



# Distance Learning and School-Related Stress Among Belgian Adolescents During the COVID-19 Pandemic

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To improve our understanding of the mental health consequences of the shift to distance learning during the COVID-19 pandemic, this study examined which factors are associated with increased school-related stress in adolescents. The sample consists of 16,093 adolescents, aged 12 to 18, who were enrolled in secondary education in Flanders, Belgium in May 2020. Stepwise binomial logistic regressions were used to investigate associations between the (online) learning environment, family-, and peer-related factors and increased stress in adolescents, controlling for sociodemographic characteristics. Results show that overcrowding, financial difficulties, and domestic violence are risk factors for increased stress, while social support and no material deprivation are protective factors. These findings suggest that, in addition to distributing the necessary materials for distance learning, also social policy efforts are required to compensate for the negative effects of distance learning. Without this, distance learning may fail to deliver equal educational opportunities and outcomes.

**Keywords:** COVID-19, pandemic, remote teaching, adolescents, distance learning, stress

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## 1 INTRODUCTION

The rapid spread of the COVID-19 pandemic from March 2020 onward turned homes around the world into classrooms in a couple of weeks, if not days (Bayrakdar and Guveli, 2020). As a reaction to the rapid spread of the virus, many countries closed schools nationwide, others implemented regional or local closures. As a result, the learning environment of 80% of the children and adolescents worldwide radically changed, with many schools forced to prepare and develop remote teaching overnight (Bol, 2020; Van Lancker and Parolin, 2020).

Aside from the educational benefits, schools provide structure and stability in young people's lives, develop talents and abilities, and stimulate social skills through interactions with peers and teachers (Alexander et al., 2001; Breen, 2004; Hout & DiPrete, 2006; Bayrakdar & Guveli, 2020). The rapid shift to remote teaching and distance learning is expected to have had a significant impact on learning outcomes of children and adolescents, widening existing inequalities with potentially long-lasting impacts on education and labor market outcomes. Burgess and Sievertsen (2020) estimate that closing schools for 60 days (12 weeks) would result in a significant decrease in test scores. In this regard, Maldonado and De Witte (2020) documented that Flemish (the northern, Dutch-speaking region of Belgium) adolescents who were in the final year of primary education during the COVID-19 school closures experienced significant learning losses, with a decrease in school averages of mathematics scores of 0.19 standard deviations and of Dutch scores of 0.29 standard deviations,

when compared to earlier cohorts. This is equivalent to losing half a year of learning. These findings hold when accounting for school characteristics and test results in earlier grades (Maldonado and De Witte, 2020).

The rapid closure of schools and the uncertainty regarding the return, the adoption and application of distance learning and remote teaching, and the crisis in society at large, had an adverse effect on the mental health of children and adolescents (Bozkurt et al., 2020; Ghosh et al., 2020; Guessoum et al., 2020; Lee, 2020). In a review of data of children's learning experiences during the COVID-19 pandemic, Di Pietro et al. (2020) point to heightened feelings of anxiety and stress in particular. Studies of students in secondary and tertiary education show that many reported increased stress due to insecurities about academic evaluations, potential study delays, and precarious home situations (Bozkurt et al., 2020; Crabbendam and Goes, 2020; Di Pietro et al., 2020; Xie et al., 2020). Also, earlier studies show that increased school-related stress among adolescents—both in regular times and in periods of quarantine during previous pandemics—is associated with decreased academic performances in the short term (Arsenio & Loria, 2014; Di Pietro et al., 2020). Kaplan, Liu, and Kaplan (2005) showed that this type of stress also has a significant scarring effect in the long term: it negatively affects academic performances of adolescents for up to 3 years.

While there is a large body of research on the psychosocial outcomes of large-scale disease outbreaks (e.g. SARS, Ebola, H1N1) and subsequent quarantine measures (Brooks et al., 2020), there are still important gaps in this literature. First, these studies are often conducted in the U.S. and in African and Asian countries, as many of these diseases were discovered and contained in these regions. Much less is known about the psychosocial outcomes among European populations, where such far-reaching quarantine measures have only rarely been deployed on a large scale (Brooks et al., 2020). Second, Lee (2020) identifies a lack of studies on the mental health effects of quarantine measures on children and adolescents, citing a “need to monitor young people's mental health status over the long term, and to study how prolonged school closures, strict social distancing measures, and the pandemic itself affect the wellbeing of children and adolescents” (Lee, 2020, p. 421). Particularly for adolescents, the current pandemic presents particular challenges as they are confined to their homes, forced to learn in sometimes precarious socioeconomic and/or family conditions, and away from their friends and peers.

Both the World Health Organization (WHO) (2020) and the American Psychological Association (APA) (2019) identify several key factors associated with stress among adolescents: the learning environment, the family or home environment, and peer contacts. As for the learning environment, which is considered to be the greatest source of stress (World Health Organization, 2020), distance learning requires specific resources (e.g., computer, reliable internet access, physical spaces suited for learning) that not all adolescents have access to, whether because of a lack of such resources at home, or having to share them with siblings (Solari and Mare, 2012; Bol, 2020; Brown et al., 2020). In such cases, school-related stress may increase because adolescents cannot

keep up with their schoolwork. Furthermore, some parents may lack the cognitive and/or non-cognitive skills to assist their children with their schoolwork (Di Pietro et al., 2020), particularly among disadvantaged families. They may have factual knowledge about a certain subject but lack the procedural knowledge that is necessary for teaching and learning (Cooper, 2005). Another disadvantage suffered by adolescents from families in precarious socioeconomic conditions is that their parents may not be able to provide sufficient support to their children to study while at home, thereby reinforcing often already existing societal inequalities (Nash, 2003).

With regards to family-related factors, reports in several countries show that there was an increase in the incidences of domestic violence during lockdowns (Bradbury-Jones and Isham, 2020; Guessoum et al., 2020; Kofman and Garfin, 2020). This often has roots in psychological and economic stressors, both of which were more pronounced during the lockdown period (Brown et al., 2020). Specifically in terms of economic insecurities, many people were either forced to work from home or to not work at all, sometimes leading to significant long-term losses in household income—particularly among families already in precarious socioeconomic positions (Blundell et al., 2020; Brooks et al., 2020). Specific characteristics of the living environment also affect stress in adolescents. Since entire families were confined to their home for long periods, adolescents in families whose residences are smaller or whose families are larger, likely had little to no room where they could be alone and relax, or work for school. The lack of such a space has been known to increase stress (Brooks et al., 2020).

Adolescence is an important developmental period in the life course in which there is a heightened motivation for peer affiliation. Peers provide an important context for social and emotional support—although they can also be a source of stress (American Psychological Association, 2019)—, but in-person interactions are largely absent during times of physical isolation (Ellis et al., 2020). Distancing yourself from someone to whom you are emotionally attached, like peers, is a psychological stressor (Ammar et al., 2020). Therefore, it is important to remain connected in order to maintain an acceptable level of life satisfaction. As Ammar et al. (2020) showed, social participation through contact with friends is negatively affected by home confinement, revealing the importance of staying in touch (even while respecting the physical distancing measures) to keep an acceptable level of life satisfaction. Recent studies have found that maintaining digital social connections with peers is important for mental health outcomes during home confinement (Pancani et al., 2020). In their study on adolescent stress during the COVID-19 pandemic, Ellis et al. (2020) surprisingly found that more time connecting with friends digitally was associated with greater depression. The authors theorize that, during these stressful and confusing times, online conversations among adolescents may ruminate on negative feelings and excessive discussions of problems, thereby unintentionally escalating stress among adolescents (Ellis et al., 2020).

## 1.1 The Current Study

As a second wave of the pandemic affected much of Europe and North America in the fall of 2020, policy makers were initially reticent to avoid new school closures, recognizing the adverse impact on many adolescents and families. However, as infection rates rapidly increased and in some countries even surpassed those from the first wave, many countries saw no alternative but to close schools again, at least partially. Public health experts agree that subsequent waves are also possible (Smit et al., 2020), which implies that distance learning will likely play an important part of the learning experience of many adolescents worldwide in the months and years to come. In such a context, it is of utmost importance to better understand the determinants of stress in times of remote teaching. This is necessary to ensure that learning can continue as much as possible for all children and will help to avoid disparities in learning losses to materialize (with longer-term consequences in terms of higher education attainment, labor market positions and poverty).

It is still largely unknown which factors are associated with adolescents' school-related stress during home confinement due to the COVID-19 pandemic. Set in Belgium, this study aims to 1) understand how levels of self-reported stress differ between adolescents based on key sociodemographic characteristics like age, gender, and educational type, and 2) investigate the extent to which the (online) learning environment-, family-, and peer-related factors are associated with this increased stress. First, following Di Pietro et al. (2020), we hypothesize that a disruptive (online) learning environment (either through a lack of material or social support) will be associated with higher stress levels. Second, we expect that negative family living conditions (e.g. due to economic concerns or domestic violence) will be associated with higher stress levels (Brooks et al., 2020). Finally, we predict a dual role of peer contacts. In-person peer contacts are expected to be associated with lower stress levels (Ammar et al., 2020) while digital peer contacts are expected to be associated with higher stress levels (Ellis et al., 2020).

## 2 METHODS

### 2.1 Procedure

Data were collected by the Flemish Office of the Children's Rights Commissioner and the Children's Rights Knowledge Centre, who fielded a web survey from 11 May 2020 to 17 May 2020 in Flanders, Belgium. The survey was open to all Flemish adolescents and children and was widely promoted on social and traditional media in Flanders, resulting in a large dataset of children and adolescents ( $N = 44,030$ ). These data were then made freely available to invite further investigation by scholars and policy makers on how Flemish children and adolescents coped with the lockdown measures (Kinderrechtencommissariaat et al., 2020)<sup>1</sup>. In Flanders, the National Security Council closed all schools in primary and

secondary education on 16 March 2020. In the 9 weeks afterwards, remote teaching took place, but teachers were only allowed to repeat and practice previously taught materials. Organizing this teaching was the responsibility of schools and families, and the implementation and practice therefore likely differed across schools and between families (Maldonado and De Witte, 2020). From May 18 onwards, a limited number of Flemish schools reopened their doors, but most pupils remained at home until June 1.

### 2.2 Measures

The (online) learning environment was measured via six items, preceded by the statement "Classes don't go on like usual, but you still have schoolwork. How do you feel about that? If you agree, then indicate 'yes'. If you don't agree, indicate 'no'." To assess whether pupils now experienced more stress due to their schoolwork—the main dependent variable in this study—, this item was used: "I now have more stress due to my schoolwork (I feel uneasy or nervous)," with answer options of 1 = yes, 2 = no. The item was recoded so that 0 = no, 1 = yes. From this block of items, we also included three independent variables that were related to the online learning environment: "There's someone who can help me with my schoolwork" (social support), "It is too busy at home to work for school" (overcrowding), and "I have all the necessary materials I need to be able to work for school (internet connection, laptop or pc that I can use for schoolwork . . .)" (material deprivation). Again, answers were recoded so that 0 = no, 1 = yes.

#### 2.2.1 Family-related indicators

In order to assess whether adolescents were living in precarious home situations, we used three items about financial difficulties, violence at home, or a lack of personal space at home. Regarding financial difficulties, we used the item "We have more difficulties at home because of the corona crisis to pay everything (like bills, food, clothing . . .)." Answer options were recoded so that 0 = no, 1 = yes, and 2 = do not know. As for domestic violence, we used "I sometimes have to deal with violence from an adult, for example someone beating me, pulling my ears, touching me when I don't want to, or yelling or cursing at me or laughing at me." Answer options were recoded so that 0 = no, 1 = yes. For lack of personal or private space at home, we used the item "I have a place for myself somewhere, where I can be alone and not be disturbed." Although this item does not specifically address the home, people were not allowed to leave their homes for any non-essential movements at the time of the survey. Therefore, this item could logically only apply to the home at the time of the survey. Again, answer options were recoded to 0 = no, 1 = yes.

#### 2.2.2 Peer contacts

In order to assess how adolescents had peer contacts, we used data from three items: "I see my friends in real life, like before," "I see my friends in real life, but from a distance," and "I see or hear my friends digitally (e.g., through FaceTime, Google Hangouts, WhatsApp, Snapchat, TikTok, Facebook, Houseparty, Zoom, gaming . . .)." Adolescents were able to tick boxes for all options that applied to them, which means that each of these

<sup>1</sup>The data and surveys are available from <https://www.keki.be/nl/coronakinderrechten>.

**TABLE 1 |** Sociodemographic characteristics of the sample (n = 16,163).

	N	%
<b>Age</b> (mean)	15.71	–
<b>Gender</b>		
Male	4,473	27.7
Female	11,619	71.9
Other	71	0.4
<b>Education type</b>		
General secondary education	10,148	62.8
Vocational secondary education	1,646	10.2
Artistic secondary education	593	3.7
Technical secondary education	3,776	23.4

three options is a dummy-indicator (0 = not checked, 1 = checked).

## 2.3 Participants

For this study, we limited the total dataset of 44,030 participants to pupils enrolled in secondary education (n = 16,163), roughly the age group 12 to 18. Despite its large size, the data were not representative of the Flemish secondary education population: there was an overrepresentation of pupils in general secondary education (61.6% in the dataset, 42% in Flemish secondary education in 2018–2019), while pupils from vocation secondary education were underrepresented (10.2% in the dataset, 25% in Flemish secondary education in 2018–2019)<sup>2</sup>. There was also an overrepresentation of girls (71.9% in the dataset, 49.2% in Flemish secondary education in 2018–2019). For an overview of the study sample, see **Tables 1, 2**. Because of its small group size, we set the “other” gender category as missing, resulting in a final sample of 16,093 Flemish secondary education pupils.

## 2.4 Analytical Plan

All analyses were conducted using SPSS Version 25. In **Table 2**, we observed that item nonresponse on most variables was limited (<1%), except in the three indicators regarding peer contact (30%). We found that a larger share of male pupils (37%), pupils aged 12–13 years old (38%), and those in vocational education (41%) did not answer these questions as opposed to female pupils (27%), those aged older than 13 years (30%), and those in general education (27%). About 32% of pupils in artistic and technical education also provided no response to these questions.

<sup>2</sup>Flemish secondary education starts from the age of 12 and is divided into four types. *General secondary education* provides a very broad, general education, mostly preparing pupils for higher education. *Vocational education* is highly practical and job-oriented, preparing pupils to enter the labor market directly following secondary education. *Artistic education* links general secondary education development with art practice, ranging from performance arts to display arts. Only about 2% of all Flemish pupils are enrolled in this education type. *Technical secondary education* offers a general education in some main courses (mathematics, languages ...), but pairs this with more technical or practical courses. Pupils can continue into higher education but are also prepared to enter the labor market directly if preferred.

First, to explore differences in levels of stress by gender, age, and educational type, we conducted Fisher’s exact tests. For this test, we categorized the age variable into four categories (12–13, 14–15, 16–17, and 18+), but we will be using the continuous version of this variable in subsequent analyses. Second, to explore the relationship between increased stress and the learning environment, family- and peer-related variables, stepwise binomial logistic regression analyses were conducted. Such an analysis estimates the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more independent variables. In Model 0, we only included control variables (age, gender, education type). Model 1 included the independent variables related to the learning environment, Model 2 swapped these for the family-related variables, and in Model 3 we included peer-related variables. Finally, we concluded with a full model containing all independent indicators. Most of the independent variables in these analyses were dummy variables, with the exception of age (continuous), education type (nominal), and financial difficulties (nominal). As a robustness check, we replicated this stepwise logistic regression twice: with a weighted dataset (weighted by gender and education type; **Supplementary Table SA1**) and by limiting the analysis to pupils from general secondary education (**Supplementary Table SA2**).

## 3 RESULTS

The results of the Fisher’s exact tests (**Table 3**) indicated that there was a statistically significant difference in likelihood of reporting stress by age ( $F = 60.99$ ;  $p < 0.001$ ), gender ( $F = 113.48$ ;  $p < 0.001$ ), and education type ( $F = 102.94$ ;  $p < 0.001$ ). Descriptive results showed that a higher share of older age categories, who likely had greater workloads, experienced more stress than younger age groups. As for gender, 58% of the girls indicated that they experienced stress compared to 49% of the boys. In terms of education type, about half of adolescents in general secondary education experienced stress, while this increased to around two out of three enrolled in the other three education types.

The results in **Table 4** indicated that the learning environment, family- and peer contact-indicators were associated with increased school-related stress during the lockdown. Indicators regarding the learning environment showed that adolescents who reported an overcrowded household situation were 3.50 times more likely to report increased stress ( $OR = 3.50$ ;  $p < 0.001$ ) than those without an overcrowded household situation. Those who reported social support (i.e. having someone who helps them with their schoolwork) and no material deprivation (i.e. having all the necessary materials to perform their schoolwork) were respectively 0.59 ( $p < 0.001$ ) and 0.54 ( $p < 0.001$ ) times less likely to report increased stress than adolescents without social support and with material deprivation.

The family situation also played a role in the likelihood of reporting stress. Adolescents who reported that their family was having financial difficulties due to the corona crisis were

**TABLE 2 |** Descriptive overview of school-related stress, learning-, family-, and peer-related factors in % (n = 16,163).

	School-related stress	Social support	Over crowding	Material deprivation	Financial deprivation	Private space	Domestic violence	Face-to-face contact peers	Face-to-face distance	Digital contact peers
Yes	55.3	70.2	22.9	8.2	8.5	84.3	8.5	6.0	32.9	63.5
No	44.3	29.4	76.7	91.4	68.9	15.5	91.2	64.2	37.2	6.7
Missing	0.4	0.4	0.5	0.3	0.2	0.3	0.3	29.9	29.9	29.9
Do not know	—	—	—	—	22.4	—	—	—	—	—

The italic values are merely respondents that were either missing or do not know.

**TABLE 3 |** Fisher's exact tests for associations between age, gender and education type, and increased stress.

	Fisher's exact test value	p-value	Proportion of pupils with increased stress
<b>Age * stress</b>	60.990	0.000	
12–13			50.1
14–15			53.4
16–17			56.5
18+			62.6
<b>Gender * stress</b>	113.478	0.000	
Male			48.7
Female			58.1
<b>Education type * stress</b>	102.935	0.000	
General secondary education			52.7
Vocational secondary education			59.2
Artistic secondary education			66.7
Technical secondary education			59.9

**TABLE 4 |** Binomial logistic regressions with increased stress due to schoolwork as outcome variable, and odds ratios of predictors.

	Model 0	Model 1	Model 2	Model 3	Full model
<b>Age</b>	1.09*** (0.01)	1.04** (0.02)	1.08*** (0.01)	1.08*** (0.01)	1.04** (0.01)
<b>Gender (ref: Male)</b>					
Female	1.45*** (0.04)	1.49*** (0.05)	1.44*** (0.04)	1.49*** (0.04)	1.47*** (0.05)
<b>Education type (ref: General education)</b>					
Vocational education	1.46*** (0.08)	1.28** (0.08)	1.09 (0.06)	1.35*** (0.07)	1.12 (0.09)
Artistic education	2.03*** (0.12)	1.86*** (0.12)	1.53*** (0.09)	1.84*** (0.10)	1.57*** (0.11)
Technical education	1.37*** (0.05)	1.30*** (0.05)	1.26*** (0.04)	1.36*** (0.05)	1.30*** (0.05)
<b>(Online) learning environment</b>					
Someone helps with schoolwork ( <i>social support</i> )		0.59*** (0.05)			0.59*** (0.05)
Too busy at home to work ( <i>overcrowding</i> )		3.50*** (0.06)			3.14*** (0.06)
All necessary materials available ( <i>material deprivation</i> )		0.54*** (0.10)			0.59*** (0.10)
<b>Family-related indicators</b>					
Financial difficulties since corona crisis (ref: no)					
Yes			2.10*** (0.07)		1.62*** (0.09)
Do not know			1.56*** (0.04)		1.39*** (0.05)
Place for self to be alone			0.52*** (0.05)		0.71*** (0.07)
Domestic violence			1.42*** (0.06)		1.16 (0.09)
<b>Peer contacts</b>					
Face-to-face				0.87* (0.07)	0.80** (0.08)
Face-to-face from distance				0.88** (0.04)	0.95 (0.04)
Digital				0.88* (0.07)	0.99 (0.07)
Constant	0.19*** (0.23)	0.82 (0.27)	0.42*** (0.18)	0.28*** (0.21)	1.13 (0.26)
Nagelkerke R <sup>2</sup>	0.03	0.12	0.07	0.02	0.13
N	16,092	15,950	15,972	11,219	11,213

Note: \*p < 0.05; \*\*p < 0.01, \*\*\*p < 0.001.

2.10 times ( $p < 0.001$ ) more likely to report increased stress than adolescents whose families had no financial difficulties, while those who did not know about their family's financial situation were 1.56 times ( $p < 0.001$ ) as likely. As for adolescents who experienced domestic violence, they were 1.42 times ( $p < 0.001$ ) more likely to report increased stress. Having a place for themselves decreased the likelihood of increased stress ( $OR = 0.52$ ;  $p < 0.001$ ).

Peer contacts seem to play a modest role in increased stress, as indicated by the limited explained variance from these indicators (2%). Overall, results indicated that those who reported having peer contacts—whether it be face-to-face (from a distance) or digitally—were 0.87 ( $p = 0.02$ ) to 0.88 times ( $p = 0.03$ ) less likely to report increased stress.

As for sociodemographic indicators, the results of the regressions pointed in the same direction as those in **Table 3**: girls had a higher likelihood to report stress than boys ( $OR = 1.45$ ;  $p < 0.001$ ), and those in vocational ( $OR = 1.46$ ;  $p < 0.001$ ), technical ( $OR = 1.37$ ;  $p < 0.001$ ), and especially artistic education ( $OR = 2.03$ ;  $p < 0.001$ ) had a higher likelihood to report stress than those in general secondary education. Increasing age was associated with a small increase in the likelihood of reporting stress ( $OR = 1.09$ ;  $p < 0.001$ ).

We conducted two robustness checks. First, the analyses were repeated after applying weights that ensured that the data were representative for the Flemish secondary school population by gender and education type (**Supplementary Table SA1**), but this did not yield different results. Second, we limited the dataset to students from general secondary education ( $n = 10,148$ ), which is the education type that the majority of pupils in this dataset and in Flemish secondary schools are enrolled in, and repeated the analyses, now excluding education type as a control variable (**Supplementary Table SA2**). These results were in line with those from **Table 4**. See the supplemental materials for the full results of these robustness checks (**Supplementary Tables SA1, SA2**).

## 4 DISCUSSION

The COVID-19 pandemic presents a significant threat to adolescents' mental health outcomes (Guessoum et al., 2020). In many countries, schools were forced to close in the spring of 2020, prompting adolescents to move to remote teaching and distance learning at home. The studies that have been conducted on adolescents during the pandemic indicate that they experience increased stress due to insecurities about academic evaluations, potential study delays, and precarious living conditions (Bozkurt et al., 2020; Crabbendam and Goes, 2020; Di Pietro et al., 2020; Xie et al., 2020). Based on recent reports from the World Health Organization (2020) and the American Psychological Association (2019), we identified several factors that are associated with school-related stress in adolescents: the learning environment, family- and peer-related factors. This study provides evidence for the role of these factors in the increase of school-related stress among a large sample of

adolescents enrolled in secondary education in Flanders, Belgium ( $n = 16,093$ ) in May 2020. We find that the learning environment is the strongest predictor of stress among adolescents during the current crisis (with 12% explained variance), in line with findings during regular times (World Health Organization, 2020). Having social support at home (someone who helps with schoolwork) and a lack of material deprivation (by having the necessary equipment) decreases the odds of reporting greater stress, but overcrowding appears to play a much larger role. Adolescents who report that their household is too crowded to adequately complete schoolwork are 250% more likely to report increased stress than adolescents who do not report a crowded household. Several of these findings are in line with previous preliminary studies on the effects of distance learning during the pandemic on pupils in the Netherlands and Australia (see Bol, 2020; Brown et al., 2020; Crabbendam and Goes, 2020). Of all indicators in the study, overcrowding has the strongest positive association with increased stress, which is “likely due to disrupted sleep, lack of space to study and the impact of noise levels on concentration” (Solari and Mare, 2012, p. 464). Due to the high cost of housing, it is more likely that adolescents from families in precarious socioeconomic positions live in overcrowded homes (Brown et al., 2020), which is another sign that the COVID-19 pandemic exacerbates already existing educational inequalities.

Family-related factors also play a role: adolescents who report greater financial difficulties in their household since the corona crisis are more than twice as likely to report increased stress than adolescents who report no financial difficulties. Unsurprisingly, domestic violence is also associated with greater stress, as well as the lack of a private space for the adolescent to relax. Again, those from precarious socioeconomic backgrounds are more likely to be disproportionately affected by this. While the macro-economic fall-out of the lockdown measures forced many people into (temporary) unemployment, financial strains particularly increased among families already under strain prior to the crisis (Bradbury-Jones and Isham, 2020; Kofman and Garfin, 2020; Van Lancker and Parolin, 2020). Given that financial worries are known to be associated with a greater incidence of domestic violence, we again present evidence that the negative mental health consequences of the COVID-19 pandemic likely disproportionately affect adolescents in precarious socioeconomic positions.

Finally, we found that peer-related factors are also associated with increased stress, but less so than learning- and family-related factors. Overall, we find that having contact with peers—whether it be face-to-face or digitally—somewhat decreases the odds of increased stress. The negative association between digital peer contact and increased stress was contrary to our expectations, given Ellis et al. (2020) findings that more time connecting with friends digitally was associated with greater depression. However, digital peer contact no longer has a significant effect once it is considered in the same model with school- and family-related factors. This is not surprising given that time spent with family during recent home confinements has been found to be a far

stronger predictor of mental health than digital peer contacts (Ellis et al., 2020). As such, we must be cautious in interpreting the results of the peer contacts in this study.

## 4.1 Limitations

This study is not without its limitations. Given the local nature of the sample (only Flemish secondary school pupils), these results cannot be generalized, and we therefore encourage scholars to replicate this study in other countries or regions. Furthermore, as mentioned, responses were collected after a brief but intense media campaign on social and traditional media in Flanders in May 2020, resulting in a large sample ( $N = 44,030$ ). However, not all adolescents are equally likely to be aware of the media campaign or participate in web surveys. Those from precarious socioeconomic situations who—for example—lack the necessary technical ability or equipment to access the survey are less likely to respond, which likely leads to a certain degree of selection bias in the sample. Although we have conducted several robustness checks (weighted sample, only pupils from a specific educational type), this selection bias remains a concern. Collecting information on representative adolescent samples would therefore be preferred in future studies.

Additionally, given that responses were collected through self-report questionnaires, there is a potential for social desirability reporting. As we do not know when or how adolescents completed the survey, it is possible that some sensitive questions (e.g. domestic violence) were not answered truthfully, for instance due to the presence of household members. Social desirability may also present itself in a different way: in the questions on peer contacts, adolescents may not want to reveal that they had face-to-face contact(s) with their friends during a time when this was not permitted by government regulations (thus explaining the large number of missing values here). Finally, we noticed that item nonresponse on items regarding peer contacts (around 30%) was much higher than for the other study variables (around 1%). There may be several explanations for this. The questions on peer contacts were presented at the very end of the survey and, given the survey's length, it is possible that younger respondents struggled to reach the end and dropped out (Galesic and Bosnjak, 2009). Furthermore, data from male respondents and those in precarious socioeconomic positions (which is more often the case for pupils in vocational education in Flanders) tend to be of lower quality in web surveys (i.e. by having fewer completed sets of responses) than data from female respondents and those in less precarious positions (Borgers et al., 2000). It is also possible that adolescents were unwilling to provide data for these indicators because they broke government-imposed rules regarding face-to-face social contacts during this time.

## 4.2 Implications for Practice and Policy

While many initiatives have been taken to make distance learning and remote teaching more effective (Daniel, 2020; United Nations, 2020), it is clear that only “material” efforts like providing adolescents with the necessary equipment to

perform their schoolwork is not enough to combat the adverse mental health effects of distance learning. Without far-reaching social policy efforts that mitigate disparities in living conditions (i.e. overcrowded houses, financial difficulties) and support families, distance learning may fail to deliver equitable learning outcomes for all. For example, Di Pietro et al. (2020) suggest providing additional support to working parents if their children are expected to be at home on a regular basis by having a public fund devoted to financing (part of) parental leaves of working parents that need to support their children when it is their turn to stay at home. This could be essential to preserve employment for those who do not have the option of teleworking and who would face the concrete risk of having to leave their job to assist their children. Such a fund, along with the prohibition to dismiss parents who stay at home to support their children's learning activities, would probably alleviate some of the stress among adolescents (Di Pietro et al., 2020). At the same time, we would like to echo recommendations by UNESCO (2020) to plan distance learning. Specifically, they emphasize that it is vital to connect schools, parents, teachers, and students with each other. By creating communities that ensure human interactions—even if they are online—and enable social caring measures, possible psychosocial challenges that students may face when they are isolated can be addressed at an early stage (UNESCO, 2020).

## DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found here: <https://www.keki.be/nl/coronakinderrechten>.

## AUTHOR CONTRIBUTIONS

DDC conducted the analyses and wrote the first draft of the introduction, methods, results, and discussion sections. KM and WVL thoroughly revised subsequent versions of the manuscript. 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/feduc.2022.836123/full#supplementary-material>

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