed by respondents from this country.

In the case of the first factor (PC1), 11 countries demonstrated a positive association between anxiety and personal awareness of the threat of COVID-19 (Croatia, Hungary, India, Jordan, Malaysia, Pakistan, Romania, Russia, Saudi Arabia, United States), meaning that a high levels of anxiety were registered for people with high levels of personal awareness of the threat of COVID-19. The exception was Malaysia. The Malayan respondents with significantly higher levels of GAD-7 were those

who reported a low level of personal awareness of the threat of COVID-19 (Table 7).

The second factor (PC2) significantly predicted of anxiety only in two countries – Russia and Hungary. More anxious people in these countries were those who did not believe in officially undertaken measures and think that measures were introduced too late, as well as those who felt more hostile and suspicious reaction to foreigners (Table 7).

Personal trust in official sources (PC3) was the significant predictor of GAD-7 in 13 countries – Belarus, Brazil, Croatia, India, Indonesia, Iran, Jordan, Nigeria, Pakistan, Russia,

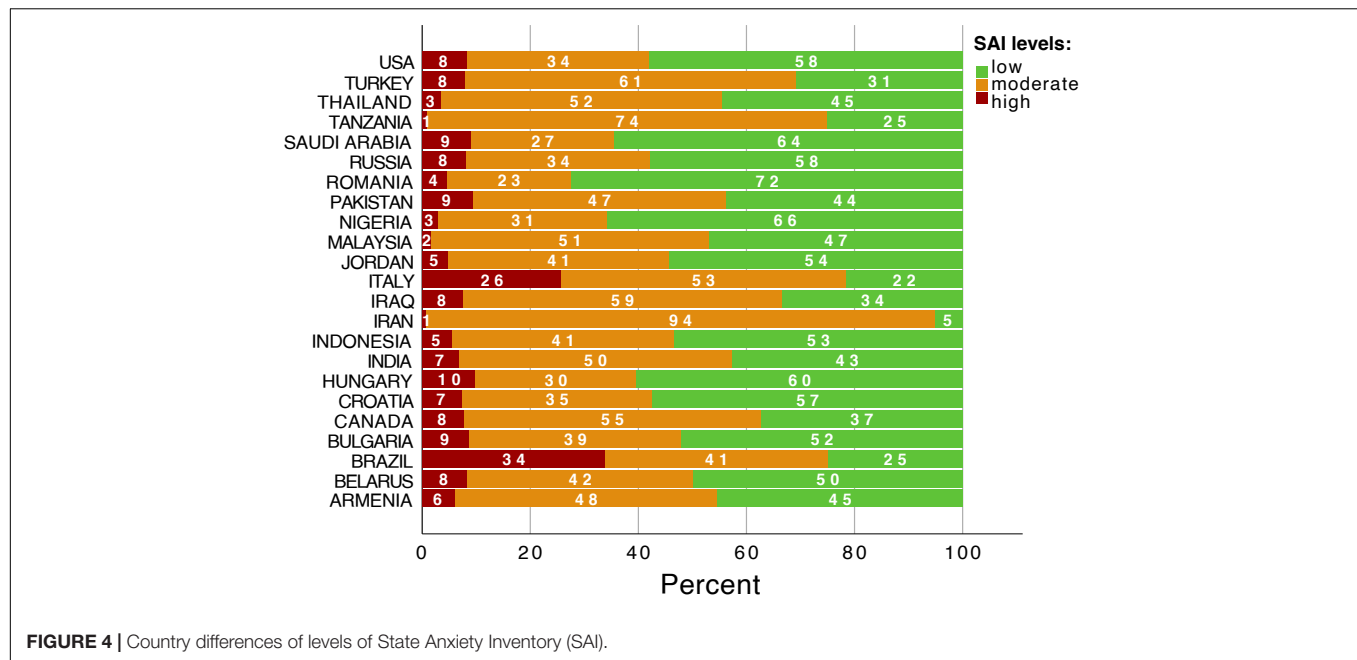


FIGURE 4 | Country differences of levels of State Anxiety Inventory (SAI).

TABLE 4 | Correlation analysis of the anxiety scales with control for country and sex and four factors in total sample.

Variables	PC1: personal awareness of the threat of COVID-19 r (p)	PC2: personal reaction towards officially undertaken measures and attitudes to foreigners r (p)	PC3: personal trust in official sources r (p)	PC4: personal experience with COVID-19 r (p)
GAD-7	0.054 (<0.001)	-0.004 (NS)	-0.119 (<0.001)	0.125 (<0.001)
SAI	0.168 (<0.001)	-0.039 (<0.001)	-0.118 (<0.001)	0.099 (<0.001)

r , coefficient of correlation; p , significance; NS, not significant.

TABLE 5 | Regression analysis for the factors predicting anxiety (GAD-7 as dependent variable, $R^2 = 0.032$) in total sample.

Predictor	B	SE	Beta	T	p
PC1: personal awareness of the threat of COVID-19	0.275	0.041	0.055	6.795	<0.001
PC2: personal reaction toward officially undertaken measures and attitudes to foreigners	-0.058	0.041	-0.012	-1.435	NS
PC3: personal trust in official sources	-0.586	0.041	-0.116	-14.460	<0.001
PC4: personal experience with COVID-19	0.614	0.041	0.112	15.146	<0.001

NS, not significant.

TABLE 6 | Regression analysis for the factors predicting anxiety (SAI as dependent variable, $R^2 = 0.053$) in total sample.

Predictor	B	SE	Beta	t	P
PC1: personal awareness of the threat of COVID-19	1.800	0.086	0.167	20.960	<0.001
PC2: personal reaction toward officially undertaken measures and attitudes to foreigners	-0.464	0.086	-0.043	-5.410	<0.001
PC3: personal trust in official sources	-1.236	0.086	-0.115	-14.406	<0.001
PC4: personal experience with COVID-19	1.058	0.086	0.098	12.306	<0.001

Saudi Arabia, Turkey, and the United States. High levels of anxiety in these countries were associated with low personal trust in government and official sources (Table 7).

Personal experience with COVID-19 (PC4) was a significant predictor of GAD-7 in 9 countries – Armenia, Canada, India, Indonesia, Malaysia, Russia, Saudi Arabia, Turkey, and the United States. The citizens from these countries who fell

ill themselves or had someone infected within their close environment had higher ratings of anxiety (Table 7).

The results of a regression analysis with SAI for each country are presented in Table 8. Again, we excluded Tanzania from the analysis, as some questions were not completed in this country.

In the case of the first factor (PC1), 17 countries demonstrated a positive association between anxiety and personal awareness

TABLE 7 | Regression analysis for the factors predicting anxiety (GAD-7) in each country.

Country	R^2	Predictor	B	SE	Beta	t	p
Armenia	0.329	PC1	1.454	0.809	0.283	1.798	0.083
		PC2	-0.532	0.897	-0.096	-0.593	0.558
		PC3	0.561	0.831	0.110	0.674	0.506
		PC4	3.414	1.060	0.511	3.221	0.003
Belarus	0.046	PC1	0.223	0.328	0.038	0.682	0.496
		PC2	0.227	0.387	0.032	0.588	0.557
		PC3	-0.994	0.297	-0.185	-3.353	0.001
		PC4	0.356	0.246	0.078	1.448	0.149
Brazil	0.058	PC1	0.540	0.394	0.062	1.372	0.171
		PC2	-0.312	0.363	-0.038	-0.862	0.389
		PC3	-1.027	0.249	-0.186	-4.119	<0.001
		PC4	0.290	0.156	0.080	1.854	0.064
Bulgaria	0.018	PC1	0.237	0.242	0.056	0.981	0.327
		PC2	-0.139	0.335	-0.024	-0.416	0.678
		PC3	0.050	0.261	0.011	0.190	0.849
		PC4	0.608	0.314	0.110	1.939	0.053
Canada	0.050	PC1	-0.138	0.232	-0.027	-0.593	0.553
		PC2	0.387	0.247	0.065	1.568	0.117
		PC3	-0.300	0.284	-0.050	-1.057	0.291
		PC4	0.711	0.151	0.195	4.694	<0.001
Croatia	0.072	PC1	1.158	0.316	0.216	3.669	<0.001
		PC2	-0.237	0.406	-0.035	-0.582	0.561
		PC3	-0.608	0.299	-0.121	-2.030	0.043
		PC4	-0.391	0.376	-0.062	-1.038	0.300
Hungary	0.080	PC1	0.875	0.299	0.188	2.928	0.004
		PC2	-1.181	0.377	-0.199	-3.135	0.002
		PC3	-0.268	0.320	-0.054	-0.838	0.403
		PC4	-0.185	0.298	-0.039	-0.620	0.536
India	0.056	PC1	0.539	0.262	0.105	2.061	0.040
		PC2	0.052	0.294	0.009	0.176	0.860
		PC3	-0.683	0.305	-0.120	-2.236	0.026
		PC4	0.819	0.270	0.152	3.039	0.003
Indonesia	0.060	PC1	0.544	0.168	0.104	3.235	0.001
		PC2	-0.238	0.187	-0.042	-1.269	0.205
		PC3	-1.123	0.200	-0.185	-5.622	<0.001
		PC4	0.345	0.164	0.067	2.098	0.036
Iran	0.069	PC1	0.376	0.262	0.082	1.432	0.153
		PC2	0.641	0.335	0.109	1.911	0.057
		PC3	-1.186	0.306	-0.220	-3.874	<0.001
		PC4	0.192	0.154	0.070	1.245	0.214
Iraq	0.033	PC1	-0.034	0.485	-0.006	-0.070	0.944
		PC2	-0.498	0.573	-0.074	-0.870	0.386
		PC3	-0.716	0.416	-0.148	-1.723	0.087
		PC4	0.020	0.384	0.004	0.052	0.958
Italy	0.026	PC1	0.460	0.297	0.099	1.548	0.123
		PC2	-0.514	0.357	-0.092	-1.438	0.152
		PC3	-0.132	0.357	-0.024	-0.371	0.711
		PC4	0.213	0.230	0.059	0.927	0.355
Jordan	0.036	PC1	0.689	0.188	0.176	3.668	<0.001
		PC2	0.244	0.386	0.031	0.631	0.528
		PC3	-0.574	0.286	-0.100	-2.011	0.045
		PC4	0.253	0.431	0.028	0.586	0.558
Malaysia	0.053	PC1	-0.516	0.179	-0.092	-2.880	0.004

(Continued)

TABLE 7 | (Continued)

Country	R ²	Predictor	B	SE	Beta	t	p
Nigeria	0.028	PC2	-0.325	0.231	-0.043	-1.410	0.159
		PC3	0.019	0.340	0.002	0.056	0.955
		PC4	1.678	0.257	0.196	6.538	<0.001
		PC1	0.296	0.230	0.072	1.289	0.198
		PC2	0.192	0.383	0.028	0.502	0.616
Pakistan	0.063	PC3	-0.610	0.270	-0.128	-2.264	0.024
		PC4	0.421	0.325	0.073	1.295	0.196
		PC1	0.892	0.229	0.174	3.905	<0.001
		PC2	-0.238	0.302	-0.036	-0.788	0.431
Romania	0.019	PC3	-0.787	0.246	-0.145	-3.202	0.001
		PC4	0.182	0.196	0.041	0.931	0.353
		PC1	0.604	0.289	0.128	2.094	0.037
		PC2	-0.060	0.383	-0.010	-0.156	0.876
Russia	0.036	PC3	-0.268	0.387	-0.043	-0.692	0.490
		PC4	0.156	0.264	0.036	0.590	0.556
		PC1	0.256	0.109	0.056	2.363	0.018
		PC2	-0.414	0.143	-0.069	-2.895	0.004
Saudi Arabia	0.122	PC3	-0.502	0.105	-0.111	-4.787	<0.001
		PC4	0.646	0.141	0.104	4.570	<0.001
		PC1	1.156	0.204	0.268	5.670	<0.001
		PC2	-0.477	0.375	-0.059	-1.274	0.203
Turkey	0.016	PC3	-0.917	0.342	-0.127	-2.682	0.008
		PC4	0.730	0.304	0.112	2.399	0.017
		PC1	0.291	0.087	0.048	3.343	0.001
		PC2	-0.115	0.074	-0.024	-1.554	0.120
Thailand	0.016	PC3	-0.507	0.070	-0.113	-7.283	<0.001
		PC4	0.205	0.083	0.036	2.468	0.014
		PC1	-0.035	0.249	-0.008	-0.142	0.887
		PC2	-0.238	0.332	-0.044	-0.718	0.473
United States	0.068	PC3	-0.740	0.466	-0.099	-1.588	0.113
		PC4	0.273	0.302	0.053	0.905	0.366
		PC1	0.687	0.239	0.118	2.880	0.004
		PC2	-0.312	0.282	-0.045	-1.107	0.269
		PC3	-1.200	0.247	-0.186	-4.863	<0.001
		PC4	0.380	0.154	0.095	2.471	0.014

The bold values show significant association.

of the threat of COVID-19 – Armenia, Brazil, Bulgaria, Croatia, Hungary, India, Indonesia, Italy, Jordan, Malaysia, Nigeria, Pakistan, Romania, Russia, Saudi Arabia, Turkey, and the United States. Notably, in the case of the SAI scale Malaysia had a positive association of anxiety and PC1, contra GAD-7 ratings (Table 8).

The second factor (PC2) was a significant predictor of anxiety SAI only in 5 countries – Hungary, Nigeria, Russia, Turkey, and Thailand. More anxious people in four of these countries (Hungary, Russia, Turkey, and Thailand) were those who did not believe in officially undertaken measures and thought that measures were introduced too late, as well as those who felt more hostile and suspicious reaction to foreigners. On the contrary, in Nigeria this association was positive (Table 8).

Personal trust in official sources (PC3) was a significant predictor of anxiety SAI in 12 countries – Belarus, Brazil, Canada, Hungary, India, Indonesia, Nigeria, Pakistan, Russia,

Saudi Arabia, Turkey, United States. The level of anxiety decreased with trust in official sources. The high level of anxiety in these countries was associated with low personal trust in government and official sources (Table 8).

Personal experience with COVID-19 (PC4) was a significant predictor of anxiety SAI in 7 countries – Armenia, Brazil, Canada, India, Indonesia, Russia, and the United States. People with personal experience of coronavirus reported higher ratings of anxiety (Table 8).

DISCUSSION

The results of the current cross-cultural study revealed differences in anxiety variables between the participants from 23 countries during the first wave of COVID-19, as well as differences in association with the personal awareness of

TABLE 8 | Regression analysis for the factors predicting anxiety (SAI) in each country.

Country	R^2	Predictor	B	SE	Beta	t	p
Armenia	0.301	PC1	5.776	2.067	0.448	2.795	0.009
		PC2	2.635	2.292	0.190	1.150	0.260
		PC3	0.556	2.123	0.044	0.262	0.795
		PC4	5.780	2.707	0.346	2.135	0.042
Belarus	0.070	PC1	1.047	0.722	0.080	1.450	0.148
		PC2	-0.055	0.852	-0.003	-0.064	0.949
		PC3	-2.614	0.654	-0.218	-3.997	<0.001
		PC4	0.796	0.542	0.078	1.468	0.143
Brazil	0.065	PC1	3.225	0.833	0.175	3.871	<0.001
		PC2	-0.159	0.767	-0.009	-0.207	0.836
		PC3	-1.279	0.528	-0.109	-2.425	0.016
		PC4	0.734	0.331	0.095	2.219	0.027
Bulgaria	0.036	PC1	1.521	0.611	0.140	2.490	0.013
		PC2	-0.723	0.845	-0.048	-0.856	0.393
		PC3	-0.731	0.659	-0.062	-1.110	0.268
		PC4	1.062	0.792	0.075	1.342	0.181
Canada	0.026	PC1	-0.659	0.481	-0.066	-1.370	0.171
		PC2	0.007	0.509	0.001	0.015	0.988
		PC3	-1.785	0.583	-0.149	-3.064	0.002
		PC4	0.866	0.313	0.119	2.764	0.006
Croatia	0.064	PC1	2.772	0.810	0.203	3.421	0.001
		PC2	-1.449	1.043	-0.084	-1.389	0.166
		PC3	-1.343	0.768	-0.105	-1.748	0.082
		PC4	0.563	0.966	0.035	0.583	0.561
Hungary	0.097	PC1	2.502	0.800	0.199	3.130	0.002
		PC2	-2.567	1.008	-0.161	-2.547	0.012
		PC3	-2.038	0.856	-0.152	-2.382	0.018
		PC4	-1.374	0.797	-0.108	-1.723	0.086
India	0.128	PC1	1.916	0.468	0.200	4.091	<0.001
		PC2	-0.667	0.527	-0.064	-1.264	0.207
		PC3	-1.833	0.547	-0.173	-3.351	0.001
		PC4	1.642	0.483	0.164	3.401	0.001
Indonesia	0.106	PC1	2.594	0.390	0.209	6.656	<0.001
		PC2	-0.564	0.435	-0.042	-1.296	0.195
		PC3	-2.503	0.463	-0.174	-5.402	<0.001
		PC4	1.687	0.382	0.138	4.423	<0.001
Iran	0.011	PC1	-0.125	0.190	-0.039	-0.654	0.513
		PC2	-0.146	0.243	-0.035	-0.599	0.549
		PC3	-0.006	0.222	-0.002	-0.026	0.979
		PC4	0.175	0.112	0.091	1.564	0.119
Iraq	0.044	PC1	1.120	0.939	0.097	1.193	0.235
		PC2	-0.644	1.107	-0.049	-0.581	0.562
		PC3	-1.410	0.804	-0.149	-1.753	0.082
		PC4	0.630	0.743	0.069	0.847	0.398
Italy	0.063	PC1	2.219	0.739	0.187	3.001	0.003
		PC2	-1.172	0.890	-0.083	-1.317	0.189
		PC3	-0.886	0.889	-0.063	-0.997	0.320
		PC4	0.944	0.574	0.102	1.646	0.101
Jordan	0.027	PC1	1.116	0.421	0.128	2.652	0.008
		PC2	-1.153	0.864	-0.066	-1.335	0.183
		PC3	-0.767	0.640	-0.060	-1.200	0.231
		PC4	1.420	0.965	0.069	1.471	0.142
Malaysia	0.027	PC1	2.142	0.456	0.153	4.703	<0.001

(Continued)

TABLE 8 | (Continued)

Country	R ²	Predictor	B	SE	Beta	t	p
Nigeria	0.200	PC2	-0.788	0.586	-0.042	-1.344	0.179
		PC3	-1.040	0.865	-0.039	-1.202	0.229
		PC4	0.458	0.652	0.021	0.702	0.483
		PC1	2.501	0.459	0.277	5.443	<0.001
		PC2	3.607	0.766	0.242	4.709	<0.001
Pakistan	0.079	PC3	-2.663	0.540	-0.253	-4.934	<0.001
		PC4	1.097	0.650	0.086	1.687	0.093
		PC1	2.662	0.510	0.230	5.215	<0.001
		PC2	-0.155	0.673	-0.010	-0.231	0.818
		PC3	-1.570	0.549	-0.129	-2.859	0.004
Romania	0.035	PC4	0.430	0.437	0.043	0.982	0.326
		PC1	1.839	0.720	0.155	2.554	0.011
		PC2	-0.452	0.955	-0.029	-0.473	0.636
		PC3	-1.555	0.966	-0.100	-1.611	0.108
		PC4	0.263	0.658	0.024	0.399	0.690
Russia	0.045	PC1	1.075	0.259	0.097	4.151	<0.001
		PC2	-1.100	0.341	-0.076	-3.222	0.001
		PC3	-1.378	0.250	-0.127	-5.512	<0.001
		PC4	1.250	0.337	0.084	3.704	<0.001
		PC1	1.797	0.547	0.159	3.285	0.001
Saudi Arabia	0.082	PC2	-1.729	1.005	-0.082	-1.721	0.086
		PC3	-3.287	0.917	-0.173	-3.585	<0.001
		PC4	1.309	0.816	0.077	1.604	0.109
		PC1	0.912	0.141	0.093	6.457	<0.001
		PC2	-1.174	0.120	-0.151	-9.777	<0.001
Turkey	0.033	PC3	-0.762	0.113	-0.103	-6.733	<0.001
		PC4	0.170	0.135	0.018	1.261	0.208
		PC1	0.239	0.509	0.028	0.470	0.639
		PC2	-1.855	0.678	-0.166	-2.736	0.007
		PC3	0.170	0.953	0.011	0.179	0.858
Thailand	0.028	PC4	0.147	0.617	0.014	0.238	0.812
		PC1	1.819	0.610	0.125	2.984	0.003
		PC2	-0.624	0.726	-0.036	-0.860	0.390
		PC3	-3.245	0.626	-0.200	-5.181	<0.001
		PC4	0.859	0.388	0.086	2.213	0.027

The bold values show significant association.

the threat of COVID-19, personal reaction toward officially undertaken measures and attitudes to foreigners, personal trust to official sources and personal experience with COVID-19.

Country Differences in Anxiety Scales

Our data revealed that the highest GAD-7 scores during restrictions and lockdown of the first wave of COVID-19 were in participants from Iraq, Canada, Brazil, Croatia, Italy (when looking at the GAD-7 scale) and Brazil, Italy, Iran (SAI scale). Most of these countries rated highest in the number of total confirmed cases of COVID-19 (Figure 5). Lowest anxiety scores were in participants from Malaysia, Indonesia, Thailand (as measured by GAD-7), Romania and Nigeria (as measured by SAI). All are rated as countries with medium numbers of total confirmed cases (Figure 5). These results may be discussed in line with cultural dimensions, such as collectivism/individualism or tightness/looseness. Collectivistic societies put more emphasis on group interest over personal interests and enjoyment, which is in contrast to individualistic societies (Hofstede, 2001). The dimension of cultural

tightness-looseness refers to the strength of cultural norms: tight culture (e.g., Pakistan, Singapore, South Korea, and China) allows little room for individual liberty and poses high censoring pressure, whereas a loose culture provides members more room for discretion (Gelfand et al., 2011). The data presented by Kowal et al. (2020), revealed no association along the continuum of individualism–collectivism and anxiety. In this study participants with the high ratings of anxiety were from countries which scored high on individualism and looseness indexes (Canada, Italy, United States, Brazil) (Hofstede, 2001; Gelfand et al., 2011). In contrast, the least anxious ratings were obtained for respondents from collectivistic countries (Thailand, Indonesia, Malaysia, and Nigeria). Other authors stated that Brazil, Colombia, and the United States demonstrated higher levels of anxiety compared to Israel, Germany, and Norway (Mækela et al., 2020). The study conducted on 54 nations tested how the cultural variations in individualism and tightness affected the containment of COVID-19 during a 30-day period of government intervention (restrictions and measures to mitigate or stop the virus) (Cao W. et al., 2020).

It demonstrated significant relationships between cultural variables and national performance in slowing the spread of the coronavirus, measured by the three tightness–looseness indexes (namely, changes in the prevalence rate, crude mortality rate and case fatality rate – and their interaction). Loose and individualistic nations experienced higher rates of increases in infected cases and deaths than tight and collectivistic ones (Cao W. et al., 2020).

Anxiety and Personal Awareness of the Threat of COVID-19

High levels of anxiety were significantly correlated with high levels of personal awareness of the threat of COVID-19 in our study in both anxiety scales for a majority of countries. High level of GAD-7 anxiety was associated with more personal awareness of the threat of COVID-19 in Croatia, Hungary, India, Jordan, Malaysia, Pakistan, Romania, Russia, Saudi Arabia, and the United States, but not in Malaysia. Personal awareness of the threat of COVID-19 was a significant predictor of SAI anxiety in Armenia, Brazil, Bulgaria, Croatia, Hungary, India, Indonesia, Italy, Jordan, Malaysia, Nigeria, Pakistan, Romania, Russia, Saudi Arabia, Turkey, and the United States. Past research on the impact of the epidemics on psychological health has shown that a fear of infection has been a good predictor of increased stress (Cava et al., 2005; Desclaux et al., 2017; Brooks et al., 2020; Luo et al., 2021). The same is true for recent studies; for example, in Jordan fear toward the COVID-19 outbreak correlated with downloaded applications to trace COVID-19 cases, and many respondents mentioned that they were very afraid of the COVID-19 virus and were feeling uncomfortable thinking about it or when watching news and stories related to the pandemic on social media (Abuhammad et al., 2021). Another study reported that 72% of Indian respondents had concerns for themselves and their loved ones during the COVID-19 pandemic (Roy et al., 2020). In Italy, a collective ritual has been consolidating during the first phases of the pandemic, as evidence of this threat: listening on a daily basis to civil protection's announcements of the number of deaths, contagions, and people who had to be hospitalized or even admitted to intensive care units. Some compared this ritual to that of tuning to BBC radio during the Second World War (Cipolletta and Ortu, 2021, p. 280). Coronavirus anxiety positively correlated with fear about coronavirus in an online survey of 398 adult Amazon MTurk workers in the United States (Lee et al., 2020). Recent data suggest, however, that accurate public risk perceptions are critical to effectively managing public health risks (Dryhurst et al., 2020). Particularly, it was found that higher collective efficacy beliefs reduced risk perceptions about COVID-19 in Spain, Japan, Mexico, the United Kingdom, and the United States (Dryhurst et al., 2020). Hence, it may be concluded, that the factor of awareness of the real danger of a pandemic associates with other significant factors, especially with the trust in official sources (government, official mass media, laws and restrictions), the reaction on taken measures and the personal experiences of COVID-19. Lastly, a systematic review and meta-analysis of fear of COVID-19 across 44 articles with a sample size of 52,462

showed the mean of fear of COVID-19 was high around the world (Luo et al., 2021).

Anxiety and Personal Reaction Toward Officially Undertaken Measures and Attitudes to Foreigners

A high level of GAD-7 anxiety in our study was significantly correlated with low levels of personal reaction toward officially undertaken measure (did not believe in officially undertaken measures and think that measures were introduced too late) and attitudes to foreigners (felt more hostile and suspicious reaction to foreigners) in two countries: Russia and Hungary. In the case of the SAI scale this factor significantly predicted anxiety level in five countries – Russia and Hungary, as well as Nigeria, Turkey, and Thailand. More anxious people in all these countries (excluding Nigeria) were those who did not believe in officially undertaken measures and think that measures were introduced too late, as well as those who felt more hostile and suspicious reaction to foreigners. In the case of Russia, this may be interpreted in terms of the high levels of power distance (extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally) found in earlier works (Javidan and Dastmalchian, 2009; Fedenok and Burkova, 2020) on the one hand, and by spatial proximity to China and the common border on the other hand. According to other findings from Brazil, Colombia, Germany, Israel, Norway and US, more worried and stressed people showed less trust in authority, and expressed high pessimism related to governmental ability to control the outbreak (Mækela et al., 2020).

Previous experience with epidemics, as well as current data, suggest that anxiety and fear related to infection may lead to various acts of discrimination (McCauley et al., 2013; Monson, 2017; Chui, 2020; Ren et al., 2020). For example, it is known that people from Wuhan were targeted and blamed for the COVID-19 outbreak by other Chinese people, and the Chinese people in the whole have been stigmatized internationally in media, as the COVID-19 has been entitled as the “China virus”/the “Wuhan virus”/the “New Yellow Peril” (Chui, 2020; Ren et al., 2020). Dating back to 2014, during Ebola outbreak, people of African descent were intensively discriminated outside Africa (Monson, 2017), and during the 2009 H1N1 flu outbreak in the United States the Mexicans and migrant workers were subjected to discrimination (McCauley et al., 2013). Since the spread of COVID-19 in January 2020 the United Kingdom and the United States have seen an increase in reports of violence and hate crimes against people of Asian descent and an overall rise in anti-Chinese sentiments (Usher et al., 2020). Misinformation plays an important role in this discrimination and government and health officials should be aware of this problem, and be able to help protect the vulnerable and endangered groups of population. Perceived mixed and unclear messaging from state authorities can also result in public confusion and fear (Han et al., 2018). Research conducted in Poland and the United Kingdom showed a positive relationship between media exposure in the both countries, and prejudice against four foreign nationalities (Sorokowski et al., 2020). The same is true, with obviously

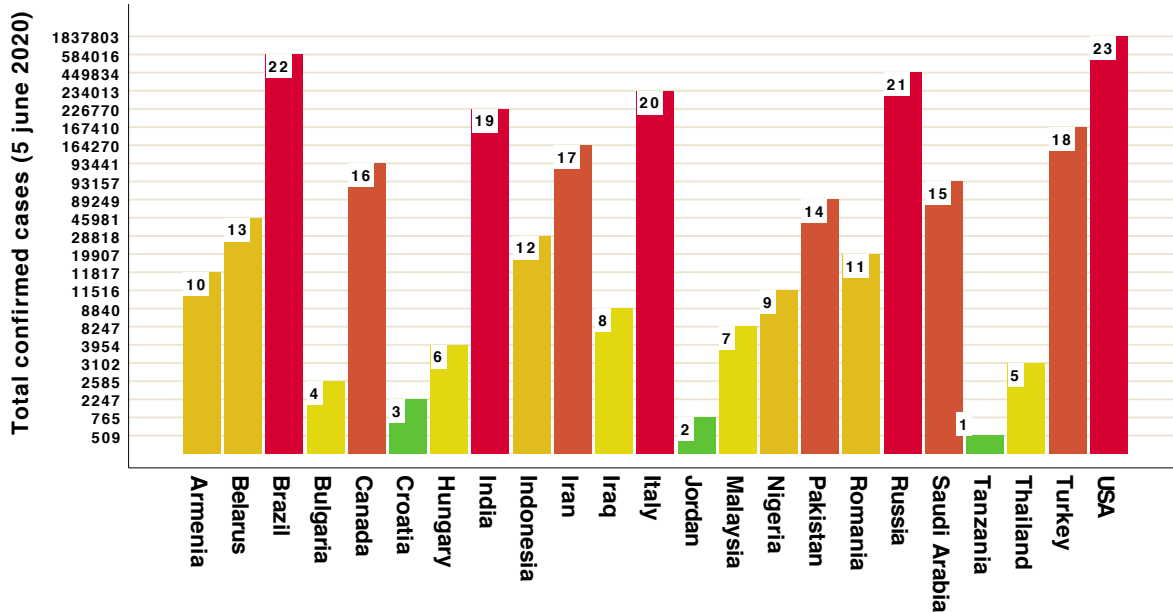


FIGURE 5 | Total confirmed cases of COVID-19 across 23 countries (WHO data).

negative reactions toward Italians in Europe and United States, i.e., the nations struggling with the most severe COVID-19 outbreak at the time of the study (Sorokowski et al., 2020).

Anxiety and Personal Trust in Official Sources

Personal trust in official sources was a significant predictor of GAD-7 in 13 countries from our study, including Belarus, Brazil, Croatia, India, Indonesia, Iran, Jordan, Nigeria, Pakistan, Russia, Saudi Arabia, Turkey, and the United States, and was a predictor of SAI anxiety level in 12 countries, including Belarus, Brazil, Canada, Hungary, India, Indonesia, Nigeria, Pakistan, Russia, Saudi Arabia, Turkey, and the United States. Respondents from these countries who did not trust official sources exhibited higher anxiety scores. Past studies of the 2001 foot and mouth disease and the 2009 swine flu showed that perceptions of government action were associated with judgments of trust (Poortinga et al., 2004; van der Weerd et al., 2011; Dryhurst et al., 2020). A study of social distancing in the context of the coronavirus pandemic conducted among Russian-speaking respondents living or staying in various countries at the time of the outbreak and spread of the coronavirus also demonstrated that individual behavior in the context of the COVID-19 pandemic has been affected by country of residence, trust in authorities, awareness of the prescribed rules of behavior, and cultural norms and traditions (Fedenok and Burkova, 2020). Moreover, these factors affected both the perception of the situation and the implementation of the authorities' recommendations. According to earlier findings, trust and beliefs in the effectiveness of the adopted restrictions contribute to the observance of the recommended preventive measures of behavior (Maddux and Rogers, 1983). It should also

be mentioned, that variations in reactions of political leaders around the world in the time of the COVID-19 outbreak not only affected the country infection rate, but also the rate of public trust in leaders and people's responses to the pandemic (Han et al., 2020; Mækela et al., 2020; Wilson, 2020).

Anxiety and Personal Experience With COVID-19

High levels of anxiety were significantly correlated with personal experience with COVID-19. It was a significant predictor of GAD-7 in 9 countries – Armenia, Canada, India, Indonesia, Malaysia, Russia, Saudi Arabia, Turkey, and the United States; and SAI in seven countries – Armenia, Brazil, Canada, India, Indonesia, Russia, and the United States. People from countries where citizens had been familiar with a new coronavirus or other pandemic infections revealed the higher ratings of anxiety. These findings are generally consistent with the data of another cross-cultural study conducted in the United Kingdom, United States, Australia, Germany, Spain, Italy, Sweden, Mexico, Japan, and South Korea that people with direct personal experience of infection turned to perceive the risk of COVID-19 significantly more seriously (Dryhurst et al., 2020). A study of the impact of COVID-19 experiences and associated stress showed that COVID-19 experiences were consistently associated with higher odds of probable anxiety and depression diagnoses and predicted large proportions of variance ($R^2 \geq 30\%$) in anxiety, depression, and functional impairment, with the worst outcomes associated with a confirmed COVID-19 diagnosis and death of relatives and close friends (Gallagher et al., 2020). Current research has documented elevated symptoms of depression, anxiety, and stress among those who have contracted COVID-19 (Yao et al., 2020).

CONCLUSION

The results presented in this paper revealed the general increase of anxiety during the first wave of the COVID-19 pandemic, as well as cross-cultural variations in the level of anxiety observed. Along with the findings from other scholars (Berta et al., 2020; Brooks et al., 2020; Cao C. et al., 2020; Chen et al., 2020; Kowal et al., 2020; Mækelæ et al., 2020; van Bavel et al., 2020; Rodríguez et al., 2021; etc.), as well as our previous data (Burkova et al., 2021), we conclude, that feelings of anxiety as well as being stressed is a normal reaction of the human psyche in the face of global threat. Age, sex, education, living conditions, having family, economic status, access to internet and mobile communications are among the universal factors potentially affecting personal anxiety during pandemic (Burkova et al., 2021; Butovskaya et al., 2021; Semenova et al., 2021). Individuals reacted differently to a health-threatening condition such as COVID-19, based on their own illness behavior - this concept to describe the different ways in which individuals may perceive, evaluate, and react to certain physical symptoms (Mechanic, 1995; Cosci and Guidi, 2021). Illness behavior represents the result of different interacting variables, including individual, social, and cultural determinants. In our research cross-cultural differences in levels of anxiety, as well as the proportion of citizens being stressed by the pandemic, vary due to a number of factors, including personal comprehension of the danger and understanding of its consequences, trust in the government, hostility to foreigners, information presented by media, and previous experience with pandemics.

The developmental trajectory of the epidemic situation in the countries, investigated during the first wave, provided additional sources of information. Our data from 23 countries showed that such cultural dimensions as individualism/collectivism, power distance and looseness/tightness may function as protective adaptive mechanisms against the development of anxiety disorders in a pandemic situation (Burkova et al., 2021). Countries with high distance to power, strict governmental restrictions and quarantine measures, high availability of medical services, and afterward with access to COVID-19 vaccines and effective state programs for the vaccination of citizens, were generally doing better in terms of the number of infected and deaths per capita. Whether country-level anxiety has been fluctuating in accordance with positive or negative changes in this respect remains to be tested in the future. This study provides interesting findings that may help to plan tailored interventions aimed to reduce anxiety related to COVID-19, considering cultural differences. The varying psychological responses observed during the COVID-19 pandemic can be effectively subsumed under the conceptual framework of illness behavior. It may substantially impact on the use of healthcare services, treatment adherence, and self-management behaviors.

Limitation

Limitations of the current study include the disproportionate representation of women to men. Additionally, it is important to acknowledge that while the overall sample included over

15,000 participants, the representation in some countries (i.e., Armenia, Iraq) was quite low, which limits our ability to examine within-country differences. In addition, the magnitude of changes in anxiety and depression symptoms will vary under political and cultural situation in each country (for example, in this study, the level of anxiety in Iraq was very high, and this was a consequence not only of COVID-19, but also of a difficult political situation in the country). Differences in the roles of men and women across cultures have not been accounted in frame of this study, but future research needs to further explore these relationships to better understand gender differences in pandemic responses. Another consideration is that participation in this study was limited to those with a stable internet connection (to complete the questionnaire), which precluded participation from those without this access. We did not measure countries' policies relating to COVID-19 and mortality rates, which may also be an important predictor of anxiety increase. Because the situation with COVID-19 is rapidly changing, we anticipate that some of the things we will consider may seem plausible today but might not be relevant tomorrow.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Scientific Council of the Institute of Ethnology and Anthropology of the Russian Academy of Sciences. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MB and VB: conceptualization, data analysis, writing-original draft preparation, visualization, and project administration. MB, VB, and AR: methodology. VB: data curation. All authors contributed to the data collections, resources, read and agreed to the published version of the manuscript.

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Mental Health and Social Connectedness During the COVID-19 Pandemic: An Analysis of Sports and E-Sports Players

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Recently, the pandemic context in which the world finds itself has inspired studies that sought to evaluate to mental health and the way people are relating to the purpose of understanding and promoting improvements psychological health. The epidemiological and public health literature shows that social connection protects and promotes mental health, being an important clinical tool for reducing anxiety, depression, and stress. Thinking in the broad sense of connection, that is, feeling and perceiving oneself connected with the environment, applied to the context of sport, it is suggested that social connection could be related to the interactions in the practice of sport. Although playing sports can promote mental health, there are few findings on the topic in the context of a pandemic and with physical sports and electronic sports (e-sports) players. In this sense, the present study aims to assess the extent to which social connection and mental health indicators are correlated in a sample of sports and e-sports players. The participants were 401 Brazilian physical sports ($N = 199$, 49.6%) and e-sports players ($N = 202$, 50.4%), mostly male (53.1%) and single (59.9%), who filled in the Social Connectedness Scale (SCS), the Depression, Anxiety and Stress Scale (DASS), and demographic questions. The results indicated that social connection was negatively correlated and also predict the anxiety ($r = -0.37$), depression ($r = -0.54$), and stress ($r = -0.39$). When comparing sports and e-sports players, a statistically significant difference was identified in the levels of social connection [$t(398) = -3.41$; sports_{mean} (SD) = 4.53 (1.14); e-sports_{mean} (SD) = 4.14 (1.15)] and depression [$t(396) = 2.90$; sports_{mean} (SD) = 1.10 (0.89); e-sports_{mean} (SD) = 0.85 (0.81)]. These findings can serve as a theoretical basis for the development of intervention programs (e.g., to guide managers regarding the social distancing rules that enable them to keep holding sports practices and events) and promoting discussions that focus on the analysis of aspects promoting psychological health in sports context (physical and e-sports).

Keywords: mental health, social connectivity, sports, e-sport, wellbeing

INTRODUCTION

Throughout history, humankind has lived with pandemic situations of different proportions (e.g., black plague, Ebola, and severe acute respiratory syndrome), and in all cases, impacted in physical and psychological health were identified (Qiu et al., 2017). In March 2020, coronavirus disease 2019 (COVID-19) was declared a global pandemic by the World Health Organization (World Health Organization [WHO], 2021), and due to its high degree of infection and the fact that the virus has spread rapidly, safety measures from hygiene guidelines (e.g., use of masks and alcohol gel) to the implementation of social distancing and isolation measures were mandated.

In Brazil, different sanitary measures have been implemented (e.g., use of masks, alcohol gels, and social distancing), causing the work, educational, and inter-relational routine experienced by the population to be altered (Asmundson and Taylor, 2020), including engaging in sport due to the closure of gyms, sports centers, and public areas (Schinke et al., 2020). This aspect deserves more attention, as playing sports is considered an efficient mechanism for coping with stressful situations and promoting mental health (Tenenbaum and Eklund, 2020).

When observing the number of studies that assess aspects of mental health in the general population and in the sports context, it is observed that there is a lower prevalence of studies with a sample of sports practitioners. However, there has been an expansion of studies with sports practitioners in recent decades (Zoë et al., 2021), with findings indicating that this group is as susceptible to mental health problems as the general public (Gorczynski et al., 2017; Moesch et al., 2018). Studies in this area are fundamental, since for a long time the discussions about mental health in this group were stigmatized and those affected themselves resisted exposing the theme. Something they see changing today (Hong and Rao, 2020).

The same pattern of research that mostly considers the general population was observed in the current pandemic context, highlighting the efforts of researchers, newspapers, and scientific associations that called for studies aimed at the subset of the populace who are athletes. An example is one publication of the Association for Applied Sport Psychology (AASP), which expressed recommendations on the maintenance of mental health for athletes and practitioners of sports in this pandemic period (Byrd et al., 2020).

In this sense, recent studies have sought to fill the gap in the knowledge about the mental health status of sports practitioners and athletes during situations of pandemic and social isolation (e.g., Pillay et al., 2020; Sokić et al., 2021; Uroh and Adewunmi, 2021). Uroh and Adewunmi (2021) evaluated the psychological impact of COVID-19 social isolation measures in athletes who could not perform their activities at the time of total blockade in Nigeria. They found that individual-sport athletes experienced more psychological distress than those who played team sports. Sokić et al. (2021) explored the effects of physical activity and training routine on mental health during the COVID-19 pandemic, comparing elite vs. recreational athletes and the training routine adopted in the pandemic (inactivity, 14.7%; reduced training, 74%; and no change in the training routine, 11.3%) in a Serb sample. The results showed that elite athletes

who trained less showed less anxiety than recreational athletes who also reduced training or maintained routines, suggesting that the reduction or pause in physical activities negatively impacted the mental health of the participants.

Thus, although it is important to differentiate the effects of the pandemic between different groups of athletes (Şenışık et al., 2021), athletes of different modalities (Pillay et al., 2020), and athletes with different routines (Sokić et al., 2021), it is also necessary to consider formats beyond the traditionally physical sport, such as electronic sport (e-sport). E-sport is defined as a form of sport in which the primary aspects of its practice are facilitated by electronic means, with the players, teams, and the game system mediated by a computerized interface (Hamari and Sjöblom, 2017).

The pandemic has become a propitious moment for the expansion of e-sports practice (Tudor, 2020), whose definition is not yet consolidated and involves nomenclature challenges, which often misuse the term “e-sport” (Goedert and Soares, 2020). However, scientific interest in understanding this sport in greater detail is already evident, with researchers dedicated to identifying psychosocial factors that are related to this practice (Seo and Jung, 2016).

In-depth research on the sports environment makes it possible to identify studies that seek to understand how sports activity, both physical and electronic, can be directly linked to the mental health of its players (Tang and Fox, 2016; Pluhar et al., 2019). Previous studies before the pandemic have pointed to the importance of linking physical and mental health in the practice of physical and electronic sports (Weinberg and Gould, 2017; Rudolf et al., 2020). Another important aspect related to the protection and promotion of mental health is social connection, which refers to connecting socially, be it as a group or as a person, or even as the ability to connect *per se* (Townsend and McWhirter, 2005).

In the pandemic context, studies have sought to relate aspects of social connection with psychological health, wellbeing, loneliness, and stress (Hunsaker et al., 2020; Nitschke et al., 2020; Sun et al., 2020; Wu et al., 2021). Researchers in Italy conducted an investigation on the impacts of COVID-19 on the population of the country during the lockdown period (Marotta et al., 2020), demonstrating the relevance of measuring the construct to obtain global health indicators at specific times, such as a global pandemic.

Physical and E-Sport

When searching for the first records of any sports activity in the history of mankind, it is noted that the performance of a physical activity has always been present in human existence, but it was only in Greece that the first record of an activity focussed on competition and not only survival. The creation of the Olympic Games was the main milestone in terms of sport, and they were very close to the current vision, as they were governed by pre-established rules, relied on spectators watching, and, especially, the athletes prepared by warming up, eating a certain diet, and weight training (Tenenbaum and Eklund, 2020).

The conditions of most modern sports were established in the nineteenth century in England, bringing a standardization of pastimes with regulation and adaptation for a competition to

be practiced, with modalities that emphasized different motor skills put to the test through various types of movement. Over time, other practices began to be encompassed as sports, without necessarily showing interest purely in visible bodily attributes. One example is chess, in strategizing, quick thinking, and reaction are important, traits common to other physical modalities but without requiring physical strength itself (Bottenburg, 2016).

The consideration of non-physical attributes in athletes brings to light a new concept of sport that involves the perception that there are ways to engage in a sporting activity in a completely virtual environment while maintaining certain attributes of physical sport (Kane and Spradley, 2017; Gostlin, 2021). Such competitions, called e-sports, uses electronic means, with players, teams, and the game system mediated by a computerized interface (Jonasson and Thiborg, 2010; Hamari and Sjöblom, 2017).

Research involving the topic of e-sports ends up being erroneously allocated to the online games category, since the latter encompasses a diversity of concepts that are not configured as sports. The definition of e-sport brings with it the same classic premise used to describe physical sports, as mentioned above: in short, the idea that players need to perform a competitive activity based on their skills and pre-established rules (Seo and Jung, 2016; Kane and Spradley, 2017).

Social Connection and Mental Health

Social connection is a term widely used in the psychological field that is related both to the idea of connecting to a specific group or person and to the generalized ability to connect (Townsend and McWhirter, 2005; Malone et al., 2012; Stanley et al., 2019). It is related to the subjective recognition of being in a close relationship with people in the social world (Wu et al., 2021). The sense of connection, in general, directs an individual's feelings as well as their thoughts and behaviors in social situations (Lee and Robbins, 1998, 2000).

Lee and Robbins (1995) consider that social connection is related to an individual's self-opinion in relation to other people, focussing on the perceived emotional distance between themselves and friends or society. Studies point to the need to broaden the understanding of self-perception about their levels of social connection due to its important relationship with psychological health indicators, such as anxiety, depression, and stress (Williams and Galliher, 2006; Wu et al., 2021), as well as with health factors in general (Townsend and McWhirter, 2005).

According to the WHO, the presence of a social support network is a determinant of public health (Holt-Lunstad et al., 2017). Being socially connected is important to maintaining good mental health, reducing the risk of having higher anxiety, stress, and depression scores in the general population (Santini et al., 2020). Empirical evidence highlighting this relationship was observed in a longitudinal study of 21,227 New Zealanders that indicated that social connection was a stronger and more consistent predictor of mental health than the ability of mental health to predict social connection (Saeri et al., 2018).

Conversely, in the pandemic context, studies have aimed to relate social connection with mental health and its impact on the lockdown period (Marotta et al., 2020; He et al., 2021), since social

isolation, especially if prolonged, can increase the risk of mental disorders (Sani et al., 2020) and increase the rates of stressors (73.4%) and depression (50.7%) and anxiety symptoms (44.7%) (Liu et al., 2020).

He et al. (2021) demonstrated that increased social connection led to an improvement in mental health indicators during COVID-19, both in the general population and among health professionals who had their mental health impacted, especially in their exposure to anxiety, depression, and lack of sleep (Cantarero et al., 2021; He et al., 2021). Wu et al. (2021) expanded these findings, highlighting that social connections with family and friends and their indirect effects on wellbeing were more potent than the effects of colleagues and neighbors, reinforcing the evidence of the relevance of social connections for wellbeing during the pandemic.

The Present Study

In the sports context, before the pandemic, studies had evaluated the influence of sport on mental health, with the results considering the difference between different sports (Sheehan et al., 2018; Pluhar et al., 2019). Thus, they related the practice of physical activities and social connection as important variables for understanding mental health (Lamblin et al., 2017) and identified better mental health indicators in team-sport players than in individual-sport players (Doré et al., 2016; Lamblin et al., 2017). The COVID-19 pandemic also led to studies that evaluated its impact on the practice of physical activities, mental health, and social connection (Shepherd et al., 2021), with findings highlighting that in the first months of COVID-19, team-sport athletes reported more anxious and depressive symptoms than individual-sport athletes, probably because social isolation is felt more by team-sport players (McGuine et al., 2021).

As a reflection of the pandemic context, there are consistent changes in the way people related and performed activities, especially with regard to the adaptation and incorporation of new sports practices, such as e-sports. According to Kim et al. (2020), e-sport paved the way for the sports industry as a practice that involves physical and mental skills similar to other sports but practiced in a way (computer interface) that minimizes the need for physical contact and becomes a good option in a moment like the current one.

Given the above, and since the time of the pandemic generated a demand to expand the attention given to the relationship between social factors and mental health, both in the general population and in the sports context (Harandi et al., 2017), the present study aimed to evaluate the relationship between social connection and psychological health indicators in a sample of physical and electronic sport practitioners.

MATERIALS AND METHODS

Participants and Procedure

The participants were 401 Brazilian physical sport ($N = 199$, 49.6%) and e-sport players ($N = 202$, 50.4%) who practice the sport for at least 30 min a day (physical sport—36.4%; electronic sport—43.1%) with an average age of 23 years (ranging from 18 to 57 years; $SD = 5.14$), the majority of

whom were men (53.1%) and single (59.9%) without missing data. A non-probabilistic convenience sample was enrolled. To gather data, we advertised the survey link on social media (e.g., WhatsApp, Instagram, Facebook) social networks aimed at sports practitioners (e.g., university athletic groups and electronic sports players) between August and September 2020 using the snowball sampling method (Dusek et al., 2015). The primary survey screen presented information about the purpose of the survey and the voluntary and anonymous nature of its participation. As an inclusion criterion, we only considered physical and e-sport players from Brazil.

Materials

Participants answered a set of questions about themselves (sex, age, marital status, how important is sport in your life? do you practice physical sports, electronic sports or both? on average, how much time do you dedicate to your sports practice?) and filled in the following surveys:

Social Connectedness Scale

This measure was originally developed by Lee and Robbins (1995) to assess the degree of interpersonal closeness experienced by individuals in different spheres (e.g., friends and society), consisting of eight items (e.g., “I feel distant from people”), answered on a six-point scale ranging from 1 (strongly agree) to 6 (strongly disagree). The original study identified adequate indicators of internal consistency ($\alpha = 0.91$) and test-retest consistency over a 2-week interval ($r = 0.96$). In this study, Cronbach's alpha and the omega score were satisfactory ($\alpha = \omega = 0.88$).

Depression, Anxiety and Stress Scale—Short Form (DASS-21; Lovibond and Lovibond, 1995): The scale validated in the Brazilian context (Vignola and Tucci, 2014) consists of 21 items, answered on a four-point scale ranging from 0 (does not apply to me) to 3 (applies a lot to me or most of the time). In this study, satisfactory precision indicators were identified for the factors of depression ($\alpha = \omega = 0.91$), stress ($\alpha = 0.85$; $\omega = 0.87$), and anxiety ($\alpha = 0.79$; $\omega = 0.81$).

Data Analysis

For data analysis, we used PASW software (version 24). Pearson's correlation coefficient (r) was calculated to estimate the direction and strength of the correlations between social connectedness, depression, anxiety and stress. To assess whether the correlations between the scales were significantly different between the groups of physical and electronic sports practitioners, z -tests were performed using the online calculator by Lenhard and Lenhard (2014). Student's t -test was performed to assess player (physical and electronic) differences. Finally, we used three simple regressions to identify the predictive power of social connections on mental health (depression, stress and anxiety).

RESULTS

Initially, we calculated the descriptive statistics to characterize the variables of our sample. As seen in **Table 1**, with regard to mental

health indicators, the participants showed high scores for anxiety ($M = 1.32$; $SD = 0.79$), followed by stress ($M = 0.83$; $SD = 0.70$), and depression ($M = 0.98$; $SD = 0.86$).

When comparing physical and e-sports players, a statistically significant difference was identified in the levels of social connection [$t(398) = -3.41$, $p < 0.001$] and depression [$t(396) = 2.90$, $p < 0.05$], the physical sport players showing higher scores of social connection ($M = 4.53$; $SD = 1.14$) than the e-sports practitioners ($M = 4.14$; $SD = 1.15$) and the e-sports practitioners having higher levels of depression ($M = 1.10$; $SD = 0.89$) than the physical sport players ($M = 0.85$; $SD = 0.81$). A statistically significant difference was observed between the groups (physical and electronic sports) and the variables sex [$\chi^2(1) = 28.56$, $p < 0.001$] and age [$t(399) = -3.99$, $p < 0.001$] and there is no difference with the marital status variable [$\chi^2(4) = 8.29$, $p = 0.081$].

Pearson's r was calculated to determine to what extent and direction the social connection would correlate with the mental health factors (**Table 2**). Social connection correlated negatively with depression ($r = -0.54$, $p < 0.001$), stress ($r = -0.39$, $p < 0.001$), and anxiety ($r = -0.37$, $p < 0.001$). There was no significant difference between physical and e-sports players in the strength of the correlation between social connection and depression ($z = -1.108$, $p = 0.134$), stress ($z = -1.298$, $p = 0.097$), or anxiety ($z = -0.584$, $p = 0.28$) (Lenhard and Lenhard, 2014).

Next, we tested the extent to which mental health factors were predicted by social connection (**Table 3**). For this, three simple regression analysis considered social connection as a predictor were performed of the mental health symptoms (depression, stress, and anxiety) in total sample (Hair et al., 2015).

Social connection, that is, the degree of interpersonal closeness reported by the individuals, was a negative predictor of depression ($\beta = -0.54$, $p < 0.001$), stress ($\beta = -0.39$, $p < 0.001$), and anxiety ($\beta = -0.37$, $p < 0.001$).

DISCUSSION

This study aimed to evaluate the relationship between social connection and mental health indicators in a sample of physical and e-sport practitioners. In addition, the presence of differences between the modalities (physical and electronic) and the predictive role of social connection with mental health indicators (depression, stress, and anxiety) was evaluated.

Implications of Study

Our study has three main findings. First, statistically significant relationships were identified between the social connection and the mental health-describing factors, both in the total sample and by group (physical and e-sport). Second, when evaluating the difference between the modalities, a significant result was observed only in the scores of social connection and depression. Finally, social connection was a predictor of depression, anxiety, and stress levels in the total sample. Given the above, we believe that the general objective of this research has been achieved.

When we compared physical and e-sport players in the three mental health dimensions depression, anxiety, and stress,

TABLE 1 | Descriptive analyses of social connection and mental health.

	Total (<i>N</i> = 401)		Physical (<i>N</i> = 199)		Electronic (<i>N</i> = 202)	
	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%
Female	188	46.9	120	60.3	68	33.7
Male	213	53.1	79	39.7	134	66.3
Single	240	59.9	127	63.8	113	55.9
In a relationship	122	30.4	49	24.6	73	36.1
Married	36	9.0	22	11.1	14	6.9
Divorced	2	0.5	1	0.5	1	0.5
Other	1	0.5	0	0.0	1	0.5
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	23.4	5.14	24.50	6.35	22.49	3.31
Social connection	4.33	1.16	4.53	1.14	4.14	1.15
Mental health						
Depression	0.98	0.86	0.85	0.81	1.10	0.89
Stress	0.83	0.70	0.86	0.70	0.80	0.70
Anxiety	1.32	0.79	1.30	0.79	1.34	0.79

M, mean; *SD*, standard deviation; *N*, sample size.

a statistically significant difference was observed only in the depression scores, the players of e-sports presenting higher depressive levels than the physical sports athletes. Thus, although physical sport has been linked to both the increase in depressive symptoms and their reduction (Reardon, 2017; Kim et al., 2020), it is important to envision this relationship in e-sports, which consists of a broadly expanding modality (Gostlin, 2021) and has advantages and disadvantages (Rasdi and Rusli, 2021). For

example, digital games have been used as an intervention against depressive symptoms (Li et al., 2014) and can help reduce depression and loneliness in children (Przybylski et al., 2012). Thus, it may be that e-sport can be useful to improve the mental health of practitioners both in a normal-health context and in situations of isolation such as a pandemic that are conducive to the development of feelings of loneliness.

Regarding social connection, the findings of this study point to different ways for practitioners of the two modalities to prioritize the search for connection with other people in the group or with the environment itself (Lee et al., 2008). Practitioners of physical sport perceive themselves as more socially connected than e-sports players. The results are in line with other studies, corroborating the relevance of sport as an important tool for the promotion of psychological health, reducing levels of depression, anxiety, and stress (Townsend and McWhirter, 2005; Williams and Galliher, 2006). It should be noted that both groups' scores were higher than the empirical median of the measure used (Lee and Robbins, 1995), suggesting that the two sports may favor the feeling of social connection and may boost mental health at a time when sports practitioners suffer from changes in their routines and are more exposed to situations conducive to depressive, stressful, and anxious states (Liu et al., 2020; McGuine et al., 2021; Shepherd et al., 2021).

Our results also highlight the relationship between social connection and mental health indicators (depression, anxiety, and stress), a negative relationship being observed, i.e., stronger perceptions of social connection were correlated with lower scores of depression, anxiety, and stress. These relationships were identified both when considering the total sample and when evaluating the modalities separately, highlighting the fact that the correlation indicators (Pearson's *r* values) did not differ statistically between the groups. For this reason, a regression analysis was performed, which showed evidence of the predictive

TABLE 2 | Correlations between social connection and mental health.

Construct	Social connection		
	Total (<i>N</i> = 401)	Physical (<i>N</i> = 199)	Electronic (<i>N</i> = 202)
Depression	−0.54*	−0.57*	−0.49*
Stress	−0.39*	−0.45*	−0.34*
Anxiety	−0.37*	−0.41*	−0.36*

**p* < 0.001 (two-tailed test); mental health is represented by the variables depression, stress, and anxiety.

TABLE 3 | Simple linear regression for mental health indicators (social connection as predictor).

	<i>R</i>	<i>R</i> ² Adjusted	<i>F</i>	<i>B</i> (SE)	<i>Beta</i>	<i>t</i>
Depression	0.54	0.29	<i>F</i> (399) = 163.67	−0.40 (0.03)	−0.54	−12.79*
Stress	0.39	0.15	<i>F</i> (399) = 71.99	−0.27 (0.03)	−0.39	−8.48*
Anxiety	0.37	0.14	<i>F</i> (399) = 63.96	−0.22 (0.03)	−0.37	−7.99*

**p* < 0.001. Three simple regression analyzes were performed, one for each mental health factor.

role of the social connection on the mental health of sports practitioners, both physical and electronic.

As expected, the results were in line with previous studies that highlighted the importance of promoting the social connection between practitioners of sport (Doré et al., 2016; Lamblin et al., 2017). However, little is known about this relationship when comparing physical and e-sports, since previous studies focussed more on differentiating individual and team sports (Doré et al., 2016).

Although previous studies have reported the relationship and predictive capacity of social connection with mental health indicators in the general population or with players of eminently physical sports (Saeri et al., 2018; Groarke et al., 2020; Nitschke et al., 2020), our results show that even when including computer-mediated sports in the context of COVID-19, social connection remains a relevant variable that can reduce negative psychological symptoms such as depression, stress, and anxiety. The view of social connection as a promoter of psychological health among players of both more traditional sports (physical) and a group of players who are increasingly recognized by society in general as practitioners of various forms of e-sport is broadened here.

Limitations and Final Considerations

Despite the promising results, as with all scientific endeavors, some limitations mar this study. The first is the time when the data were collected. Restrictive measures had already been implemented due to the pandemic (e.g., social isolation and lockdown), so we could not present baseline data before the pandemic, limiting our ability to compare the levels of social connection during and before the restriction measures. In addition, due to the type of survey (online and anonymous), it was not possible to control the presence of multiple responses (despite the disclosure requesting participation only once).

A second limitation comes from the use of self-report measures. This factor could have biased the responses, since the responses given may have diverged from the true reflection of the levels of social connection, anxiety, stress, and depression. Neither physiological nor neuropsychological measures were used to corroborate the self-reported findings. Furthermore, another potential limitation convenience nature of our sample, composed by those individuals that voluntarily decided to take part in the study, which may limit the generalization of the findings. Finally, and probably the most important limitation of this study, was the cross-sectional design. We can conclude that social connection was correlated with the anxiety, stress, and depression scores, and the perception of social connection was correlated with the three mental health indicators, but these results do not imply any causal links, given the cross-sectional nature of the data.

Nevertheless, the results expand the previous observations from the literature, such as the relevance of social connections to the mental health of sports practitioners (Doré et al., 2016; Pluhar et al., 2019; McGuine et al., 2021), adding evidence about the relevance of the variables in a group of e-sports players. In addition, our findings warrant future studies in larger samples (for example, increasing the number of participants, contemplating individual and team sports in both groups,

and considering elite practitioners and professionals) and studies of a longitudinal design to allow us to evaluate the evolution of the predictive role of social connection during and after the pandemic.

Although the empirical and relational character of this study and the social distancing measures used to control the COVID-19 pandemic have influenced the reduction in the social connection and practice of sport, our findings can serve as a theoretical basis for the development of intervention programs that aim, for example, to guide managers regarding the social distancing rules that enable them to keep holding sports practices and events and the maintenance of the social connection between practitioners of all modalities in pandemic situations. In addition to promoting discussions that focus on the analysis of aspects promoting psychological health not only in the practice of physical sports but also in the practice of e-sports, a modality that also promotes lower stress, depression, and negative thoughts (Kowert and Quandt, 2020) is a constant in scenarios of isolation like those required for the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Comitê de Ética em Pesquisa com Seres Humanos—Universidade Federal do Mato Grosso do Sul (CAAE: 26564719.2.0000.0021). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AS and MG: conceptualization, study design, data analysis, and wrote the original draft. MG and AV: critical revision. AS: funding acquisition. All authors contributed to the article and approved the submitted version.

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