

INDIVIDUAL VERSUS DYADIC PROCESSES: HEALTH AND RELATIONSHIP OUTCOMES

EDITED BY: Maria Nicoleta Turliuc, Tea L. Trillingsgaard and Anne Milek
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INDIVIDUAL VERSUS DYADIC PROCESSES: HEALTH AND RELATIONSHIP OUTCOMES

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Editorial: Individual versus Dyadic Processes: Health and Relationship Outcomes

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Editorial on the Research Topic

Individual versus Dyadic Processes: Health and Relationship Outcomes

INTRODUCTION

Building strong relationships is a fundamental human need, and finding an intimate partner is evolutionary important for survival and procreation (Buss and Schmitt, 1993). Once established, intimate relationships entail interpersonal support processes that are fundamental to growth, development and coping with life's adversities (Feeney and Collins, 2015). Intimate partners have a strong mutual influence over on each other's health and stress experiences (Randall and Bodenmann, 2017; Sbarra and Coan, 2018). The number and quality of intimate relationships are associated with many health outcomes including immunological and endocrine responses (Hostinar et al., 2014), cardiovascular disease and cancer (Farrell and Stanton, 2019) as well as length of life (Holt-Lunstad et al., 2017). At the same time, discord in intimate relationships is involved in the onset, severity, and progression of a wide range of diseases, as well as in the severity, progression, treatment, and recovery from mental health disorders (Dunkel Schetter, 2017). Research consistently indicate that individual processes and conditions may also affect health. Most often studied, the big five personality traits interact to predict sexual health (Allen and Walter, 2018) or mental treatment outcomes (Bucher et al., 2019). Considering illness as an individual cognition, Singer and his colleagues (Singer et al., 2010) found that one-third of the cancer patients in acute care hospitals is suffering from mental health disorders, depression being the most common psychiatric condition (Singer et al., 2010). Moreover, individual processes and conditions may also affect relationship outcomes. For example, self-reported and partner-perceived reported personality traits (Weidmann et al., 2016), attachment insecurity (Candel and Turliuc, 2019), emotional regulation (Bloch et al., 2014) or emotional intelligence (Malouff et al., 2014) were found to play important roles in predicting relationship satisfaction. Finally, various dyadic processes are important predictors of relationships outcomes. Yoo et al. (2014) found that sexual satisfaction significantly predicted emotional intimacy, and that both variables mediated the association between spouse's communication and their own relationship satisfaction, for both husbands and wives. Relationship stress is a mediator between external stress and marital communication or marital quality (Ledermann et al., 2010). Further, marital communication mediates the association of relationship stress with marital quality. Also, dyadic coping strongly predicts relationship satisfaction regardless of gender, its aggregated positive forms being a stronger predictor of relationship satisfaction than the aggregated negative ones (Falconier et al., 2015). Systematically analysing both individual and dyadic processes, Joel and her colleagues (Joel et al., 2020) used machine learning techniques to predict relationship quality across 43 dyadic longitudinal datasets of 11,196 romantic couples (Joel et al., 2020). Their findings indicate

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that the top individual-difference predictors of relationship quality were life satisfaction, negative affect, depression, attachment avoidance, and attachment anxiety, and the top relationship-specific predictors of relationship quality were perceived-partner commitment, appreciation, sexual satisfaction, perceived-partner satisfaction, and conflict (Joel et al., 2020).

KEY PREMISES OF THE RESEARCH TOPIC

Together with individual differences (e.g., personality traits, attachment dimensions, positive and negative emotions, illness etc.), dyadic processes (e.g., perceived and received support, self-disclosure, dyadic coping, dyadic emotion regulation, conflict, forgiveness, etc.) influence both the individual's health (physical and the psychological well-being), as well as the quality of his/her intimate relationship (e.g., intimacy, commitment, love, and relationship satisfaction). Consistent research findings indicating that close relationships (with the romantic or marital partner) are one of the longer-term, more salient, and mutually influential relations. On one hand, there is evidence indicating that individual differences shape people's health, psychological well-being, and their close relationship. On the other hand, research findings also indicate that intimate relationships may affect health through biological, behavioural, and psychosocial pathway, shape health and relationship outcomes throughout the life course and have a cumulative impact over time. Moreover, what happens inside couples' life is important because intimate interaction and co-regulation impact relationship' quality and well-being.

THIS SPECIAL RESEARCH TOPIC

Based on these findings and premisses, understanding the interrelatedness between close relationships, health and well-being becomes even more crucial. We need research to disentangle the specific dyadic behaviours or interaction patterns that underlie this interrelatedness. We also need to focus on the large heterogeneity in how relationships fare in terms of health and functioning over time and to understand the individual differences in circumstances, traits or states that may explain this variability. Finally, we are in constant need for improved methods to design dyadic studies, sample data of better quality and improve tools to model the complexities of dyadic data. The current Research Topic features contributions from numerous esteemed researchers who offer a variety of high-quality, informative publications on these key issues in the field of close relationships. We present original empirical reports, literature reviews, and demonstration of novel developments within research methodology. It is our hope that the articles included in this collection will inform readers about the latest developments in the field, inspire the development of theory and methods to understand relationship dynamics and stimulate discussions about effective interventions to support strong relationships in practise.

In this topic, you will find that several notable themes emerged throughout the 17 contributions. One first central

theme is the role of support provision and receipt and its consequences for health and relationship outcomes. Scholz et al. reported from three rigorous diary studies on the way positive and negative social control from a partner influences own affect and health related behaviour. Song et al. included both quantitative and qualitative data describing the crucial role of lay caregivers in the survival of patients after allogeneic hematopoietic stem cell transplant, a patient group exposed to an extensive and demanding self-care regime. To investigate the thought-provoking idea that support provision is beneficial for the support provider, Berli et al. conducted a study on couples dealing with overweight and inactivity and examine the association between providing support, physical activity, affect and relationship satisfaction. The idea that shared pursuit of goals has positive implications for both the individuals and the relationship was also explored by Ungar et al. In their study, they investigate whether joint goals in older adults (and an accurate perception of what is joint or not) was associated with goal progress, relationship satisfaction and nine different biomarkers summed up to report the allostatic load. Ștefănuț et al. systematically assessed the results of previous research on the relationship between dyadic coping and emotional well-being as well as the relationship between dyadic coping and the relationship quality in cancer patient and their partners. Support provision, support receipt and we-perspective on burdens and joys of life are all key tenets of theoretical models within relationship science and the current articles in this topic offer unique perspectives on these dynamics.

A second theme throughout this topic is the way in which physical or mental health, as individual conditions, shape the interpersonal process. Rapelli et al. presented a study on married couples faced with cardiac illness in which they examined the dyadic coping strategies as a potential moderator of the link between perceived distress and partner support. Bertschi et al. systematically identified, selected, and critically discussed previous research to describe the key dyadic challenges and dyadic coping strategies when one partner has a chronically disabling physical or sensory impairment. Nalbant et al. investigated the reasons of separation in partners or ex-partners of cancer patients, the factors influencing separation, and the positive or negative perception of the impact of cancer on the relationship. Overall, this group of pieces contribute with important insights into the dyadic challenges of coping with illness, disability or distress.

A third theme in this topic is on the heterogeneity of health and relationship thriving caused by the history, circumstances, and experiences of the individual, including both state and trait characteristics. Zuo et al. used three datasets with heterosexual couples to investigate the concurrent and longitudinal association between trait self-control and romantic relationship satisfaction, also when controlling for commitment. Candel and Turliuc reported from an online daily diary study on how partners' sense of relational entitlement affects day-to-day couple satisfaction levels in interaction with variables of the interpersonal process model of intimacy. Celsi et al. examined childhood-related predictors and mediators of cyber

dating abuse among young non-cohabiting partners. With a 5-wave longitudinal dataset tracking newlywed couples along the years, Kuile et al. investigated how pre-pregnancy happiness in the relationship functions as a predictor of post-natal changes in relationship commitment for fathers and mothers, in comparison with childless couples. Going from dating, newlywed, and new parenthood couples to the other end of the relationship cycle, Sander et al. examined data from recently divorced men and women. In their study, they seek to understand both overall levels of mental and physical health in the divorce population, as well as the individual differences in response to divorce as predicted by conflict levels, objective circumstances of the divorce and relationship history. Horn et al. conducted an online diary study to understand the interplay of intrapersonal emotion regulation (rumination) with interpersonal regulation processes (disclosure quality) in the context of the adjustment to retirement in late adulthood. As highlighted by studies on this theme, both trait and state of the individual is an important context for understanding relationship outcome and health.

A final contributing theme of this topic arises from the articles that pursue methodological issues for standardised lab paradigms. Liekmeier et al. applied a novel method for modelling microlevel observed changes in affective behaviour during a discussion task, using data obtained from two in-therapy parent couples with different slopes of change during a discussion task, a potentially important marker of response to therapy. Pauw et al. investigated the often neglected but potentially influential spill over of lingering affect from one experimental task to the next when partners are instructed to take turns in providing support to one another. To take a step forward in the dynamic modelling of physiological data from the lab, Li et al. explored patterns of physiological linkage in cardiovascular data from male same sex partners interacting around trivial as well as sensitive discussions of health and appearance in the lab. These studies contribute to the current developments of the lab paradigm and to the improvement of this important setting for collecting dyadic data.

This collection of research put forward the central idea of dyadic interdependency, support, and co-regulation, yet all contributions differ markedly in the choice of time unit resolution: from one time-frame measurement to multiple waves of data collection, from weekly daily diary sampling to moment-to-moment fluctuations within minutes in the lab. Surely,

the coregulation within close and caring relationship occur at all these time levels, and at all developmental stages. The articles in this collection span from college students engaged in (cyber)dating, young adults going through the newlywed and early parenthood years, couples coping with poor health conditions (obesity and physical inactivity, cancer, cardiac illness), male same sex couples in the lab, parental couples in therapy, divorcing couple with and without new relationships, couples transitioning to retirement, and couples in old age. The dyadic processes in close and caring relationship are linked to health and well-being at all stages of the life span.

CONCLUSION AND SPECIAL THANKS

In conclusion, the studies presented in this Research Topic provide a comprehensive and cutting-edge view of the ways in which individual and dyadic processes act and interact in shaping health and relationship outcome. The articles indicate some of the most promising ways of approaching this topic, include the combination of individual and dyadic perspectives and the modelling of data interdependency using state-of-the-art research methods.

We are grateful to all authors of this special issue for sharing their significant scientific contributions and to the many peer-reviewers who provided great knowledge and feedback on them. This Research Topic calls upon our community of researchers working with close relationships to adapt study designs that are even better in capturing and analysing the interdependent processes between dyad members in the lab, in diary studies, and in surveys. It calls upon both researchers and clinicians to attend—in research and practice—to the contextual circumstances, traits and states that shape the large variability in how relationship changes. Finally, this topic calls on us to continue to foster relationships with feelings of intimacy, wellness, responsive support, and acceptance. This are of particular importance across those many life stages when relationships are at stake, under change, and the key source of support.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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When Love Hurts – Mental and Physical Health Among Recently Divorced Danes

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The last decades of research have consistently found strong associations between divorce and adverse health outcomes among adults. However, limitations of a majority of this research include (a) lack of “real-time” research, i.e., research employing data collected very shortly after juridical divorce where little or no separation periods have been effectuated, (b) research employing thoroughly validated and population-normed measures against which study results can be compared, and (c) research including a comprehensive array of previously researched sociodemographic- and divorce-related variables. The current cross-sectional study, including 1,856 recently divorced Danes, was designed to bridge these important gaps in the literature. Mental and physical health were measured using the Short Form 36 (SF-36)-2. Analyses included correlational analyses, *t*-test comparisons, and hierarchical multiple regression analyses. The study found that the health-related quality of life of Danish divorcees was significantly worse than the comparative background population immediately following divorce. Across gender, higher levels of divorce conflict were found to predict worse mental health, and worse physical health for women, even when controlling for other socio-demographic variables and divorce characteristics. Among men, lower age and higher income predicted better physical health, while more children, more previous divorces, participant divorce initiation, new partner status, and lower levels of divorce conflict predicted better mental health. Among women, higher income, fewer previous divorces, new partner status, and lower levels of divorce conflict predicted better physical health while higher income, participant divorce initiation, new partner status, and lower levels of divorce conflict predicted better mental health. The findings underscore the relevance of providing assistance to divorcees who experience higher levels of divorce conflict immediately following divorce, in seeking to reduce potential long-term negative health effects of divorce.

Keywords: divorce, divorce intervention, mental health, physical health, Danes

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INTRODUCTION

The last 20 years of research have consistently found strong associations between divorce and adverse health outcomes among adults. Generally, divorcees report poorer physical and mental health and more symptoms of stress, anxiety, depression, and social isolation than the general population (Amato, 2000, 2010; Kessing et al., 2003; Hewitt and Turrell, 2011; Hewitt et al., 2012; Hald et al., 2020b). Furthermore, divorce is associated with more frequent hospitalization (Nielsen et al., 2014), substance use (Waite et al., 2009), higher suicide rates (Kposowa, 2000), lower

levels of psychological well-being (Bracke et al., 2010; Colman et al., 2012), and greater overall mortality risk (Kposowa, 2000; Sbarra and Nietert, 2009). However, four limitations relate to a significant part of this research.

First, often studies include only one or two health-related outcomes per study (e.g., stress and/or depression) (e.g., Lindström, 2009; Hewitt et al., 2012; Knöpfli et al., 2016). While this is important in mapping out specific effects of divorce, it limits the ability to gain insight into more comprehensive physical and mental health profiles among divorce populations. These could be important for more accurate and comprehensive assessments and profiling of the effects of divorce on health. Second, most countries in the world require separation periods before juridical divorce is granted. This means that divorce studies able to employ “real-time” research are scarce and there has been a call for such studies (e.g., Thuen, 2001; Cipric et al., 2020). The concept of “real-time” research usually refers to the collection of data among divorcees with little or no separation periods before formal juridical divorce (Hald et al., 2020a). When studying health effects of divorce, this may be especially important since many health outcomes related to divorce may be sensitive to a “time heals effect,” whereby negative effects of divorce naturally decline over time (Amato, 2010; Sander et al., 2020). Therefore, current research on adverse health effects of divorce may, in fact, underestimate negative health effects of divorce as data have often been collected after a divorce that was preceded by significant periods of separation and thus is likely to be subject to the “time heals effect” (Sander et al., 2020). Third, studies employing thoroughly validated and population-normed measures are few. Validated measures are needed for accurate assessment of the health outcomes studied. However, these assessments may benefit from contextualization by having background population norms against which the results can be directly compared. This allows for more direct insights into the degree to which divorcees may differ from background population norms and thus the relative impact of the divorce on health. Fourth, studies are needed that include a more comprehensive array of previously researched sociodemographic- and divorce-related predictor or explanatory variables of mental and physical health. This would allow for a more thorough assessment of the individual and combined effect of these variables on mental and physical health. The current study was designed to bridge these four important gaps in health research related to divorce.

Divorce theory and divorce research suggest that there are sociodemographic variables and divorce-related characteristics that may moderate the effects of divorce on mental and physical health. Theoretically, Amato’s Divorce-Stress-Readjustment perspective (DSR; Amato, 2000) suggests that adverse effects of divorce depend on a number of risk and protective factors experienced during and following the divorce process. Examples of risk factors include lower standards of living, loss of benefits associated with marriage, and conflict with the former partner, whereas examples of protective factors include having a new romantic partner, adequate income, and holding positive views about the divorce. According to the DSR, it is the interplay between risk and protective factors that may be important in

determining the effects of divorce on mental and physical health (Amato, 2010).

From an empirical perspective, studies suggest that lower socioeconomic status, being unemployed, lower levels of education, and lower family income (Barrett, 2000; Simon, 2002; Symoens et al., 2013b) are associated with lower mental and physical health following divorce. In addition, younger age has been found to be associated with lower mental health following divorce (Bulloch et al., 2017). In relation to divorce characteristics, mutual divorce agreement initiation (Weiss, 1976; Gray and Silver, 1990; Wang and Amato, 2000; Sweeney and Horwitz, 2001; Sakranda, 2008; Cohen and Finzi-Dottan, 2012; Symoens et al., 2013a), having a new partner (Mastekaasa, 1994; Amato, 2000; Øygard, 2004; Blekesaune, 2008; Kulik and Heine-Cohen, 2011; Symoens et al., 2013b; Symoens et al., 2014) and lower levels of divorce-related conflict (Symoens et al., 2014; Petren et al., 2017) have been found to be associated with better mental and physical health. Both empirically and from an applied point of view, divorce conflict has been found to adversely affect or accelerate declines in mental health among divorcees. While the cross-sectional nature of the current study does not allow for investigation of the impact of divorce conflict on mental health over time, it does allow for an independent assessment of the explanatory value of divorce conflict on mental health, accounting for basic sociodemographic variables and other divorce-related characteristics. Compared with previous research, this allows for a more thorough and “independent” investigation of divorce conflict on mental health immediately following divorce.

The current study took place in Denmark, providing a unique perspective on divorce and divorce-related processes. First, in Denmark, there is high societal acceptance of divorce (Uggla and Andersson, 2018), and in general, divorce is not associated with societal stigma, as it is in many other parts of the world. Second, Denmark is a country with high levels of equality, both in terms of gender equality (European Institute for Gender Equality, 2018) and income equality (OECD, 2018). As such, Denmark offers a unique context in which to study whether sociodemographic and divorce-related factors predict post-divorce mental and physical health.

Based on the above, the current study sought to investigate mental and physical health among recently divorced Danes using a well-known, comprehensive, and population-normed mental and physical health measure. Further, the study sought to examine the explanatory value of a comprehensive array of previously identified sociodemographic variables and divorce-related characteristics on overall mental and physical health. Finally, the study sought to compare overall mental and physical health to relevant population norms. Accordingly, the following two research questions and one study hypothesis guided the study investigation:

RQ1: What is the mental and physical health among recently divorced individuals and how does it compare to population norms?

RQ2: What is the explanatory value of sociodemographic variables (i.e., age, number of children, income, education)

and divorce-related characteristics (i.e., marriage duration, number of previous divorces, divorce initiator status, new partner status, and divorce conflict) on overall mental and physical health among recently divorced individuals?

H1: Divorce conflict will significantly add to the explanatory value of mental health after accounting for basic sociodemographic variables (i.e., age, number of children, income, education) and divorce-related characteristics (i.e., marriage duration, number of previous divorces, divorce initiator status, and new partner status).

MATERIALS AND METHODS

Participants

The study sample comprised 1,856 participants of which 66% were women. The average age of women was 44.65 years ($SD = 8.34$), while for men, it was 46.66 years ($SD = 9.31$). The majority of participants had at least a medium educational level and earned at least the national average salary (see **Table 1**). The majority of the sample (88.3%) were parents, with an average of 1.88 ($SD = 0.99$) children per participant. The average marriage duration for men was 12.22 years ($SD = 8.11$) and for women 13.0 ($SD = 7.98$), and for approximately 88% of the sample, this was their first divorce. A majority of women (52%) reported to have initiated the divorce, with 29% of men reporting to be divorce initiators. The majority of both male and female participants did not have new partners following their divorce (65% men, 64% women). The mean legal divorce duration before survey completion was 4.47 days ($SD = 6.97$) for men and 5.23 ($SD = 7.66$) days for women. Of note, there were some gender differences in sociodemographic and divorce-related characteristics. Specifically, compared to men, women were younger, had been married slightly longer, were more highly educated, earned less than men, had initiated the divorce more often, and had a different partner status than men [age ($t(1854) = 4.74, p < 0.001$); duration of marriage ($t(1854) = -1.972, p = 0.049$); education ($\chi^2 = 32.61, p < 0.001$); income ($\chi^2 = 107.41, p < 0.001$); initiator status ($\chi^2 = 90.50, p < 0.001$); new partner ($\chi^2 = 14.82, p = 0.002$)].

Data on all people who divorced in Denmark during the study period were obtained from Statistics Denmark and compared to the study sample. The study sample was found to be representative in terms of age, income, and marriage duration ($p > 0.05$). There were statistically significant differences between participants and the comparison population in terms of gender (more women participated: $\chi^2 = 208.45, p < 0.001$), educational attainment (study participants were more highly educated: $\chi^2 = 1135.23, p < 0.001$), and the number of previous divorces [participants had on average fewer previous divorces than the average Danish divorcee: $t(1855) = -8.47, p < 0.001$].

Procedure

During the study period (January 2016 to January 2018), those seeking divorce in Denmark initiated formal legal divorce and separation procedures by submitting an application to the Danish State Administration (DSA). Legal divorce was granted

TABLE 1 | Participant demographics ($N = 1,856$).

| Variable | Men | Women |
|--|--------------|----------------|
| Age, years, mean (SD) | 46.66 (9.31) | 44.65 (8.34)** |
| Number of children, % | | |
| 0 | 13.3 | 11.0 |
| 1 | 15.2 | 15.8 |
| 2 | 49.3 | 49.7 |
| 3 | 19.1 | 19.6 |
| 4 or more | 3.1 | 3.9 |
| Education level, % | | |
| Low level of education | 43.9 | 32.5** |
| Medium level of education | 28.8 | 41.5 |
| High level of education | 27.2 | 26.0 |
| Income, % | | |
| Below national average salary | 26.7 | 47.7** |
| National average | 47.0 | 41.8 |
| Above national average salary | 26.3 | 10.8 |
| Marriage length, mean (SD) | 12.22 (8.11) | 13.0 (7.98)* |
| Total divorce duration in days, mean (SD) ^a | 4.47 (6.97) | 5.23 (7.66) |
| Number of times divorced, % | | |
| One time | 86.7 | 88.2 |
| Two times | 10.7 | 10.1 |
| Three times | 1.9 | 1.5 |
| More than three times | 0.6 | 0.2 |
| Initiative divorce, % | | |
| Participant | 28.5 | 51.8** |
| Mutual agreement | 19.2 | 13.2 |
| Former spouse | 52.3 | 35.0 |
| New partner, % | | |
| Both have new partners | 3.6 | 5.3* |
| Neither have new partners | 64.7 | 63.7 |
| Participant does, former spouse does not | 13.5 | 8.7 |
| Participant does not, former spouse does | 18.3 | 22.3 |
| Divorce Conflict Scale Scores, mean (SD) | 13.28 (4.92) | 13.97 (4.97)* |

^aLegal divorce duration was calculated in days from the legal divorce date to survey response date. * $p < 0.05$. ** $p < 0.001$.

immediately when there was a mutual agreement to the marital dissolution. However, if there was disagreement regarding the divorce itself or its terms, a 6-month separation period was instituted, after which divorce was granted even in the absence of mutual agreement. The DSA reports that approximately 30% of couples underwent the 6-month separation period. The average processing time required by the DSA to issue divorce decrees was 2–3 weeks.

Invitations to the present study were sent by the DSA along with the divorce decree. The invitation letter described the 12-month Randomized Controlled Trial intervention study entitled “Cooperation after Divorce” that sought to investigate the effects of a digital intervention platform called “Cooperation after Divorce (CAD)” on divorcees’ mental and physical health. As the DSA sent out invitations, we were unable to send re-invitations to those who did not respond to the initial invitation sent out by the DSA. Those who completed the baseline survey received invitations from the intervention platform to complete surveys at 3, 6, and 12 months; for each of these time points, two reminder

e-mails were sent out, one after 3 days and one after 14 days, if no response had been provided.

Cooperation after Divorce covers three main areas: (1) the divorce, (2) children, and (3) cooperation following divorce, employing 17 learning modules delivered through an online platform. This paper reports only the baseline results of the study, therefore, please also see Hald et al. (2020a) for a more thorough description of the CAD platform. The letter also described the procedure for participation, which consisted of clicking on a web-link in the invitation letter, provide informed consent, and respond to the baseline questionnaire anonymously. The research received approval from the Danish Data Protection Agency and was exempt from further ethical evaluations following the rules and regulations as set forth by the Scientific Ethical Committees of Denmark.

The exact response rate is not possible to report because the DSA could not provide the precise number of study invitations sent during the study period. There were 32,487 legal divorces in Denmark during the RCT enrollment period; however, it is unknown whether all individuals who divorced received an invitation along with their divorce decree. In total, 1,882 people began the study and due to impossible or invalid responses, 26 were excluded (i.e., those who did not report gender, reported to be married less than 1 day, or to have married the same year as they were born). Thus, 1,856 participants were included in the final analytical study sample.

Measures

Sociodemographic Variables

(a) Age at divorce was measured in years and months. (b) Sexual identity was determined by answering: "Are you a man or a woman?" with the response options: 1 = "Man" 2 = "Woman." (c) Education level was assessed by answering: "What is the highest education you have completed?" with the following response options: 1 = "low level of education" (e.g., primary school, high school, business high school, vocational education), 2 = "medium level of education" (e.g., medium-length tertiary education, bachelor's degree), and 3 = "high level of education" (e.g., master's degree or higher). (d) Income was measured with the question "What is your monthly income before tax?" in Danish Crowns (1 USD = 6.35 DKK). The response options were: 1 = "Below 10,000DKK," 2 = "10–20,000DKK," 3 = "20–30,000DKK," 4 = "30–40,000DKK," 5 = "40–50,000DKK," 6 = "50–60,000DKK," 7 = "60–70,000DKK," 8 = "70–80,000DKK," 9 = "More than 80,000DKK." These categories were reduced for descriptive purposes for **Table 1** so that 1–3 = "Below average," 2–4 = "Average," 5+ = "Above average"; however, in all analyses the original scale was used. (e) The number of children was obtained by asking how many children participants had from 0 to 8.

Divorce-Related Variables

(a) Marriage duration was calculated in years and months from marriage date to divorce date; (b) legal divorce duration was calculated in days from the legal divorce date to survey response date; (c) number of divorces was obtained by asking, "How many time have you divorced?" with response options including 1 = "One time," 2 = "Two times," 3 = "Three times," and 4 = "More

than three times"; (e) divorce initiator status was ascertained with the question "Who initiated your divorce" and 1 = "Me," 2 = "Mostly me," 3 = "We mutually agreed," 4 = "Mostly my former spouse," 5 = "My former spouse," 6 = "Not sure." Initiator status responses were reduced so that 1–2 = "Me," 3 = "We mutually agreed," 4–5 = "My former spouse," and 6 = "System missing" [only seven participants (0.4%) responded "not sure"]; (f) New partner status was obtained with the question "Do you or your ex have a new partner?" with the following response options: 1 = "Yes, we both have a new partner," 2 = "No, none of us have a new partner," 3 = "I have a new partner, but not my ex," 4 = "My ex has a new partner, but not me"; (g) Divorce conflict was assessed employing the six-item self-report Divorce Conflict Scale (DCS). The DCS measures six dimensions of divorce-related conflict: communication, co-parenting, global assessment of former spouse, negative and pervasive negative exchanges and hostile, insecure emotional environment, and self-perceived conflict (Hald et al., 2020d). The internal consistency of the DCS scale was high ($\alpha = 0.88$).

Physical and Mental Health

The second version of the Short Form 36 (SF-36) Health Assessment was used for the core outcomes of this study. The SF-36 is a 36-item self-report measure that is a widely used instrument to assess health-related quality of life over the previous 4 weeks among general populations and diverse patient groups (Maruish, 2011). The instrument includes the following eight domains which are measured using 35 items: physical functioning, role physical (role participation with physical health problems), bodily pain, general health, vitality, social functioning, role-emotional (role participation with emotional health problems), and mental health. The final item is not included in the domains subscales and addresses self-evaluation health transition. The responses are given with a Likert scale or a yes/no format. Domain scores are reported in 0–100 transformed scores and *t*-scores that are calculated from the raw scores and higher scores indicate better health status (see Maruish, 2011 for more information). The physical health and mental health summary variables are calculated using all eight health domains based on their relative factor analytical weights. Many language versions of the SF-36 exist and the instrument has been determined to be a valid and reliable instrument for a wide range of populations (Bjorner et al., 1998; Maruish, 2011). In this study, all of the eight health scales demonstrated high internal consistency (Cronbach's $\alpha = 0.85$ – 0.93).

Data Analyses

Missing data were less than 5% for all variables in the present paper, which is below the proportion of missingness that may bias results (Schafer, 1999; Bennett, 2001; Dong and Peng, 2013). Thus, the data were omitted "listwise" in analyses. For the legal divorce duration variable, outliers were changed to missing values using the moderately conservative ± 2.5 times the median absolute deviation (MAD) threshold, as recommended by Leys et al. (2013). To assess gender differences, sociodemographic and divorce-related characteristics were compared using two-sample *t*-tests and chi-square tests.

Prior to any other data analyses, a rake weight was constructed and applied to the data. The rake weight was based on gender, education, and previous number of divorces and adjusted for sample representativeness (see section “Participants”). When constructing rake weights, a set of variables for which the distribution is known are chosen, and the statistical program creates weights for each case until the sample distribution aligns with the population for those variables. The resultant weight was applied to the data. Thus, all following data analyses (correlations, comparisons to norms, cut-off score comparison, and hierarchical regressions) reflect results with the weight applied.

One-sample *t*-tests were employed to compare our sample with the available Danish normative data from the Danish SF-36 user's manual, which comprise a random population sample of 4,080 Danish adults (52% women) from the SF-36 Health Assessment Danish Manual study (for more information regarding this normative population sample, see also Bjorner et al., 1998). For comparisons, the SF-36 0–100 transformed scale scores were used.

Pearson correlation analyses were used for assessing bivariate correlations between variables. Hierarchical multiple regression analyses were used to assess the independent contribution to the explanation of the variance SF-36 physical and mental health summary *t*-scores. In a first step, age, number of children, income, and education were entered as predictors; in a second step, marriage duration, number of previous divorces, divorce initiator status, and new partner status were entered as predictors. DCS scores were entered as a predictor in the third step. This approach allows for an assessment of the unique contributions of sets of variables (i.e., demographics and divorce-related

variables), and specifically, allows for an assessment of the unique contribution of divorce conflict, beyond the contribution of demographics and divorce-related factors.

RESULTS

When compared with Danish normative data, male participants reported lower role physical scores [$t(878) = -9.38, p < 0.001, d = 0.32$], worse general health [$t(878) = -5.66, p < 0.001, \text{Cohen's } d = 0.19$], lower vitality [$t(875) = -31.88, p < 0.001, \text{Cohen's } d = 1.08$], decreased social functioning [$t(878) = -23.51, p < 0.001, \text{Cohen's } d = 0.79$], lower role emotional scores [$t(878) = -25.63, p < 0.001, \text{Cohen's } d = 0.87$], and worse mental health [$t(875) = -40.79, p < 0.001, \text{Cohen's } d = 1.38$], but better physical functioning [$t(879) = 6.66, p < 0.001, \text{Cohen's } d = 0.23$] and lower levels of bodily pain [$t(878) = 2.34, p = 0.020, \text{Cohen's } d = 0.08$], than the Danish normative male population.

Statistically significant differences were found on the SF-36 domains for women. Compared with the Danish normative female population, female participants reported lower role physical scores [$t(880) = -3.00, p = 0.003, d = 0.10$], worse general health [$t(883) = -7.25, p < 0.001, \text{Cohen's } d = 0.24$], lower vitality [$t(878) = -33.00, p < 0.001, \text{Cohen's } d = 1.11$], lower social functioning scores [$t(880) = -23.19, p < 0.001, \text{Cohen's } d = 0.78$], decreased role emotional capacity [$t(880) = -25.86, p < 0.001, \text{Cohen's } d = 0.87$], and worse mental health [$t(878) = -38.31, p < 0.001, \text{Cohen's } d = 1.29$], but better physical functioning [$t(883) = 9.94, p < 0.001, \text{Cohen's } d = 0.33$] and lower levels of bodily pain [$t(880) = 2.92, p = 0.004, \text{Cohen's } d = 0.10$] (see Figures 1, 2).

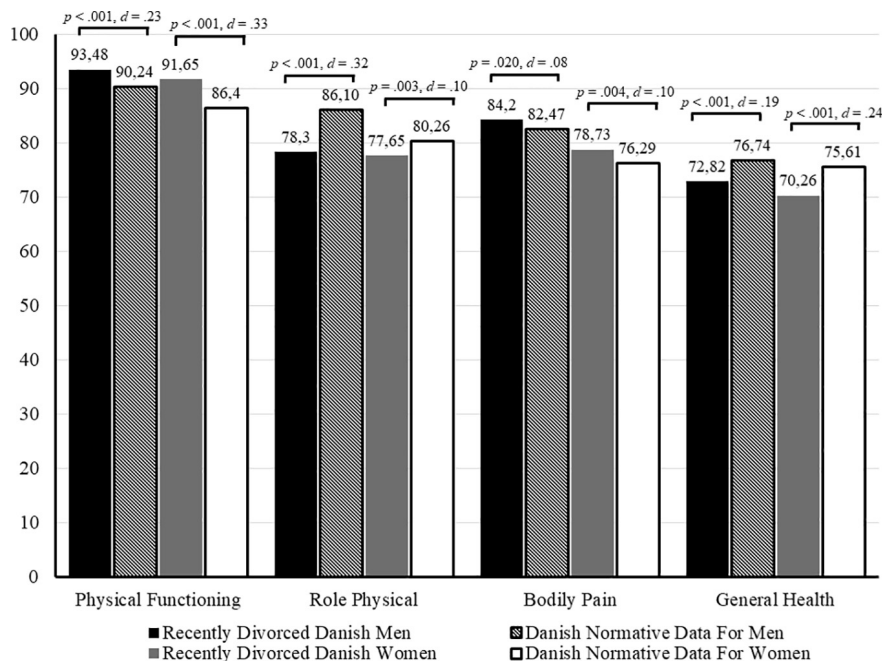


FIGURE 1 | SF-36 physical health domain means compared to normative data.

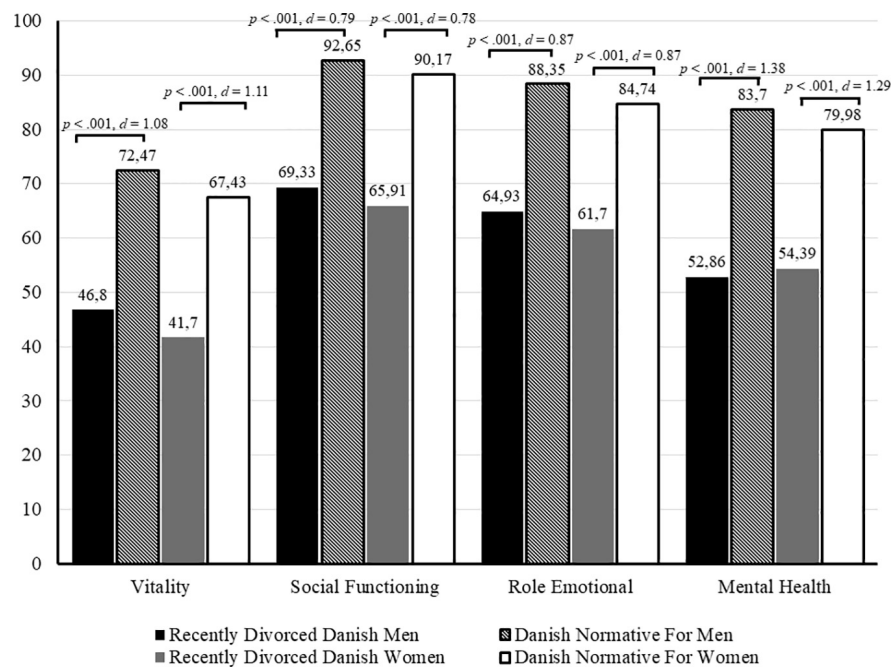


FIGURE 2 | SF-36 mental health domain means compared to normative data.

Comparison cut-off scores were created such that those with t -scores below 44 were categorized as poor functioning, those with t -scores between 44 and 56 (i.e., average) were categorized as normal functioning, and those with t -scores above 56 (i.e., above) were categorized as superior functioning. The comparisons revealed that for the intervention group, 8.3% fell below the cut-score on physical health (normal = 23.8% and superior = 68%) and 73.6% fell below the cut-score on mental health (normal = 19.9% and superior = 6.6%). Similarly, for the control group, 8.0% fell below the cut-score on physical health (normal = 22.5% and superior = 69.5%) and 72.6% fell below the cut-score on mental health (normal = 23.8% and superior = 3.6%).

Among men, bivariate correlation analyses demonstrated that lower age, higher income, higher education, shorter duration marriages, fewer previous divorces, and lower mental health scores were significantly associated with better physical health ($p < 0.05$). Among women, lower age, higher income, higher educational level, fewer previous divorces, new partner status, lower divorce conflict, and lower mental health scores were significantly associated with better physical health ($p < 0.05$). Among men, higher age, longer marriage duration, more previous divorces, initiator and new partner status, and lower divorce conflict scores were significantly associated with better mental health, while for women higher income, fewer previous divorces, initiator status, and lower divorce conflict scores were significantly associated with better mental health ($p < 0.05$; see also **Table 2**).

Force enter hierarchical multiple regression analyses were used to assess whether socio-demographic and divorce characteristics predicted mental and physical health and whether

divorce conflict added to the explanatory value of mental health after controlling for sociodemographic variables and divorce characteristics. The first step of the analyses included the sociodemographic variables of age, number of children, income, and education, and the second step included the divorce-related variables of marriage duration, number of previous divorces, divorce initiator status, and new partner status, while the third and final step included divorce conflict. The variables (Step 3) explained 14.6% of the variance of the physical health summary scores for men [$F(12,875) = 12.33, p < 0.001, R^2 = 0.146$] and 8.8% for women [$F(12,878) = 6.96, p < 0.001, R^2 = 0.088$]. Among men, lower age and higher income significantly added to the prediction of better physical health ($p < 0.05$). Among women, higher income, fewer previous divorces, new partner status, and lower divorce conflict added to the prediction of better physical health ($p < 0.05$) (see also **Table 3**).

For mental health, sociodemographic and divorce-related variables, as well as divorce conflict (Step 3) accounted for 19.3% of the explained variance among men [$F(12,875) = 17.15, p < 0.001, R^2 = 0.193$] and 9.9% among women [$F(12,878) = 7.89, p < 0.001, R^2 = 0.099$]. Factors that significantly added to the prediction of better mental health for men were more children, more previous divorces, participant divorce initiation, new partner status, and lower divorce conflict, while for women, higher income, participant divorce initiation, new partner status, and lower divorce conflict significantly added to the prediction of better mental health.

Regarding the study hypothesis, among both men and women, divorce conflict was found to significantly add to the explanation of mental health after controlling for basic sociodemographic variables and divorce characteristics (see also **Table 4**).

TABLE 2 | Correlations among sociodemographic variables, divorce conflict scale scores, physical and mental health summary scores ($N = 1856$, men $n = 617$, women $n = 1239$).

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1 Age | – | 0.026 | –0.094** | 0.080* | 0.560** | 0.354** | 0.048 | 0.104** | 0.155** | –0.097** | –0.022 |
| 2 Number of children | –0.026 | – | 0.011 | –0.064 | 0.297** | –0.140** | –0.092** | 0.001 | 0.022 | 0.037 | 0.033 |
| 3 Education | 0.013 | 0.032 | – | 0.331** | –0.072* | –0.103** | –0.049 | –0.023 | –0.047 | 0.116** | 0.046 |
| 4 Income | –0.006 | 0.090** | 0.304** | – | 0.053 | –0.012 | –0.013 | 0.082* | –0.051 | 0.214** | 0.114** |
| 5 Marriage duration | 0.459** | 0.204** | 0.037 | 0.167** | – | –0.193** | –0.027 | 0.145** | 0.096** | –0.011 | 0.033 |
| 6 Number of prev. divorces | 0.498** | –0.121** | –0.040 | –0.159** | –0.184** | – | 0.050 | –0.023 | 0.102** | –0.131** | –0.080* |
| 7 Initiator status | –0.116** | 0.031 | –0.075* | –0.133** | –0.067* | –0.052 | – | 0.199** | 0.048 | 0.058 | –0.215** |
| 8 New partner status | –0.109** | 0.116** | –0.052 | –0.039 | –0.121** | –0.089** | 0.057 | – | 0.196** | 0.087** | –0.020 |
| 9 Divorce Conflict Scale | –0.019 | 0.027 | –0.050 | –0.071* | –0.094** | –0.012 | –0.138** | 0.142** | – | –0.078* | –0.144** |
| 10 Physical Health Summary | –0.260** | 0.019 | 0.116** | 0.240** | –0.121** | –0.159** | 0.008 | 0.041 | –0.056 | – | –0.095** |
| 11 Mental Health Summary | 0.256** | 0.047 | 0.043 | 0.040 | 0.127** | 0.271** | –0.200** | –0.171** | –0.131** | –0.165** | – |

* $p < 0.05$. ** $p < 0.01$. Correlations for women are above the diagonal and correlations for men are below the diagonal.

DISCUSSION

Pertaining to research question one, across gender, the study found that the mental health of Danish divorcees was significantly different from and worse than the Danish background population immediately following divorce. Further, across all mental health indicators, the magnitudes of these differences were large [i.e., Cohen's (d) = 0.78–1.38]. The results for physical health were more equivocal. While both male and female divorcees reported better physical functioning in everyday life than the Danish background population, both genders also reported worse general health than the background population immediately following divorce.

The results for mental health corroborate existing research in the field and, notably, the effect sizes here were large, which may mainly reflect the timing of the collection of baseline data. With the unique opportunity to collect data very close to the juridical divorce (on average less than five days from juridical divorce) and the fact that the majority of the sample divorced without any prior separation period, data may have been less subject to a “time heals effect” (Hald et al., 2020a). Following Amato (2000) DSR, this means that time has not yet had a chance to mitigate the adverse effects of the divorce. Further, although caution needs to be taken regarding the generalizability of the sample, due to the non-probability sampling process, the results offer some of the first insights into *how* adverse the impacts of divorce on mental health may be immediately following divorce, using a range of common mental health indicators (Sander et al., 2020).

The equivocal findings concerning physical health among divorcees immediately following divorce, we speculate, mainly have to do with (a) the study sample, (b) the content of questions of the outcome measure, and (c) the timing of measurements. Accordingly, the study sample comprised relatively younger individuals as compared to the background population sample used for comparisons. The majority of the items from the physical health scale include responses to tasks most non-elderly individuals would easily be able to accomplish, but which may prove increasingly difficult with age (e.g., walking one block, dressing and bathing, or lifting or carrying groceries), and this may account for the better physical health among our study

sample as compared to the background population. Further, as first suggested by Sander et al. (2020), when it comes to physical health, a “time hurts” effect may also be at play, whereby physical health is more adversely affected over the course of time following divorce than immediately after the divorce. A causal mechanism may be that reduced mental health increasingly adversely affects physical health over time (Sander et al., 2020). We encourage future studies to further investigate this.

From an applied point of view, across diverse samples and patient groups, better health-related quality of life as measured by the SF-36 has been found to be associated with lower risk of morbidity, mortality, cancer as well as the recurrence of cancer, anxiety, and depressive symptoms (e.g., Lacson et al., 2010; Saquib et al., 2011; Folker et al., 2019). Further, multiple studies have found that worse health-related quality of life as measured by the SF-36 instrument is predictive of higher occurrence of work absence due to sickness, hospitalizations, and higher health care costs among both general populations and across multiple subpopulations (e.g., Lacson et al., 2010; Laaksonen et al., 2011; Pymont and Butterworth, 2015). In conjunction with the study results, especially for mental health, this means that there is sound human and financial reasoning in developing interventions that may help divorcees cope with adverse (mental) health effects of their divorce and, that among many divorcees, the need for help may be especially pronounced immediate following their divorce.

Pertaining to research question 2 and the study hypothesis, it was found that for men, lower age and higher income added to the prediction of better physical health. Among women, higher income, fewer previous divorces, new partner status, and lower levels of divorce conflict added to the prediction of better physical health. For mental health, among men, it was found that more children, more previous divorces, participant divorce initiation, new partner status, and lower levels of divorce conflict added to the prediction of better mental health, while for women, higher income, participant divorce initiation, new partner status, and lower levels of divorce conflict were found to add to better mental health. Moreover, our study hypothesis that divorce conflict would add to the overall prediction of mental health, even when other sociodemographic variables

TABLE 3 | Multiple regression analyses predicting SF-36 physical health summary *t*-scores.

| Variable | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β |
|--|----------|-------------|---------|----------|-------------|---------|----------|-------------|---------|
| Men | | | | | | | | | |
| Age | −0.225** | 0.027 | −0.261 | −0.198** | 0.042 | −0.230 | −0.194** | 0.042 | −0.225 |
| Number of children | 0.020 | 0.274 | 0.002 | 0.176 | 0.286 | 0.020 | 0.221 | 0.286 | 0.026 |
| Education | 0.683 | 0.417 | 0.054 | 0.729 | 0.416 | 0.058 | 0.702 | 0.416 | 0.056 |
| Income | 2.600** | 0.383 | 0.225 | 2.733** | 0.393 | 0.236 | 2.686** | 0.393 | 0.232 |
| Duration of marriage | | | | −0.057 | 0.048 | −0.053 | −0.065 | 0.048 | −0.062 |
| Number of times divorced | | | | −0.108 | 0.601 | −0.008 | −0.162 | 0.601 | −0.012 |
| Initiator Status: Participant vs Former Spouse | | | | −0.507 | 0.656 | −0.031 | −0.769 | 0.670 | −0.047 |
| Initiator Status: Participant vs Mutual Agreement | | | | −1.173 | 0.827 | −0.056 | −1.546 | 0.850 | −0.074 |
| New Partner Status: Both vs neither | | | | 0.837 | 1.368 | 0.049 | 0.849 | 1.366 | 0.050 |
| New Partner Status: Both vs Participant Yes, Ex No | | | | −1.766 | 1.539 | −0.071 | −1.749 | 1.537 | −0.070 |
| New Partner Status: Both vs Participant No, Ex Yes | | | | 1.384 | 1.462 | 0.068 | 1.543 | 1.462 | 0.076 |
| Divorce Conflict | | | | | | | −0.103 | 0.055 | −0.062 |
| <i>R</i> | | 0.36 | | | 0.38 | | | 0.38 | |
| Adjusted <i>R</i> ² | | 0.12 | | | 0.13 | | | 0.13 | |
| <i>F</i> | | 31.99** | | | 13.10** | | | 12.33** | |
| Change <i>R</i> ² | | | | | 0.02 | | | 0.003 | |
| <i>F</i> Change <i>R</i> ² | | | | | 2.14* | | | 3.47 | |
| Women | | | | | | | | | |
| Age | −0.117** | 0.034 | −0.113 | −0.088 | 0.051 | −0.085 | −0.081 | 0.051 | −0.079 |
| Number of children | 0.536 | 0.299 | 0.059 | 0.498 | 0.319 | 0.055 | 0.505 | 0.318 | 0.055 |
| Education | 0.451 | 0.454 | 0.035 | 0.441 | 0.453 | 0.034 | 0.432 | 0.452 | 0.033 |
| Income | 3.001** | 0.487 | 0.216 | 2.930** | 0.487 | 0.211 | 2.859** | 0.487 | 0.206 |
| Duration of marriage | | | | −0.009 | 0.053 | −0.009 | −0.008 | 0.053 | −0.007 |
| Number of times divorced | | | | −1.808* | 0.760 | −0.096 | −1.711* | 0.760 | −0.091 |
| Initiator Status: Participant vs Former Spouse | | | | 1.098 | 0.666 | 0.059 | 1.094 | 0.664 | 0.059 |
| Initiator Status: Participant vs Mutual Agreement | | | | −0.813 | 0.904 | −0.031 | −1.086 | 0.911 | −0.041 |
| New Partner Status: Both vs neither | | | | 1.637 | 1.342 | 0.089 | 1.511 | 1.341 | 0.082 |
| New Partner Status: Both vs Participant Yes, Ex No | | | | 1.432 | 1.633 | 0.045 | 1.340 | 1.630 | 0.042 |
| New Partner Status: Both vs Participant No, Ex Yes | | | | 2.728 | 1.455 | 0.129 | 2.937* | 1.456 | 0.139 |
| Divorce Conflict | | | | | | | −0.133* | 0.062 | −0.073 |
| <i>R</i> | | 0.25 | | | 0.29 | | | 0.30 | |
| Adjusted <i>R</i> ² | | 0.06 | | | 0.07 | | | 0.08 | |
| <i>F</i> | | 14.76** | | | 7.15** | | | 6.96** | |
| Change <i>R</i> ² | | | | | 0.02 | | | 0.005 | |
| <i>F</i> Change <i>R</i> ² | | | | | 2.69* | | | 4.52* | |

p* < 0.05. *p* < 0.001. When analyses were run with number of previous divorces coded as “1/2/3 or more,” the pattern of results remained the same. Moreover, when analyses were run with number of children coded as “1/2/3 or more,” the pattern of results also remained the same.

and divorce characteristics were controlled for, was supported. Of note, lower divorce conflict also predicted better physical health for women.

The current study indicates that, already at the time of or close to juridical divorce, higher degrees of divorce conflict are associated with worse mental health, even after accounting for other sociodemographic variables and divorce-related factors. This may not be surprising, given that higher degrees of divorce conflict are likely to negatively interfere with or complicate important decisions and life choices around the time of juridical divorce, like division of property, co-parenting, and child custody. This study finding accentuates the need to focus on divorce conflict levels already at divorce onset (Hald et al., 2020d).

Amato's DSR theory stipulates that the adverse effects of divorce depend on the interplay between risk and protective factors (Amato, 2010). These factors include many of those found in this study to significantly predict both mental and physical health, including income (DSR = economic security, standards of living), new partner status (DSR = having a new partner), and levels of divorce conflict (DSR = conflict with the former partner). Accordingly, the results of this study may be seen as support for Amato's DSR theory, in that DSR theory views divorce “not as a discrete event, but as a process that unfolds over months and even years” (Amato, 2010, p. 10). Moreover, it follows that mental and physical health may already be adversely affected prior to the juridical divorce as a consequence of a prolonged stressful and/or unsatisfactory relationship (Hald et al., 2020c). Therefore,

TABLE 4 | Multiple regression analyses predicting SF-36 mental health summary *t*-scores.

| Variable | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | <i>B</i> |
|--|----------|-------------|---------|----------|-------------|---------|----------|-------------|----------|
| Men | | | | | | | | | |
| Age | 0.384 | 0.049 | 0.256 | 0.086 | 0.072 | 0.057 | 0.100 | 0.072 | 0.066 |
| Number of children | 0.715** | 0.492 | 0.048 | 0.936 | 0.486 | 0.062 | 1.083* | 0.484 | 0.072 |
| Education | 0.689 | 0.749 | 0.031 | 0.428 | 0.708 | 0.020 | 0.339 | 0.704 | 0.015 |
| Income | 0.547 | 0.687 | 0.027 | 0.411 | 0.668 | 0.020 | 0.256 | 0.665 | 0.013 |
| Duration of marriage | | | | 0.175* | 0.081 | 0.095 | 0.146 | 0.081 | 0.079 |
| Number of times divorced | | | | 5.611** | 1.022 | 0.237 | 5.435** | 1.016 | 0.230 |
| Initiator Status: Participant vs Former Spouse | | | | −3.997** | 1.115 | −0.139 | −4.856** | 1.133 | −0.169 |
| Initiator Status: Participant vs Mutual Agreement | | | | 2.402 | 1.407 | 0.066 | 1.180 | 1.437 | 0.032 |
| New Partner Status: Both vs neither | | | | −5.127* | 2.327 | −0.173 | −5.088* | 2.311 | −0.172 |
| New Partner Status: Both vs Participant Yes, Ex No | | | | −1.723 | 2.617 | −0.040 | −1.666 | 2.599 | −0.038 |
| New Partner Status: Both vs Participant No, Ex Yes | | | | −8.862** | 2.486 | −0.251 | −8.341** | 2.473 | −0.236 |
| Divorce Conflict | | | | | | | −0.337** | 0.094 | −0.117 |
| <i>R</i> | | 0.27 | | | 0.43 | | | 0.44 | |
| Adjusted <i>R</i> ² | | 0.07 | | | 0.17 | | | 0.18 | |
| <i>F</i> | | 16.49** | | | 17.29** | | | 17.15** | |
| Change <i>R</i> ² | | | | | 0.11 | | | 0.01 | |
| <i>F</i> Change <i>R</i> ² | | | | | 16.57** | | | 13.02** | |
| Women | | | | | | | | | |
| Age | −0.051 | 0.053 | −0.033 | −0.008 | 0.076 | −0.005 | 0.011 | 0.076 | 0.007 |
| Number of children | 0.596 | 0.462 | 0.044 | 0.097 | 0.480 | 0.007 | 0.115 | 0.477 | 0.008 |
| Education | 0.087 | 0.700 | 0.004 | −0.104 | 0.683 | −0.005 | −0.128 | 0.677 | −0.007 |
| Income | 2.477** | 0.752 | 0.118 | 2.254* | 0.734 | 0.108 | 2.061** | 0.729 | 0.098 |
| Duration of marriage | | | | 0.021 | 0.080 | 0.013 | 0.024 | 0.079 | 0.015 |
| Number of times divorced | | | | −1.462 | 1.145 | −0.051 | −1.197 | 1.138 | −0.042 |
| Initiator Status: Participant vs Former Spouse | | | | −5.617** | 1.002 | −0.202 | −5.627** | 0.994 | −0.202 |
| Initiator Status: Participant vs Mutual Agreement | | | | 0.125 | 1.361 | 0.003 | −0.621 | 1.364 | −0.016 |
| New Partner Status: Both vs neither | | | | −5.553** | 2.021 | −0.200 | −5.898* | 2.007 | −0.212 |
| New Partner Status: Both vs Participant Yes, Ex No | | | | −0.904 | 2.459 | −0.019 | −1.156 | 2.440 | −0.024 |
| New Partner Status: Both vs Participant No, Ex Yes | | | | −4.510* | 2.192 | −0.142 | −3.941 | 2.179 | −0.124 |
| Divorce Conflict | | | | | | | −0.362** | 0.093 | −0.132 |
| <i>R</i> | | 0.13 | | | 0.29 | | | 0.31 | |
| Adjusted <i>R</i> ² | | 0.01 | | | 0.07 | | | 0.09 | |
| <i>F</i> | | 3.51* | | | 7.13** | | | 7.89** | |
| Change <i>R</i> ² | | | | | 0.07 | | | 0.02 | |
| <i>F</i> Change <i>R</i> ² | | | | | 9.06** | | | 15.06** | |

p* < 0.05. *p* < 0.001. When analyses were run with number of previous divorces coded as “1/2/3 or more,” the pattern of results remained the same. Moreover, when analyses were run with number of children coded as “1/2/3 or more,” the pattern of results also remained the same.

the measurements of mental and physical health employed in this study, done immediately after juridical divorce with little or no prior separation period, may “capture” the mental and physical health consequences of this “. . . process that unfolds over months and even years” (Amato, 2010, p. 10).

Notably, even in an egalitarian society such as the Danish one, with a large public sector, a well-developed welfare system, and fewer differences between rich and poor as compared to most other Western countries, higher income still significantly predicted mental well-being among women and physical well-being among both men and women. In accordance with DSR theory, this suggests that income may be a key protective factor against negative divorce-related health impacts (Leopold, 2018), even in highly egalitarian societies. Even more so, income may be more important than level of education, a variable previously

found to be related to post-divorce psychological and physical health outcomes (Cohen and Finzi-Dottan, 2012; Perrig-Chiello et al., 2015), but which was not found to significantly predict mental or physical well-being in this study.

To the best of our knowledge, this study is the first to include a large sample of very recently divorced individuals, employ standardized and validated mental and physical health measures consisting of multiple health-related indicators with available background population data for direct comparisons, and a multitude of sociodemographical and divorce-related variables previously shown to be associated with health-related outcomes. However, when evaluating the results, the following study limitations should be taken into consideration. The study used a non-probability sample of divorcees and employed self-report measures, which may limit the generalizability of findings.

Specifically, the study sample may have consisted of individuals with more conflicts and more mental and physical problems than those who did not participate in the study, as these individuals may have believed that the intervention platform would be particularly helpful to them. Conversely, it may also be that people with more conflicts and more mental and physical problems may have decided not to participate because it may have felt threatening to their sense of self (Howell and Shepperd, 2012; DiBello et al., 2015), and thus, are underrepresented in the current study. Additionally, we were unable to determine if both partners in a prior marriage participated in the study, which may affect the assumption of independence of data in the analyses. Further, due to the cross-sectional nature of our data, the results preclude causal inferences. Lastly, while the Danish context is interesting for several reasons, including the minimal societal stigma surrounding divorce and the presence of greater gender and income equality, there is also great acceptance of non-marital cohabitation, such that many couples choose to not get legally married. As the study targeted formerly legally married individuals, individuals who cohabitate were not recruited, and thus, it is unclear whether the study results may generalize to this group of individuals. However, we expect that the relationship dissolution process is similar for married and cohabitating individuals, to the extent that there can be children involved and shared assets (e.g., house). Therefore, we do not have reason to expect that non-married individuals differ from married individuals; however, future research should seek to examine this point.

In conclusion, the study found that the health-related quality of life of Danish divorcees immediately following divorce was significantly different from and worse than the comparative Danish background population. Further, higher levels of divorce conflict predicted worse mental health even after controlling for other sociodemographic variables and divorce characteristics often targeted in research on the interplay between divorce and health. The findings underscore the relevance of providing divorce interventions for divorcees as early as possible following their divorce to improve health-related quality of life.

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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 the Danish Data Protection Agency and the Regional Scientific Ethical Committee of Copenhagen, Denmark. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

This original research report is part of the doctoral thesis for SS. SS and GH were responsible for the design of the intervention and the study protocol and also responsible for the manuscript writing. JS was responsible for data analysis. CØ and AC were responsible for feedback and editing. All authors have read and approved the final manuscript.

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Conflict of Interest: For due diligence, we would like to declare that the University of Copenhagen, Denmark, where the authors work, owns the digital intervention platform "Cooperation after Divorce (CAD)" while two of the co-authors (GH and SS) hold the commercial license and intellectual property rights to the platform through the Company "CAD" (Samarbejde Efter Skilsmisse ApS).

The reviewer LL declared a shared affiliation, with no collaboration, with the author to the handling editor at the time of the review.

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A Dyadic Test of the Association Between Trait Self-Control and Romantic Relationship Satisfaction

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Previous research has demonstrated that trait self-control is related to a range of positive romantic relationship processes, suggesting that trait self-control should be positively and robustly linked to relationship satisfaction in both partners in a romantic relationship. However, the existing empirical evidence is limited and mixed, especially regarding partner effects (i.e., the effect of one's self-control on the partner's relationship satisfaction). With three datasets of heterosexual couples (S1: $N = 195$ newlyweds, longitudinal; S2: $N = 249$ couples who transition into first parenthood, longitudinal; S3: $N = 929$ couples, cross-sectional), the present pre-registered studies examined: (1) the dyadic associations between trait self-control and relationship satisfaction both cross-sectionally and longitudinally, and (2) whether these effects hold when controlling for both partners' relationship commitment. The results indicated a cross-sectional positive actor effect, some support for a positive cross-sectional partner effect, and only little support for a longitudinal actor (but not partner) effect. After controlling for relationship commitment, all effects of trait self-control on satisfaction diminished except for a longitudinal actor effect among women in Study 2. Potential explanations for the current results, and implications for theory and practice, are discussed.

Keywords: trait self-control, relationship satisfaction, relationship commitment, romantic relationships, dyadic, cross-sectional, longitudinal

INTRODUCTION

Trait Self-control, defined as the ability to inhibit unwanted impulses and to respond in a goal-directed manner (Vohs and Baumeister, 2016, p. 2), is important in many life domains, including the functioning and wellbeing of romantic relationships (Finkel and Campbell, 2001; Karremans et al., 2015). Indeed, many studies found that trait self-control is associated with various relationship benefits, such as increased levels of perspective-taking (Tangney et al., 2004), responsiveness (Gomillion et al., 2014), constructive communication (Bornstein and Shaffer, 2017), sacrifice (Pronk and Karremans, 2014), forgiveness (Burnette et al., 2014), reductions in aggressiveness (Denson et al., 2012), and refraining from the temptation of attractive alternatives (Pronk et al., 2011).

Given these positive romantic relationship outcomes, it seems reasonable to assume that the higher one's trait self-control, the higher romantic relationship satisfaction will be, in both the individual and the partner, and that the current level of trait self-control is predictive of future relationship satisfaction. There is evidence suggesting that couples are happier when there is more overall self-control in the relationship (Vohs et al., 2011). However, surprisingly, relatively few studies have focused explicitly on the

association between trait self-control and relationship satisfaction while taking a dyadic and/or longitudinal approach, and as will be explained in more detail shortly, the existing support is somewhat mixed. Thus, it is not clear whether people high in trait self-control are actually more satisfied with their relationship, and importantly, whether their partners are also more satisfied with the relationship, both cross-sectionally and longitudinally. In the current research, we used two longitudinal couple datasets and a third large-scale cross-sectional dataset, to examine these associations. We examined whether consistent findings would emerge among samples with different relationship characteristics. In addition, we explored whether trait self-control plays a unique role in predicting relationship satisfaction when a core factor of relationship wellbeing, relationship commitment, is also considered.

Trait Self-control and Relationship Satisfaction

How would trait self-control be associated with relationship satisfaction? It has been argued that self-control is a driving force directing gut-level destructive impulses towards constructive responses that are aligned with long-term relationship goals (Finkel and Campbell, 2001), a process called the transformation of motivation (Yovetich and Rusbult, 1994). Consistent with this reasoning, and as mentioned above, individuals with high trait self-control indeed are better able to exhibit pro-relationship behaviors towards the partner, especially when faced with dilemmas between responding on self-interested motives or partner- and relationship-oriented motives (e.g., constructive communication, forgiveness, sacrifice). Because they are more likely to do so, individuals with high self-control also tend to be perceived as more responsive (Gomillion et al., 2014) and trustworthy (Gomillion et al., 2014; Righetti and Finkenauer, 2011) by their partners. Based on such findings, one could predict that high trait self-control is associated with a high level of relationship satisfaction, both for oneself, and perhaps especially, for the partner.

However, the empirical support is mixed. There is some evidence for both positive cross-sectional and longitudinal *actor effects* of trait self-control on relationship satisfaction (i.e., is partner A's level of trait self-control associated with partner A's relationship satisfaction?), but only a little evidence for a positive cross-sectional (but not longitudinal) *partner effect* (i.e., is partner A's level of trait self-control associated with partner B's relationship satisfaction?). We found ten studies that employed a dyadic approach in examining the association between romantic relationship satisfaction and self-control (Vohs et al., 2011; Young, 2017), or related constructs that have large conceptual overlap with self-control, namely, constraint (Donnellan et al., 2007), impulsivity (Lavner et al., 2017), self-discipline versus impulsiveness (Patrick et al., 2007), and disinhibition (Watson et al., 2004). As for actor effects, the findings generally supported that own self-control indeed was positively associated with own concurrent relationship satisfaction (Donnellan et al., 2007; Lavner et al., 2017; Mead, 2005; Robins et al., 2000; Stroud et al., 2010; Tan et al., 2017; Watson et al., 2004; Young, 2017), and with

own relationship satisfaction 9 months later (Vohs et al., 2011), but not with own relationship satisfaction later on (e.g., 4 years' trajectories of marital satisfaction; Lavner et al., 2017). As for partner effects, only a few studies found that own self-control was positively associated with the partner's concurrent relationship satisfaction (Mead, 2005; Patrick et al., 2007; Tan et al., 2017). However, one study found no actor nor partner effects (Stroud et al., 2010). Moderating effects of gender (Robins et al., 2000) and relationship status (e.g., dating versus married couples, the number of children; Stroud et al., 2010), and varying results with different measures (Robins et al., 2000; Stroud et al., 2010), make the findings even more ambiguous.

What may explain these mixed findings? Although there may be various reasons (we return to this issue more extensively in the General Discussion), one plausible reason may be that the effects of self-control are relatively small as compared to the effects of broader relationship motives, specifically, relationship commitment. Relationship commitment is defined as the motivation to stay in a relationship and having a long-term orientation (Rusbult and Buunk, 1993), and is rooted in past relationship experiences. Rooted in interdependence theory (Rusbult and Van Lange, 2003), relationship commitment can be considered as a major relationship-specific motive (i.e., macro-motive; Holmes and Rempel, 1989) that plays a central role in the functioning and wellbeing of romantic relationships. Existing literature has documented that relationship commitment is associated with positive feelings and thoughts about the partner and the relationship (Rusbult and Buunk, 1993), trust (Wieselquist et al., 1999), forgiveness (Finkel et al., 2002), intimacy (Acker and Davis, 1992), and a range of other beneficial relationship outcomes (Stanley et al., 2010). Furthermore, a large body of research has shown that commitment (Givertz et al., 2016; Hendrick et al., 1988) is strongly associated with relationship satisfaction. It is important to note that relationship satisfaction can both be a determinant as well as an outcome of relationship commitment, affecting each other in a cyclical manner (e.g., satisfaction promotes commitment, and commitment promotes relationship satisfaction by promoting pro-relationship responses; Wieselquist et al., 1999). Considering the importance of commitment for relationship satisfaction, an interesting and important question that we aim to answer is whether the effects of trait self-control on relationship satisfaction occur *above and beyond* the effects of relationship commitment. Or put differently, when the commitment, the motivation to stay in a relationship, is strong, does self-control play any additional role in promoting relationship satisfaction? This question also speaks to the broader issue of whether relationship satisfaction is determined mainly by relationship-specific factors, or is determined mainly or additionally by individual difference factors of both partners (Joel et al., 2020).

The Current Research

The goal of the current research was to test whether trait self-control has a robust and replicable association with own and the partner's relationship satisfaction, concurrently and longitudinally, and whether any such associations would hold when a broader macro-motive (i.e., relationship commitment) is

taken into account. We explored the actor and partner effects across the three datasets (see pre-registration, https://osf.io/hc5gt/?view_only=753af6222c7545dd9df5991b353dac9b). In all three studies, self-control was operationalized in terms of participants' self-reported level of self-control¹. We first re-analyzed a longitudinal dataset (Study 1, 195 heterosexual newlyweds, 5 waves' annual evaluation) to test both the cross-sectional and longitudinal actor and partner effects of trait self-control on relationship satisfaction. Second, we analyzed another longitudinal dataset (Study 2, 249 heterosexual couples who went through the transition to parenthood) to examine whether the results of Study 1 could be replicated. Third, we used a large cross-sectional couple study (Study 3, 929 heterosexual couples whose relationship lengths ranged from about 8 to 37 years), with greater precision and power to obtain reliable estimates of concurrent associations between trait self-control and relationship satisfaction².

STUDY 1

Materials and Methods

Participants

The original sample consisted of 199 heterosexual newlywed couples (five waves with annual assessments; for a description of the first two waves of the study, see Finkenauer et al., 2009; for a description of the waves 3, 4, and 5 of the study, see Muusses et al., 2015) in the Netherlands. Men and women in the first assessment were 32.91 ($SD = 4.87$) and 29.97 ($SD = 4.25$) years old, respectively. Relationship length was 5.71 years on average ($SD = 3.03$). For the current study, we made an *a priori* decision to use only self-report data of wave 2 (Time 1, 195 couples) and wave 5 (Time 2, 141 couples), as only wave 2 included all predictors of interest. At Time 1 (T1), 37.44% of the couples had children, while 94.33% had children at Time 2 (T2). Independent samples *t*-tests indicated that couples who dropped out at T2 did not differ from those who completed the T2 assessment on relationship commitment and relationship

satisfaction (p 's $\geq .332$), but they did differ on trait self-control. Men who dropped out scored higher on trait self-control at T1 than those who did not [$t(193) = -1.98, p = 0.049$], while women who dropped out were lower in trait self-control than those who did not [$t(193) = 0.71, p = 0.027$].

Measures

All the measures were in Dutch.

Trait Self-Control

The 11-item version of the Brief Self-Control Scale (BSCS; used in Finkenauer et al., 2005; Tangney et al., 2004) was used to assess trait self-control at T1. The original scale shows adequate reliability (Tangney et al., 2004) and structural validity (Manapat et al., 2019). The short Dutch version of the scale showed adequate reliability (Finkenauer et al., 2005; Frijns et al., 2005). Example items were "I have a hard time breaking bad habits," and "I am good at resisting temptation." Items were rated on a 5-point scale (1 = *not at all like me* to 5 = *very much like me*). Higher average scores indicated higher levels of trait self-control. Cronbach's alphas for men and women were 0.74 and 0.71, respectively.

Relationship Commitment

An 8-item commitment scale (revised from the Investment Model Scale; Rusbult et al., 1998) was used at T1. The original scale shows good reliability, as well as convergent, discriminant, and predictive validity (Rusbult et al., 1998). Example items were "I want our relationship to last for a very long time," and "I would not feel very upset if our relationship were to end in the near future" (reversed; 1 = *not true at all* to 5 = *completely true*). Higher average scores indicated higher levels of relationship commitment. Cronbach's alphas for men and women were 0.90 and 0.91, respectively.

Relationship Satisfaction

The 10-item Dyadic Satisfaction Subscale of the Dyadic Adjustment Scale (Spanier, 1976) was used at T1 and T2. The original scale shows high reliability, as well as content, criterion-related, and construct validity (Spanier, 1976). Sample items are "How happy are you and your husband/wife - all in all - with your marriage?" (1 = *extremely unhappy* to 7 = *perfect*) and "How often do you think things are going well between you and your husband/wife? (1 = *never* to 6 = *always*)." Higher average scores indicated greater relationship satisfaction. Cronbach's alphas for men and women at T1 and T2 ranged from 0.68 to 0.79.

Statistical Analysis

Descriptive analyses were carried out in SPSS 25.0. To test the main hypotheses, we used the actor-partner interdependence model (APIM; Kenny et al., 2006, p. 145) with structural equation modeling using the Lavaan package (Rosseel, 2012) in R Core Team (2013). In the current study, all variables were mixed variables (i.e., variables that could differ both across and within couples; Kenny et al., 2006, p. 9). Given the existing evidence for gender differences on the association between trait self-control and relationship satisfaction (Robins et al., 2000), we considered the heterosexual couples as distinguishable dyads in all the dyadic

¹It is important to mention that there is an ongoing debate about the nature of self-control and its underlying fundamental processes. For example, dual-process models of self-control regard inhibition as a fundamental aspect of self-control, allowing more controlled processes to override automatic responses (e.g., Hofmann et al., 2009). Recently, the value-based choice model of self-control (Berkman et al., 2017) provides a different view, arguing that although decisions often feel as if effortful inhibition is needed, ultimately a decision results from a dynamic integration process during which the subjective values of different behavioral options are computed. The option with the greatest value will result in action. Notably, the current research is not designed to test these specific models against each other.

²Notably, we also explored interactions between self-control and relationship commitment on relationship satisfaction (both cross-sectionally and longitudinally). As indicated in previous literature, low levels of self-control could perhaps be compensated intra-personally by own high levels of commitment (cf. Balliet et al., 2011). Additionally, low levels of self-control might be compensated by the partner's high levels of commitment. Finally, perhaps both high self-control and high commitment in both partners may be required to promote relationship satisfaction (i.e., a synergistic model). For the sake of brevity, however, we will not report the outcomes in the main text. In short, while we found some significant interactions in each study, we found no consistent interaction patterns across the three studies (see **Supplementary Material B**).

analyses in the current research. First, to investigate the cross-sectional effects of trait self-control on relationship satisfaction, we ran a basic APIM with both partners' trait self-control at T1 predicting both partners' relationship satisfaction at T1. Second, we ran another APIM controlling for both partners' relationship commitment at T1. Third, we investigated the longitudinal effects of trait self-control on relationship satisfaction with another basic APIM, in which both partners' trait self-control at T1 predicted both partners' relationship satisfaction at T2, while controlling for both partners' relationship satisfaction at T1. Fourth, we ran another APIM in which both partners' relationship commitment at T1 were added to the model. To adjust for univariate and multivariate non-normality, all the models applied maximum likelihood estimation with robust (Huber-White) standard errors and a scaled test statistic that is (asymptotically) equal to the Yuan-Bentler test statistic, for both complete and incomplete data. We used full information maximum likelihood (fiml) to handle the missing data. Since the four APIMs were saturated models, which estimate p^* parameters and fit the data perfectly (West et al., 2012), we used the sampling-error-adjusted Bayesian information criterion (SABIC) as the fit index (Garcia et al., 2015). All the models were tested among samples with and without outliers, which generated similar findings. Thus, for the final models, we used all the available data (i.e., with outliers). The same data analysis strategy was used for all three studies (i.e., cross-sectional effects in Studies 1, 2 and 3; longitudinal effects in Studies 1 and 2).

Results

Descriptive Statistics

Descriptive statistics are presented in **Table 1**. The Pearson correlational analysis (two-tailed) provided support for a positive actor effect of trait self-control on relationship satisfaction, both cross-sectionally and longitudinally, but no support for partner effects, except that men's trait self-control was associated with women's concurrent relationship satisfaction.

Cross-Sectional Actor and Partner Effects of Trait Self-Control on Relationship Satisfaction

Cross-sectional APIM statistics are summarized in **Table 4** and **Figure 1** (for detailed statistics of each model, see Table A1 in **Supplementary Material A**). Consistent with the correlational analysis, the results indicated positive actor effects of trait self-control on relationship satisfaction for men ($b = 0.30$, $SE = 0.06$, $p < 0.001$) and women ($b = 0.16$, $SE = 0.06$, $p = 0.010$). In addition, the results indicated a significant partner effect of trait self-control on relationship satisfaction for women ($b = 0.15$, $SE = 0.08$, $p = 0.047$), but not for men ($b = 0.08$, $SE = 0.06$, $p = 0.165$). That is, men's levels of trait self-control were positively associated with their female partner's current relationship satisfaction, whereas women's levels of trait self-control were not significantly associated with their male partner's current relationship satisfaction.

When adding partners' relationship commitment to the model, the association between men's own trait self-control and own concurrent relationship satisfaction remained significant ($b = 0.23$, $SE = 0.04$, $p < 0.001$), but the actor effect for

women disappeared ($b = 0.09$, $SE = 0.06$, $p = 0.141$), and there were no significant partner effects for both genders (men: $b = 0.03$, $SE = 0.05$; women: $b = 0.10$, $SE = 0.06$; p 's ≥ 0.084). Additionally, relationship commitment was a significant predictor of concurrent relationship satisfaction, as an actor effect for both genders (men, $b = 0.46$, $SE = 0.08$; women, $b = 0.44$, $SE = 0.12$; p 's < 0.001), and a partner effect for women (women, $b = 0.21$, $SE = 0.07$; $p = 0.002$), but not for men ($b = 0.07$, $SE = 0.05$, $p = 0.203$).

Longitudinal Actor and Partner Effects of Trait Self-Control on Relationship Satisfaction

Longitudinal APIM statistics are presented in **Table 4** and **Figure 2** (for detailed statistics of each model, see Table A2 in **Supplementary Material A**). The results showed no significant actor (men, $b = 0.04$; women, $b = 0.11$; SE 's = 0.07, p 's ≥ 0.136) or partner effects (men, $b = -0.06$, $SE = 0.07$; women, $b = -0.05$, $SE = 0.06$, p 's ≥ 0.362) of trait self-control on relationship satisfaction 3 years later for both genders. Controlling for both partner's relationship commitment did not change the significance of these results (p 's ≥ 0.139). Thus, for both genders, trait self-control did not predict one's own or the partner's relationship satisfaction 3 years later. Additionally, there was no actor (men, $b = 0.05$, $SE = 0.08$; women, $b = -0.01$, $SE = 0.09$; p 's ≥ 0.563) or partner effects (men, $b = -0.05$, $SE = 0.06$; women, $b = 0.01$, $SE = 0.10$; p 's ≥ 0.445) of relationship commitment on satisfaction 3 years later.

Discussion

In sum, Study 1 found some support for both positive actor and partner effects of trait self-control on relationship satisfaction. However, these effects only emerged cross-sectionally, with no evidence for any longitudinal effect. We found some gender differences, such that cross-sectionally men's levels of trait self-control were associated with their female partner's relationship satisfaction, but women's levels of trait self-control were not associated with their male partner's relationship satisfaction. Importantly, when both partners' relationship commitment was taken into account, both cross-sectional actor and partner effects diminished.

STUDY 2

We used another existing couple data set (Study 2) to test the replicability and robustness of both the cross-sectional and longitudinal effects we found in Study 1.

Materials and Methods

Participants

The original dataset consisted of 440 Dutch men and women who were going through the transition to parenthood (Ter Kuile et al., in press). Participants either received 20 euros upon completion of the fourth wave's assessment or participated in a lottery for one prize of 250 euro and five prizes of 50 euros. With online questionnaires, four waves of data were collected during pregnancy, and when the child was approximately

TABLE 1 | Correlations between variables in Study 1 ($N = 195$).

| | <i>N</i> | <i>Mean (SD)</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------------------|----------|------------------|---------|---------|---------|---------|-------|---------|---------|---|
| Men | | | | | | | | | | |
| 1. T1 Trait self-control | 195 | 3.30 (0.47) | | | | | | | | |
| 2. T1 Relationship commitment | 195 | 4.59 (0.45) | 0.15* | | | | | | | |
| 3. T1 Relationship satisfaction | 195 | 4.27 (0.38) | 0.36*** | 0.59*** | | | | | | |
| 4. T2 Relationship satisfaction | 138 | 4.16 (0.42) | 0.31*** | 0.46*** | 0.68*** | | | | | |
| Women | | | | | | | | | | |
| 5. T1 Trait self-control | 195 | 3.18 (0.43) | -0.09 | 0.08 | 0.06 | -0.06 | | | | |
| 6. T1 Relationship commitment | 194 | 4.65 (0.41) | 0.02 | 0.13 | 0.18* | 0.11 | 0.12 | | | |
| 7. T1 Relationship satisfaction | 195 | 4.16 (0.43) | 0.15* | 0.31*** | 0.36*** | 0.24** | 0.14# | 0.42*** | | |
| 8. T2 Relationship satisfaction | 141 | 4.10 (0.42) | 0.11 | 0.30*** | 0.36*** | 0.41*** | 0.17* | 0.31*** | 0.52*** | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, # $p = 0.050$, Two-tailed.

TABLE 2 | Correlations between variables in Study 2 ($N = 249$).

| | <i>N</i> | <i>Mean (SD)</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------------------|----------|------------------|---------|---------|---------|---------|---------|---------|---------|---|
| Men | | | | | | | | | | |
| 1. T1 Trait self-control | 236 | 3.23 (0.55) | | | | | | | | |
| 2. T1 Relationship commitment | 233 | 4.82 (0.32) | 0.23*** | | | | | | | |
| 3. T1 Relationship satisfaction | 233 | 4.49 (0.52) | 0.29*** | 0.62*** | | | | | | |
| 4. T2 Relationship satisfaction | 119 | 4.41 (0.65) | 0.20* | 0.37*** | 0.59*** | | | | | |
| Women | | | | | | | | | | |
| 5. T1 Trait self-control | 247 | 3.15 (0.52) | 0.03 | 0.05 | 0.15* | 0.20* | | | | |
| 6. T1 Relationship commitment | 247 | 4.89 (0.22) | 0.07 | 0.15* | 0.18** | 0.27** | 0.14* | | | |
| 7. T1 Relationship satisfaction | 247 | 4.52 (0.51) | 0.06 | 0.28*** | 0.39*** | 0.46*** | 0.24*** | 0.54*** | | |
| 8. T2 Relationship satisfaction | 136 | 4.53 (0.55) | 0.02 | 0.26** | 0.24** | 0.60*** | 0.31*** | 0.31*** | 0.53*** | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, Two-tailed.

TABLE 3 | Correlations between variables in Study 3 ($N = 929$).

| | <i>N</i> | <i>Mean (SD)</i> | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------------|----------|------------------|---------|---------|---------|---------|---------|---|
| Men | | | | | | | | |
| 1. Trait self-control | 929 | 4.85 (1.24) | | | | | | |
| 2. Relationship commitment | 929 | 6.31 (0.91) | 0.29*** | | | | | |
| 3. Relationship satisfaction | 929 | 5.83 (0.96) | 0.33*** | 0.73*** | | | | |
| Women | | | | | | | | |
| 4. Trait self-control | 929 | 4.88 (1.21) | 0.17*** | 0.17*** | 0.22*** | | | |
| 5. Relationship commitment | 929 | 6.32 (0.94) | 0.24*** | 0.51*** | 0.54*** | 0.22*** | | |
| 6. Relationship satisfaction | 929 | 5.74 (1.04) | 0.28*** | 0.51*** | 0.66*** | 0.23*** | 0.76*** | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, Two-tailed.

four months old, eight months old, and one year old (about 1.5 years after the first assessment). To make the current study comparable with Study 1, we used only two waves' data (T1: wave 1, 249 couples; T2: wave 4, 139 couples) and included only heterosexual couples of which both partners' data were available in the first wave. Independent samples t -tests indicated that couples who dropped out at T2 did not differ from those who completed the T2 assessment on the key variables of the current study (p 's > 0.095). At T1, the mean ages of men and women were 30.72 ($SD = 4.72$) and 28.06 ($SD = 3.72$) years old, respectively. The average relationship length was 6.25 years ($SD = 3.53$). Half of the couples (52%) were married,

29% were living together, and 19% were cohabiting with a cohabitation contract. Most respondents received their highest education in an applied/scientific university (60.2% for men, 77% for women), while around one-third of them completed primary/high school or basic vocational education (37.8% for men, 31% for women). Around half of them had a monthly income of less than 2000 euros (men, 48.5%; women, 69.2%), and the rest mainly had an income between 2000 to 3000 euros (men, 41.6%; women, 28%).

Measures

All the measures were in Dutch.

TABLE 4 | Statistic summary on the actor and partner effects of trait self-control on relationship satisfaction across the three studies.

| | The basic APIM models | | The APIM models controlling for relationship commitment | |
|--|-----------------------|---------|---|--------|
| | Men | Women | Men | Women |
| Cross-sectional models | | | | |
| Actor effect^a | | | | |
| Study 1 (N = 195) | 0.30*** | 0.16* | 0.23*** | 0.09 |
| Study 2 (N = 249) | 0.28*** | 0.24*** | 0.15** | 0.16** |
| Study 3 (N = 929) | 0.23*** | 0.16*** | 0.08*** | 0.04* |
| Partner effect^b | | | | |
| Study 1 | 0.08 | 0.15* | 0.03 | 0.10 |
| Study 2 | 0.14* | 0.04 | 0.11* | -0.03 |
| Study 3 | 0.14*** | 0.21*** | 0.05** | 0.06** |
| Longitudinal models^c | | | | |
| Actor effect | | | | |
| Study 1 | 0.04 | 0.11 | 0.04 | 0.11 |
| Study 2 | 0.05 | 0.19* | 0.05 | 0.21* |
| Partner effect | | | | |
| Study 1 | -0.06 | -0.05 | -0.06 | -0.06 |
| Study 2 | 0.04 | 0.00 | 0.06 | 0.00 |

^aActor effect indicates the effect of partner A's predictor on partner A's relationship satisfaction (unstandardized regression co-efficients). ^bPartner effect indicates the effect of partner B's predictor on partner A's relationship satisfaction (unstandardized regression co-efficients). ^cEffects in the longitudinal models illustrate the effects of trait self-control on the change of relationship satisfaction between T1 and T2 (i.e., the slope). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Trait Self-Control

The 11-item version BSCS (used in Finkenauer et al., 2005; Tangney et al., 2004) was used at T1 as in Study 1. Cronbach's alphas for men and women were 0.75 and 0.76, respectively.

Relationship Commitment

In this study, a 5-item³ commitment scale (Arriaga and Agnew, 2001) was used at T1. Sample items were "I intend to stay in this relationship" and "I feel strongly attached to our relationship" (1 = *totally disagree* to 5 = *totally agree*). Higher average scores indicated higher levels of relationship commitment. Cronbach's alphas for men and women were low, 0.68 and 0.59, respectively.

Relationship Satisfaction

A 5-item Satisfaction Subscale of the Investment Model Scale (Rusbult et al., 1998) was used at T1 and T2. The original scale shows good reliability, as well as convergent and discriminant validity (Rodrigues and Lopes, 2013; Rusbult et al., 1998). Sample items were "Our relationship makes me very happy" and "My relationship is much better than others' relationships" (1 = *completely disagree* to 5 = *completely agree*). Higher average scores indicated greater relationship satisfaction. Cronbach's alphas for men and women at T1 and T2 ranged from 0.81 to 0.89.

³The original scale consists of 12 items. However, Cronbach's alpha for the original 12-item scale was 0.67 for men and 0.47 for women, respectively. For an acceptable reliability, the final scale consists of 5 items.

Results

Descriptive Statistics

Descriptive statistics are presented in **Table 2**. Consistent with Study 1, the correlation analysis (two-tailed) provided support for the cross-sectional and longitudinal actor effects of trait self-control on relationship satisfaction for both genders, and non-significant longitudinal partner effect on women's relationship satisfaction. Other than in Study 1, significant partner effects on men's satisfaction were found, both cross-sectionally and longitudinally. Additionally, in contrast to Study 1, there was no cross-sectional partner effect on women's relationship satisfaction.

Cross-Sectional Actor and Partner Effects of Trait Self-Control on Relationship Satisfaction

As shown in **Table 4** and **Figure 1** (for detailed statistics for each model, see Table A3 in **Supplementary Material A**), the results of the APIM indicated a positive actor effect of trait self-control on relationship satisfaction for both men ($b = 0.28$, $SE = 0.07$, $p < 0.001$) and women ($b = 0.24$, $SE = 0.06$, $p < 0.001$), which is consistent with Study 1. Different from Study 1, we found a positive partner effect on men's satisfaction ($b = 0.14$, $SE = 0.07$, $p = 0.038$), but not on women's satisfaction ($b = 0.04$, $SE = 0.06$, $p = 0.470$). When controlling for both partners' commitment, even though the effect sizes diminished, the significance levels of all effects on satisfaction did not change for both genders (actor effect: men, $b = 0.15$; women, $b = 0.16$; SE 's = 0.05, p 's = 0.001; partner effect: men, $b = 0.11$, $SE = 0.05$, $p = 0.044$; women, $b = -0.03$, $SE = 0.04$, $p = 0.432$). These findings are consistent with Study 1, with the exception that women's trait

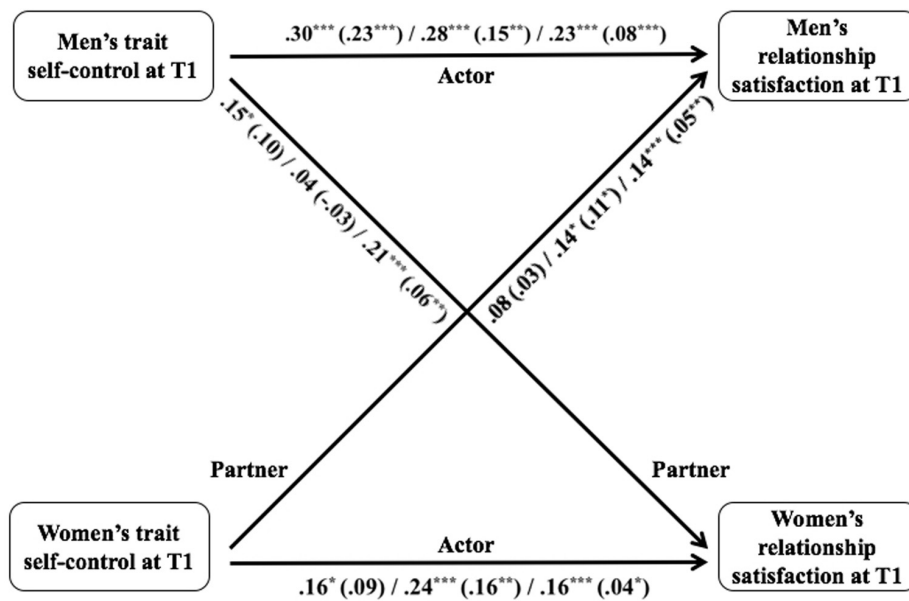


FIGURE 1 | Cross-sectional Actor and Partner Effects of Trait Self-control on Relationship Satisfaction across Studies. Statistics illustrate the effects (unstandardized regression coefficients) in Studies 1, 2 and 3 respectively. Statistics in parentheses illustrate the effects when controlling for relationship commitment at T1. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

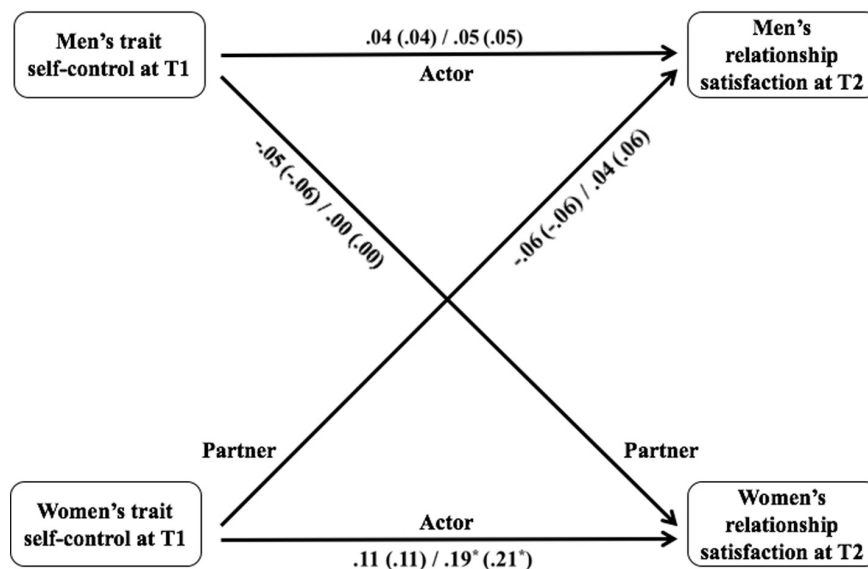


FIGURE 2 | Longitudinal Actor and Partner Effects of Trait Self-control on Relationship Satisfaction in Studies 1 and 2. Statistics illustrate the effects (unstandardized regression coefficients) of trait self-control on the change of relationship satisfaction between T1 and T2 (i.e., the slope) in Studies 1 and 2 respectively. Statistics in parentheses illustrate the effects when controlling for relationship commitment and relationship satisfaction at T1. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

self-control was still significantly associated with their own and their male partner's concurrent relationships satisfaction after controlling for commitment.

Additionally, and similar to the findings in Study 1, there was a significant actor effect of commitment on concurrent relationship satisfaction for both genders (men, $b = 0.92$, $SE = 0.12$; women, $b = 1.16$, $SE = 0.18$; p 's < 0.001), and a partner effect for women ($b = 0.33$, $SE = 0.14$,

$p = 0.021$), but not for men ($b = 0.16$, $SE = 0.15$, $p = 0.280$).

Longitudinal Actor and Partner Effects of Trait Self-Control on Relationship Satisfaction

Longitudinal APIM statistics are presented in Table 4 and Figure 2 (for detailed statistics for each model, see Table A4 in Supplementary Material A). Consistent with Study 1, the

results indicated that there was no longitudinal actor effect on men's satisfaction (b 's = 0.05; SE 's = 0.10; p 's \geq 0.582), regardless of whether or not controlling for both partners' commitment. However, different from Study 1, the data of Study 2 yielded a positive longitudinal actor effect of trait self-control at T1 on relationship satisfaction 1.5 years later among women (b = 0.19, SE = 0.08, p = 0.021), even when controlling for commitment (b = 0.21, SE = 0.08, p = 0.01). There were no partner effects on men's (b 's = 0.04 and 0.06; SE 's = 0.12; p 's \geq 0.637) nor women's satisfaction (b 's = 0.00; SE 's = 0.09 and 0.08; p 's \geq 0.966), which is consistent with Study 1. Additionally, no longitudinal actor nor partner effects of commitment on relationship satisfaction were found for either genders (actor effect: men, b = 0.17, SE = 0.22; women, b = 0.20; SE = 0.34; partner effect: men, b = 0.32, SE = 0.38; women, b = 0.29, SE = 0.17, p 's \geq 0.093).

Discussion

In replication of Study 1, Study 2 obtained positive cross-sectional actor effects of trait self-control for both genders, and some support for a partner effect. In contrast to Study 1, the partner effect now occurred for men (and not for women, as in Study 1), meaning that women's levels of trait self-control were associated with their male partner's relationship satisfaction. Different from Study 1, the cross-sectional actor effect still emerged for women when taking commitment into account, as well as a partner effect for men. Other than in Study 1, we also found support for a longitudinal actor effect for women, even when controlling for commitment.

STUDY 3

Study 3 was a large-scale study that we used to provide a well-powered validation for the cross-sectional effects that were found in Studies 1 and 2.

Materials and Methods

Participants

We used data from a study among 1233 romantic couples who were invited to participate in a two-week couple intervention (Karremans et al., 2020). Before the intervention, all participating couples were asked to fill in questionnaires that included trait self-control, relationship commitment and relationship satisfaction. We used these baseline data for the current study. Participants who were currently involved in a romantic relationship with a minimum duration of one year, living together with their partner, and 18 years or older were recruited via an independent Dutch research agency⁴, which has a nation-wide participant panel. Qualified participants were invited to fill in the informed consent, and completed the questionnaires. In the current study, we included data from heterosexual couples of which both partners completed the questionnaires (N = 929 couples). Men and women were on average 50.59 (SD = 14.10) and 47.77 (SD = 13.76) years old, respectively. Relationship length was 22.45 years on average (SD = 14.57). Most couples (92.9%)

were living together, 71.8% were married and 73.6% had at least one child. Nearly half of the participants received their highest education from an applied/scientific university (45.4% of the men, and 43.5% of the women), while the rest had a high school, vocational education or less. The gross annual salary of all household members was almost evenly distributed: 18.7% were below 34,500 euros, 21.5% were between 34,500 euros and 41,200 euros, 26.2% were between 41,200 euros and 69,000 euros, 15.5% were equal to or beyond 69,000 euros.

Measures

All the measures were in Dutch.

Trait Self-control

We used the 4-item self-restraint subscale of Barkley deficits in executive functioning scale (adults and short version; Barkley, 2011, p. 154). The original scale shows good reliability (Barkley, 2011, p. 71), as well as construct and criterion validity (Barkley, 2011, p. 73). Participants rated to what extent the items described their behavior during the past 6 month (1 = never or rarely to 7 = very often). Example items were "unable to inhibit my reactions or response toward events or others (reversed)," and "acting without thinking (reversed)." Higher average scores indicated higher levels of self-control. Cronbach's alphas for men and women were 0.84 and 0.83, respectively. While this measure is different from the self-control measures used in Studies 1 and 2, there is a large conceptual overlap in the measures, and in our previous research (Zuo et al., 2018), the correlations between Tangney's scale (i.e., the 13-item version BSCS) and Barkley's measure were 0.57 for men and 0.48 for women, respectively (one-tailed, p 's < 0.001).

Relationship Commitment

The 7-item commitment subscale of the Investment Model Scale (Rusbult et al., 1998) was used, as in Study 1. Cronbach's alphas for men and women were 0.84 and 0.83, respectively.

Relationship Satisfaction

A 7-item Relationship Assessment Scale (Hendrick, 1988) was used. The original scale shows good reliability and construct validity (Hendrick, 1988). Sample items are "How satisfied are you with your relationship," and "How many problems are there in your relationship (reversed)" (1 = low satisfaction to 5 = high satisfaction). Higher average scores indicated higher levels of relationship satisfaction. Cronbach's alpha was 0.92 for men and 0.93 for women.

Results

Descriptive Statistics

Descriptive statistics are presented in Table 3. The correlation analysis (two-tailed) provided consistent support for the cross-sectional actor effects of trait self-control on relationship satisfaction for both genders. Unlike Studies 1 and 2, cross-sectional partner effects were significant for both genders.

⁴www.flycatcher.eu

Cross-Sectional Actor and Partner Effects of Trait Self-Control on Relationship Satisfaction

Cross-sectional APIM statistics are summarized in **Table 4** and **Figure 1**. Detailed statistics for each model are presented in Table A5 (see **Supplementary Material A**). Consistent with the correlation analysis, the results indicated a positive actor effect of trait self-control on relationship satisfaction for both genders (men: $b = 0.23$, $SE = 0.02$; women: $b = 0.16$, $SE = 0.03$; p 's < 0.001), which is consistent with the findings in Studies 1 and 2. A significant partner effect also emerged for both genders (men: $b = 0.14$; women: $b = 0.21$; SE 's = 0.03; p 's < 0.001). After controlling for both partners' commitment, the significance of all effects did not change, but the effect sizes diminished (actor effect: men, $b = 0.08$, $SE = 0.02$, $p < 0.001$; women, $b = 0.04$, $SE = 0.02$, $p = 0.028$; partner effect: men, $b = 0.05$, $SE = 0.02$, $p = 0.006$; women, $b = 0.06$, $SE = 0.02$, $p = 0.001$). Thus, in Study 3, positive actor and partner effects of trait self-control on concurrent relationship satisfaction were found for both sexes, but the associations were weaker after controlling for relationship commitment.

Similar to the findings in Studies 1 and 2, both partners' own commitment were significant predictors of their own concurrent relationship satisfaction (i.e., actor effect; men, $b = 0.62$, $SE = 0.04$; women, $b = 0.73$; $SE = 0.03$; p 's < 0.001), and men's levels of commitment significantly predicted their female partner's concurrent relationship satisfaction (i.e., a partner effect for women, $b = 0.16$; $SE = 0.03$; p 's < 0.001). However, different from Studies 1 and 2, women's levels of commitment now were significantly associated with their male partner's concurrent relationship satisfaction (i.e., a partner effect for men, $b = 0.21$, $SE = 0.04$, $p < 0.001$).

Discussion

Thus, the findings of Study 3 provided cross-sectional support for both actor and partner effects regarding the association between trait self-control and relationship satisfaction, and again, the effects diminished when controlling for relationship commitment. We did not find gender differences that were consistent with the gender differences obtained in Study 1 or Study 2.

GENERAL DISCUSSION

In three studies, actor-partner interdependence models yielded some support for the prediction that both men and women were currently more satisfied with their relationship to the extent that they reported higher levels of trait self-control. This actor effect remained significant after controlling for relationship commitment in Studies 2 and 3 (except for women in Study 1). Importantly, the data showed little consistent support for partner effects, especially in Studies 1 and 2. These studies also showed some gender differences, but not consistent across studies. However, in the high-powered Study 3, both men and women were currently more satisfied with their relationship when their romantic partner reported higher levels of trait self-control, even when commitment was considered. Longitudinally,

we found a positive actor (but not partner) effect among women in Study 2 only, independent of commitment. There were no other longitudinal partner effects for trait self-control. Across the three studies, we found a consistent positive actor effect of relationship commitment on concurrent relationship satisfaction for both genders, and a consistent positive partner effect of relationship commitment on concurrent relationship satisfaction for women (but not for men). In sum, the present findings suggest that trait self-control has a positive association with one's own relationship satisfaction that is small to medium in magnitude, a less robust association with the partner's relationship satisfaction, and all associations diminished when considering the role of relationship commitment, except for a longitudinal actor effect among pregnant women in Study 2.

In light of the large literature on the role of self-control in promoting relationship-beneficial processes, the current findings may seem surprising at first sight. Self-control has been associated with a variety of pro-relationship responses (e.g., forgiveness, sacrifice, and resisting tempting alternatives) that can be expected to contribute to both one's own and the partner's relationship satisfaction. However, trait self-control had only a relatively small impact on relationship satisfaction, particularly concurrently, as compared to the effects of a more motivational construct as commitment. Empirically, the effect sizes in the correlational findings were about twice as large for commitment as for trait self-control, and trait self-control explained less variance in concurrent relationship satisfaction than commitment. Neither trait self-control nor commitment effectively predicted relationship satisfaction longitudinally, with one exception in Study 2 (i.e., pregnant women's trait self-control, but not commitment, predicted their own satisfaction 1.5 years later, even though the effects of trait self-control and commitment were similar in magnitude).

Although we do not want to suggest that ability factors like trait self-control do not play any role in determining relationship satisfaction, the current findings do suggest that when motivated – being highly committed to the relationship – partners may come a long way in maintaining a relatively satisfying relationship, irrespective of one's own or the partner's level of trait self-control. Interestingly, the current findings echo the results of a recent large-scale study (using machine learning), showing that relationship satisfaction is mainly explained by relationship-specific variables (like commitment), and that a range of individual difference variables does not add much predictive power in explaining relationship satisfaction or quality (Joel et al., 2020). One explanation may be that relationship-specific variables by definition were measured in the context of the relationship, whereas individual difference variables, like trait self-control, were not. Perhaps a different picture may emerge if self-control would have been measured regarding the specific context of the relationship (i.e., to what extent one exerts self-control ability in the context of his/her romantic relationship; see Slatcher and Vazire, 2009). Moreover, perhaps individual differences may exert a relatively distal and indirect effect on relationship satisfaction. The fact that the association between self-control and satisfaction diminished when controlling for commitment, may reflect such an indirect model: self-control

may promote pro-relationship responses (as shown in previous research), resulting in stronger relationship commitment in both self and the partner through a dyadic process, which ultimately results in higher relationship quality and satisfaction.

Another possible and theoretically interesting reason for the relatively weak association between trait self-control and relationship satisfaction is that opposing forces may be at work. That is, whereas high self-control generally leads to positive relationship outcomes as previous research has indicated, there may be ‘hidden’ relationship costs to high self-control, and ‘hidden’ benefits of low self-control, that have received little theoretical and empirical attention so far. Koval et al. (2015) found that partners with high self-control experienced a greater burden from the partner relying on them, which could undermine their relationship satisfaction. Moreover, individuals with low self-control are viewed as more spontaneous and interesting (Zabelina et al., 2007), are less predictable (van Steenbergen et al., 2014), and display more non-normative behaviors (DeBono et al., 2011), making the relationship potentially more exciting and therefore satisfying (Reissman et al., 1993). Such processes may partly compensate for the general positive relationship outcomes of high self-control. Thus, the link between self-control and relationship satisfaction is possibly less straightforward than often assumed. More research is required to further explain the current findings, and explore the potential benefits of low self-control and costs of high self-control may be a fruitful direction.

Consistent with previous findings (Kelly and Conley, 1987), we found little support for the longitudinal effects of trait self-control on relationship satisfaction. However, there was one notable exception: in Study 2 we found a significant longitudinal effect, even after controlling for commitment, among pregnant women. This finding tentatively suggest that trait self-control may be particularly important during developmental transitions in a relationship, such as the transition to parenthood. During those transitions, more conscious and effortful adjustments are needed, which requires self-control (Tangney et al., 2004). Additionally, this may explain the gender differences in our findings: Women generally experience more changes (both physically and mentally) than men after the transition to parenthood (e.g., Kluwer, 2010), and they may need to exert self-control in keeping a balance between the well-being of self and the relationship. This finding may reflect, more generally, the impact of specific contexts (i.e., sample characteristics) on the role of trait self-control in romantic relationships. For example, the lack of support for the longitudinal effects of trait self-control on relationship satisfaction (and little support for partner effects, cross-sectionally) in Study 1 perhaps may be explained by the fact that this sample consisted of newlyweds. During this period, interdependence dilemmas arguably occur with lower intensity and lower frequency, and self-control therefore may be less ‘needed’ in the relationship (cf. Myrseth and Fishbach, 2009). Study 3, in which the findings more consistently provided support for the association between trait self-control and relationship satisfaction, consisted of a sample with a wider range of relationship duration, and interdependence dilemmas

may have been more frequent in this sample. How contextual factors may impact the role of trait self-control in romantic relationships is an interesting topic to further explore more systematically in future studies.

As can be read in Footnote 2 (and **Supplementary Material B**), we also tested moderation patterns of commitment on the associations between trait self-control and relationship satisfaction. For example, one may predict that self-control is associated with relationship satisfaction only at relatively high levels of commitment (e.g., van der Wal et al., 2014). However, across the three studies, we did not find any consistent moderation between commitment and trait self-control. Interestingly, these findings may resonate with the value-based choice model of self-control (Berkman et al., 2017), which defines self-control as a process of calculating gains and costs of optional behaviors, and selecting the most highly valued behavior to enact (see also Footnote 1). People who are highly committed to the relationship may be more likely to more or less automatically select or “choose” the behavioral option that promotes the wellbeing of the partner and the relationship, resulting in higher relationship satisfaction. In terms of the value-based model of self-control, commitment provides “value” to behavioral options that promote the partner and/or the relationship, and such behaviors are thus more likely to be enacted, even without a need to exert self-control (cf., Karremans and Aarts, 2007; Righetti et al., 2013). Again, our findings seem to highlight the role of motivation (vs. ability) in relationship satisfaction.

The present research has some practical implications. Based on previous findings on the benefits of self-control in relationship outcomes, it has been suggested that promoting self-control in partners may be an effective way to increase relationship functioning and wellbeing (e.g., Finkel et al., 2009). There has been much debate about whether self-control training is feasible (Inzlicht and Berkman, 2015). Even when training programs would be effective in promoting self-control, our results raise the question of whether and how much this increased self-control would actually promote the wellbeing of a romantic relationship. The present findings suggest that the link between trait self-control and relationship satisfaction is not straightforward and robust, and self-control training as a way to improve the wellbeing of relationships therefore is not obvious (unless, perhaps, when partners suffer from clinical levels of low self-control, such as ADHD; VanderDrift et al., 2019). Instead, targeting ‘deeper’ roots of relationship distress, such as attachment- or commitment-related issues (as done in, for example, emotion-focused couple therapy; Johnson, 2012), probably is more effective in promoting relationship satisfaction.

Before closing, we should discuss several limitations. First, the samples mainly consisted of relatively happy heterosexual couples and the lack of variability in relationship satisfaction might underestimate the strength of the associations between trait self-control and relationship satisfaction (Wickham and Knee, 2012). Relatedly, the negative impact of trait self-control on relationships may only appear at ‘clinical’ levels of low self-control, probably underrepresented in our sample. Second, across the three studies, all measures were self-reported, which may

inflate the correlations between variables, in particular when examining actor effects, while underestimating partner effects (Donnellan et al., 2007). More generally, the use of self-report measures limits the conclusions that can be drawn from the current research and previous studies regarding the role of self-reported trait self-control in romantic relationships. Self-reports of self-control may be biased by processes like impression management and social desirability. Moreover, among the existing approaches of self-control measurements (i.e., self-report and informant-report questionnaires, and lab tasks), self-report questionnaires tend to be moderately correlated with informant-report questionnaires, and only weakly with lab tasks (Duckworth and Kern, 2011). Thus, the current findings cannot be generalized to indicators of self-control as measured with the other two approaches. Whether and how such informant-report questionnaires and behavioral measures of self-control are associated with romantic relationship functioning remains an important issue to be further explored in future studies (see Karremans et al., 2015). Third, sample characteristics and measures were not identical between studies, which may have contributed to some inconsistent findings between studies.

In spite of these limitations, the current findings contribute to our understanding of the concurrent and longitudinal effects of trait self-control on relationship satisfaction. Is trait self-control the key to relationship success? With three independent datasets, the findings seem to provide a relatively reliable estimation of the association between trait self-control and relationship satisfaction, which was weaker and less robust than the extant literature on the role of self-control in romantic relationships would suggest.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: The raw data supporting the conclusions of this article will be made available by the authors, if the original owner of the dataset agrees. Requests to access these datasets should be directed to P-YZ, p.zuo@psych.ru.nl.

ETHICS STATEMENT

The studies involving human participants were conducted in compliance with the approved research and consent protocols of the Faculty of Social Sciences of the Free University of Amsterdam (Study 1), the Faculty of Social Sciences of Utrecht

University (Study 2). Being more recently conducted, study 3 has received formal approval from the Ethics Committee of the Faculty of Social Sciences of Radboud University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

P-YZ, JK, AS, and EK developed the initial research question, designed the study, revised the manuscript altogether, and approved the final version of the manuscript. HK and EK collected the data used in Study 2. GK and JK collected the data used in Study 3. P-YZ conducted the analysis and wrote the first draft of the manuscript. WB contributed to the data analysis and the improvement 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/fpsyg.2020.594476/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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The Relationship of Dyadic Coping With Emotional Functioning and Quality of the Relationship in Couples Facing Cancer—A Meta-Analysis

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Objective: This study is a meta-analysis that considers the association between dyadic coping and emotional functioning, and between dyadic coping and the quality of the relationship as perceived by cancer patients and their life partners.

Methods: A systematic search was conducted in the electronic databases PsycINFO, PubMed, ScienceDirect and those peer-reviewed cross-sectional and longitudinal studies published up until April 2020 that investigated these relationships were selected.

Results: A total of 1,168 studies were identified, of which 10 met the inclusion criteria ($N = 1,727$ couples). These evidenced statistically significant positive relationships between common dyadic coping and emotional functioning and between common dyadic coping and the quality of the relationship as perceived by patients and their partners. There was also a statistically significant positive association between stress communication (by oneself), supportive dyadic coping (by oneself and by partner), and the quality of the relationship. In addition, a statistically significant negative association was found between negative dyadic coping (by oneself and by partner) and the quality of the relationship as perceived by patients' partners and also between negative dyadic coping (by oneself) and the quality of the relationship as perceived by patients.

Conclusions: The results suggest the existence of a significant association between dyadic coping and emotional functioning and between dyadic coping and the quality of the relationship as perceived by members of couples facing cancer. However, these results must be interpreted with caution due to the small number of studies included in the analysis. Clinically, an understanding of the existence of such relationships is helpful for the implementation, and study of the effectiveness of, interventions aimed at improving dyadic coping in order to improve both quality of life and quality of relationship in couples where there is an oncological diagnosis.

Keywords: cancer, dyads, quality of relationship, meta-analysis, emotional functioning

INTRODUCTION

Cancer is a life-threatening disease that represents one of the most difficult experiences that a person can be faced with during their life. The development of effective treatments has contributed to a gradual reduction of the taboo which previously accompanied open discussion of a diagnosis, to the investigation of the psychological and social aspects associated with the disease, and to a search for the most appropriate methods of offering support. Over time psycho-oncological research has employed a range of theoretical principles that have led to a corresponding variety of approaches.

One of the most used theoretical frameworks in psychological research in the context of cancer has been the Transactional Model of Stress and Coping proposed by Lazarus and Folkman (1984), in which social support is seen as a way of helping people cope with stress. Following this, research frequently centered on patients (Stark and House, 2000; Massie, 2004; Drageset and Lindstrøm, 2005; Thomsen et al., 2010), with their relatives being seen mainly as sources of support. However, it became clear that the chief source of support for cancer sufferers was frequently their life partners (Kim and Spillers, 2010) and that these people in their turn faced high levels of distress (Jaafar et al., 2014; Heckel et al., 2015), sometimes higher than those experienced by patients (Couper et al., 2006). This led to a recognition that cancer patients' partners too were in need of support (Northhouse and Muhammad, 2000; Jaafar et al., 2014; Heckel et al., 2015). It also became evident both that the process of coping with cancer affects both members of a partnership and that they influence one another (Li and Loke, 2014), and thus cancer began to be regarded as a "we-disease" (Kayser et al., 2007). In recent years psycho-oncological research has widened its focus from a concentration on the individual (patient or partner) toward a dyadic perspective, from individual coping to dyadic coping.

This modification means that stress and coping with stress are no longer seen as intrapsychic phenomena, but as interdependent processes experienced by the couple, ones in which cognitive evaluation, feelings and coping behaviors are shared by the two of them (Revenson et al., 2005). Professionals agreed to use the following terms in their formal language, as common ground was needed (Goian, 2004, 2010). Dyadic stress is the term used for situations, such as a cancer diagnosis, which affect both partners directly or indirectly and trigger a shared coping endeavor. Dyadic coping involves the interdependence of the partners, shared concerns, and shared purposes which stimulate a resolving of the problems together and shared activities aimed at emotional balance. Dyadic coping supplements individual coping strategies and its purpose is to restore homeostatic balance both for each individual and for the couple as such (Bodenmann, 1997, 2005).

Several models of dyadic coping have been defined, but according to Falconier et al. (2015) the only ones that do not also include individual coping strategies but only take into consideration the way the two partners show mutual support in facing stress are The Relationship-Focused Coping Model (DeLongis and O'Brien, 1990; Coyne and Smith, 1991), The Systemic-Transactional Model (Bodenmann, 1997) and The

Developmental-Contextual Coping Model (Berg and Upchurch, 2007). Since the review carried out by Regan et al. (2015) demonstrates that the Systemic-Transactional Model (STM) provides the most comprehensive model for elucidating the behaviors exhibited by couples confronting cancer, it is this way of conceptualizing dyadic coping that we will be focusing on in this paper.

STM is based on the Transactional Model of Stress and Coping developed by Lazarus and Folkman, which comprehends concepts such as the perception of stress, evaluation of stress and the coping response but extends this model to the systemic dimension. Thus, following Bodenmann (2005), after one of the partners has perceived and evaluated stress, they engage in a process of verbal or non-verbal communication with the other partner. The receiving partner perceives, interprets and decodes these signals and engages in a kind of dyadic coping. Dyadic coping can take both positive and negative forms. *Positive dyadic coping* includes *supportive dyadic coping* (by oneself or by partner – by which help is given to the partner in their coping efforts in a variety of ways, such as empathetic understanding and the expression of solidarity), *delegated dyadic coping* (by oneself or by partner – by which one of the partners takes over some of the responsibilities of the other with the aim of helping them), and *common dyadic coping* (by which the two partners take action together in order to address the situation). *Negative dyadic coping* can take the form of ambivalent, hostile or superficial behaviors. Ambivalent behaviors occur when the partner offers support unwillingly, accompanying this help with an attitude that suggests that his or her contribution is not necessary. Hostile dyadic strategies consist of the fact that the partner offers support in a negative way, accompanied by distance, disinterest, sarcasm, or minimizing the seriousness of the other's stress. Superficial dyadic coping refers to the fact that the support offered is insincere, devoid of empathy.

The importance of dyadic coping for mental and physical functioning and for the functioning of the relationship has been established for a number of types of stressors (Vilchinsky et al., 2010; Duca and Turliuc, 2014; Turliuc and Rusu, 2014; Bertonni et al., 2015). As well as the present paper, the mentioned researches were interested in the relationship between dyadic coping and other psychological variables. Although there are experimental studies that considered causal relationships in which dyadic coping was involved, they were not mentioned in order not to create ambiguity. Studies have been devised to investigate dyadic coping in the context of different chronic conditions: diabetes (Johnson et al., 2013), chronic obstructive pulmonary disease (Meier et al., 2011; Vaske et al., 2015), kidney transplant (Tkachenko et al., 2019), chronic pain (Burri et al., 2017) and cancer. It has been shown that in the case of couples facing a diagnosis of breast cancer there is a positive relationship between relational mutuality and common dyadic coping and positive dyadic coping, both for patients and their partners, and also a negative relationship between relational mutuality and the avoidance of dyadic coping, a negative dyadic coping style (Kayser and Acquati, 2019). Additionally, for couples facing breast cancer, it has been shown that levels of depression experienced by both partners reduce in direct proportion to

the extent to which they engage in common dyadic coping (Rottmann et al., 2015). Both for patients with metastatic breast cancer and their partners the exercise of negative dyadic coping was associated with higher levels of distress (Badr et al., 2010). Likewise, a high level of perception of negative dyadic coping on the part of one's partner was associated with a high level of supportive care needs both for blood cancer patients and for their partners (Weißflog et al., 2017).

In recent decades, oncological clinical studies have shown a growing interest in quality of life (Gotay et al., 1992). Although defining this concept has proved difficult (Bottomley, 2002), according to Haas (1999) "Quality of life is a multidimensional evaluation of an individual's current life circumstances in the context of the culture in which they live and the values they hold. Quality of life is primarily a subjective sense of well-being encompassing physical, psychological, social, and spiritual dimensions. In some circumstances, objective indicators may supplement or, in the case of individuals unable to subjectively perceive, serve as a proxy assessment of Quality of life." The term health-related quality of life refers to the effects that disease and associated treatments have on the quality of life and excludes those aspects of quality of life that are not related to health (Ferrans et al., 2005). In the systematic review conducted by Bakas et al. (2012) it was pointed out that the most used models of health-related quality of life are those defined by Wilson and Cleary (1995), Ferrans et al. (2005), or World Health Organization (WHO). The model of Ferrans et al. (2005) is a revision of the model proposed by Wilson and Cleary (1995) and was chosen as the basis for this study in terms of health-related quality of life. This model includes five domains: biological, symptoms, function, general health perception, and overall health-related quality of life. Each of these areas is related to the other and there may also be reciprocal relationships. The biological field refers to the functioning of cells and various life-sustaining systems. Symptoms refer to the perception of an abnormal physical, psychological, cognitive state. Functional status considers the ability to perform tasks in various areas such as physical, social, psychological or role related. General health perception is a synthesis of health aspects, in a global assessment and the last domain of the model refers to the satisfaction of the person with the life. The model also states that these five domains are influenced by the characteristics of the person (demographic, developmental, psychological, biological) but also by the characteristics of the environment (social, physical) (Ferrans et al., 2005). In the context of a cancer diagnosis, Nayfield et al. (1992) emphasize the importance of assessing at least the following aspects of quality of life: physical, social and emotional functioning, symptoms and side effects of treatment, overall assessment of the quality of life. Because psychological suffering is often present in the case of a cancer diagnosis, emotional functioning is one of the aspects of interest in both evaluation and psycho-oncological interventions. In the present study, emotional functioning is conceptualized based on the model of Ferrans et al. (2005) as the person's perception of feeling tense, worried, nervous, irritable or sad- the emotional aspects of depression, anxiety or distress.

Since cancer is still a serious illness that impacts both the quality of life of sufferers and their partners (Kershaw et al., 2004; Tuinman et al., 2004) and the quality of their relationship (Hagedoorn et al., 2011; Ross et al., 2016), recent years have seen the appearance of research studies analyzing the relationship between dyadic coping and these aspects. These have demonstrated that common dyadic coping (Badr et al., 2010) and positive dyadic coping (Badr et al., 2018) are associated with an improvement in the functioning of the relationship and that couples' ability to act as one contributes to the quality of this (Picard et al., 2005).

Other studies have shown that common dyadic coping by partners is associated with a lower level of each member's functional quality of life (Crangle et al., 2019), while negative dyadic coping is associated with lower levels of emotional well-being in partners, as measured by Quality of Life Spouses Scale (Feldman and Broussard, 2006).

Although there are systematic reviews analyzing the quality of life in cancer patient-partner dyads (Sterba et al., 2016), their relationship quality (Kayser et al., 2018) and the link between dyadic coping and relationship quality in couples facing cancer (Traa et al., 2014), to the best of the authors' knowledge no meta-analysis that provides a quantitative analysis is available. The meta-analysis of Falconier et al. (2015) highlights relationships that are important for clinical practice by demonstrating that common dyadic coping, supportive dyadic coping and negative coping are more important predictors of relationship satisfaction than the communication of stress and delegated coping; however, it deals with a larger context than that of oncological disease. Likewise, to the best of the authors' knowledge no systematic review or meta-analysis has yet been applied to focus on the relationship between dyadic coping and the emotional functioning as part of health-related quality of life or between dyadic coping and relationship quality of the members of couples where there is a cancer diagnosis. This paper therefore intends to supply this lacuna in the literature. Its purpose is (i) to summarize the results of cross-sectional or longitudinal studies that have analyzed the relationships between dyadic coping and relationship quality and emotional functioning in couples where there is a cancer diagnosis (ii) to quantify the strength of these relationships (iii) to analyze the moderating nature of age and type of cancer on these relationships. The result of exploring the relationship between dyadic coping and the quality of the relationship and the emotional functioning can be useful information from the perspective of future interventions that by addressing dyadic coping behaviors could target results both at the intrapersonal level and at the couple level. The PRISMA guide was followed to answer these research questions.

While some studies have found that certain kinds of positive dyadic coping may be associated with a negative impact on the quality of life, possibly due to the effects of exhaustion (Crangle et al., 2019), most research associates these positive forms of dyadic coping with beneficial effects for the couple (Rottmann et al., 2015; Kayser et al., 2018). Previous studies have also brought to light the negative impacts of negative forms of dyadic coping on couples facing cancer (Feldman and Broussard, 2006; Weißflog et al., 2017). Bearing all this

in mind, we would expect there to be a significant positive relationship between positive forms of dyadic coping and the relationship quality and emotional functioning of members of couples facing cancer and a significant negative relationship between negative forms of dyadic coping and their relationship quality and emotional functioning. We would expect the intensity of these relationships to depend on the type of cancer and we would also expect these relationships to be stronger in the case of older couples. We intend to carry out this analysis with regard to the communication of stress and to different forms of dyadic coping as evidenced by the STM (supportive dyadic coping by oneself/by partner, delegated dyadic coping by oneself/by the partner, common dyadic coping, negative dyadic coping by oneself/by the partner) rather than based on aggregated scores. This higher resolution identification of the relationships between the components of dyadic coping and emotional functioning and relationship quality in couples facing cancer will make it possible for future interventions to focus on those behavioral changes that have an impact on individual emotional functioning or relationship quality, depending on which of these aspects requires improvement.

METHODS

Inclusion Criteria

To be considered eligible, studies needed to meet the following criteria.

Criteria associated with their design: only studies with either a cross-sectional or a longitudinal design were included in the analysis, and in the case of the longitudinal ones only the sizes of the effects that resulted from the first evaluation carried out were extracted.

Criteria associated with the dyadic coping variable: only studies in which dyadic coping was measured using an instrument that conceptualized it in accordance with the STM model were taken into consideration. In addition, they had to register the correlations between at least one kind of dyadic coping and relationship quality or between at least one kind of dyadic coping and emotional functioning. As well as this, only studies that registered these kinds of relationships for at least one of the partners were taken into account.

Criteria associated with the relationship quality variable: to be included in the analysis, research studies need to have measured one of the following constructs: relationship quality, quality of the marriage, relationship satisfaction, satisfaction with the marriage.

Criteria associated with the emotional functioning variable: to be regarded as eligible, studies needed to have used instruments for measuring the quality of life that included the emotional functioning dimension of this construct. Thus, these questionnaires had to consider the affective aspects of depression, anxiety, distress, such as sadness, worry, irritability, emotional tension.

Criteria associated with the participants: research papers involving participants aged at least 18 who formed couples in which one of the partners had a cancer diagnosis (regardless of the type or stage of the condition) were regarded as eligible.

Search Strategies

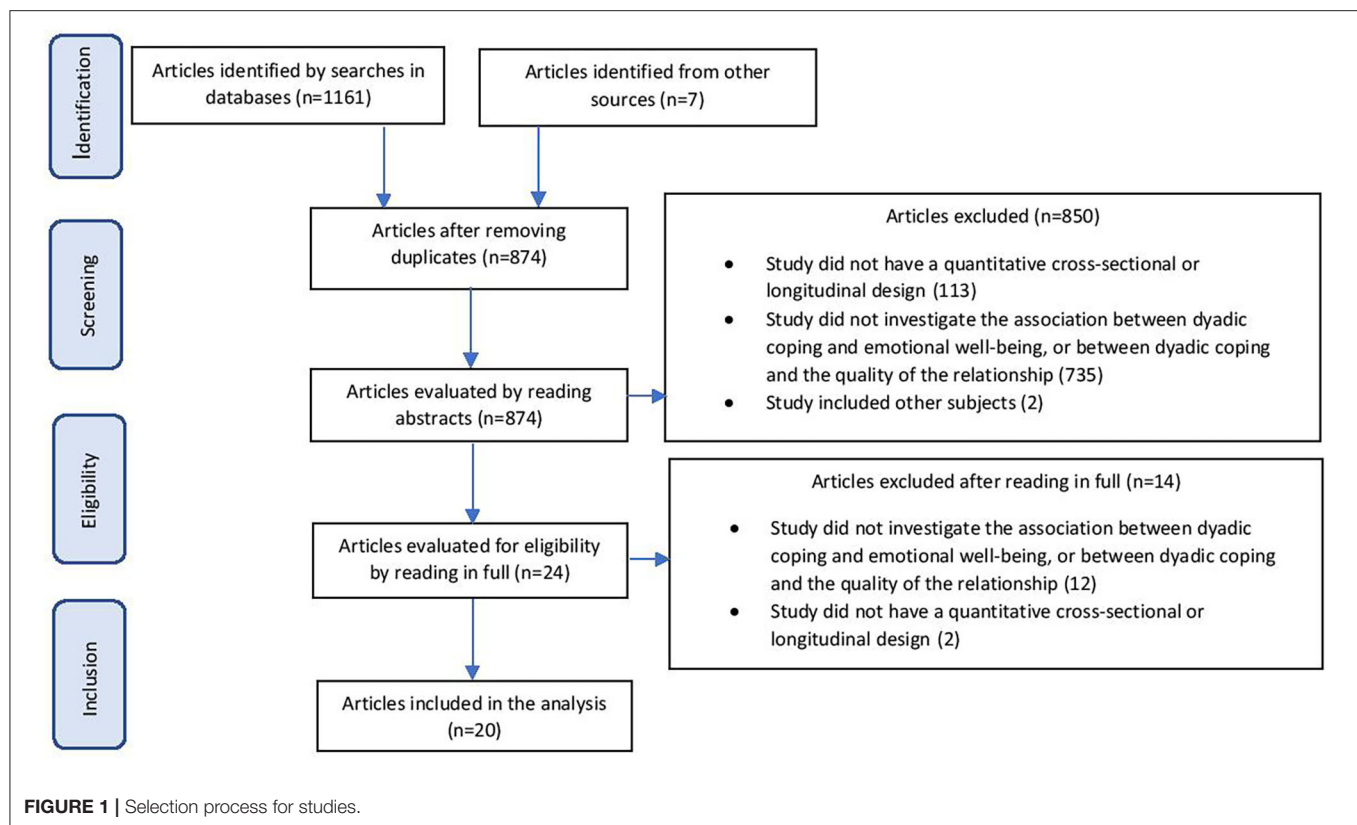
Identification of relevant studies was achieved by searching the PsycINFO, PubMed and ScienceDirect online databases. Abstracts were searched using the Boolean criterion string: (cancer OR tumor OR neoplasia) AND (couple OR spouse OR partner OR dyad) AND (well-being OR wellbeing OR “quality of life” OR “relationship satisfaction”). This was done to cast the search net as widely as possible while at the same time preserving precise targeting. Only peer-reviewed English language academic journals were searched. There was no time limit on publication dates and research published up until April 2020 was considered. This search process was supplemented by a manual search of references in systematic reviews available to us on related subjects. Any articles thus identified were included in the general list which was then filtered according to the selection criteria.

Selection Process

The database search yielded 1,161 articles. Another seven studies were located following searches that used references from studies on related topics. 294 of the 1,168 were excluded as duplicates. The abstracts of the remaining 874 studies were compared with the inclusion criteria and 735 were found not to have been directed at analyzing the relationship between dyadic coping and emotional functioning and relationship quality. One hundred thirteen did not meet the design criteria and two dealt with different subjects (doctors). This left us with 24 studies to read in full and analyze. Of these, 12 had not investigated relationships of interest to our research and a further two lacked a cross-sectional or longitudinal design; 10 studies thus remained for final analysis and these formed the database for our meta-analysis. The authors worked independently on each article in the initial selection process and any differences of evaluation were resolved through discussion leading to consensus. Writers of articles who had not included data we needed for our analysis in their published papers were approached by email to furnish them. The process followed is schematized in **Figure 1**.

Data Extraction

In order to prepare, administer and individually analyse the studies we devised a 27-item coding manual. These codes have been grouped into several sections: identification, sample data, design data, measured variables data, results data, effect size calculation data. The studies were divided between the first and the second author based on their appearance on the list. The coding was done independently by the first and second authors. The third author reviewed all the coding. Where there were ambiguities and potential sources of error, they were discussed to reach a consensus on the most appropriate coding decision. The data needed for the meta-analytical statistical analysis (correlation coefficient and number of participants) and information about the characteristics of participants (type of cancer, number of dyads, average age of patients, average age of partners, percentage of male patients), outcomes measures, the nature of the studies (cross-sectional or longitudinal) and their principal results were extracted from the articles.



Meta-Analytical Strategy

Statistical analysis was performed using the Comprehensive Meta-Analysis software v3.3 (Borenstein et al., 2013). The size of effect used for this meta-analysis was the Bravis-Pearson r correlation coefficient. This type of analysis (Borenstein et al., 2009) transforms the r coefficient into Fisher's z for the processing of the meta-analytical calculation but at the end the result is converted back into the r correlation coefficient. The purpose of these transformations is that when Fisher's z is used the dispersion associated with each measure of size of effect depends exclusively on the sample size whereas if the r is used directly the dispersion related to size of effect is dependent both on sample size and on the size of the correlation coefficient. The r coefficient was calculated for relationships between kinds of dyadic coping and emotional functioning and between kinds of dyadic coping and relationship quality both for patients and for their life partners. Because the studies analyzed differed both in terms of the characteristics of participants (patients had been diagnosed with different types of cancers and had been recruited in different medical centers) and in terms of methodology (different evaluative instruments having been applied), we assumed the existence of random variation in the true size of the effect from one study to another and therefore applied a meta-analysis that assumes a random-effect. This method of analysis also permits a greater degree of generalization than the fixed effects model (Hedges and Vevea, 1998). To investigate the moderating nature of the age and the type of cancer, meta-regressions were applied

as recommended by Borenstein et al. (2015). While in empirical studies the sample size is equal to the number of participants (N), in meta-analysis the sample size is given by the number of studies included (k). The I^2 index (Higgins et al., 2003) was used to estimate inter-study heterogeneity. This statistic corresponding to the percentage of observed dispersion due to real differences, as distinct from random variations, between the values of the measures of size when comparing studies. It can take values ranging from 0 to 100% with a value of 75% typically being regarded as high, 50% being described as "moderate" and 25% as "low," according to the initial suggestion of those who first devised it.

Sources of Bias

Since any such systematic review may be affected by publication bias this aspect was analyzed by calculation of Egger's intercept (Egger et al., 1997). Additionally, to evaluate the studies included we used the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) checklist for observational studies (von Elm et al., 2007).

RESULTS OF THE SYSTEMATIC REVIEW

A summary of the characteristics of the studies is presented in Table 1.

TABLE 1 | Results of the systematic literature review ($k = 10$).

| Study ID | Dyadic aim | Design | Study population (type of cancer, no of dyads, % male patients, average age patients, average age partners) | Measures | | Main conclusions | Risk of bias |
|------------------------------------|--|--|---|--|---|---|--------------|
| | | | | Patients | Partners | | |
| Acquati and Kayser (2019) (USA) | The impact of illness on the QoL and dyadic coping, the influence of relational mutuality on dyads' coping in case of younger and middle-aged couples | Cross-sectional | <i>Cancer:</i> breast <i>No dyads:</i> 86 <i>% male patients:</i> 0 <i>Average age patients:</i> 46.6 <i>Average age partners:</i> 49.1 | <i>DC:</i> Dyadic Coping Scale <i>QoL:</i> Functional Assessment of Cancer Therapy- Breast (FACT-B) <i>Relational mutuality:</i> Mutual Psychological Development Questionnaire (MPDQ) | <i>DC:</i> Dyadic Coping Scale <i>QoL:</i> Quality of Life Questionnaire for Spouses (QL-SP), Illness Intrusiveness Ratings Scale (IIRS) <i>Relational mutuality:</i> Mutual Psychological Development Questionnaire (MPDQ) | Younger couples reported statistically significant worse QoL and dyadic coping scores than the middle-age couples. For younger dyads, coping styles (positive and negative) were the result of both actor and partner effects of mutuality | Low |
| Badr et al. (2010) (USA) | Prospective evaluation of association between dyadic coping and cancer-related distress and dyadic adjustment in couples facing metastatic breast cancer | Longitudinal | <i>Cancer:</i> breast <i>No dyads:</i> 191 <i>% male patients:</i> 0 <i>Average age patients:</i> NS <i>Average age partners:</i> NS | <i>DC:</i> Dyadic Coping Questionnaire (FDCT-N) <i>Distress:</i> Impact of Event Scale (IES) <i>RQ:</i> Dyadic Adjustment Scale (DAS-7) | <i>DC:</i> Dyadic Coping Questionnaire (FDCT-N) <i>Distress:</i> Impact of Event Scale (IES) <i>RQ:</i> Dyadic Adjustment Scale (DAS-7) | More common positive dyadic coping and less common negative dyadic coping was associated with greater dyadic adjustment for patients and partners Effects of common positive dyadic coping on cancer-related distress significantly differed for patients and their partners (partners reported lower levels of distress, patients reported higher levels of distress) Common negative dyadic coping was always significantly associated with distress and the relation was stronger for patients | Low |
| Badr et al. (2018) (USA) | Relations between patients' and spouses' dyadic coping and their own/each other's psychological and marital adjustment. Associations between changes in dyadic coping and changes in patients' and spouses' psychological and marital adjustment | Cross-sectional (secondary analysis of a randomized pilot trial) | <i>Cancer:</i> head and neck <i>No dyads:</i> 60 <i>% male patients:</i> 30 <i>Average age patients:</i> 58.43 <i>Average age partners:</i> 58.07 | <i>DC:</i> Dyadic Coping Inventory (DCI) <i>Anxiety, depression:</i> Patient-Reported Outcomes Measurement Information System (PROMIS) <i>RQ:</i> Dyadic Adjustment Scale (DAS-7) | <i>DC:</i> Dyadic Coping Inventory (DCI) <i>Anxiety, depression:</i> Patient-Reported Outcomes Measurement Information System (PROMIS) <i>RQ:</i> Dyadic Adjustment Scale (DAS-7) | Significant actor effects were found for problem-focused stress communication, problem-focused dyadic coping, emotion-focused dyadic coping on marital adjustment. Actor and partner effects for negative dyadic coping were also significant. Also, significant actor effects of problem-focused stress communication and problem-focused dyadic coping were noticed on depression | Low |

(Continued)

TABLE 1 | Continued

| Study ID | Dyadic aim | Design | Study population (type of cancer, no of dyads, % male patients, average age patients, average age partners) | Measures | | Main conclusions | Risk of bias |
|---------------------------------------|---|-----------------|--|---|--|---|--------------|
| | | | | Patients | Partners | | |
| Crangle et al. (2019) (Canada) | Whether common dyadic coping mediates the associations between attachment and quality of life | Cross-sectional | Cancer: ovarian No dyads:106 % male patients: 0 Average age patients: 59.1 Average age partners: 60.8 | DC: Dyadic Coping Inventory (DCI) Adult attachment: Close Relationships Scale—Revised (ECR-R) QoL: Functional Assessment of Cancer Therapy (FACT)-Ovarian | DC: Dyadic Coping Inventory (DCI) Adult attachment: Close Relationships Scale—Revised (ECR-R) QoL: Functional Assessment of Cancer Therapy (FACT)-general population | Worse social and functional QOL were associated with one's own and one's partner's greater insecure attachment and this relation was mediated by common dyadic coping. Greater common dyadic coping reported by one's partner was associated with one's own lower functional QOL | Low |
| Ernst et al. (2017) (Germany) | The impact of dyadic coping on QoL | longitudinal | Cancer: hematologic No dyads:208 % male patients: 62 Average age patients: 57.7 Average age partners: 56.9 | DC: Dyadic Coping Inventory (DCI) QoL: SF-12 Health Survey | DC: Dyadic Coping Inventory (DCI) QoL: SF-12 Health Survey | DC (t1) had a partner effect on physical QoL (t2) and an actor and partner effect on mental QoL(t2) Different subtypes of DC had actor and partner impact on patient's or partner's QoL | Low |
| Feldman and Broussard (2006) (USA) | Men's dyadic coping when their partners are diagnosed with breast cancer | Cross-sectional | Cancer: breast No dyads: 0 (71 partners) % male patients: NA Average age patients: NA Average age partners: 51 | - | DC: Dyadic Coping Scale (DCS) QoL: Quality of Life Spouses Scale (QOL-SP) Illness intrusiveness: Illness Intrusiveness Rating Scale (IIRS) | Significant associations were noticed between dyadic coping styles and illness intrusiveness | Low |
| Pankrath et al. (2018) (Germany) | How the relationship satisfaction is affected by the dyadic coping | Cross-sectional | Cancer: haematologic No dyads: 327 % male patients: 63.3 Average age patients: 57 Average age partners: 56 | DC: Dyadic Coping Inventory (DCI) RQ: Partnership Questionnaire (PFB-K) Anxiety, depression: PHQ-4 | DC: Dyadic Coping Inventory (DCI) RQ: Partnership Questionnaire (PFB-K) Anxiety, depression: PHQ-4 | A significant positive association was noticed between positive DC and relationship satisfaction while negative DC was related to lower levels of relationship satisfaction. Age, distress and duration of relationship duration had moderating effects on the association between DC and relationship satisfaction A negative significant association was highlighted between partners' distress and the relationship satisfaction of the partners | Low |

(Continued)

TABLE 1 | Continued

| Study ID | Dyadic aim | Design | Study population (type of cancer, no of dyads, % male patients, average age patients, average age partners) | Measures | | Main conclusions | Risk of bias |
|-------------------------------------|--|-----------------|--|--|--|---|--------------|
| | | | | Patients | Partners | | |
| Regan et al. (2014) (Australia) | Dyadic coping affects patients 'and their wives' anxiety, depression and relationship satisfaction differently (wives are more likely than patients to be influenced by their own and their partner's dyadic coping) | Cross-sectional | Cancer: prostate No dyads: 42 % male patients: 100 Average age patients: 63.7 Average age partners: 59.6 | DC: Dyadic Coping Inventory (DCI) RQ: Revised-Dyadic Adjustment Scale (R-DAS) Anxiety, depression: Hospital Anxiety and Depression Scale (HADS) | DC: Dyadic Coping Inventory (DCI) RQ: Revised-Dyadic Adjustment Scale (R-DAS) Anxiety, depression: Hospital Anxiety and Depression Scale (HADS) | A significant association was highlighted between relationship satisfaction and patients' and wives' positive and negative dyadic coping, and same strategies of their partners'. Partner's use of supportive dyadic coping was related with anxiety and depression. Husbands' and wives' perceptions of their partner's negative dyadic coping was also related with anxiety and depression | |
| Rottmann et al. (2015) (Denmark) | The relationship over time between different forms of dyadic coping and relationship quality and depressive symptoms | longitudinal | Cancer: breast No dyads: 538 % male patients: 0 Average age patients: 58 Average age partners: 60.1 | DC: Dyadic Coping Inventory (DCI) RQ: ladder with steps numbered 0 through 10, where 0 represents the worst possible, and 10 the best possible, relationship Depression: Center for Epidemiologic Studies-Depression Scale (CES-D) | DC: Dyadic Coping Inventory (DCI) RQ: ladder with steps numbered 0 through 10, where 0 represents the worst possible, and 10 the best possible, relationship Depression: Center for Epidemiologic Studies-Depression Scale (CES-D) | All participants experienced more depressive symptoms the more delegated coping the patients provided to the partners A negative association was noticed between the delegated coping offered by the partners to the patients and their depressive symptoms The common dyadic coping was positive associated with relationship quality and was negative associated with depressive symptoms of patients and partners The negative dyadic coping was inverse associated with patients' and partners' outcomes | Low |
| Zimmermann et al. (2010) (Germany) | Individual factors, dyadic variables and individual variables of man as predictors of body image in women with breast cancer | Cross-sectional | Cancer: breast No dyads: 98 % male patients: 0 Average age patients: 51.9 Average age partners: 53.1 | DC: Dyadic Coping Questionnaire RQ: Quality of Marriage Index (QMI), Abbreviated Dyadic Adjustment Scale (ADAS) Depression: Hospital Anxiety and Depression Scale (HADS) Body image: Self Image Scale (SIS) | DC: Dyadic Coping Questionnaire RQ: Quality of Marriage Index (QMI), Abbreviated Dyadic Adjustment Scale (ADAS) Depression: Hospital Anxiety and Depression Scale | Women's self-acceptance was predicted by women's depressive symptoms and men's marital satisfaction Women's perceptions of their partner's acceptance of their appearance was predicted by relationship satisfaction and perspective on common dyadic coping | Low |

DC, Dyadic Coping; QoL, Quality of Life; RQ, relationship quality; NA, Not Applicable, NS, Not Specified.

META-ANALYSIS RESULTS

The Association Between Common Dyadic Coping and Relationship Quality

The authors' expectations regarding the relationship between common dyadic coping and relationship quality were borne out both as concerning patients and as concerning their partners. For patients, the analysis included four studies and the coefficient of correlation, r , was statistically significant, having a value of 0.48, with the confidence interval (0.43, 0.53). For life partners, the analysis again included four studies and the coefficient of correlation obtained was statistically significant, having a value of 0.36 (0.30, 0.42) (Figure 2).

The Association Between Common Dyadic Coping and Emotional Functioning

A statistically significant positive association was found between common dyadic coping and emotional functioning both for patients and for their partners (Figure 3). Two studies provided information about this association for patients; the coefficient of correlation was 0.12 with a confidence interval of (0.02, 0.21). For their partners, information extracted from three studies was analyzed, giving a coefficient of correlation r with a value of 0.14 (0.05, 0.23).

The Association Between Communication of Stress by Oneself and Relationship Quality

A statistically significant positive relationship was also found between the communication of stress by oneself and relationship quality. Three studies provided information regarding patients and two gave information about this relationship in the case of their partners. The coefficient of correlation obtained for patients was 0.16 (0.05, 0.27). The coefficient of correlation obtained for partners was 0.19 with a confidence interval of (0.06, 0.31). These results are shown in Figure 4.

The Association Between Supportive Dyadic Coping by Oneself and Relationship Quality

The authors' expectations regarding the relationship between supportive dyadic coping by oneself and relationship quality were borne out both for patients and for their partners. For patients, three studies were analyzed and the coefficient of correlation r , statistically significant, had a value of 0.24 (0.16, 0.31). For their life partners, four studies were analyzed, giving a statistically significant correlation of 0.2 lying within a confidence interval (0.09, 0.3) (Figure 5).

The Association Between Supportive Dyadic Coping by Partner and Relationship Quality

Both for patients and for their partners the relationship between supportive dyadic coping by partner and relationship quality was positive and statistically significant (Figure 6). For patients the coefficient of correlation obtained was 0.39 (0.3, 0.48), while

for their partners the correlation coefficient was 0.26 within the confidence interval (0.13, 0.38). For patients the analysis included three studies and for their partners two studies.

The Association Between Negative Dyadic Coping by Oneself and Relationship Quality

As expected, the analysis showed a statistically significant negative relationship between negative dyadic coping by oneself and relationship quality for all participants. For patients, three studies were analyzed with respect to this relationship and a correlation of -0.38 (-0.57 , -0.16) was calculated. For partners, the analysis included four studies and the coefficient of correlation had a value of -0.24 within the confidence interval (-0.37 , -0.1) (Figure 7).

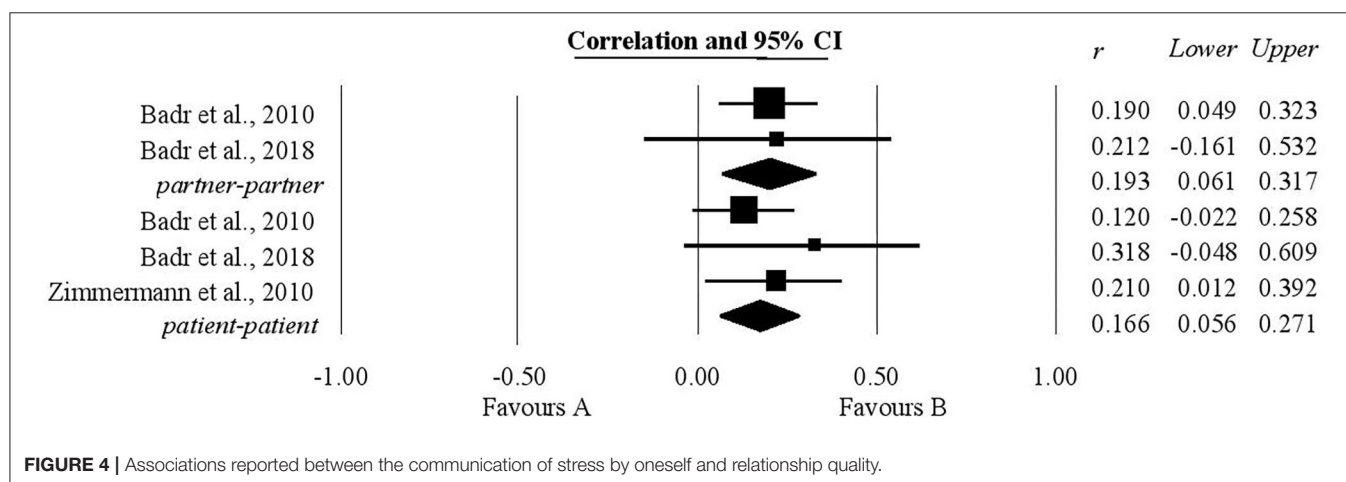
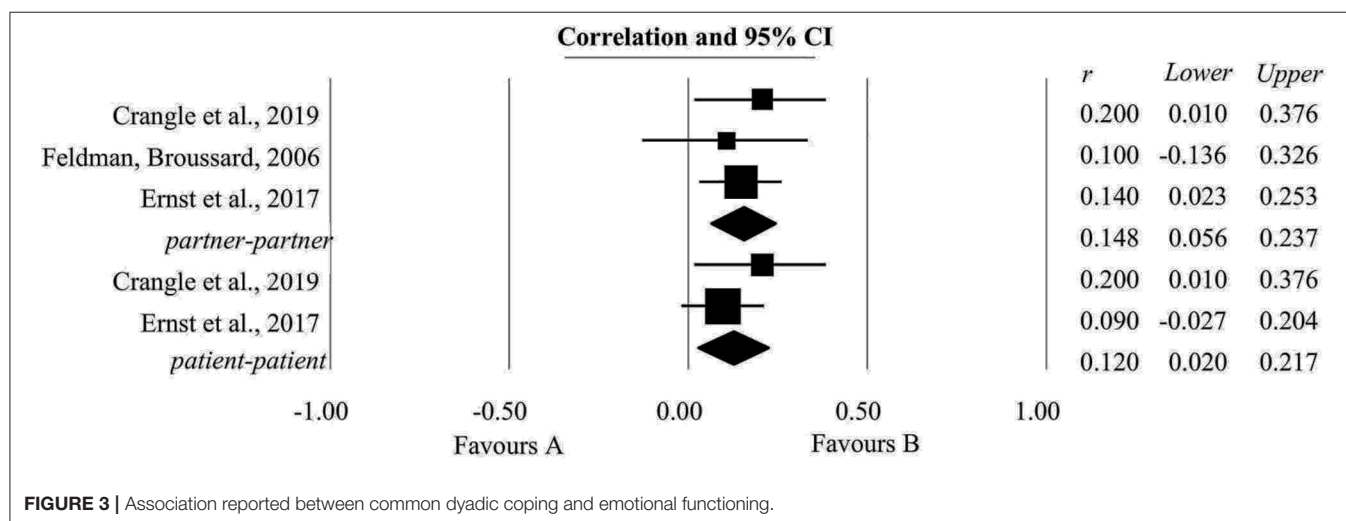
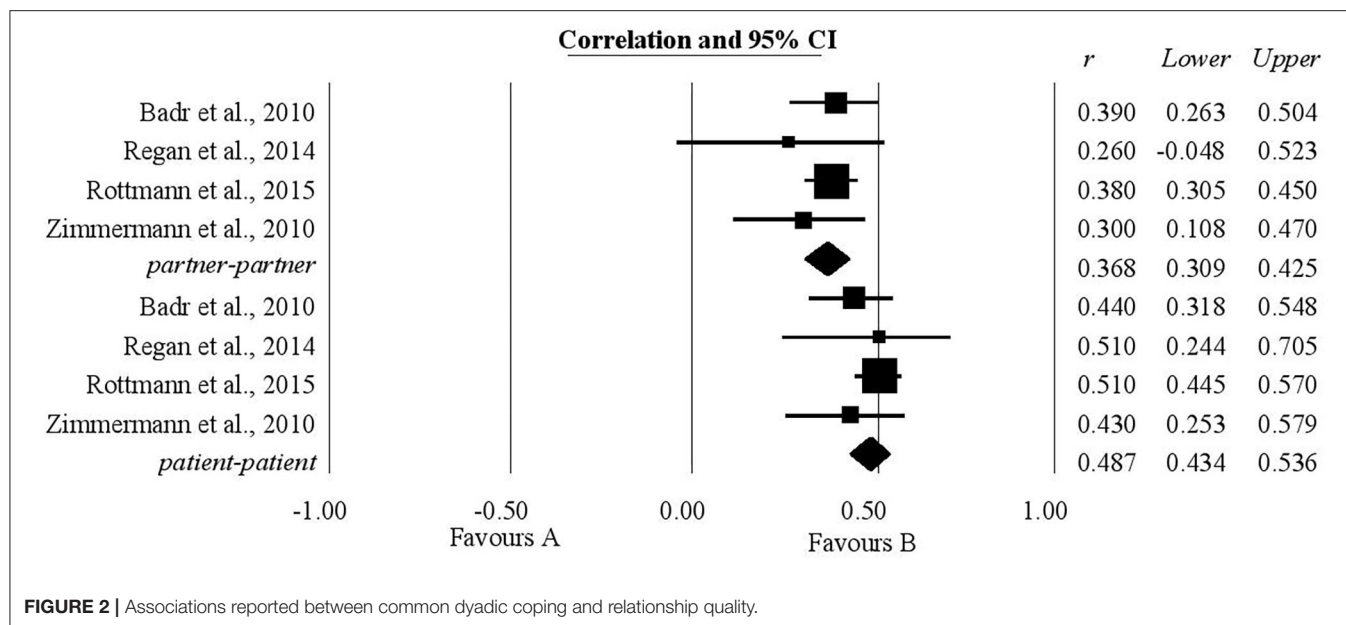
The Association Between Negative Dyadic Coping by Partner and Relationship Quality

For the relationship between negative dyadic coping by partner and relationship quality, our expectations were only partially confirmed. It was only for partners, after an analysis of the two studies that provided data on this point, that a statistically significant negative correlation was found, the value being -0.23 within the confidence interval (-0.35 , -0.11) (Figure 8).

Table 2 provides a summary of the results.

Additional Analysis

In addition to the analyzes that we initially intended to perform, supplementary analyzes were included that consider the associations of interest at the level of all participants, not only at the level of subgroups formed by patients and their partners. All results obtained were statistically significant. Where possible, the results obtained were compared with those highlighted in the meta-analysis performed by Falconier et al. (2015). Thus, it was found that for the associations between negative dyadic coping by partner, stress communication by self, supportive dyadic coping by partner, supportive dyadic coping by self, common dyadic coping and satisfaction in the relationship, the confidence intervals do not overlap. Because these statistics have non-overlapping confidence intervals, they are significantly different. Since the confidence intervals associated with the correlation coefficients obtained in the two meta-analyses for the association between negative dyadic coping by self and relationship quality overlap, we cannot say with certainty that these statistics are significantly different. Therefore, statistical tests were performed to clarify this issue. In order to test the hypothesis that there is zero correlation between the correlation coefficients obtained in these two studies, the RStudio software version 1.2.5042 was used. The results obtained pointed out that there is no correlation between the correlation coefficients obtained in the meta-analysis conducted by Falconier et al. (2015) and in the present meta-analysis regarding the association between negative dyadic coping by the partner, negative dyadic coping by self, stress communication by self, supportive dyadic coping by the partner, supportive dyadic coping by self, common dyadic coping and the relationship quality.



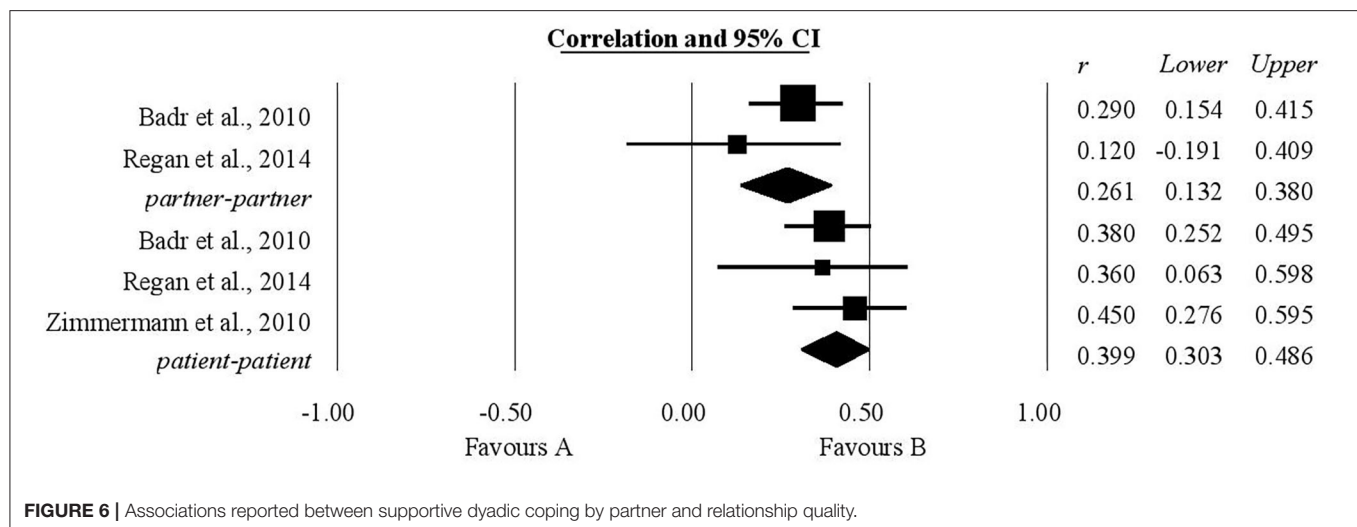
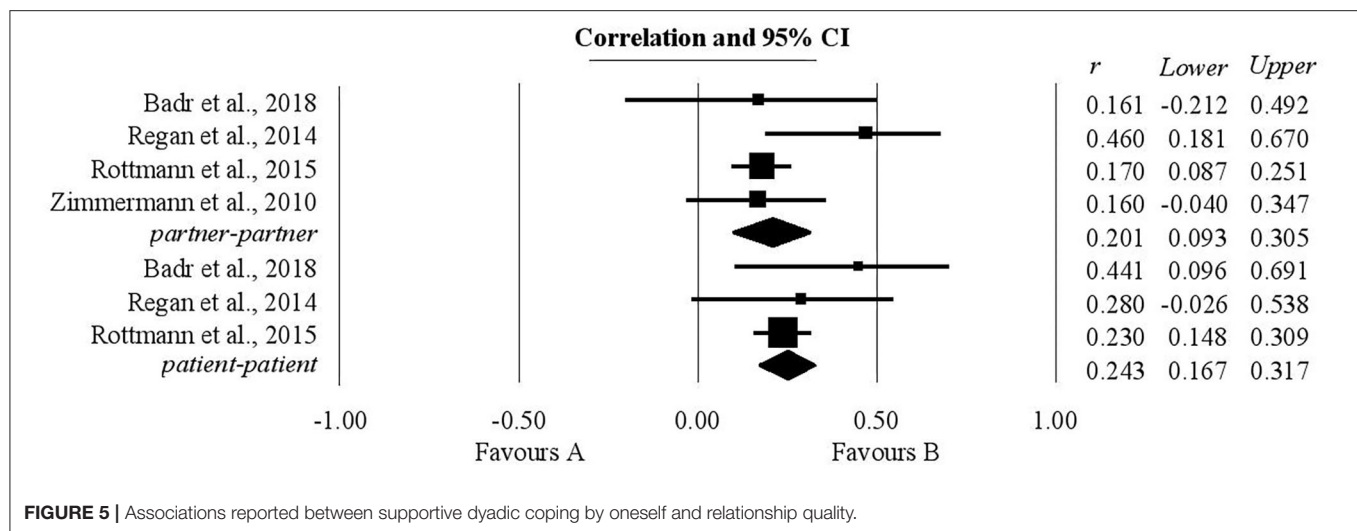


Table 3 shows the dimensions of dyadic coping for which the associations with the relationship quality could be compared between the two meta-analyses.

Moderator Analysis

Attempts were made to apply meta-regressions to investigate the moderating nature of age and cancer type, but the small number of studies did not allow the analysis. Meta-regression could be applied only to study the moderating character of the age in terms of the relationship between the supportive dyadic coping by oneself and the relationship quality. The result obtained was statistically insignificant.

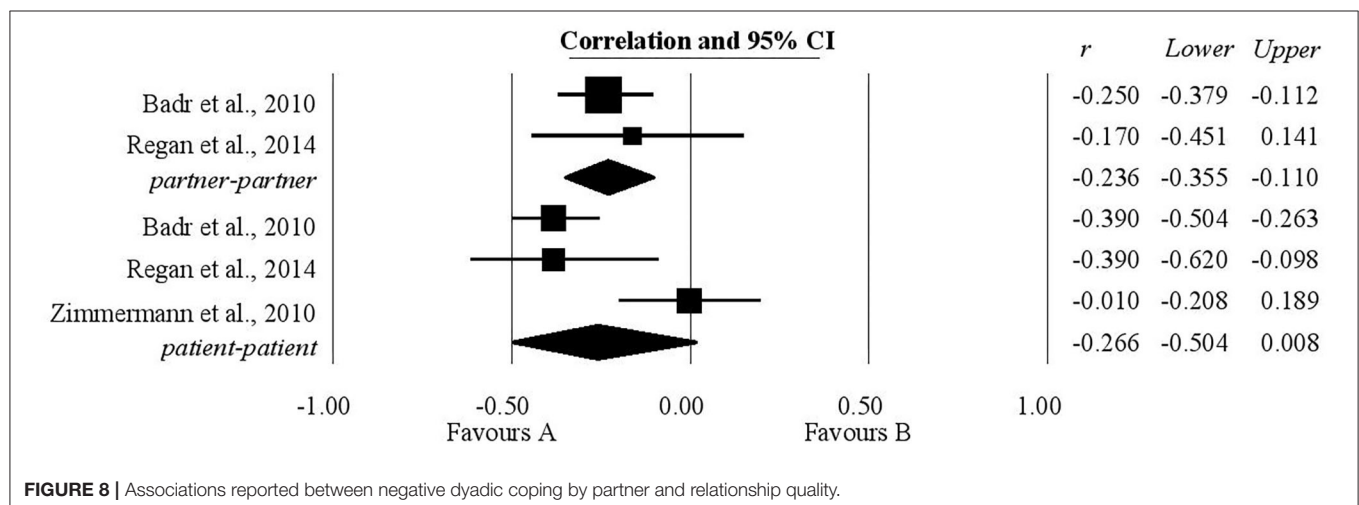
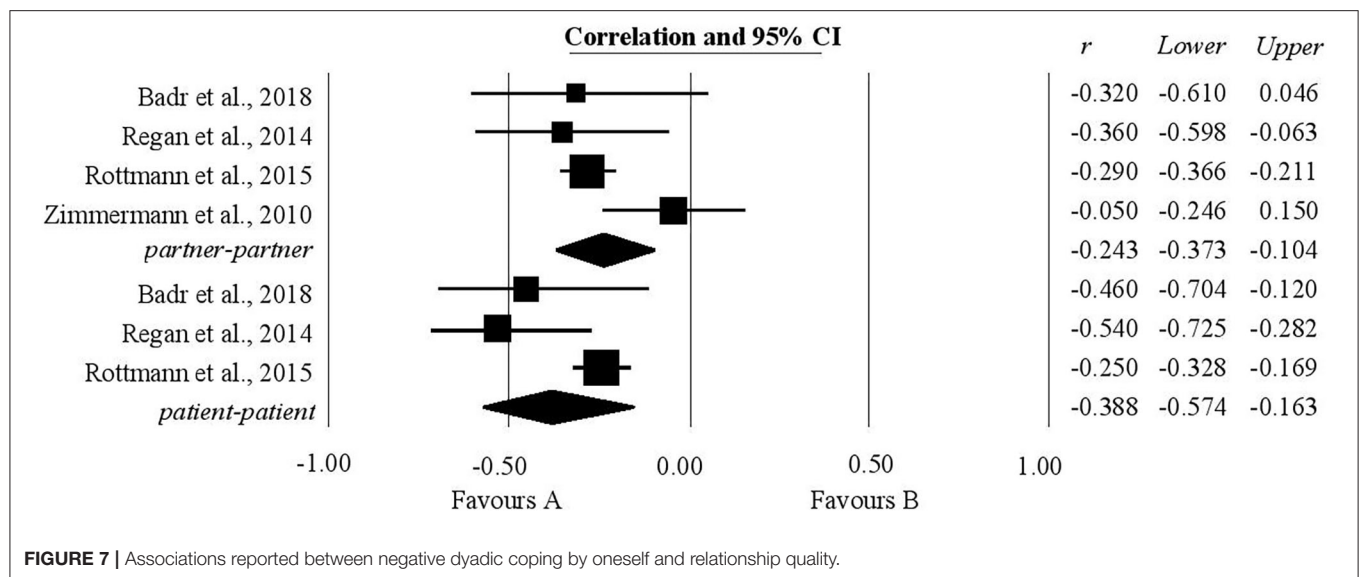
The Risk of Bias

The risk of bias in individual studies was assessed based on the STROBE checklist (STrengthening the Reporting of OBservational studies in Epidemiology) checklist for observational studies (von Elm et al., 2007). Thus, for each study, each item of this checklist was considered. The scoring was

done as follows: if the study considered the aspect described by that item it was marked with "0," otherwise it was marked with "1." For items that required checking several aspects, the value "1" was divided according to the number of targeted aspects. The final score corresponding to the risk of bias for each study was obtained by summing the scores obtained for each item. Following this approach, it was found that the studies included in the analysis have a low risk of bias with scores corresponding to the risk ranging between 1.4 and 4. The less treated issues referred to how the sample size was calculated, which were the ways to address possible sources of bias, how the missing data were approached.

DISCUSSION

To the authors' knowledge this is the first meta-analysis to study the relationship between dyadic coping conceptualized according to the STM model and both relationship quality and emotional



functioning in couples facing a cancer diagnosis. To this end we analyzed ten articles identified using systematic searches in the PsycINFO, PubMed and ScienceDirect databases. This piece of research has several strengths, including the use of strict inclusion/exclusion criteria and the application of meta-analytical techniques of processing data which facilitated the bringing together of results from different studies, but it also has the weakness that only a small number of studies were included in the final analysis.

The meta-analyses carried out largely confirmed our expectations regarding the relationships between dyadic coping and both relationship quality and emotional functioning in couples in which one member has been diagnosed with cancer. Statistically significant positive associations were demonstrated between common dyadic coping, the communication of stress by oneself, supportive dyadic coping by oneself/by partner and relationship quality both for cancer patients and for their life partners. It was also shown that there is a statistically

significant negative correlation between negative dyadic coping by oneself and relationship quality for both members of the couple and a statistically significant negative correlation between negative dyadic coping by partner and relationship quality, but only for non-patient partners. Additionally, a statistically significant positive relationship was also found between shared dyadic coping and emotional functioning for both patients and their partners.

The strongest effects were found in terms of the relationship between common dyadic coping and the quality of the relationship for both patients and partners. However, although weaker, statistically significant effects were also present in the relationship between common dyadic coping and the emotional functioning of patients and their partners. These results suggest that this dyadic process is important in couples facing cancer not only in terms of couple-level outcomes but also in terms of individual-level outcomes. Also, both the perception of one's own coping and the perception of one's partner's coping is

TABLE 2 | Effect sizes of outcomes.

| Evaluated relationship | No. of studies <i>K</i> | No. of participants <i>N</i> | Correlation (95% CI) | <i>Q</i> | <i>I</i> ² | Egger's <i>t</i> test for publication bias |
|---|----------------------------|---------------------------------|--------------------------|----------|-----------------------|--|
| Common dyadic coping-emotional functioning | | | | | | |
| Patients-Patients | 2 | 386 | 0.12 (0.02 to 0.21)* | 0.95 | 0.00 | FS |
| Partners-Partners | 3 | 457 | 0.14 (0.05 to 0.23)** | 0.47 | 0.00 | 0.04 |
| All participants | 3 | 843 | 0.13 (0.06 to 0.20)** | 1.24 | 0.00 | 0.43 |
| Common dyadic coping-relationship quality | | | | | | |
| Patients-Patients | 4 | 869 | 0.48 (0.43 to 0.53)** | 1.70 | 0.00 | −0.79 |
| Partners-Partners | 4 | 869 | 0.36 (0.30 to 0.42)** | 1.34 | 0.00 | −1.13 |
| All participants | 4 | 1,738 | 0.42 (0.39 to 0.46)** | 1.84 | 0.00 | −1.36 |
| Stress communication by oneself-relationship quality | | | | | | |
| Patients-Patients | 3 | 319 | 0.16 (0.05 to 0.27)** | 1.32 | 0.00 | 1.86 |
| Partners-Partners | 2 | 221 | 0.19 (0.06 to 0.31)** | 0.01 | 0.00 | FS |
| All participants | 3 | 540 | 0.17 (0.09 to 0.25)** | 0.77 | 0.00 | 1.28 |
| Supportive dyadic coping by oneself-relationship quality | | | | | | |
| Patients-Patients | 3 | 610 | 0.24 (0.16 to 0.31)** | 1.53 | 0.00 | 1.07 |
| Partners-Partners | 4 | 708 | 0.20 (0.09 to 0.30)** | 3.96 | 24.23 | 0.97 |
| All participants | 4 | 1,318 | 0.22 (0.15 to 0.29)** | 3.45 | 13.14 | 0.99 |
| Supportive dyadic coping by partner-relationship quality | | | | | | |
| Patients-Patients | 3 | 331 | 0.39 (0.30 to 0.48)** | 0.54 | 0.00 | 0.08 |
| Partners-Partners | 2 | 233 | 0.26 (0.13 to 0.38)** | 1.02 | 2.26 | FS |
| All participants | 3 | 564 | 0.34 (0.25 to 0.43)** | 2.48 | 19.5 | 0.22 |
| Negative dyadic coping by oneself-relationship quality | | | | | | |
| Patients-Patients | 3 | 610 | −0.38 (−0.57 to −0.16)** | 5.64 | 64.59 | −2.25 |
| Partners-Partners | 4 | 708 | −0.24 (−0.37 to −0.10)** | 5.58 | 46.24 | 0.43 |
| All participants | 4 | 1,318 | −0.28 (−0.42 to −0.13)** | 9.46 | 68.3 | −0.42 |
| Negative dyadic coping by partner-relationship quality | | | | | | |
| Patients-Patients | 3 | 331 | −0.26 (−0.50 to 0.008) | 10.81 | 81.5 | – |
| Partners-Partners | 2 | 233 | −0.23 (−0.35 to −0.11)** | 0.22 | 0.00 | FS |
| All participants | 3 | 564 | −0.21 (−0.39 to −0.02)* | 7.97* | 74.93 | 3.13 |

P* < 0.05; *P* < 0.001; FS, Few Studies.**TABLE 3 |** Comparison of the results obtained in the two meta-analyses.

| Dyadic coping dimension | Summary information Falconier et al. | | Summary information current study | | Test statistic <i>z</i> | 2-tail <i>p</i> |
|-------------------------------------|--------------------------------------|------------------------|-----------------------------------|--------------------------|-------------------------|-----------------|
| | <i>k</i> | <i>r</i> (95% CI) | <i>k</i> | <i>r</i> (95% CI) | | |
| Negative dyadic coping by partner | 24 | −0.48 (−0.53, −0.43)** | 3 | −0.21 (−0.39 to −0.02)* | 0 | 1 |
| Negative dyadic coping by self | 30 | −0.37 (−0.42, −0.33)** | 4 | −0.28 (−0.42 to −0.13)** | −0.1 | 0.92 |
| Stress communication by self | 20 | 0.34 (0.29, 0.39)** | 3 | 0.17 (0.09 to 0.25)** | 0 | 1 |
| Supportive dyadic coping by partner | 32 | 0.57 (0.50, 0.63)** | 3 | 0.34 (0.25 to 0.43)** | 0 | 1 |
| Supportive dyadic coping by self | 34 | 0.39 (0.34, 0.45)** | 4 | 0.22 (0.15 to 0.29)** | 0.18 | 0.85 |
| Common dyadic coping | 30 | 0.53 (0.48, 0.57)** | 4 | 0.42 (0.39 to 0.46)** | 0.14 | 0.89 |

P* < 0.05; *P* < 0.001.

significantly associated with the quality of the relationship, which emphasizes the importance of both partners' behaviors for relationship satisfaction. Another aspect worth emphasizing is that both positive and negative forms of dyadic coping have been significantly associated with the quality of the relationship, but in opposite directions, an aspect that may be important in the design of future interventions. These results can be explained by the fact that the forms of positive dyadic coping include taking over the partner's tasks to help him but also finding solutions together and empathic support, strategies that can help strengthen couple cohesion thus facilitating improving the relationship quality. Carrying out pleasant activities together with the purpose of relaxation leads to the reduction of stress and can also contribute in this way to an increase in the relationship quality. Communication on various stressful aspects of the disease can also contribute to improving the relationship quality by lowering the level of stress. Besides, engaging in strategies specific to positive dyadic coping can lead to increased trust that the two partners have in each other and to enhance the feeling of belonging. On the other hand, the negative forms of dyadic coping imply that the support provided is accompanied by a lack of empathy, which can reduce openness and intimacy, thus affecting the relationship quality. The relationship quality can be negatively impacted by the presence of disinterest, of distance that can affect the feeling of belonging. Minimizing the partner's stress can lead to the fact that the relationship is not seen as a source of support in difficult circumstances diminishing the level of trust, increasing the perceived stress, and thus negatively influencing the relationship quality.

In most cases, the small number of studies did not allow the analysis of the moderating nature of the age and type of cancer. Meta-regression could be applied only to study the moderating character of age in terms of the relationship between the supportive dyadic coping by oneself and the relationship quality and the result obtained was statistically insignificant.

The results of the meta-analysis demonstrate the importance of the communication of stress and of different forms of dyadic coping for the relationship quality and emotional functioning of couples facing cancer. The significant positive connection between the communication of stress and relationship quality may be explained by the fact that this kind of communication can achieve a better match between felt needs and support received (Cutrona and Russell, 1990). The significant positive connection between supportive dyadic coping and relationship quality may also be understood through the fact that, in the context of the disease, what the partners need to do in following treatment and in day-to-day life can be challenging, with the result that resolving of problems and the giving and receiving of support in achieving concrete tasks can be particularly important and can lead to an increase in cohesion between the couple. Common dyadic coping too is significantly positively associated with relationship quality, possibly because a coordinated and shared approach to the disease improves the feeling of closeness in the relationship (Kayser et al., 2007). This coordinated response to the disease can facilitate the employment of appropriate coping strategies capable of having a positive effect on psychological adjustment to the disease both in patients and in their partners

(Manne et al., 2004), which contributes to the positive connection between common dyadic coping and the emotional functioning of the members of the couple. At the same time negative dyadic coping was associated with lower relationship quality, which may be understood in the light of the fact that this type of coping does not show an attitude of respect toward the partner, one which appreciates their resourcefulness, but rather displays disinterest and a minimizing of the problems they are facing.

The results of the present analysis are in harmony with those obtained by Falconier et al. (2015) in their meta-analysis, namely that both positive and negative dyadic coping make a significant contribution to couple relationship quality, but in opposite directions; however, that meta-analysis deals with a wider context than that of stress caused by cancer and considers several models of dyadic coping not only STM. Thus, only two of the studies included in the meta-analysis performed by Falconier et al. (2015) met the eligibility criteria of this research and are found in the present analysis (Badr et al., 2010; Zimmermann et al., 2010). If we refer to the magnitudes of the effects obtained for the relationships studied by both meta-analyses: the association between supportive dyadic coping by oneself / by the partner, communication of stress by oneself, negative dyadic coping by oneself / by partner and relationship quality, we notice that those obtained in the present meta-analysis are inferior to those obtained by Falconier et al. (2015). The closest values in terms of effect size were obtained in these studies for the associations between the common dyadic coping and the quality of the relationship. It should be noted that for the correlations obtained in the present meta-analysis between the common dyadic coping of patients, partners and all participants and the quality of the relationship, the confidence intervals are relatively narrow which leads to high confidence in point estimates. For the other correlation coefficients calculated in this study, the confidence interval is wider which leads to greater uncertainty regarding the effect size. Also, the statistical tests performed showed that there is no association between the correlation coefficients determined in the present meta-analysis and the meta-analysis performed by Falconier et al. (2015) for the associations between supportive dyadic coping by oneself/by the partner, communication of stress by oneself, negative dyadic coping by oneself/by the partner, common dyadic coping and relationship quality. This fact highlights that the correlations between the mentioned components of dyadic coping and the relationship quality are different in the context of cancer compared to the broader context of different stressors considered by Falconier et al. (2015). In the oncological context, these associations are weaker, which raises the question of whether they are influenced by other psychological variables and what they would be, whether these variables are individual or dyadic and whether they refer to characteristics of the disease or treatments. Thus, future studies could investigate for example the possible influence of the prevalence of physical or mental symptoms, disease characteristics, body image.

When talking about dyadic coping in the context of cancer, our results are in line with those reported by Traa et al. (2014) in their systematic review, which showed that resolving problems together, supportive behaviors, positive dyadic coping

and open, constructive communication about the disease are associated with better functioning of the relationship than when dysfunctional communication patterns, unsupportive behaviors and negative dyadic coping are adopted. These were associated with less functional relationships. In the context created by renal transplant, the dyadic coping of male patients was positively associated with their own satisfaction in the relationship and also with their female partners' satisfaction in the relationship, but the dyadic coping of their female partners was positively associated only with their own satisfaction in their relationship and not also with the satisfaction of the male patients (Tkachenko et al., 2019).

Regarding the relationship between common dyadic coping the emotional functioning of patients, this has not previously been examined in any reviews of the literature. The review of Sterba et al. (2016) did investigate the quality of life for dyads formed of patients with a diagnosis of cancer of the head or neck and their partners and drew attention to the fact that psychological quality of life had been the most studied construct, but results had varied between studies, possibly because of differences in the research questions and variability in the participants. In regard to chronic obstructive pulmonary disease it was found that a more sustained practice of negative dyadic coping and a lower degree of positive dyadic coping was associated with a lower quality of life and a higher level of distress (Meier et al., 2011), and that the greater the disparity between the levels of perceived delegated coping for each couple, the poorer their quality of life. It was likewise apparent that in the case of partners, quality of life was influenced by the communication of stress by patients and also by their negative dyadic coping, as measured at an earlier point (Vaske et al., 2015).

Besides relationships of interest for the present study, the research papers included in the present analysis also report other results that are significant in the context of dyad-centered psycho-oncological research. These include the fact that for younger couples mutuality in the relationship influences dyadic coping at both a personal and an interpersonal level (Acquati and Kayser, 2019), that for women facing cancer in metastasis and their partners common dyadic coping influences partners' level of distress due to the disease differently (Badr et al., 2010), and that relationship satisfaction and their perspective on common dyadic coping is an accurate predictor of the perception of patients facing breast cancer regarding their partners' acceptance of their appearance (Zimmermann et al., 2010).

Although the results of the meta-analyses we performed largely confirmed our expectations and were also in harmony with those of previous studies conducted in the context of cancer but also in the wider one of other conditions, they need to be interpreted with caution given the small number of studies analyzed. This small number of studies is a limitation of this research and arises for various reasons. The first of these to acknowledge is our strict inclusion criteria. This policy contributed to a clear delimitation of our area of interest, to the use in the studies analyzed of a single clear concept of dyadic coping, and to an easier application of the meta-analytical techniques, but resulted in a reduction in the number of eligible studies. Another possible explanation is that the development of psycho-oncological research has only relatively recently widened

its attention from the individual (patient or partner) to the dyad formed of the two. The limited availability of suitable studies may also reflect the greater difficulty of working with dyads (Kazak, 2001).

There currently exist couple-based interventions for cancer patients and their partners that give limited but helpful benefits (Badr and Krebs, 2013) or have mixed results (Vintilă et al., 2019), but analysis of them has shown that they frequently lack any specific theoretical foundation. Since both in the area of psychology and in the broader context of health services and public services it is recognized that efforts to modify behavior work better when interventions have a sound theoretical base (Campbell et al., 2000; Craig et al., 2008), the results of this meta-analysis could be seen as an argument for using the STM approach as the departure point for developing couple-based interventions for those facing cancer. Despite the limitations arising from the small number of studies considered, the results of this meta-analytical synthesis have the advantage of being the product of a process of bringing together the results of a number of individual studies. Give the additional fact that they are in harmony with those obtained in earlier research, they can be used as the basis for advancing some ideas regarding the use of the dyadic approach in psycho-oncological research and practice.

The significant associations found between different forms of dyadic coping and both relationship quality and emotional functioning may be seen as arguments in favor of the development and implementation of dyadic interventions based on the STM for couples facing cancer. The fact that the analyses were carried out separately for different forms of dyadic coping (common, supportive, negative, the communication of stress) makes possible a more precise identification of coping behaviors which could be the subject of interventions, depending on the result of an evaluation of each couple and on the aims in view. In addition, a dyadic coping approach in interventions could be more cost-effective, since the emotional functioning both of patients and of their partners can be addressed. Likewise, these kinds of intervention would have the advantage of using the shared time of both partners, which could be a plus given that partners often plead a lack of available time as a problem.

From the point of view of content, interventions based on the STM could be aimed at psycho-education that could help partners to understand the importance of the communication of stress, of providing support via taking over the duties of the other person, and also the importance of concentrating on finding and implementing solutions together. Interventions could also include the practicing of abilities aimed at increasing the frequency of behaviors associated with positive consequences (supportive dyadic coping, common dyadic coping, the communication of stress) and reducing those associated with negative consequences (negative dyadic coping).

To summarize, the novelty elements highlighted by this paper are the following. This research is the first meta-analysis that studies the relationship between dyadic coping conceptualized according to the STM model and both relationship quality and emotional functioning in couples facing a cancer diagnosis. The obtained results suggest that the relationship previously found in the broader context of different stressors between dyadic coping

and relationship satisfaction is maintained in the context of cancer, but these relationships seem to be weaker, which raises the hypothesis of variables that could influence their intensity. Also, it was pointed out that in the case of couples in which there is an oncological diagnosis, there is a significant relationship between common dyadic coping and emotional functioning. All these support the idea that in an oncological context this dyadic process is important both in terms of individual outcomes and in terms of couple outcomes.

LIMITATIONS

One already-mentioned limitation of this research study is the small number of papers included. The small number of studies included in the analysis may be due to several factors. Thus, strict inclusion criteria such as considering only STM-based research contributed to the clear delimitation of the area of interest and the unitary conceptualization of dyadic coping but reduced the number of eligible studies. Also, psycho-oncology has relatively recently turned to the dyadic approach of stress and coping. The small number of studies found can also be explained by the difficulty of recruiting participants when one of the eligibility conditions is for them to form couples. Another limitation has to do with the fact that since the inclusion criteria required studies to have been published in English in peer-reviewed journals, it is possible that relevant dissertations, conference papers, and unpublished studies may have been overlooked.

Most of the studies identified were cross-sectional in type, which highlights the need for more longitudinal studies to help in the understanding of any temporal dynamics of the relationships between dyadic coping and both relationship quality and emotional functioning.

All the studies were carried out in countries with a western type culture, which limits the degree to which the results can be generalized. Analyzing these relationships in other cultural contexts too could help to overcome this limitation.

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While the methodologies of the studies included in the analysis were appropriate, in order to improve this aspect future studies should ideally furnish clearer accounts of how they addressed potential sources of bias and explain how they calculated their sample size. In addition, bearing in mind that the rate of refusal to participate in the studies varied substantially and was sometimes high, the methodology of future research studies should ideally focus on ways of overcoming the kind of objections to participation that patients and their partners raise.

CONCLUSIONS

This meta-analysis has shown statistically significant relationships between different forms of dyadic coping and both relationship quality and emotional functioning for both cancer patients and their partners. A knowledge of these relationships may have useful implications for clinical practice; however, given the small number of studies reviewed, the findings should be interpreted with caution. Despite this limitation, the results reported here show that the dyadic approach has a part to play as a research direction in psycho-oncology.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

MV and AŞ contributed to all phases of the article. OT contributed to the design phase of the paper, to the collection and analysis of data. All authors contributed to the article and approved the submitted version.

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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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How Do People Experience and Respond to Social Control From Their Partner? Three Daily Diary Studies

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Positive and negative forms of social control are commonly used to regulate another person's health-related behaviors, especially in couples. Social control efforts have been shown to result in desirable, but also undesirable effects on different outcomes. Little is known for which outcomes, when, and under which contextual conditions these different effects unfold in people's everyday lives. Using the dual-effects model of health-related social control, we predicted that same-day and previous-day positive social control would result in desirable effects on target behavior, and same-day positive control on affect. Same-day and previous-day negative control was assumed to result in undesirable effects on reactant responses (i.e., doing the opposite of what the partner wanted and hiding the unhealthy behavior), and same-day negative control on affect. Further, we explored whether it makes a difference if one or both partners intend to change their health behavior. Three daily diary studies addressed these questions for smoking (Studies 1 and 2), and physical activity (Study 3). Receiving more positive control related to more desirable target behavior, and feeling better; more negative control was associated with more reactant responses and feeling worse. Social control unfolded its effects within 1 day, but hardly across days, indicating that control and its reactions to it are fast-acting processes in daily life. The pattern of results were the same for couples with one and both partners intending to change their behavior. Further, results replicated when using partner-reported provided control. Based on these results, social control cannot be unanimously recommended as a behavior change strategy in couples. Future studies should follow up on dyadic and temporal dynamics of social control in couples' everyday lives in different contexts.

Keywords: social control, health behavior, behavior change, reactance, affect, daily diary, couples

INTRODUCTION

Interest in the role of social relationships for health-related self-regulation has increased in social and health psychology in recent years, with a growing number of publications (e.g., Overall et al., 2009; Fitzsimons et al., 2015; Young et al., 2019). One interpersonal process involved in the social regulation of health behaviors is social control, defined as the influence on and regulation of another person's behaviors (Lewis and Rook, 1999). Existing evidence on associations of social control with

health behaviors and additional outcomes, such as affect or reactant responses, is mostly based on cross-sectional studies, while the few available longitudinal studies mainly speak to differences between persons (Craddock et al., 2015). It is thus largely unknown how and when, and for which outcomes social control effects unfold within individuals over time. Moreover, it is an open question whether effects of social control differ depending on context, i.e., whether one or both partners of a dyad intend to change their health behavior. Three daily diary studies presented in this article set out to address these questions.

Social Control: Definition, Theoretical Models, Empirical Evidence, and Research Gaps

Changing health behaviors is notoriously difficult, as research on self-regulation has shown (e.g., Sheeran, 2002). Although there is a long tradition of social psychological theories pointing to the importance of close others for self-regulation (van Lange and Rusbult, 2012), this issue has been largely neglected in health-related self-regulation research so far (Fitzsimons et al., 2015). In this report, we will highlight the role of health-related social control for two prominent health behaviors, as well as for affect, and reactant responses.

Health-related social control is defined as a set of specific interpersonal strategies meant to influence and regulate another person's health behaviors (Lewis et al., 2004; Young et al., 2019). It is distinct from social support (cf. Rook, 1990) that aims at easing a challenging situation in the support recipient (Cohen, 2004). While this distinction is straightforward, partner regulation, a prominent concept from relationship science focusing on romantic relationships (Simpson et al., 2018; Baker and McNulty, 2020) is more closely related to social control. Partner regulation is defined as "an attempt to resolve relationship problems that arise" (p. 5, Baker and McNulty, 2020). Partner regulation and health-related social control thus address different targets. The only overlap between these two constructs occurs when it comes to influencing health behaviors that cause (potential) problems not only for one partner's health, but also for the relationship. However, even in this area of overlap an important distinction between partner regulation and social control is that a prominent form of cooperative partner regulation is social support (Baker and McNulty, 2020) which again is distinct from social control. Owing to the differences in partner regulation and health-related social control the present work draws primarily on the health-related social control literature.

Several theoretical models on how health-related social control relates to health behavior and additional outcomes have been proposed (Okun et al., 2007), with the modified dual-effects model of social control receiving recent support by a meta-analysis (Craddock et al., 2015). The original dual-effects model postulates beneficial effects of social control on the target behavior, but at the same time costs in the form of reduced positive and increased negative affect in the social control recipient (Okun et al., 2007). The modified version of the dual-effects model distinguishes between positive and negative social

control and has been tested in a number of studies (e.g., Lewis and Rook, 1999; Fekete et al., 2006; Scholz et al., 2013).

Positive control has been defined with a negotiation component: Positive control providers try to get recipients to agree with the change, using control strategies such as discussions about the behavior, complimenting recipients on change attempts or using reminders. Negative control in contrast is defined as lacking this negotiation component and as relying on using pressure and inducing guilt instead for making the target person change their health behavior (Lewis et al., 2004).

Empirical evidence indicates that positive control relates to the behaviors targeted at with a moderate-size effect, while negative control is unrelated to behavior (Craddock et al., 2015). Higher negative control was also moderately related to higher negative affect and lower positive affect. Positive control was unrelated to negative affect and moderately related to more positive affect (Craddock et al., 2015).

Recent research on the dual effects model of health-related social control has gone beyond the target behavior and affect as outcomes and additionally included reactant responses. The intertwined model of reactance postulates that reactance comprises negative affect (such as anger) and negative cognition components that are inseparable (Dillard and Shen, 2005; Rains, 2013). Reactance is triggered by a perceived threat to one's autonomy (Brehm and Brehm, 1981); it is a common response to attempts of external persuasion and regulation (Dillard and Shen, 2005). Responses to social control, such as doing the opposite of what the control provider wanted the recipient to do (e.g., Tucker, 2002) and hiding undesirable behaviors (Tucker and Anders, 2001), can be considered consequences of reactance in that they represent different forms of direct restoration of one's autonomy (Brehm and Brehm, 1981). An example for doing the opposite of what the control provider wanted is to smoke even more cigarettes, examples for hiding an undesirable behavior is to smoke in hiding or not telling the partner about skipping the exercise class. In health-related social control research, only a minority of studies has considered these additional, reactance-related outcomes of health-related social control (Craddock et al., 2015). Yet, investigating social control effects on these reactance-related responses is central for gaining a more comprehensive understanding of the consequences of social control. This study will address this issue by applying an extended version of the dual-effects model of social control: We relate both positive and negative social control to health behaviors and affect, and also to hiding the behavior and doing the opposite of the control provider's intention as two reactance-related responses.

Between-Person and Within-Person Effects of Social Control

Most research on social control has tested hypotheses by focusing on differences between people: If Person A reports a higher level of negative control compared to Person B, Person A will on average also report higher levels of negative affect than Person B. The association between negative social control and negative affect *within* Person A or Person B over time, however, remains unknown (Hamaker, 2012), e.g., that at

times of higher social control people will also experience more negative affect. In fact, the within-person association may be zero or even in the opposite direction as the between-person association (Hamaker, 2012). The strong focus on between-person associations is also in contrast to the causal claim most theories, including the dual-effects model of social control, make on associations *within* persons. The majority of studies on health-related social control followed cross-sectional designs and of the longitudinal ones few examined associations at the within-person level (Craddock et al., 2015). Those studies largely confirmed the hypothesized associations of the dual-effects model, but mostly while examining same-day relations (Khan et al., 2013). Consequently, an open question in health-related social control research is how effects of social control unfold over time within individuals. For answering this question, we will focus on micro-time dynamics from 1 day to another to gain a better understanding of the temporal dynamics of social control and its outcomes in people's everyday lives (e.g., Scholz, 2019).

Social Control in Context

A further extension of previous research on social control is the inclusion of contextual factors to better understand under which conditions positive and negative social control unfold their beneficial or undesired effects (Tucker, 2002). So far, relationship quality has been studied most frequently as a contextual moderator of social control effects. Couples with higher relationship quality showed more beneficial and less undesirable outcomes of social control than less satisfied couples (Tucker, 2002; Knoll et al., 2012; Scholz et al., 2013). Another context factor that has not yet been addressed in research on effects of social control is the couple constellation with regard to the intended change in the health-related behavior, for instance, whether one or both partners intend to stop smoking or increase their physical activity. Couples with only one partner intending to change their behavior are more likely to rely on one-sided social control receipt and provision than couples with both partners intending to change jointly. This might be related to stronger threats to recipients' autonomy, and consequently evoke stronger reactance-related responses, more negative affect, and less behavior change. In contrast, couples in which both members want to change their behavior, the joint endeavor might better legitimize the use of positive and negative control strategies, or enable reciprocation among partners (Gleason et al., 2003), thereby potentially buffering detrimental and intensifying beneficial effects of both positive and negative social control on behavior, affect, and reactance-related responses. The present research comprised different couple constellations with regard to individual or joint intended behavior change allowing to inspect different patterns of results.

Aims of the Present Research

Based on current evidence, it is largely unknown how, when and for which outcomes social control effects unfold within individuals over time. Moreover, it is an open question whether effects of social control differ depending on whether one or both partners of a dyad intend to change their behavior. This

article addresses these questions using data from three daily diary studies, focusing on the within-person perspective.

In line with the modified dual-effects model (Butterfield and Lewis, 2002; Lewis et al., 2004; Scholz et al., 2013), we assumed positive associations between positive social control and the target behavior (i.e., less smoking or more physical activity, respectively). We hypothesized an effect of previous day (Hypothesis 1a, H1a) and same day (Hypothesis 1b, H1b) positive control on the target behavior. Positive control strategies are mostly prospective in nature (discussing, persuading, reminding) and may therefore likely unfold their effects from 1 day to the next.

Given the evidence from the dual-effects model, no hypothesis on associations between negative control and target behavior was formed. We refrain from generating explicit hypotheses for these kind of null effects, because proving that there is no or only a trivially small effect would require impossibly large samples (Cohen, 1990) that are beyond the scope of the intensive longitudinal dyadic studies reported here.

In terms of affect, we investigated whether or not people feel better or worse after receiving positive and negative social control from their romantic partners. Affective responses are likely to change quickly with changes in the situation, i.e., when control is present or not (cf. Gross, 2014). Therefore, we primarily assumed short-acting effects of social control on affect within a given day. We expected that people feel better in response to receiving positive control on the same day (Hypothesis 2; H2), and that they feel worse in response to receiving negative control on the same day (Hypothesis 3; H3).

Regarding associations between positive and negative control with reactant responses, we hypothesized that more negative social control received on the previous day (i.e., lagged effect; Hypothesis 4a, H4a) and on the same day (Hypothesis 4b, H4b) would be associated with more reactant responses, i.e., more doing the opposite of what the partner wanted and more hiding the behavior. Receiving high levels of negative social control is assumed to result in immediate and non-volatile reactance (anger and negative cognitions; Dillard and Shen, 2005). Attempting to restore one's autonomy will take place the same day the reactance is experienced (i.e., same day effect). Further, the higher the level of negative control received the previous day, the higher the likelihood that this restoration of one's autonomy might continue from the previous day to the next day (i.e., lagged effect). Positive social control strategies, such as discussions with the target person, still leave room for recipients to choose whether or not to adopt the target behavior. Consequently, the recipients of positive social control would experience no or only a weak threat to their autonomy. Therefore, no hypotheses are set for the associations between positive control and reactant responses.

Finally, we will address a gap in the literature, namely how contextual factors might affect associations between social control and its outcomes. Particularly, we will explore whether effects of social control differ depending on whether one or both partners of a dyad intend to change their behavior. This will be examined at an exploratory level as the couple constellations are part of the different studies. Study 1 tests hypotheses in a couple constellation with only one partner intending to change their

behavior, whereas Study 2 and 3 examine social control in couples with both partners intending to change their behavior.

Hypotheses tests and exploratory analyses examined received positive and negative social control reported by target persons. Additionally, effects of partner-provided positive and negative control were examined to learn whether results hold across different perspectives and to exclude potential artifacts due to shared method variance.

STUDY 1: SMOKER-NON-SMOKER COUPLES

Participants were couples with one smoking partner undergoing a quit attempt. Study 1 focuses on 22 end-of-day diary entries (self-set quit date and 21 days after) of 70 smokers who relapsed after their self-set quit date (of a total of 100 quitting smokers). In line with prior research, relapse was defined as having smoked more than five cigarettes since the quit date at the project's 1 month follow-up (West et al., 2005). The focus was on relapsers only, because during the time of assessment successful quitters smoked no cigarettes after the quit attempt, therefore they did not show within-person variability in smoking and could not contribute to a better understanding of within-person links between social control and smoking, reactance-related outcomes, and affective reactions.

Methods

Procedure and Sample

The data of Study 1 are from the larger project "Dyadic and Individual Regulation to End Chronic Tobacco Use (DIRECT)" funded by the Swiss National Science Foundation (100014_124516/1). Participants were adult smokers intending to quit during the study, and their non-smoking partners (for a full description of this study's methods please see Ochsner et al., 2014). To be eligible, smokers had to smoke at least one cigarette daily, intend to quit during the study, be married or in a committed heterosexual relationship for at least 12 months, and be living with their non-smoking partner for at least 6 months. Smokers who attended a smoking cessation program, worked shifts of 24 h, were not fluent in German, or were pregnant were not eligible to participate. Couples received (100 Swiss Francs, about \$109) for participating in the diary phase. Participants were provided with study smartphones and instructed to complete daily questionnaires within 1 h of going to bed for 22 consecutive days starting at the self-set quit date. Participants were treated in accordance with the ethical guidelines of the Helsinki Declaration (2000).

Participants had a mean age of 39.96 years ($SD = 10.40$), 22 (31.4%) were women. The majority (70%) reported 9 years of schooling and were currently employed (81.4%). Roughly half (55.7%) of the participants had children, with 35 (50%) living with the children in the same household.

Measures

Means and standard deviations across the diary phase, as well as the range of the scales, ICCs and number of participants

providing data are displayed in **Table 1**. All item examples are translations from German.

Positive and negative social control were assessed with four items each by Butterfield and Lewis (2002) and adapted to the context of smoking (Ochsner et al., 2015) and daily assessments. A sample item for positive social control is "Today, my partner tried to influence my smoking behavior by trying to persuade me to reduce my smoking or to quit." A sample item for negative control is "Today my partner tried to influence my smoking behavior by trying to make me feel guilty." The response format ranged from 1 = never today to 4 = frequently today.

Partner provided positive and negative control was assessed with exactly the same items and response format, but from the perspective of the provider (e.g., Today, I tried to influence my partner's smoking behavior by trying to make him/her feel guilty).

Target Behavior: Daily number of cigarettes smoked was assessed by two questions. "Did you smoke today (including only one puff)?" If participants indicated yes, they were asked to report how many cigarettes they had smoked (Heatherton et al., 1991); if they indicated no, daily number of cigarettes smoked was set to 0.

Affect after having received control was measured daily with the item: "How did you feel today after your partner tried to influence you this way?" Response options ranged on a seven-point scale from -3 "much worse" via 0 "unchanged" to +3 "much better." A further option for participants was to indicate that their partner did not try to influence their smoking behavior today, which was then coded as missing. This resulted in 49 relapsers providing data for this item across the 22 days.

Reactant responses. Doing the opposite of what the partner wanted was assessed with an item adapted from Tucker and Anders (2001): "Today I did exactly the opposite of what my partner wanted me to do with regard to my smoking." *Hiding smoking from the partner* was assessed with an item adapted from Tucker and Anders (2001): "Today I hid my smoking from my partner." For both items, response options ranged from 1 "today not at all" to 6 "today very frequently." Again, a further option for participants was to indicate that their partner did not try to influence their smoking today, items were then coded as missing. Across 22 days, data for *doing the opposite* were provided by 49 participants; data for *hiding smoking* were provided by 56 participants.

Analytic Strategies

We used multilevel modeling to account for the hierarchical data structure, following recommendations by Bolger and Laurenceau (2013). Within-person (Level 1) predictors were person-mean centered. These centered variables provide information on the daily fluctuation around the person-specific mean, testing links between positive and negative social control and the different outcome variables within persons (Level 1). Between-person (Level 2) predictors, i.e., the average scores across the diary days of the respective variables were grand-mean centered at the sample mean. Due to the different number of participants for the outcomes affect, doing the opposite, and hiding in Study 1 and 2, the centering of the between-person variables was adjusted for the subsamples with available data.

TABLE 1 | Means, standard deviations, ranges across all diary days, and intraclass correlations (ICC) of main variables in Study 1, Study 2 for women and men separately, and Study 3.

| | | <i>M</i> | <i>SD</i> | <i>SD</i> | Range | <i>ICC</i> | <i>N</i> |
|---------------|-----------------------------------|----------|-----------|-----------|----------|------------|----------|
| Study 1 | Daily number of cigarettes smoked | 7.31 | 7.71 | 3.65 | 0–45 | 0.80 | 70 |
| | Affect | 0.03 | 0.62 | 0.70 | –3 to +3 | 0.24 | 49 |
| | Doing the opposite | 1.75 | 0.89 | 0.83 | 1–6 | 0.41 | 49 |
| | Hiding smoking | 1.52 | 0.80 | 0.83 | 1–6 | 0.39 | 56 |
| | Positive social control | 1.36 | 0.40 | 0.38 | 1–4 | 0.49 | 70 |
| | Negative social control | 1.12 | 0.21 | 0.21 | 1–4 | 0.45 | 70 |
| Study 2 women | Daily number of cigarettes smoked | 6.08 | 6.19 | 2.81 | 0–40 | 0.82 | 59 |
| | Affect | 0.17 | 1.07 | 0.91 | –3 to +3 | 0.40 | 19 |
| | Doing the opposite | 1.47 | 0.98 | 0.79 | 1–6 | 0.42 | 31 |
| | Hiding smoking | 1.17 | 0.41 | 0.50 | 1–6 | 0.36 | 43 |
| | Positive social control | 1.40 | 0.42 | 0.41 | 1–4 | 0.48 | 59 |
| | Negative social control | 1.09 | 0.14 | 0.20 | 1–4 | 0.29 | 59 |
| Study 2 men | Daily number of cigarettes smoked | 6.20 | 5.16 | 3.16 | 0–34 | 0.71 | 60 |
| | Affect | 0.41 | 0.93 | 0.85 | –3 to +3 | 0.40 | 49 |
| | Doing the opposite | 1.55 | 0.83 | 0.83 | 1–6 | 0.47 | 54 |
| | Hiding smoking | 1.35 | 0.69 | 0.74 | 1–6 | 0.41 | 59 |
| | Positive social control | 1.52 | 0.45 | 0.38 | 1–4 | 0.48 | 60 |
| | Negative social control | 1.13 | 0.22 | 0.22 | 1–4 | 0.29 | 60 |
| Study 3 | Daily MVPA (log) | 3.52 | 0.57 | 0.95 | 1.6–4.7 | 0.36 | 118 |
| | Affect | 0.35 | 0.48 | 0.87 | –3 to +3 | 0.21 | 113 |
| | Doing the opposite | 1.30 | 0.44 | 0.53 | 1–6 | 0.39 | 120 |
| | Hiding inactivity | 1.22 | 0.38 | 0.37 | 1–6 | 0.48 | 120 |
| | Positive social control | 1.42 | 0.39 | 0.43 | 1–4 | 0.42 | 120 |
| | Negative social control | 1.11 | 0.20 | 0.20 | 1–4 | 0.47 | 120 |

N = Number of cases. The *ICC* (intraclass correlation) stands for the amount of between-person variance in relation to total variance (Bolger and Laurenceau, 2013). *MVPA* = moderate-to-vigorous physical activity; *log* = log-transformed.

To test Hypotheses 1–4, lagged analyses with a lag of 1 day were run. Models included between-person positive and negative control, within-person previous day, and same day positive and negative social control together with previous day's outcome to predict the same day outcome. Testing effects of previous day positive and negative control on present day's outcomes allow to establish temporal order. Further, including present day's positive and negative control as predictors excludes the possibility that effects of previous day positive and negative control on present day's outcome are artifacts due to strong associations of present day's positive and negative control with present day's outcome. Note that predictors are strongly correlated from one day to the next. Similarly, including previous day outcome in the analyses excludes the possibility that effects of previous day positive and negative control on present day outcomes are artificially inflated because of correlations between previous day positive and negative control and previous day outcomes. Due to lagged analyses, the second diary day served as the first outcome day. A linear time trend centered on Day 2 controlled for common time effects. One unit increase in time indicated 1 week representing all diary days (Day 1 = 0, Day 2 = 0.14, ..., Day 7 = 1, Day 8 = 1.14, ...).

Variables were standardized for better comparability of effects. While it is possible to standardize with the between-person standard deviation as was done here, it is also

possible to standardize with the pooled within-person standard deviation or with the individualized standard deviation. For the present studies, standardizing with the between-person standard deviation was chosen for the following reasons: Standardizing with the between-person standard deviation allows comparing effect sizes (a) across the three studies for different couple constellations, (b) within our studies for between- and within-person effects, and (c) with other studies, e.g., from the meta-analyses on social control (Craddock et al., 2015). Although for between- person effects between-SD standardization and for within-person effects the within-SD standardization would have been ideal, using different standard deviations for standardizations would have prevented comparison of the different effect sizes of between- and within-person effects and with other studies. Thus, we standardized all effects with the between-person standard deviation by dividing all variables by their respective between-person standard deviation (*SD*). Of note, the between- and within-person *SD*s were largely comparable in size (see **Table 1**, and **Supplementary Table P1** for provided control). For each *SD* increase in the predictor, the outcome changes in *SD*s as much as the regression weight indicates. This allows interpretation of effect sizes: $b < 0.3$ = small effect, $0.3 \leq b < 0.5$ = medium effect, $b \geq 0.5$ = large effect (Cohen et al., 2003). As daily number of cigarettes smoked is a meaningful metric, this outcome was not standardized in Studies 1 or 2.

Daily number of cigarettes smoked (Studies 1 and 2) was a count variable, thus generalized linear mixed Poisson models with a logarithmic link function were used (Xie et al., 2013), resulting in rate ratios as the regression coefficients. Rate ratios (RR) indicate that a one-unit increase in the predictor results in percentage increase (distance above one) or percentage decrease (distance below one) in the criterion (Atkins et al., 2013). For the other three outcomes in Studies 1 and 2 (doing the opposite, hiding, and affect) linear mixed models were run.

For all analyses, a maximal random effects structure was specified (Barr et al., 2013). In case of non-convergence, the random effects structure was successively reduced until convergence was met. For parsimony, we reported results of the Level-1 random effects in the **Supplementary Material S1** (and P2 for provided control). Intra-class correlations (ICC) for all measures were computed. The ICC is the amount of variance between second-level units, in our case persons, in relation to total variance (Bolger and Laurenceau, 2013). All analyses were conducted in SPSS 23, with a probability level of $p = 0.05$.

Sensitivity analyses were conducted for all models. We adjusted for nicotine dependence at baseline (Fagerström test of nicotine dependence; Heatherton et al., 1991), age, and gender in Study 1 and nicotine dependence and age in Study 2 (where we ran separate analyses for men and women). In Study 3, we adjusted for gender, age, BMI, intervention group vs. control group, intervention phase vs. follow-up phase, and weekday vs. weekend, and wear time of accelerometers in the analyses of physical activity. For parsimony, we report the unadjusted analyses in this article. Tables depicting sensitivity analyses are reported in the **Supplementary Material S2** (and **Supplementary Table P2** for provided control).

Results Study 1

Results of Study 1 are displayed in **Table 2**. For random effects see **Supplementary Tables S1-1**. Results of partner-reported provided social control, largely reflecting the results of received social control, are displayed in **Supplementary Table P1-1**. Sensitivity analyses showed the same patterns of results, see **Supplementary Table S2-1** for received and **Supplementary Table P2-1** for provided control.

Does Positive Social Control Predict Daily Number of Cigarettes Smoked (H1a and H1b)?

In contrast to H1a assuming a previous-day effect, but in support of H1b assuming a same-day effect, positive control on the same day, but not the previous day was significantly related to smoking: On days with higher than usual same-day positive control smokers reported 5% less cigarettes smoked (see **Table 2**). As expected from the theoretical assumptions of the extended dual-effects model, same day and previous day negative control were unrelated to daily number of cigarettes smoked.

Does Positive and Negative Social Control Predict Affect (H2 and H3)?

In support of H2, same day positive control was associated with feeling better. Additionally, a positive effect of previous-day positive control on feeling better emerged. In line with H3,

same-day, but not previous-day negative control was related to smokers feeling worse.

Does Negative Social Control Predict More Reactant Responses (H4a and H4b)?

Supporting H4b, but contrasting H4a, only same day, but not previous day negative control was related to *doing the opposite*, indicating that higher than usual levels of negative control were related to more doing the opposite within the same day. Similarly, only same day but not previous day negative control significantly predicted *hiding*: More than usual same day negative control related to more hiding. Further, same day positive control was significantly related to less hiding, but – as expected from the extended dual-effects model – unrelated to doing the opposite.

Brief Discussion of Study 1 Results

Overall, results mainly confirmed our hypotheses on same-day effects (see **Table 3** and **Supplementary Table P6** for provided control for a color-coded overview of the results across all studies with regard to confirmation/disconfirmation of Hypotheses 1–4). Positive control predicted fewer cigarettes smoked (H1b) and less hiding. Negative control predicted more doing the opposite and hiding (H4b). However, these effects emerged only for the same day, but not the previous day. This speaks in favor of social control being a fast process linked with rather immediate outcomes in people's everyday lives. For the reactant responses this might be explained by relationship maintenance issues: displaying maladaptive behaviors across several days may prove negative for the relationship (Burke and Segrin, 2017). Thus, smokers might try to avoid prolonged negative behavioral reactions for the sake of their relational well-being.

Hypotheses 2 and 3 for affect were largely confirmed and highlight the applicability of the assumptions on affective correlates in the extended dual-effects model to smokers' everyday lives. The more consistent link of affective reactions to receiving positive and negative control compared to the behavioral outcomes might also be explained by better measurement precision: Affect was assessed as a direct affective reaction to receiving control from the partner. All behavioral outcomes were assessed in a less targeted manner, leaving room for other influences.

The results of Study 1 emerged in a couple constellation with only one partner intending to change their behavior. Studies 2 and 3 addressed the same hypotheses in the context of both partners intending to change their behavior.

STUDY 2: DUAL-SMOKER COUPLES

The second study had the same research design as Study 1, but participants were dual-smoker couples intending to quit jointly on a self-set quit date. This allows for a comparison between effects of social control in a different couple context. Due to this planned comparison, data for female and male smokers were analyzed separately to ensure the same structure of results as in Study 1.

TABLE 2 | Study 1: within- and between-person effects of negative and positive social control on daily number of cigarettes smoked, affect, doing the opposite, and hiding smoking after the quit date for relapsing smokers.

| Fixed effects | DV: Number of cigarettes smoked | | | | DV: Affect | | | DV: Doing the opposite | | | DV: Hiding smoking | | |
|------------------------------|---------------------------------|--------|--------|------|------------|--------|-------|------------------------|--------|-------|--------------------|--------|-------|
| | b | RR | 95% CI | | β | 95% CI | | β | 95% CI | | β | 95% CI | |
| | | | LL | UL | | LL | UL | | LL | UL | | LL | UL |
| Intercept | 1.25 | 3.48** | 2.52 | 4.80 | 0.20 | -0.25 | 0.66 | 1.29** | 1.09 | 1.49 | 1.85** | 1.38 | 2.32 |
| Time | 0.10 | 1.10** | 1.03 | 1.19 | -0.06 | -0.35 | 0.23 | 0.43** | 0.14 | 0.72 | 0.06 | -0.25 | 0.36 |
| Previous day outcome | 0.002 | 1.00 | 0.90 | 1.12 | -0.34** | -0.49 | -0.20 | -0.30** | -0.40 | -0.20 | -0.26** | -0.42 | -0.09 |
| Negative control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | 0.02 | 1.02 | 0.97 | 1.08 | -0.30** | -0.41 | -0.19 | 0.18* | 0.04 | 0.32 | 0.11* | 0.02 | 0.21 |
| On the previous day | 0.002 | 1.00 | 0.95 | 1.05 | -0.10 | -0.21 | 0.02 | 0.004 | -0.11 | 0.12 | 0.07 | -0.02 | 0.17 |
| Between-person effects | 0.36 | 1.43* | 1.07 | 1.89 | -0.18 | -0.56 | 0.21 | 0.22 | -0.05 | 0.49 | 0.30 | -0.12 | 0.72 |
| Positive control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | -0.05 | 0.95* | 0.91 | 0.99 | 0.35** | 0.22 | 0.48 | -0.07 | -0.16 | 0.02 | -0.11* | -0.20 | -0.01 |
| On the previous day | -0.05 | 0.96 | 0.91 | 1.0 | 0.22** | 0.08 | 0.36 | -0.01 | -0.11 | 0.09 | -0.05 | -0.18 | 0.08 |
| Between-person effects | -0.19 | 0.83 | 0.60 | 1.14 | 0.40* | 0.06 | 0.74 | -0.09 | -0.32 | 0.14 | 0.19 | -0.18 | 0.57 |

For the effects of all random effects please see **Supplementary Table S1-1**. For daily number of cigarettes smoked: $n = 70$, $n = 1,186$ available days; for affect: $n = 37$; $n = 353$ available days; for doing the opposite: $n = 38$, $n = 357$ available days; for hiding: $n = 48$, $n = 530$ available days; RR = rate ratio; b = unstandardized regression coefficients (outcome in original metric), β = standardized regression coefficients (predictor and outcome in between-person SD units), 95% CI = 95% confidence interval; LL = lower level; UL = upper level; * $p < 0.05$, ** $p < 0.01$.

Methods

Procedure and Sample

Data from this study came from the larger project “Individual regulation and dyadic exchanges during an on-going quit attempt in dual-smoker couples” funded by the Swiss National Science Foundation (PP00P1_133632/1). The procedure and eligibility criteria were the same as in Study 1 with the exception that Study 2 focused on dual-smoker couples with both partners intending to quit jointly during the study (Lüscher et al., 2017; for a comprehensive description of the study’s procedures, etc., please see Lüscher and Scholz, 2017). The project was approved by the Ethics Committee of the Faculty of Human Sciences of the University of Bern in Switzerland (2011-11-14409).

Like Study 1, the current study focused on 22 end-of-day diary entries (self-set quit date and 21 days after) of $N = 60$ male smokers and $N = 59$ female smokers who relapsed after a joint self-set quit date (of a total of 83 couples participating in the diary phase). In line with Study 1, relapse was defined as having smoked more than five cigarettes since quit date at the project’s 1 month follow-up (West et al., 2005).

Female smokers had a mean age of 38.53 ($SD = 14.95$). Most ($n = 26$, 44.1%) reported 9 years of schooling and a majority of 64.4% ($n = 38$) were currently employed. Male smokers had a mean age of 40.85 ($SD = 14.65$). The majority ($n = 33$, 55%) reported 9 years of schooling and were currently employed ($n = 46$, 76.7%). Of all couples, 26 (43.3%) were married, and 11 (18.3%) couples had at least one child living in their household.

Measures

All constructs were assessed with the same items as in Study 1. All descriptive information on the measures are provided in **Table 1** (and **Supplementary Table P1** for provided control).

Results of Study 2

Results of Study 2 are displayed in **Table 4** (male smokers) and **Table 5** (female smokers). For random effects see **Supplementary Tables S1-2, S1-3**. Results of partner-reported provided control, again largely reflecting results of received social control, are reported in **Supplementary Tables P1-2, P1-3**. For sensitivity analyses also resulting in the same patterns of results, please see **Supplementary Tables S2-2, S2-3** for received and **Supplementary Tables P2-2, P2-3** for provided control.

Does Positive Social Control Predict Daily Number of Cigarettes Smoked (H1)?

Comparable to results of Study 1, and only supporting H1b, it was only same, but not previous day positive control that was significantly related to smoking and only in men: On days with higher than usual same day positive control male smokers reported 4% less cigarettes smoked. In line with the extended dual-effects model, no significant effects emerged for previous or same day negative social control for male and female relapsers.

Does Positive and Negative Social Control Predict Affect (H2 and H3)?

H2 was fully supported in both the female and the male subsample: for both women and men, same day positive control was related to feeling better. Additionally, for men only previous day positive control was associated with feeling better. Supporting H3 in the male sample, same-, but not previous day negative control received from the partner was related to feeling worse. For women neither same nor previous day negative control was associated with affect, partly disconfirming H3.

TABLE 3 | Overview of results for study 1, study 2 (for men and women), and study 3 for received positive and negative social control.

| | Target behavior | | | Affect | | | Reactance-related responses | | | | | | | | | | | |
|---|-----------------|--------|-------|----------|--------|--------|-----------------------------|-------|--------|--------|--------|-----|--------|--------|--------|--------|-----|-------|
| | Smoking | | | Activity | | | Doing the opposite | | | | | | Hiding | | | | | |
| | Study1 | Study2 | Women | Study3 | Study1 | Study2 | Men | Women | Study3 | Study1 | Study2 | Men | Women | Study3 | Study1 | Study2 | Men | Women |
| Negative control | | | | | | | | | | | | | | | | | | |
| Within-person same day | 0 | 0 | 0 | 0 | — | — | — | 0 | — | — | + | + | + | + | + | + | + | + |
| Within person previous day | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Positive control | | | | | | | | | | | | | | | | | | |
| Within-person same day | — | — | 0 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Within person previous day | 0 | 0 | 0 | 0 | + | + | + | 0 | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 = non-significant effect; + = positive significant effect; — = negative significant effect; + or — = small effect size, + + or — = medium effect size, + + + = large effect size; effect sizes are only displayed for significant effects; red color coding: disconfirming hypothesis; green color coding: confirming hypothesis; white color coding: no a priori hypotheses. | | | | | | | | | | | | | | | | | | |

0 = non-significant effect; + = positive significant effect; - = negative significant effect; + or - = small effect size, +++ = medium effect size, ++++ = large effect size; effect sizes are only displayed for significant effects; red color coding: disconfirming hypothesis, green color coding: confirming hypothesis; white color coding: no a priori hypotheses.

Does Negative Social Control Predict Daily Reactant Responses (H4)?

Partly in line with H4b, but disconfirming H4a, the only significant effect emerged for same day negative control in male smokers, indicating that at higher than usual levels of same day negative control, higher levels of doing the opposite were reported by men. Again, in line with H4b, but disconfirming H4a, same-, but not previous day negative control significantly predicted hiding: In men and women alike, more than usual same day negative control was associated with more hiding. In accordance with the extended dual-effects model, no effects of same- or previous day positive control on hiding emerged.

Brief Discussion of Study 2 Results

As in Study 1, analyses largely supported our hypotheses on same-day effects (see **Table 3** and **Supplementary Table P6** for provided control for the color-coded overview). Overall, the pattern of results in dual-smoker couples with the joint goal of quitting smoking was very similar to the pattern of smokers within smoker–non-smoker couples, i.e., with only one partner intending to change their behavior. Study 2 replicates the majority of results of Study 1 with regard to effect sizes. This might be explained by a strong influence of the target behavior: quitting smoking might be such a desired behavior change that it legitimizes many means to be achieved. One limitation of Study 1 and 2 were the use of self-reported target behavior. Study 3 addresses this shortcoming by assessing behavior (physical activity) objectively. Moreover, Study 3 introduces another context by focusing on couples where both partners were overweight and intended to increase their daily physical activity. Thus, instead of giving up an undesirable behavior as in studies 1 and 2, Study 3 focuses on the uptake of a desirable behavior, i.e., more physical activity.

STUDY 3: OVERWEIGHT COUPLES INCREASING THEIR PHYSICAL ACTIVITY

Overweight (i.e., with a Body Mass Index, BMI, higher than 25) individuals are particularly encouraged to engage in regular physical activity for weight regulation and health benefits (World Health Organization, 2004). The World Health Organization recommends adults to engage in at least 150 min of moderate- or 75 min of vigorous-intensity aerobic activity or a combination thereof per week. A recent meta-analysis indicates promising effects of couple-oriented interventions on physical activity (Richards et al., 2017). In Study 3, participating couples were characterized by both partners being overweight and insufficiently physically active, but both intending to increase their physical activity. Thus, similar to Study 2, both partners intended to change their behavior. Comparing results across the three different studies exploratorily will thus provide a comprehensive picture for different couple constellations across different behaviors.

TABLE 4 | Study 2 men: within- and between-person effects of negative and positive social control on daily number of cigarettes smoked, affect, doing the opposite, and hiding smoking after the quit date for relapsing smokers.

| Fixed effects | DV: Number of cigarettes smoked | | | | DV: Affect | | | DV: Doing the opposite | | | DV: Hiding smoking | | |
|------------------------------|---------------------------------|--------|--------|------|------------|--------|-------|------------------------|--------|-------|--------------------|--------|-------|
| | b | RR | 95% CI | | β | 95% CI | | β | 95% CI | | β | 95% CI | |
| | | | LL | UL | | LL | UL | | LL | UL | | LL | UL |
| Intercept | 1.23 | 3.43** | 2.42 | 4.86 | 0.38* | 0.03 | 0.73 | 1.82** | 1.51 | 2.13 | 2.03** | 1.70 | 2.36 |
| Time | 0.07 | 1.07 | 0.94 | 1.22 | −0.14 | −0.38 | 0.10 | 0.06 | −0.06 | 0.17 | −0.03 | −0.22 | 0.16 |
| Previous day outcome | −0.02 | 0.98 | 0.91 | 1.06 | −0.21** | −0.30 | −0.13 | −0.20** | −0.33 | −0.08 | −0.28** | −0.37 | −0.18 |
| Negative Control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | 0.01 | 1.01 | 0.98 | 1.05 | −0.18* | −0.32 | −0.03 | 0.30** | 0.22 | 0.38 | 0.24** | 0.08 | 0.39 |
| On the previous day | −0.004 | 1.00 | 0.97 | 1.02 | −0.04 | −0.11 | 0.03 | 0.04 | −0.05 | 0.12 | 0.05 | −0.03 | 0.13 |
| Between-person effects | −0.11 | 0.90 | 0.72 | 1.11 | −0.05 | −0.29 | 0.18 | 0.17 | −0.11 | 0.46 | 0.74** | 0.54 | 0.94 |
| Positive control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | −0.05 | 0.96* | 0.92 | 0.99 | 0.22* | 0.05 | 0.39 | −0.08 | −0.23 | 0.07 | −0.10 | −0.27 | 0.07 |
| On the previous day | −0.02 | 0.98 | 0.96 | 1.0 | 0.09* | 0.01 | 0.17 | −0.06 | −0.15 | 0.04 | −0.07 | −0.16 | 0.02 |
| Between-person effects | 0.22 | 1.24 | 0.93 | 1.66 | 0.30* | 0.04 | 0.56 | 0.55** | 0.25 | 0.84 | −0.16 | −0.37 | 0.04 |

For the effects of all random effects please see **Supplementary Table S1-2**. For daily number of cigarettes smoked: $n = 60$, $n = 945$ available days; for affect: $n = 38$; $n = 480$ available days; for doing the opposite $n = 49$, $n = 620$ available days; for hiding: $n = 56$, $n = 777$ available days; RR = rate ratio b = unstandardized regression coefficients (outcome in original metric), β = standardized regression coefficients (predictor and outcome in between-person SD units), 95% CI = 95% confidence interval; LL = lower level; UL = upper level; * $p < 0.05$, ** $p < 0.01$.

TABLE 5 | Study 2 women: within- and between-person effects of negative and positive social control on daily number of cigarettes smoked, affect, doing the opposite, and hiding smoking after the quit date for relapsing smokers.

| Fixed effects | DV: Number of cigarettes smoked | | | | DV: Affect | | | DV: Doing the opposite | | | DV: Hiding smoking | | |
|------------------------------|---------------------------------|--------|--------|------|------------|--------|------|------------------------|--------|-------|--------------------|--------|-------|
| | b | RR | 95% CI | | β | 95% CI | | β | 95% CI | | β | 95% CI | |
| | | | LL | UL | | LL | UL | | LL | UL | | LL | UL |
| Intercept | 1.19 | 3.28** | 2.27 | 4.74 | 0.26* | 0.03 | 0.49 | 1.22** | 0.98 | 1.45 | 2.89** | 2.62 | 3.15 |
| Time | −0.05 | 0.96 | 0.84 | 1.10 | −0.05 | −0.15 | 0.05 | 0.09 | −0.02 | 0.19 | 0.02 | −0.17 | 0.22 |
| Previous day outcome | −0.03 | 0.97 | 0.91 | 1.03 | −0.02 | −0.11 | 0.08 | −0.07* | −0.13 | −0.01 | −0.15* | −0.27 | −0.03 |
| Negative control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | 0.01 | 1.0 | 0.98 | 1.04 | −0.09 | −0.20 | 0.03 | 0.09 | −0.04 | 0.22 | 0.16* | 0.001 | 0.32 |
| On the previous day | 0.01 | 1.0 | 0.98 | 1.03 | 0.002 | −0.05 | 0.05 | 0.02 | −0.02 | 0.07 | 0.06 | −0.003 | 0.13 |
| Between-person effects | −0.17 | 0.85 | 0.66 | 1.09 | −0.15 | −0.32 | 0.02 | 0.02 | −0.17 | 0.22 | 0.48** | 0.25 | 0.71 |
| Positive control | | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | | |
| On the same day | −0.03 | 0.98 | 0.94 | 1.01 | 0.37** | 0.21 | 0.53 | 0.01 | −0.06 | 0.07 | −0.01 | −0.09 | 0.08 |
| On the previous day | −0.03 | 0.97 | 0.92 | 1.03 | 0.01 | −0.07 | 0.10 | −0.02 | −0.09 | 0.04 | 0.04 | −0.04 | 0.12 |
| Between-person effects | 0.23 | 1.26 | 0.99 | 1.61 | 0.28** | 0.12 | 0.45 | 0.12 | −0.08 | 0.31 | −0.14 | −0.35 | 0.07 |

For the effects of all random effects please see **Supplementary Table S1-3**. For daily number of cigarettes smoked: $n = 59$, $n = 986$ available days; for affect: $n = 32$; $n = 336$ available days; for doing the opposite: $n = 50$, $n = 606$ available days; for hiding: $n = 55$, $n = 820$ available days; RR = rate ratio b = unstandardized regression coefficients (outcome in original metric), β = standardized regression coefficients (predictor and outcome in between-person SD units), 95% CI = 95% confidence interval; LL = lower level; UL = upper level; * $p < 0.05$, ** $p < 0.01$.

Methods

Procedure and Sample

The data of Study 3 came from the larger project “A Dyadic Action Control Trial in Overweight and Obese Couples (DYACTIC)” funded by the Swiss National Science Foundation (PP00P1_133632/1) and registered as a randomized controlled trial (ISRCTN15705531). The study was approved by the Ethics Committee of the Faculty of Human

Sciences of the University of Bern, Switzerland (2011-12-36206). Analyses of the current study are secondary analyses unrelated to the intervention. The intervention conditions were included in all analyses as a covariate, but were not the focus of the research question (for a full description of this study’s design, recruitment procedures, and primary analyses on the effectiveness of the intervention see Berli et al., 2016). Part of the intervention was to randomly assign one of the partners to be the target person

for behavior change. Only target persons reported on the social control received from their partners, partners reported on the social control provided to target persons.

Criteria for participation were that both partners of eligible heterosexual couples had to be between 18 and 75 years old, both partners had to be overweight (body mass index, BMI > 25), insufficiently physically active (< 30 min per day of moderate-to-vigorous physical activity, MVPA), and both had to intend to enhance their physical activity. As in studies 1 and 2, eligible couples had to live in a committed relationship for at least 12 months and cohabit for at least 6 months and to be fluent in German. Moreover, for reasons related to the intervention, couples were only eligible if able to receive and read text messages throughout the day. Exclusion criteria were: working 24 h shifts, participating in a professional weight loss program during the time of the study, and pregnancy in women.

Couples were provided with study smartphones and accelerometers. The end-of-day diary phase started after a baseline assessment and comprised 28 consecutive days. Analyses focus on the randomly assigned target persons of the intervention only. Couples received a financial incentive of (100 Swiss Francs; about \$109) for completing the diary phase.

A total of $N = 120$ target persons and their partners participated in the diary phase of this study¹. Participants had a mean age of 46.03 ($SD = 13.64$), $n = 62$ (51.7%) were women. The majority of participants ($n = 70$, 58.3%) reported 9 years of schooling and were currently employed ($n = 78$, 65%). Of $n = 69$ (57.5%) reporting to have children, $n = 52$ (43.3%) also lived with children in the same household. BMI of participants was $M = 31.01$ ($SD = 5.6$; range = 24.98–61.73).

Measures

Means and standard deviations across the diary phase, as well as the theoretical range of the scales, ICCs and number of participants providing data are displayed in **Table 1** (and Table P1 in the **Supplementary Material** for provided control). All item examples are translations from German.

Positive and negative social control were assessed with four items each from Butterfield and Lewis (2002) and adapted to the context of physical activity in daily assessments. A sample item for positive social control reads “Today, my partner tried to positively influence my physical activity by stating how important it is to him/her that I am physically active.” A sample item for negative control is “Today my partner tried to positively influence my physical activity by trying to make me feel guilty.” The response format ranged from 1 = never today to 4 = frequently today.

Partner provided positive and negative control was assessed by the same items and response format asked from the provider perspective (e.g., Today, I tried to positively influence my partner’s physical activity by stating how important it is to me that he/she is physically active.).

¹ $N = 123$ couples were randomized to the different intervention conditions, $N = 2$ did not show up for baseline, $N = 1$ provided no diary data. Thus, the final sample of this study was 120 participants.

Target behavior: Moderate-to-vigorous physical activity (MVPA) was assessed across the 28 days with a triaxial accelerometer monitoring device (GT3X +, ActiGraph, Pensacola, FL) worn at the hip on the side of the dominant hand during waking hours. The GT3X + measures physical activity reliably and validly (Sasaki et al., 2011). Non-wear time was assessed and filtered in the analyses using an automated algorithm based on 90 min of consecutive zeros in vector magnitude counts per minute (cpm) (Choi et al., 2011). Only days with a minimum of 10 h of wear time (Colley et al., 2010) were included in the analyses. Further, wear time of the accelerometer data was controlled for in all analyses on MVPA. For each participant, total minutes in MVPA per day were calculated based on the threshold of 2,690 cpm in vector magnitude (Sasaki et al., 2011), resulting in overall daily MVPA in minutes. The final variable was log transformed, as the distribution of the variable was strongly skewed. A total of $N = 119$ participants provided accelerometer-based physical activity data.

Affect after having received control was measured daily with the item: “How did you feel today after your partner tried to influence you this way?” Seven response options ranged from -3 “much worse” via 0 “unchanged” to $+3$ “much better.” Also, participants could indicate that their partner had not tried to influence their physical activity that day (coded “missing”), resulting in 113 participants providing data for this outcome across 28 days.

Reactant responses. Doing the opposite of what the partner wanted was assessed daily by an item adapted from Tucker and Anders (2001): “Today I did exactly the opposite of what my partner wanted me to do with regard to my physical activity.”

Hiding was assessed by an item adapted from Tucker and Anders (2001): “Today I hid from my partner that I was not physically active.” Response options for both items ranged from 1 “today not at all true” to 6 “today very true.” All ($N = 120$) participants reported on these items across 28 days.

Results of Study 3

Results of Study 3 are displayed in **Table 6**. For random effects see also **Supplementary Tables S1–4**. In Study 3, effects of provided control paralleled effects of received control for MVPA and affect, but not for the two reactant responses (see **Supplementary Table P1–4**). Sensitivity analyses showed the same patterns of results, see **Supplementary Table S2–4** for received and **Supplementary Table P2–4** for provided control.

Does Positive Social Control Predict Daily Physical Activity (H1)?

Supporting H1b, but disconfirming H1a, same day positive social control, but not previous day positive social control significantly predicted daily MVPA. That is, one standard deviation higher than usual same day positive control was related to 0.14 standard deviations more MVPA, indicating a small effect. No significant effects emerged for previous or same day negative social control on

TABLE 6 | Study 3: within- and between-person effects of negative and positive social control on physical activity (MVPA), affect, doing the opposite, and hiding inactivity.

| Fixed effects | DV: MVPA | | | DV: Affect | | | DV: Doing the opposite | | | DV: Hiding inactivity | | |
|------------------------------|----------|-------|-------|------------|-------|-------|------------------------|-------|------|-----------------------|-------|-------|
| | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | |
| | β | LL | UL | β | LL | UL | β | LL | UL | β | LL | UL |
| Intercept | 6.10** | 5.82 | 6.37 | 0.50** | 0.25 | 0.74 | 2.93** | 2.69 | 3.17 | 3.23** | 3.02 | 3.44 |
| Time | −0.03 | −0.14 | 0.07 | 0.005 | −0.12 | 0.13 | −0.01 | −0.10 | 0.07 | 0.04 | −0.03 | 0.11 |
| Previous day outcome | −0.17** | −0.22 | −0.12 | −0.08* | −0.14 | −0.01 | −0.04 | −0.10 | 0.01 | −0.08* | −0.14 | −0.01 |
| Negative control | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | |
| On the same day | −0.04 | −0.10 | 0.03 | −0.23** | −0.36 | −0.10 | 0.14** | 0.05 | 0.23 | 0.11** | 0.07 | 0.15 |
| On the previous day | −0.01 | −0.07 | 0.05 | −0.04 | −0.10 | 0.03 | −0.01 | −0.06 | 0.05 | 0.06** | 0.03 | 0.10 |
| Between-person effects | −0.01 | −0.24 | 0.22 | −0.18* | −0.33 | −0.03 | 0.60** | 0.43 | 0.77 | 0.49** | 0.34 | 0.65 |
| Positive control | | | | | | | | | | | | |
| <i>Within-person effects</i> | | | | | | | | | | | | |
| On the same day | 0.14** | 0.07 | 0.21 | 0.57** | 0.44 | 0.69 | −0.001 | −0.08 | 0.07 | 0.005 | −0.05 | 0.06 |
| On the previous day | 0.02 | −0.03 | 0.07 | −0.001 | −0.07 | 0.07 | −0.004 | −0.05 | 0.04 | 0.004 | −0.03 | 0.04 |
| Between-person effects | −0.09 | −0.30 | 0.12 | 0.47** | 0.31 | 0.63 | 0.07 | −0.11 | 0.25 | 0.02 | −0.15 | 0.18 |

For the effects of the control variables as well as all random effects please see **Supplementary Table S1-4**. For MVPA: $n = 117$, $n = 2,326$ available days; for affect: $n = 101$; $n = 1,697$ available days; for doing the opposite $n = 120$, $n = 2,918$ available days; for hiding: $n = 120$, $n = 2,918$ available days; β = standardized regression coefficients (predictor and outcome in between-person SD units), 95% CI = 95% confidence interval; LL = lower level; UL = upper level; * $p < 0.05$, ** $p < 0.01$.

MVPA as would have been expected from the extended dual-effects model.

Does Positive and Negative Social Control Predict Affect (H2 and H3)?

Confirming H2 and H3, same-, but not previous day negative or positive social control were related to affect: More than usual same day negative control was associated with feeling worse, more than usual same day positive control was associated with feeling better.

Does Negative Social Control Predict Daily Reactance-Related Responses (H4)?

Supporting H4b, but disconfirming H4a, same-, but not previous day negative control was related to more doing the opposite. For hiding, both H4a and H4b could be confirmed: more than usual previous- and same day negative social control were associated with more hiding. As expected from the theoretical assumptions of the extended dual-effects model, previous-day and same-day positive social control were unrelated to the reactant responses.

Brief Discussion of Study 3 Results

In Study 3 we examined hypotheses in the context of a desirable target behavior, i.e., increasing regular physical activity. Previous research on social control did not find substantial differences with regard to frequency or general impact of social control on desirable and undesirable behaviors (Lewis and Rook, 1999). Results of Study 3 further added to this evidence base by using an objective measure of behavior. The positive association with same day positive control partly confirming H1 is thus net of shared method variance.

The overall pattern of results of Study 3 replicated findings of studies 1 and 2 (see **Table 3** and **Supplementary Table P6**

for provided control for an overview of the pattern of results). This is notable because Study 3, just like Study 2, but different than Study 1, examined associations in the context of both partners intending to change their behaviors but with another behavior.

GENERAL DISCUSSION

In the present article, we investigated how and when negative and positive social control would unfold desirable and less desirable effects for which outcomes in romantic partners. We also compared patterns of social control findings between couples with one or both partners wanting to change their behavior.

Across three studies, our research confirms many of our hypotheses based on the modified dual-effects model of social control (Butterfield and Lewis, 2002; Scholz et al., 2013; Craddock et al., 2015) at the daily level: Receiving higher than usual levels of positive social control on a specific day was related to less smoking and more physical activity on the same day (H1b) and to feeling better on the same day (H2). Receiving higher than usual levels of negative control on a specific day was associated with feeling worse on the same day (H3) and with more reactant responses on the same day (doing the opposite and hiding; H4b). It is noteworthy that the within-person effects were in part medium to large in size.

In contrast to our assumptions, only one out of twelve hypothesized effects of previous day positive control on target behavior and of previous day negative control on reactant responses emerged. Hypotheses on the assumed lagged effects (H1a and H4a) were thus disconfirmed. Consequently, results of the present studies indicate that social control is a fast process unfolding its effects within 1 day, but hardly across days. The

rationale for assuming lagged effects on future behavior was the prospective nature of positive control and prolonged need for restoration of one's autonomy after receiving high levels of negative control. It seems, however, that this all happened within a day. The lack of lagged effects might be due to the relatively low levels of social control receipt which is commonly reported in studies on social control (e.g., Hohl et al., 2018; Khan et al., 2013). These rather low levels of control might not have triggered strong reactant responses in recipients or made the targeted behavior change last longer than 1 day. Given the results on the regulation of the provision of social control in the service of relational well-being (Burke and Segrin, 2017), it is also possible that days high in social control were rather followed by days low in social control. Thereby also easing the need to react in a reactant way. Moreover, control recipients might apply relationship maintenance strategies that keep them from reacting too negatively to the receipt of negative control from their partner (Stafford, 2011).

Generally, developing theories on timing of effects that provide a rationale for when and for how long effects occur is necessary (cf. Scholz, 2019). Future studies are thus needed that apply a mixed methods approach that addresses questions on the provision/receipt and duration of effects of social control in couples with one or both partners changing their behavior. Audio recordings of real life conversations combined with the coding of positive and negative control (Badr et al., 2015) would constitute a fine-grained and observational approach to inform theory building of timing of control and its effects.

Effects of received control were largely confirmed by analyses with provided social control. This is noteworthy as it excludes the possible explanation that the results involving received control might mainly be due to shared method variance for all outcomes but the objectively measured MVPA in Study 3; thus substantially strengthening the validity of the results. The only apparent discrepancy between the results of *received* and partner-reported *provided* control, regarding the reactant outcomes, was present in Study 3. Possibly, and in line with theoretical assumptions on reactance, the subjective feelings of threatened autonomy through the receipt of social control is crucial and might thus not have been present for provided control.

All three studies used an intensive longitudinal design allowing to examine processes within persons. The within-person results are of special importance: They are based on individual daily experiences and thus indicate the relevance of social control receipt for how each individual behaves and feels. Given that the majority of studies on health-related social control are still following a cross-sectional design limiting the conclusions drawn to differences between persons only (cf. Craddock et al., 2015), this study furthers our knowledge by showing meaningful effects over time within persons.

Finally, patterns of results across all three studies were strikingly similar, indicating that affective and behavioral correlates might be basically the same for control recipients across different couple constellations (i.e., only one or both partners intending to change their behavior) and different health behaviors. One reason for this consistent pattern could be that couples shared the goal for behavior change in all

three studies: Partners were rooting for the target persons to succeed in their smoking quit attempt and in increasing their physical activity. Sharing a goal *per se*, independent from the target of this goal, be it one partner or the dyad, may legitimize the means both partners apply to reach this goal. Transactive goal dynamics theory, a theory defining the dyad as unit of analysis (Fitzsimons et al., 2015), provides a framework for different dyadic goal constellations and their assumed consequences for goal pursuit. Future studies should use this theory for assessing goal orientation in couples directly in order to allow examining its consequences more explicitly. In addition, other contextual factors, such as gender, age, or type of dyad (e.g., romantic couples, friends, family) and their potential moderating role of social control effects deserve more systematic investigation.

Limitations and Outlook

The results of these three studies need to be interpreted while keeping several limitations in mind. The three intensive longitudinal studies allow conclusions about temporal processes, with the within-person effects of social control indicating relatively fast processes. We have included time in all models thus ruling out time as a third variable explaining the within-person effects of social control on outcomes. However, these studies cannot establish causality, as time-varying covariates such as daily stressors could still provide a third-variable explanation for these within-person effects. It could also be the case that the social control-behavior relationship is reciprocal or that control recipients' behavior trigger the provision of social control.

Moreover, because lagged effects can be assumed to be smaller than same-day effects to begin with, power issues might have played a role. As these are among the first studies to examine lagged effects of social control on different outcomes at the within-person level, no *a priori* power analysis was possible (cf. Bolger and Laurenceau, 2013). Future lab experiments and real-life intensive longitudinal field experiments could increase positive social control and decrease negative social control to help establish causality. Furthermore, it is not clear how generalizable the current findings are for people intending to change other health-relevant behaviors and if there are moderators of these effects. The theories of social control claim universal applicability across behaviors (Okun et al., 2007). Consequently, there is also no empirical examination of differences between social control effects for different behaviors. Yet, it is possible that there are certain behaviors that are particularly sensitive to control and thus responses to social control attempts could be more pronounced in these behavioral domains. One example is a study on college students' reports of weight-related social control showing adverse effects on several outcomes particularly for young women but not for men (Brunson et al., 2014). This further emphasizes the need for better understanding not only how and when, and for which outcomes, but also for which behaviors and for whom social control unfolds its effects over time. Whereas the present study was able to contribute to some of these open questions, more systematic and particularly comparative research in different behavioral domains, contexts, and time frames on social control effects is still needed.

CONCLUSION

Social control aims at promoting another person's behavior change. The results of our studies demonstrated that positive control on a given day was related to target behaviors on that same day, but that negative social control was not. And whereas receiving more positive social control related to feeling better, more negative social control was associated with feeling worse and with more reactant responses. Thus, based on the present findings, only positive social control can be recommended as a strategy for inducing behavior change in another person. Moreover, our studies demonstrated that social control unfolds its effects within 1 day, but not across days, indicating that control and its outcomes are fast-acting processes. Different dyadic constellations where one or both partners intended to change their behavior did not make a difference for processes over time. Future studies should follow up on dyadic and temporal dynamics of negative and positive social control in couples' everyday lives, paying special attention to theory development on timing of effects and time-varying changes in contexts of social control.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Study 1: Ethics Checklist of the Ethics Committee of

the Faculty of Arts and Social Sciences of the University of Zurich, Switzerland; Studies 2 and 3: Ethics Committee of the University of Bern's Faculty of Human Sciences in Switzerland (2011-11-14409 and 2011-12-36206). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

US analyzed the data and wrote the manuscript. GS supported data analyses. GS, CB, JL, and NK provided extensive feedback to the manuscript. JL collected data of Study 2. CB collected data of Study 3. All authors approved the final version of the manuscript for submission and publication.

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SUPPLEMENTARY MATERIAL

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Exploring Physiological Linkage in Same-Sex Male Couples

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We explore physiological linkage (i.e., covariation of physiological channels between interacting partners; PL) among 34 same-sex male couples. Interbeat interval, an indicator of cardiovascular arousal, was collected across four conversational contexts in the lab: (1) a baseline period that did not involve conversation, (2) a conversation about body image, (3) a conversation about health goals, and (4) a recovery period that allowed for unstructured conversation. We used a newly developed R statistical package (i.e., *rties*; Butler and Barnard, 2019) that simplifies the use of dynamic models for investigating interpersonal emotional processes. We identified two different PL patterns: (1) a simple one that was characterized by stable synchronization and low frequency of oscillation; and (2) a complex one that was characterized by drifting synchronization, high frequency of oscillation, and eventual damping. Guided by social baseline theory and the reactive flexibility perspective, we explored the interactions between couple relationship functioning (i.e., love, conflict, commitment, sexual satisfaction, and relationship length) and conversational context as predictors of the PL patterns. The results suggest that partners in well-functioning relationships and emotionally challenging situations may be especially likely to show complex PL patterns that may reflect (or support) coregulatory processes.

Keywords: physiological linkage, relationship functioning, *rties* package, same-sex male couples, conversational context

INTRODUCTION

Social relationships often provide health supporting benefits, but they can also be stressful if they involve conflict, threat of evaluation, or ambivalent emotions (Saxbe et al., 2020). Coregulation may be one mechanism determining whether a given relationship is helpful or harmful for the people involved. Coregulation refers to social partners becoming psychologically, behaviorally, and biologically intertwined in ways that support allostasis, which refers to stability through change, or the continual adjustment of multiple systems to maintain homeostatic balance (Sbarra and Hazan, 2008; Butler and Randall, 2013; Saxbe et al., 2020). Successful coregulation may help social partners negotiate any challenges that arise in their relationship, as well as achieve joint goals. In the biological domain, coregulation has been referred to as “physiological entanglement” or “physiological linkage” (Palumbo et al., 2017). Physiological linkage (PL) is indicated by the

covariation of physiological channels between interacting partners and may provide a biological substrate for, or manifestation of, interpersonal coregulatory processes (Butler and Randall, 2013).

PL has been a focal area in the study of interpersonal relationships since the 1950s (e.g., Di Mascio et al., 1955) and offers several strengths for investigating interpersonal coregulatory processes. First, researchers can assess PL in second-by-second intervals, and such high time-resolution can reveal the nuances (e.g., fluctuations toward and away from stable emotional levels) in interpersonal dynamics and relationship functioning (Reed et al., 2013). Second, PL is unconscious and automatic, but may reflect partners' emotional responding and efforts to influence each other. As such PL may provide a more sensitive measure than self-reports for interpersonal processes that are not readily accessible to awareness for many people (Butler and Randall, 2013). Third, associations have been found between PL and mental and physical health (Butler, 2017; Wilson et al., 2018), suggesting that if we had a better understanding of PLs, it may offer novel interpersonal interventions.

Despite the rapidly growing literature on PL, several important questions remain. To begin with, when operationalizing and quantifying PL, the majority of work has used simple indicators such as cross-correlations, which pick up bi-directional associations between partners' physiology, but may fail to fully capture the complexity and diversity of PL patterns. For example, most common methods cannot distinguish the substantial differences between a PL pattern in which both partners' physiological activity *dampens* together across time, which results in a stable homeostatic interpersonal biological state, and another PL pattern in which both partners' physiological activity *amplifies* simultaneously across time, which produces an unstable or volatile interpersonal biological state (Butler and Randall, 2013; Reed et al., 2015). This methodological shortcoming may be the primary reason that PL has been widely associated with both desirable and undesirable variables, such as better health and higher relationship quality on the one hand, but stress and conflict on the other (Timmons et al., 2015; Palumbo et al., 2017; Saxbe et al., 2020).

Second, no studies we are aware of have examined PL in same-sex couple relationships (for similar arguments, see Timmons et al., 2015; Palumbo et al., 2017). Yet, the existing literature suggests one potential uniqueness of PL in same-sex couples. Specifically, in one study of heterosexual couples, the pattern when predicting men's emotional experience from the female partners was different compared to that when predicting women's emotional experience from male partners, with an in-phase pattern (e.g., partner's emotions moving in the same direction) emerging for predicting men and an anti-phase pattern (e.g., partner's emotions moving in the opposite direction) emerging for predicting women (Randall et al., 2013). Such gender differences in heterosexual couples may no longer exist in same-sex couples and may manifest as different patterns of PL.

To fill these gaps, we used secondary data from a larger project that focused on body image and health goals, as well as relational well-being, among same-sex male couples. We also used a newly developed R statistical package

(i.e., *rties*; Butler and Barnard, 2019) that simplifies the use of dynamic models for investigating interpersonal processes, which enabled us to estimate complex patterns of PL. These data and analytic methods allowed us to address three research questions: (1) Would distinct patterns of PL emerge across experimental tasks varying in levels of interpersonal challenge? (2) Would distinct patterns of PL be associated with indicators of relationship quality? and (3) Would associations between PL patterns and relationship quality depend on the context (e.g., the experimental task)?

THEORY AND EMPIRICAL STUDIES

Introducing Physiological Linkage

Although physiology is typically viewed as an intrapersonal phenomenon, the physiology of two people can display substantial correlation (Levenson and Ruef, 1992). One basic distinction that needs to be made is between simple or stable PL and more complex or dynamic PL. For example, by sharing the same stimulus (e.g., watching a scary movie together), a simple in-phase PL pattern (e.g., partners' physiologies change in the same direction) can automatically emerge as partner's emotional responses covary in unison (Parkinson, 2011). A similar pattern may also arise in conversations involving low arousal emotions, such as collaborating on an interesting task or discussing the events of the day (Palumbo et al., 2017). Conversely, an anti-phase pattern of PL (partners' physiologies change in opposite directions) may emerge when partners engage in trivial talk, possibly due to the nature of conversational turn-taking (Reed et al., 2013; Helm et al., 2014). In summary, fairly simple patterns – either in-phase or anti-phase – arise even in mundane situations and even between strangers (Palumbo et al., 2017). PL can become more complicated, however, when partners become emotional or attempt to regulate each other either consciously or automatically (Butler and Randall, 2013; Butler, 2017). For example, for some couples, the two partners' physiologies can be changing in the opposite direction (i.e., anti-phase PL) and also amplify away from each other over time; for other couples, the two partners' physiologies can switch from anti-phase to in-phase and then dampen together (Reed et al., 2015).

A large number of complicated PL patterns can be assessed by taking into consideration three characteristics of physiological signals, based on the assumption that PL takes the form of an oscillating pattern of fluctuations around a stable physiological basis (also called homeostasis or allostasis; Butler, 2011). The characteristics are: (a) frequency of oscillation (i.e., number of oscillations per unit of time), (b) damping and amplification (i.e., negative feedback loops that reduce arousal and stabilize the physiological signal across time, versus positive feedback loops that amplify physiological arousal away from homeostasis across time), and (c) coupling (i.e., whether two partners' physiologies become coordinated or uncoordinated across time; Steele and Ferrer, 2011; Helm et al., 2012; Reed et al., 2015). Specific combinations of these three characteristics produce qualitatively and quantitatively different PL patterns. One pattern that has been noted in the literature involves anti-phase,

damping oscillation; this pattern may indicate co-regulation, because the two partners are returning to homeostasis together across time. A second pattern that has been noted involves in-phase, amplifying oscillation; this pattern may indicate co-dysregulation, because the two partners increasingly deviate from homeostasis (Reed et al., 2015). Further variation can arise in the frequency of oscillation, suggesting that some couples can experience faster co-regulation/co-dysregulation than others (Helm et al., 2012).

In summary, PL can be understood as a multifaceted phenomenon in which frequency, damping/amplification, and coupling (or lack thereof) jointly give rise to complexity and diversity in the dynamic trajectories of two partners' physiological signals. Yet, the lack of proper statistical tools has prohibited the exploration of such diverse PL patterns (see Helm et al., 2018). Therefore, to extend the existing literature, we relied on *rties*, a new R statistical package (Butler and Barnard, 2019), to model potentially complex PL patterns. We take a context-specific and couple-centered approach, meaning that we model the dynamics for each couple separately for each of the experimental tasks. We then investigate whether PL patterns vary across tasks, across couples, or across both.

Associations Between Relationship Functioning and Physiological Linkage Social Baseline Theory

Social baseline theory is one of the most widely applied theories in the field of relationships and health. It suggests that a relationship provides a context in which PL unfolds, and that the quality of the social relationship can promote or diminish PL patterns contributing to psychological and physical health (for similar arguments, see Sbarra and Hazan, 2008; Holt-Lunstad et al., 2010; Helm et al., 2012). In particular, when individuals are embedded in a predictable and familiar relationship, the security provided by the relationship can be used as an automatic, unintentional default strategy for maintaining a desirable emotional state (Beckes and Coan, 2011). Simply being around a secure partner, or even just thinking about them, reduces stress responding at both psychological and biological levels (Sbarra and Hazan, 2008; Holt-Lunstad et al., 2010). Moreover, as the levels of interdependence, shared goals, and joint attention in a relationship increases, the default strategy costs less effort and energy (Coan and Sbarra, 2015). Thus a couple's relational context, in terms of habitual functioning and how much effort partners need to expend when interacting with each other, may be associated with different PL patterns.

Empirical Studies Based on Social Baseline Theory

In line with social baseline theory, some researchers have found associations between PL and variables connected to relationship functioning (e.g., relationship satisfaction, conflict, and the level of demanding or withdrawal behaviors; for reviews, see Butler, 2017; Palumbo et al., 2017). Yet, the results of these studies have been complex and ambiguous (Butler, 2017). Some studies suggest that high conflict and high withdrawing behaviors, presumably both indicators of distressed couple relationships, relate to in-phase PL (e.g., Reed et al., 2013;

Gates et al., 2015). In contrast, other studies suggest that in-phase PL is particularly likely to occur when relationship satisfaction is high (Helm et al., 2014).

Such conflicting results may be partially due to the fact that existing studies focused on the associations between only one aspect of PL (the overall degree of covariation; e.g., Helm et al., 2014) and couple relationship functioning indices. The majority of prior studies have not considered that diverse patterns of PL are perhaps better understood by considering its multiple aspects (including frequency, damping/amplification, and coupling) as a totality (Gates and Liu, 2016). Thus in the present study we revisited the connection between couple relationship functioning and PL using statistical tools that allowed us to identify complex PL patterns based on constellations of multiple aspects of the oscillating physiological signals.

Given the exploratory nature of the present study, we decided to investigate associations between multiple aspects of relationship functioning (i.e., love, conflict, sexual satisfaction, and commitment) and PL patterns. An examination of these variables allow us to relate our results to existing studies, which used similar constructs [i.e., the feeling of love and intimacy in Helm et al. (2014); conflict in Koole and Tschacher (2016); sexual satisfaction in Freihart and Meston (2019); the feeling of being committed in Helm et al. (2014)]. We also included relationship length as another potential predictor for PL patterns, primarily given that longer relationship length indicates higher interdependence between spouses (Campbell et al., 2006; Knight, 2011).

The Moderating Role of Conversational Context

Reactive Flexibility Perspective

Another factor that may have contributed to ambiguous findings regarding associations between couple relationship functioning and PL is the moderating role of context (i.e., conversational contexts). More specifically, PL patterns may vary as two partners negotiate the demands and goals of different types of conversation (e.g., cooperating on a topic, resolving a conflict, etc.) and adjust their efforts to influence each other accordingly (i.e., the reactive flexibility perspective; Hollenstein, 2015; Butler, 2017). For example, on the one hand, PL patterns may be as simple as basic anti-phase turn-taking in casual conversations or low-level in-phase synchrony when discussing a mildly interesting topic. On the other hand, however, they may be as complicated as anti-phase-to-in-phase transitions with amplification in a highly competitive conversation (Helm et al., 2014; Reed et al., 2015).

Empirical Studies Supporting Reactive Flexibility Perspective

In line with this idea, researchers have consistently found interactive effects between couple relationship functioning indices and conversational contexts in connection with PL (for a review, see Palumbo et al., 2017). Thus, in the present study we investigated a series of conversational contexts that might induce different motivations to influence the partner, and explored whether the associations between multiple aspects of couple

relationship functioning (e.g., love, conflict, etc. listed above) and qualitatively distinct patterns of PL varied across contexts.

Body Image and Health Goal Conversations Among Same-Sex Male Couples

In the current study with same-sex male couples, we focused on body image and health goal conversations. Generally, body image and health goals are serious relational topics that partners are likely to be motivated to engage in (either with collaboration or argument; Smith et al., 2009; Burke et al., 2012). Such conversations may be even more salient and arousing in same-sex male dyads. In particular, and in comparison to their heterosexual counterparts, some evidence suggests that gay men hold more unrealistic thoughts about body ideals and are more concerned with gaining weight (McClain and Peebles, 2016; Brewster et al., 2017). Similarly, partners in same-sex male couples may be particularly unsatisfied with each other's body and weight, which results in especially high levels of intention and motivation to exert influence on the other's feelings and health behaviors (Theiss et al., 2016). Therefore, we systematically varied conversational context by asking the couples to engage in: (1) a baseline context in which no conversation took place, (2) loosely structured conversations about body-image, or (3) health-goals, and finally (4) free unstructured conversations.

Exploratory Hypotheses

Given the exploratory nature of our study and lack of definitive prior literature, we did not specify detailed hypotheses, but instead used cross-validation to avoid over-fitting the data and to increase the chances that the results would replicate in a new sample (see "Analytic Approach" for details). In general, however, based on the literature reviewed above we expected: (1) at least 2 distinct PL patterns would emerge, with a simple pattern occurring most often in the non-challenging baseline and unstructured conversations and a more complex pattern emerging during the body image and health goal contexts, given that they would presumably elicit more emotion and attempts at regulation, and (2) more complex PL would be associated with higher relationship quality, especially during the challenging conversations (body image and health goals), because although negative emotions may be aroused by those contexts, partners in a secure relationship may be more effective at regulating each other's emotion and behaviors, such that their initial coupled stress responses eventually return to homeostasis.

MATERIALS AND METHODS

Participants

Data in the present study come from a larger project that examined associations between romantic relationships and health among male same-sex romantic couples who had been together for at least 6 months (for a detailed description, see Markey et al., 2014). The present study included a sub-sample of 34 couples from whom usable physiological data was collected. Although the

final sample is somewhat small, based on a systematic review, it was comparable to the median of sample size in existing studies that examined physiological linkage in romantic relationships (Palumbo et al., 2017). Further, we used Bayesian analysis which is more reliable with small samples (see below) and our goals were exploratory, not confirmatory, which also mitigates concerns about the modest sample. For the 34 couples included in the present study, participants varied in age (Range = 19–71 years, *Mean* = 31 years), race/ethnicity (69.1% non-Hispanic White, 30.9% minority group), household income (Range = under 20K to 100K or more, *Median* = 50–70K), and relationship length (Range = 0.5–34 years, *Mean* = 6.3 years).

Procedures

The research procedures were approved by the IRB at the institution where the research was conducted. Couples were recruited via advertisements in a variety of periodicals and at health and wellness centers, as well as LGBTQ + centers in the Philadelphia metro area. After being screened for eligibility via phone or a web-based survey, couples visited the researchers' laboratory to complete the study. To ensure privacy, the two partners in a couple were placed in separate rooms to complete the first part of the survey (i.e., survey related to body image, weight management behaviors, relationship with their partner, etc.).

Then, participants were asked to sit at a table in a small, distraction-free room to engage in the following social situations. Each situation lasted about 10 min. In the baseline situation, partners started working on the second part of the survey (survey about background information, personality, support received, etc.), during which little or no conversation took place. After the baseline, participants engaged in two conversations that were arranged in a counterbalanced sequence: a body image conversation and a health goal conversation. During the body image conversation, participants were asked to talk about what they thought about their own and their partners' body size and weight issues. In the health goal conversation, participants first listed their own health goals, next discussed and agreed on three shared goals that worked for themselves and their partners, and then figured out how to work together with their partners to accomplish the three shared goals. After completing the body image and health goal conversations, participants had a recovery period when they could finish the second part of the survey (if needed) and talk freely with their partners. Each couple was compensated \$100 for the time.

Measures

InterBeat Interval

Interbeat interval (IBI) refers to the time in milliseconds between subsequent R waves (the peaks in an electrocardiogram signal) and is an indicator of fluctuations in heart rate. In general terms, IBI is an index of arousal, regardless of the source of the arousal. In other words, IBI fluctuations are not indicative of valence (e.g., positive vs. negative), only of activation. One advantage of IBI for our purposes is that it is very dynamic, meaning that it changes over a time range of a few seconds, allowing us to assess between-partner PL with fine-grained temporal precision. In contrast,

other measures of autonomic physiology, such as electrodermal activity (EDA) or heart rate variability (HRV), are slower moving. Another advantage of IBI for our purposes is that it is controlled by both the sympathetic and parasympathetic systems, acting in coordination with each other. As such it reflects the full range and complexity of autonomic activity, making it sensitive to both activating influences (via the sympathetic system) and damping or de-activating influences (via the parasympathetic system). In contrast, EDA and HRV are driven uniquely by the sympathetic and parasympathetic systems respectively, making them more specific, but less likely to pick up the full range of PL.

IBI was measured by electrocardiogram (ECG) for all participants continuously throughout the interaction. ECG was recorded with electrodes in the modified Lead II placement and sent to a computer via Biopac ECG100C Module and MP150 amplifier (Biopac Systems, Inc., Goleta, CA). To extract the interbeat interval (i.e., IBI), the ECG data were scored with Acknowledge version 4.4 (Biopac Systems, Inc., Goleta, California) and aggregated in 10-second units.

Love

We used the 10-item love subscale from the Marital Interaction Scale (MIS; Braiker and Kelly, 1979). One example item is “How close do you feel toward your partner?” On each item, participants indicated the extent to which the statement described their feelings about their romantic partner. Responses ranged from 1 (Not at all) to 9 (Very much). Items were summed to create a scale score, and higher scores indicate higher love. Cronbach’s α was 0.76.

Conflict

We used the 5-item conflict subscale from the Marital Interaction Scale (MIS; Braiker and Kelly, 1979). One example item was “How often do you and your partner argue with one another?” On each item, participants indicated the extent to which the statement described their feelings about their romantic partner. Responses ranged from 1 (Not at all) to 9 (Very much). Items were summed to create a scale score, and higher scores indicated higher conflict. Cronbach’s α was 0.69.

Sexual Satisfaction

We used the 25-item, unidimensional Index of Sexual Satisfaction scale (Pepe and Byrne, 1991). An example item was “sex with my partner has become a chore (reverse scored).” On each item, participants indicated the extent to which they agreed with the statement. Responses ranged from 1 (Strongly disagree) to 5 (Strongly agree). With reversed items recoded, items were averaged to calculate the scale score, and higher scores indicated higher sexual satisfaction. Cronbach’s α was 0.91.

Commitment

We used the Multiple Determinants of Relationship Commitment Inventory, which included 30 items for 6 dimensions: rewards, match to ideal comparison level, investments, barriers, costs, and alternatives (Kurdek, 1995). Responses ranged from 1 (Disagree strongly) to 5 (Agree strongly). We first reversed scored items for costs and alternatives and then averaged all 30 items to calculate the sum score of

commitment, with higher scores indicating higher commitment. Cronbach’s α was 0.85.

Relationship Length

One open-ended question was used to measure relationship length: “For how many months have you been continuously romantically involved with your partner?”

Analytic Approach

We conducted analyses using the R Statistical Platform, version 3.6.3 (R Core Team, 2020). Analyses proceeded in the following two stages:

Stage 1: Modeling Physiological Linkage

In the present study, couples completed 133 conversational contexts in total (34 couples \times 4 contexts each, with three couples having missing data for 1 of the contexts). For each context completed by each couple, we used the *rties* package version 5.0.0 (Butler and Barnard, 2019) to estimate a Coupled Oscillator (CO) model of IBI linkage over time. The vignettes that accompany the *rties* package provide extensive documentation of the approach. In brief, the CO model in *rties* takes the form of a regression model predicting the second-derivative of the observed variable (in this study, IBI for each partner) from 8 predictors: (a) each partner’s own IBI time series (related to the frequency of oscillations), (b) the first derivative of each partner’s own IBI time series (related to damping/amplification), (c) each person’s partner’s IBI time series (coupling with respect to frequency), and (d) each person’s partner’s first derivative of their IBI time series (coupling with respect to damping/amplification). The *rties* package uses an idiographic approach and applies the regression model to each context completed by each dyad, one context at a time. As such, eight regression parameters were generated (i.e., four for each partner) based on IBI collected from each couple in each context. Across all conversational contexts completed by all couples, the average number of valid IBI data was 120 (i.e., $n = 120$ when estimating eight regression parameters).

The CO model requires individual-level, distinguishable data from the two partners (e.g., there must be some way to distinguish what data came from which partner), but in the present study the partners are indistinguishable, due to being same-sex and not otherwise systematically different from each other. To address this, we created an arbitrary distinguishing variable (“A vs. B”), such that in each couple one partner was randomly assigned as “A” and the other as “B”. This allows estimation of the CO model (which would not change if the random assignment was reversed for some or all couples), but no meaningful interpretation of the distinguishing variable is generated (see further explanation in the caption for **Table 2**).

Data for a CO model should first be linearly detrended (Boker and Laurenceau, 2006) and the *rties* package provides the tools to do so. Next, the first and second derivatives of the observed variable need to be estimated from the data (i.e., using a Local Linear Approximation; Boker and Nesselroade, 2002). This approach has notable limitations, but is tractable with relatively little knowledge about linear dynamic systems and is the approach implemented by *rties* (Butler and Barnard, 2019). To

do so, users need to specify 3 parameters: delta, tau, and embed. Delta refers to the inter-observation interval, tau is the number of time points to include when estimating the first derivative, and embed is relevant to the degree of derivatives that are desired. As we needed to estimate the second derivative, the minimum embed was 3. In the present study, we set delta to 1, so that every observation was utilized for fitting. The vector of tau included 1 and 2. The vector of embed included 3 as the sole element. The *rties* package fits a CO model to each dyad's data for each context multiple times using all combinations of the embed and tau values and returns the combination that maximized the R^2 for each couple in each context. This R^2 information can be used to determine how well the model fits the data both for each couple and on average across couples. The estimated period of oscillation is also returned and the 8 parameters for each couple in each context (described earlier) are stored as a new data frame.

Lastly, *rties* allows the user to include the set of 8 parameter estimates for each couple in each context as indicators for a Latent Profile Analysis (LPA), to derive qualitatively distinct groups of all couple-context combinations based on their dynamic linkage patterns ($n = 133$ for LPA in this study, as we have 133 conversational tasks completed by 34 couples). This approach is taken because the CO model assesses non-linear dynamics across time, which means the behavior of the dyadic system cannot be understood by interpreting individual parameters in isolation, as is possible with a linear model. The LPA allows the CO parameters to act together (versus in isolation) to estimate qualitatively distinct groups of dyads that reflect the potentially complex, dynamic trajectories for both partners in each context. The prototypical trajectories for each profile can then be plotted based on the profile's average values of the 8 parameters.

Stage 2: Predicting Physiological Linkage

The purpose of stage 2 is to predict physiological linkage patterns identified in the LPA for each couple in each context (based on the profile groupings identified in stage 1) from relationship traits and the four conversation contexts. Given the non-independence among the four contexts experienced by each couple, we conducted Bayesian multilevel modeling (MLM) with each dyad allowed to have their own intercept. Estimation of MLM was conducted via *brms* 2.11.5, an R package that uses Stan to estimate Bayesian multilevel models (Bürkner, 2017, 2018). We preferred Bayesian to traditional Null-Hypothesis Significance Testing (NHST) for the following reasons: First, Bayesian analyses are less sensitive than NHST to sample size and will, therefore, generate more robust estimation for small-to-modest sized sample (as is the case with the present study in which $n = 133$ at Level 1 and 34 at Level 2; Branch, 2014). Second, Bayesian estimation reflects the uncertainty of the population parameter more accurately than NHST. In particular, NHST represents the uncertainty of the parameter using a confidence interval (CI), which reflects the upper and lower limits of values that may not be rejected by $p < 0.05$ but provides no probability estimate that the specific parameter value is within the range. In contrast, Bayesian estimation explicitly indicates the uncertainty of parameters by generating the posterior distribution (i.e., highest density interval (HDI); Kruschke and Liddell, 2018),

which reflects the probability that the specific parameter is within the range, given the data and the model. As a result, Bayesian analysis allows researchers to make specific probability statements about each parameter.

We tested five sets of models (details are shown in **Supplementary Table 1** of the **Supplementary Material**). As seen in the measures section, relationship length is a couple-level variable; love, conflict, sexual satisfaction, and commitment are individual-level variables. In each set of models, we tested the main effect of conversational context, the main effect of the couple relationship indices, and the interaction between conversational context and couple relationship indices. For models including individual-level variables, we considered both between-dyad variation (i.e., the average of the two spouses' reports) and within-dyad variation (i.e., the discrepancy between the two spouses' reports; an average-difference model; Kenny, 1996). This is a parsimonious strategy to fully account for reports of both spouses when exploring the associations between couple relationship and PL patterns among indistinguishable dyads. To test the potential moderating role of conversational context in models including individual-level variables, two interactive terms were generated and included: (1) the average between two spouses' reports \times context, and (2) the difference between two spouses' reports \times context. If either of these two interactive terms was not notable (e.g., the 95% HDI included zero), we then removed it to generate a simplified model.

Given the lack of relevant literature, we used the *brms* default, uninformative priors (see https://cran.rproject.org/web/packages/brms/vignettes/brms_multilevel.pdf for more details about the default prior distribution). For the final models we used 10 chains to generate posterior distributions (for each chain, number of iterations = 10,000, and burnin iterations = 5,000).

TABLE 1 | Summary of relationship variables for 68 partners in 34 couples.

| | Mean | SD | Min | Max |
|--|-------|------|-------|-------|
| Love for each partner | 75.5 | 8.43 | 50.00 | 90.00 |
| Conflict for each partner | 24.5 | 6.14 | 9.00 | 36.00 |
| Sexual Satisfaction for each partner | 3.60 | 0.72 | 1.75 | 4.92 |
| Commitment for each partner | 3.85 | 2.50 | 4.73 | 0.45 |
| Average love for each couple | 77.48 | 6.97 | 58.50 | 88.00 |
| Difference in love for each couple (absolute value) | 7.88 | 5.58 | 0.00 | 22.00 |
| Average conflict for each couple | 21.48 | 4.84 | 10.00 | 29.50 |
| Difference in conflict for each couple (absolute value) | 6.53 | 3.84 | 0.00 | 18.00 |
| Average sexual satisfaction for each couple | 3.84 | 0.62 | 2.08 | 4.80 |
| Difference in sexual satisfaction for each couple (absolute value) | 0.55 | 0.46 | 0.08 | 1.96 |
| Average commitment for each couple | 3.86 | 2.73 | 4.52 | 0.36 |
| Difference in commitment for each couple (absolute value) | 0.40 | 0.00 | 1.23 | 0.32 |
| Relationship length in years | 6.33 | 8.35 | 0.50 | 34.00 |

For each relationship variable, we list estimates for the individual reports for all 68 partners; we also list the between-dyad variation (i.e., the average of the two spouses' reports) and within-dyad variation (i.e., the difference between the two spouses' reports; an average-difference model; Kenny, 1996) for all 34 couples.

We checked model convergence based on Rhats, effective sample sizes, and visualization of trace plots. All models in the **Supplementary Document** showed evidence of convergence, as well as stable results when fitting the model multiple times.

Next, we used cross-validation to compare all the models in each set to select the optimal one. Cross-validation (CV) is the gold standard for model comparison because it balances achieving a good fit for existing data, while avoiding over-fitting and hence improving generalization to future unseen data. Most standard model fit statistics, such as AIC and BIC were developed as approximations for cross-validation, but do not perform as well. We used leave-one-out (LOO) cross-validation given our relatively small sample size. This method of CV involves leaving out one data point at a time and building the model on the rest of the data. The model is then tested against the data point that was left out and the testing error is recorded. The process is then repeated for all data points and the overall prediction error is computed by taking the average of all test error estimates. Finally, the models (ranging in complexity) are compared and the best fitting model is chosen based on the expected log predictive density (ELPD) difference, relative to its standard error (SE). The smallest ELPD indicates the model that best fits the unseen data, and an ELPD difference between two models that is smaller than 2 SEs indicates equivalently fitting models for unseen data (Vehtari et al., 2017).

Finally, to further protect against Type-I errors, we considered Regions of Practical Equivalence (ROPEs) when deciding between equivalently fitting models. ROPEs are a Bayesian technique that establishes a probability region around zero for a given parameter representing a chosen effect size. We used an effect size of ± 0.1 , which is the standard range for representing an effect so small that we might as well treat it as zero for practical purposes (Kruschke, 2018). We then only consider parameters with a low probability of being in the ROPE range as credible results.

RESULTS

Descriptive Analyses for Variables Connected to Relationship Functioning

Table 1 displays descriptive statistics for variables connected to relationship functioning. As can be seen, relatively large variability existed for individuals' reports, the average between spouses' reports in each couple, and the difference between spouses' reports in each couple.

Physiological Linkage Profiles for IBI

Table 2 displays descriptive statistics averaged over all contexts and couples for the 8 parameters estimated in the CO model, including the adjusted overall R^2 value and the period of oscillation. With adjusted R^2 ranging from .43 to 0.79, the CO model fit the data fairly well for all context/couple combinations. There was also relatively large variation across contexts and couples for all of the parameters, as well as the estimated period of oscillation. Given that we assessed IBI in 10-second units, the length of the average period was about 1.45 min for both partners

TABLE 2 | Summary of CO model parameters across the 133 contexts completed by 34 couples.

| | Mean | SD | Min | Max |
|--|-------|------|-------|-------|
| Frequency of oscillations (A) | -0.69 | 0.59 | -2.83 | -0.25 |
| Damping/amplification (A) | 0.01 | 0.22 | -0.82 | 1.47 |
| Coupling with partner in frequency (A) | 0.00 | 0.20 | -1.04 | 0.98 |
| Coupling with partner in damping/amplification (A) | 0.01 | 0.24 | -0.46 | 1.55 |
| Frequency of oscillations (B) | -0.65 | 0.47 | -2.64 | -0.24 |
| Damping/amplification (B) | -0.02 | 0.11 | -0.46 | 0.39 |
| Coupling with partner in frequency (B) | 0.01 | 0.16 | -0.55 | 0.93 |
| Coupling with partner in damping/amplification (B) | 0.00 | 0.22 | -1.28 | 0.63 |
| R^2 | 0.64 | 0.08 | 0.43 | 0.79 |
| Period (A) | 8.65 | 1.96 | 3.73 | 12.45 |
| Period (B) | 8.66 | 1.78 | 3.86 | 12.87 |

The distinguishing variable A/B was randomly assigned as these were indistinguishable dyads. Since the model was fit for each context within each couple, the parameters are never averaged across people and so keeping A and B separate is legitimate, despite the random assignment. In other words, the "A" and "B" distinguisher serves only to keep the two partners' data within a context and a couple separate and reversing the order of who is "A" or "B" would simply switch the estimates for the "A" and "B" parameters for that context/couple combination. This is in contrast to a multilevel model, where the estimates are averaged over all "A" partners to get the "A" estimates and all "B" partners for the "B" estimates. In that case, the results could change substantially if the distinguisher were reversed for some couples.

*For period, the mean indicated the number of time units. As we assessed IBI in 10-second units, the length of the average period was about 1.45 min for both partners (e.g., 8.7 units * 10 s = 87 s/60 s = 1.45 min).*

(e.g., 8.7 units * 10 s = 87 s/60 s = 1.45 min). Given that the average length of the conversation contexts was 10 min, about 7 cycles were included in each context, which is a reasonable number of cycles for assessing IBI dynamics.

Based on the LPA with 8 CO parameters, we generated three solutions with 2, 3, and 4 profiles respectively. The 2-profile solution was chosen as optimal because: (a) the predicted IBI trajectories for the 2-profile solution were visually distinct, whereas the trajectories in 3- and 4- profile solutions had visually similar temporal patterns; and (b) the smallest profile in the 3- and 4- profile solutions did not include enough context/couple combinations (i.e., they included less than 10% of 133 contexts) and hence interpretation of the dynamics within these profiles was unlikely to be robust due to the solution being driven by a very small portion of the data.

Table 3 displays the average parameter estimates in Profile 1 (i.e., 109 of 133 context-couple combinations; 82.0%) and Profile 2 (i.e., 24 of 133 context-couple combinations; 18.0%). Some notable differences were observed in the frequency of oscillations, period, and coupling for damping/amplification. To better interpret the results of the 2-profile solution, we then plotted the dynamic trajectories predicted for each profile over the average length of contexts (i.e., about 10 min). As seen in **Figure 1**, Profile 1 was characterized by a relatively simple and stable temporal dyadic trajectory (i.e., stable in-phase synchronization, with lower-frequency of oscillation in comparison to Profile 2 and little amplification or damping). Thus, we labeled Profile 1 as the "Simple" profile. In contrast,

TABLE 3 | Summary of CO model parameters for the simple profile (109 context-couple combinations) and the complex profile (24 context-couple combinations).

| | Simple profile | | Complex profile | |
|--|----------------|------|-----------------|------|
| | Mean | SD | Mean | SD |
| Frequency of oscillations (A) | −0.60 | 0.49 | −1.11 | 0.83 |
| Damping/amplification (A) | 0.02 | 0.13 | −0.03 | 0.45 |
| Coupling with partner in frequency (A) | 0.00 | 0.18 | −0.01 | 0.27 |
| Coupling with partner in damping/amplification (A) | −0.03 | 0.15 | 0.19 | 0.44 |
| Frequency of oscillations (B) | −0.55 | 0.32 | −1.08 | 0.75 |
| Damping/amplification (B) | −0.01 | 0.09 | −0.06 | 0.19 |
| Coupling with partner in frequency (B) | 0.00 | 0.13 | 0.01 | 0.26 |
| Coupling with partner in damping/amplification (B) | 0.01 | 0.22 | −0.02 | 0.23 |
| R^2 | 0.64 | 0.08 | 0.65 | 0.08 |
| Period (A) | 8.91 | 1.62 | 7.47 | 2.84 |
| Period (B) | 8.99 | 1.48 | 7.14 | 2.25 |

Similar to the note in **Table 3**, A/B was randomly assigned since these were indistinguishable dyads. Switching some dyad assignments would simply change which trajectory was labeled “A” and which was labeled “B” for those dyads, without changing the overall pattern of the dynamic trajectories.

For period, the mean indicated the number of time units. As we assessed IBI in 10-second units, the length of the average period was about 1.48 min for both partners (e.g., 8.9 units * 10 s = 89 s/60 s = 1.48 min) in the simple profile. The length of the average period was about 1.23 min for both partners (e.g., 7.4 units * 10 s = 74 s/60 s = 1.23 min) in the complex profile.

Profile 2 was characterized as a higher-frequency oscillating process, with drifting synchronization (i.e., first in-phase, then anti-phase, and finally in-phase) and some evidence of damping over time. Thus, we labeled Profile 2 as the “Complex” profile.

Associations Between Linkage Profiles, Relationship Functioning, and Conversational Contexts

Table 4 shows the specifications for the final models chosen based on cross-validation. Full results for the cross-validation are provided in the **Supplementary Table 2**. In brief, within the set of models for a given predictor (e.g., love, conflict, etc.) we chose the model that either: (1) had the smallest ELPD (this applied to choosing the models for love, conflict and relationship length), or (2) had an ELPD that was less than 2 standard errors worse than the smallest ELPD and had credible effects larger than a 0.1 effect size for at least one of the additional predictors (this applied to choosing models for sexual satisfaction and commitment). These decision criteria ensure that all reported effects show some evidence of being larger than 0.1 in size and the models chosen were the optimal ones for predicting the unseen data.

Love

The final model for love included the main effects of the between-partner averages and differences in love. The R^2 for the model was .18, which means that the model accounted for 18% of the variance in the profile probabilities. Results provided modest evidence that the main effect of average love was positive and

non-zero. The posterior mean for the parameter was 0.11 and although the 95% HDI included zero, the 90% HDI did not (0.01–0.22). In addition, there was only a 19% probability that the effect was small enough to be in the ROPE. As shown in **Figure 2**, higher between-partner average love was associated with a higher probability of being in the complex profile regardless of context.

Conflict

The final model for conflict included the main effects of the between-partner averages and differences in conflict. The R^2 for the model was .19, which means that the model accounted for 19% of the variance in the profile probabilities. Results provided strong evidence that the main effect of the between-partner difference in conflict was non-zero, with the posterior mean for the parameter being 0.25 and the 95% HDI ranging from 0.08 to 0.46. In addition, there was zero probability that the effect was small enough to be in the ROPE. As shown in **Figure 3**, larger between-partner differences in conflict were associated with a higher probability of being in the complex profile regardless of context.

Sexual Satisfaction

The final model for sexual satisfaction included the main effects of the between-partner averages and differences in sexual satisfaction, along with the interaction of average sexual satisfaction and context. The R^2 for the model was 0.34, which means that the model accounted for 34% of the variance in the profile probabilities. Results provided modest evidence that the interaction of average sexual satisfaction and context during the Body Image conversation was non-zero. The posterior mean for the parameter was 2.52 and although the 95% HDI included zero, the 85% HDI did not (0.13–4.63). In addition, there was only a 0.5% probability that the interaction between sexual satisfaction and context was small enough to be in the ROPE for the Body Image conversation. As shown in **Figure 4**, during the Body Image conversation, higher average sexual satisfaction was associated with a higher probability of being in the complex profile.

Commitment

The final model for commitment included the main effects of the between-partner averages and differences in commitment, along with the interaction of average commitment and context. The R^2 for the model was 0.35, which means that the model accounted for 35% of the variance in the profile probabilities. Results provided strong evidence that the interaction between average commitment and context was non-zero during the Health Goals conversation, with the posterior mean for the parameter being 12.35 and the 95% HDI ranging from 2.28 to 25.60. In addition, there was zero probability that the interaction between commitment and context was small enough to be in the ROPE for the Health Goals conversation. As shown in **Figure 5**, during the Health Goals conversation, higher average commitment was associated with a higher probability of being in the complex profile, although as can be seen in

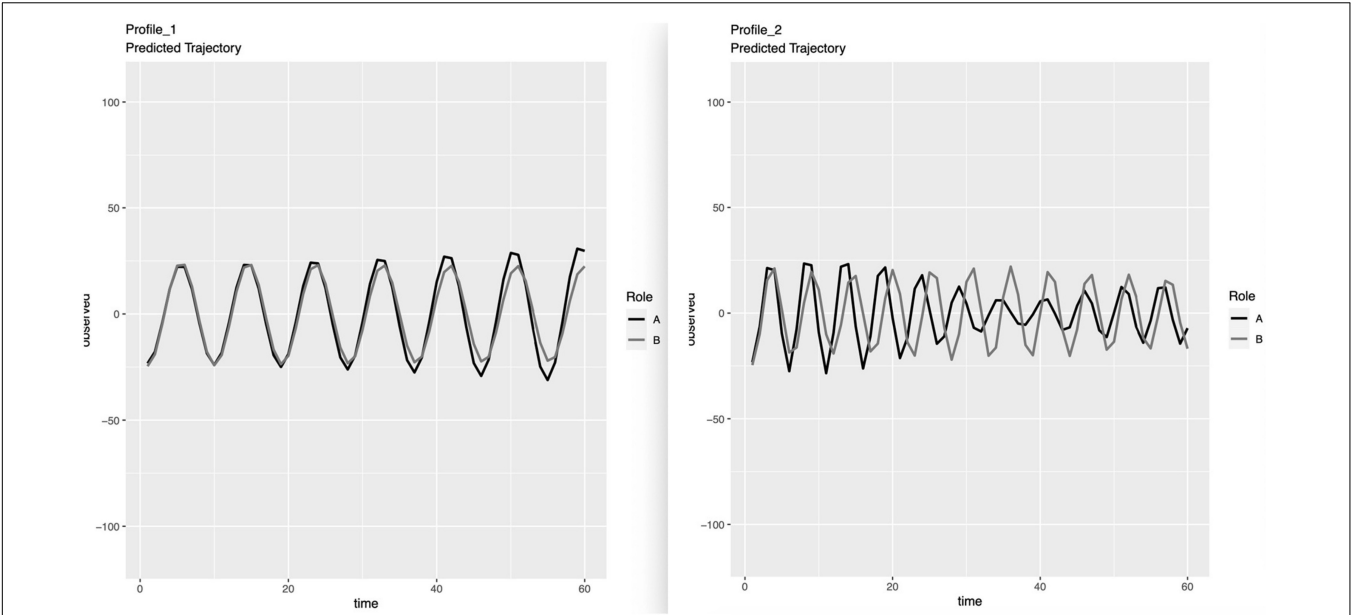


FIGURE 1 | Estimated IBI trajectories for the two profiles. The first profile characterized 109 topic-couple combinations, while the second characterized 24. For indistinguishable dyads, the distinguishing variable A/B was randomly assigned and should not be interpreted. Predicted trajectories for Profile 1: The Simple Profile. Predicted trajectories for Profile 2: The Complex Profile.

TABLE 4 | Specification of fixed effects for final models for each predictor variable. All models included a random couple intercept to account for nesting of contexts in couples.

| Predictor | Final model |
|---------------------|--|
| Love | Profile _{context,i} dyadj = π_{0j} + π_{20} (Average love) + π_{30} (Partner difference in love) |
| Conflict | Profile _{context,i} dyadj = π_{0j} + π_{20} (Average conflict) + π_{30} (Partner difference in conflict) |
| Sexual satisfaction | Profile _{context,i} dyadj = π_{0j} + π_{10} (Context) + π_{20} (Average sex satisfaction) + π_{30} (Partner difference in sex satisfaction) + π_{40} (Context) × (Average sex satisfaction) |
| Commitment | Profile _{context,i} dyadj = π_{0j} + π_{10} (Context) + π_{20} (Average commitment) + π_{30} (Partner difference in commitment) + π_{40} (Context) × (Average commitment) |
| Relationship length | Profile _{context,i} dyadj = π_{0j} + π_{10} (Context) + π_{20} (Relationship length) |

the figure, this is due to an essentially zero probability of low commitment couples being in the complex profile, rather than high commitment couples having a high probability of being in the complex profile.

Relationship Length

The final model for relationship length included the main effects of relationship length (in months) and context. The R^2 for the model was 0.26, which means that the model accounted for 26% of the variance in the profile probabilities. Results suggested that there were no credible associations between either

relationship length or context with the probability of being in the complex profile.

DISCUSSION

Social baseline theory argues that our neural processing has evolved to automatically assume that we are embedded in a supportive social network (Coan et al., 2006; Coan and Sbarra, 2015). In other words, our brain assumes social connection as the default situation and our homeostatic state is defined by interconnection with other people at all levels (e.g., psychological, behavioral, biological; Saxbe et al., 2020). Coregulation refers to the interpersonal processes that enable us to return to our baseline, e.g., our secure interpersonal state, when we are perturbed away from it (Sbarra and Hazan, 2008). Coregulation is a dynamic process, involving complex positive and negative feedback loops within and between people, across psychological, behavioral and biological channels (Butler and Randall, 2013). As such, it enables us to respond efficiently as an interpersonal system to challenges and opportunities, and then return to our interpersonal homeostatic baseline afterward. Social baseline theory further suggests that high quality relationships automatically reduce threat responding, thereby freeing up resources for social partners to engage flexibly with each other and the world (Coan et al., 2006; Coan and Sbarra, 2015). In other words, high quality relationships both promote and rely on coregulation.

Our exploratory study focused on the biological channel of coregulation, e.g., physiological linkage (PL) of interbeat interval (IBI), and extends the existing literature in the following

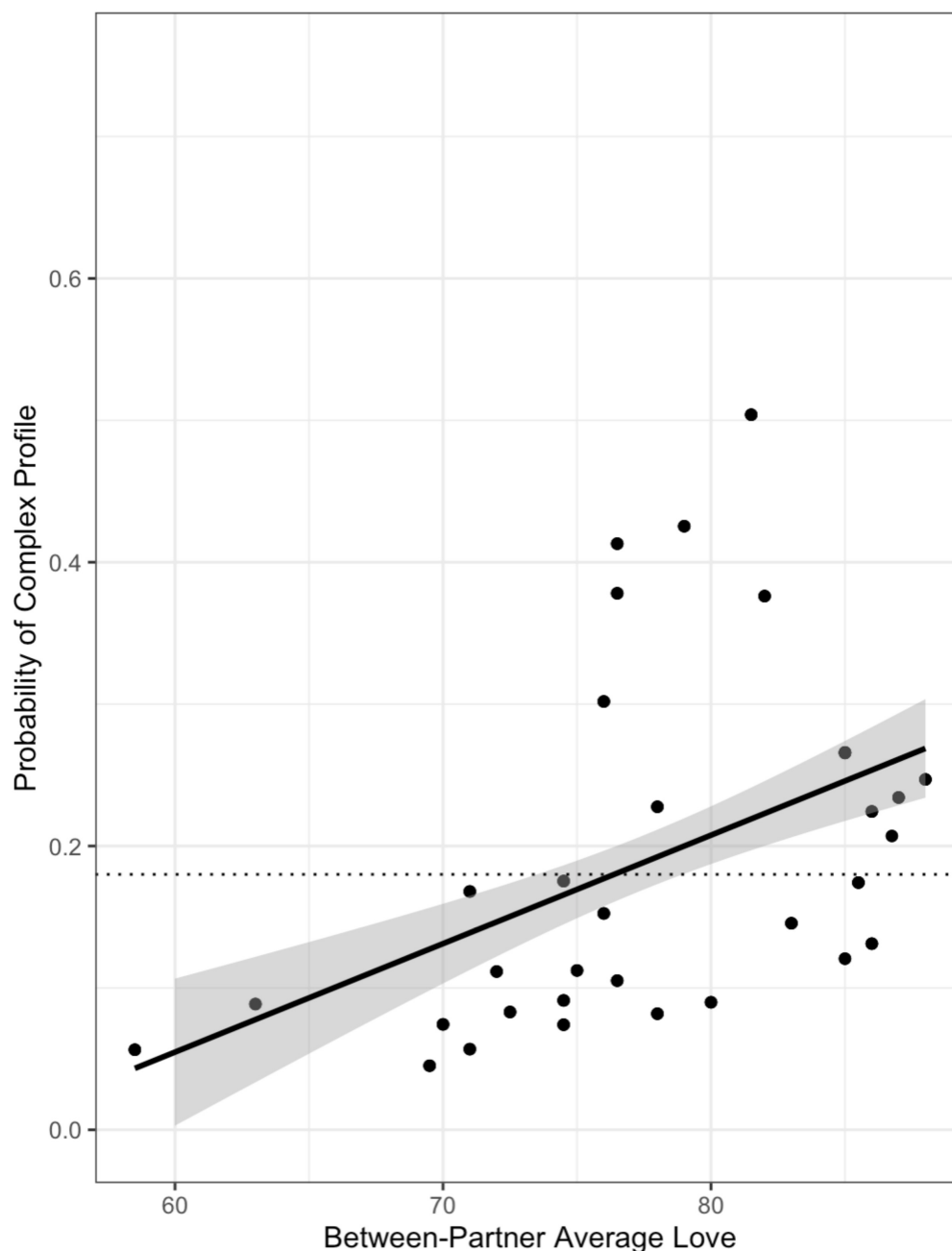


FIGURE 2 | The main effect of average love across contexts. The dotted line shows the unconditional probability of being in the complex profile as a reference point. Higher average love was associated with a higher probability of being in the complex profile across contexts.

ways: First, using a newly developed R statistical package (*rties*, Butler and Barnard, 2019), we explored diverse patterns of PL during both neutral social contexts and emotionally arousing ones (i.e., body image and health goal conversations) in an understudied population (i.e., same-sex male couples). Second, guided by the perspective of social baseline theory, we explored whether or not (and if yes, which aspect of) couple relationship functioning was associated with PL patterns in same-sex male

relationships. Third, we explored the potential moderating role of conversational contexts in the associations between couple relationship functioning and PL patterns.

Given the lack of prior work distinguishing among different PL patterns, our research is exploratory and hence our expectations for what we would find were tentative. Nevertheless, we expected that we would find at least two distinct patterns, with one being some

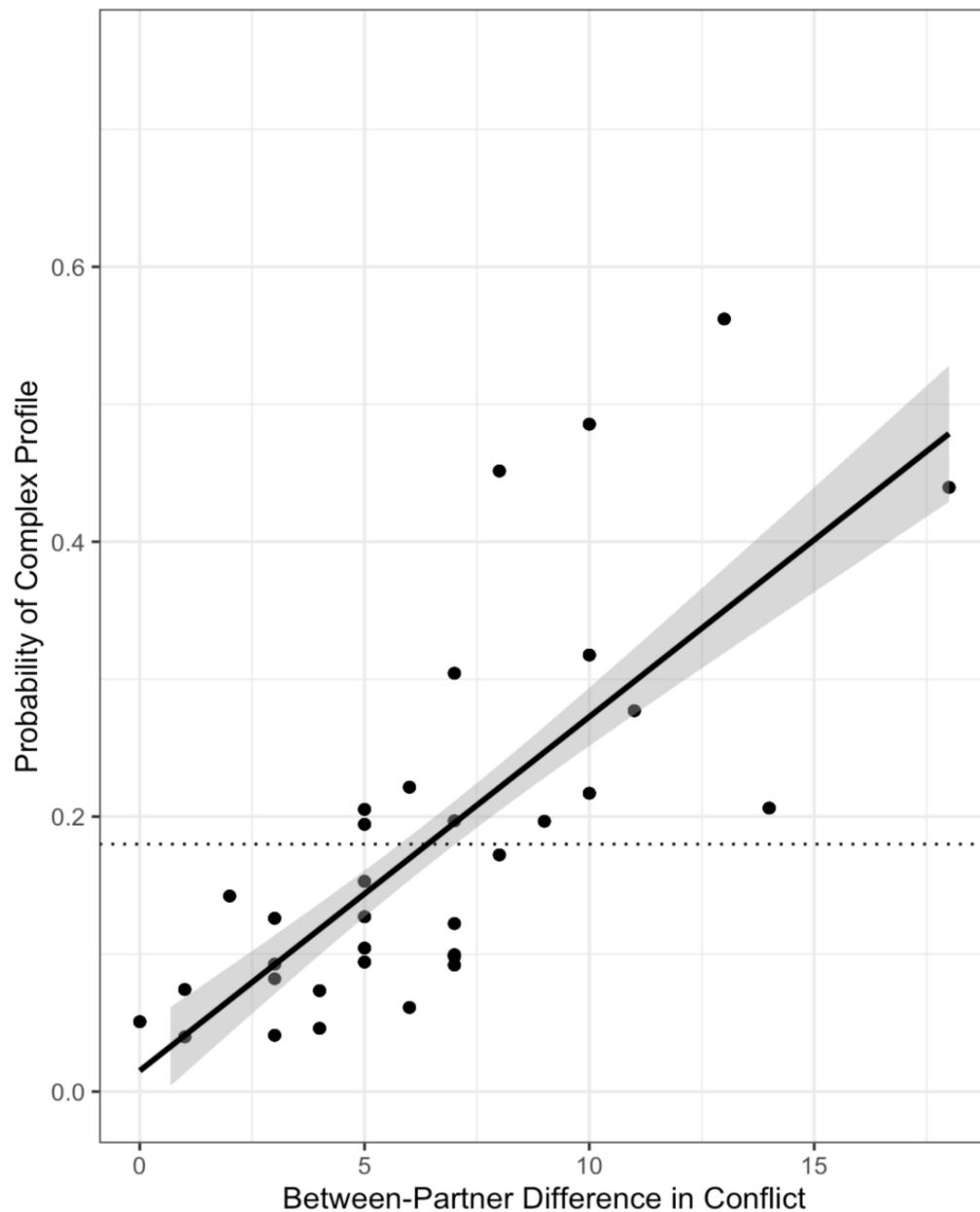


FIGURE 3 | The main effect of between-partner differences in conflict across contexts. The dotted line shows the unconditional probability of being in the complex profile as a reference point. Larger between-partner differences in conflict were associated with a higher probability of being in the complex profile across contexts.

form of relatively simple synchrony and the other being more complex. Second, we expected that higher quality relationships would promote more elaborate forms of coregulation and would therefore be associated with more complex PL. Finally, we expected the more challenging conversation contexts (body image and health goals) would produce more complex PL than the neutral contexts (non-interacting baseline and unstructured conversation), due to provoking more emotion and the need for interpersonal regulation.

Expected Findings

In the present study, we observed both a simple in-phase PL pattern for IBI and a notably complex pattern. The predicted trajectories of IBI for the complex profile revealed temporally fine-grained nuances. Within 10-min conversations, we saw a relatively fast transition from in-phase synchronization to anti-phase synchronization, and then back to in-phase synchronization. Also, the partner's oscillations eventually both damped, suggesting a regulatory process returning them toward their baseline after an initial perturbation. Although the

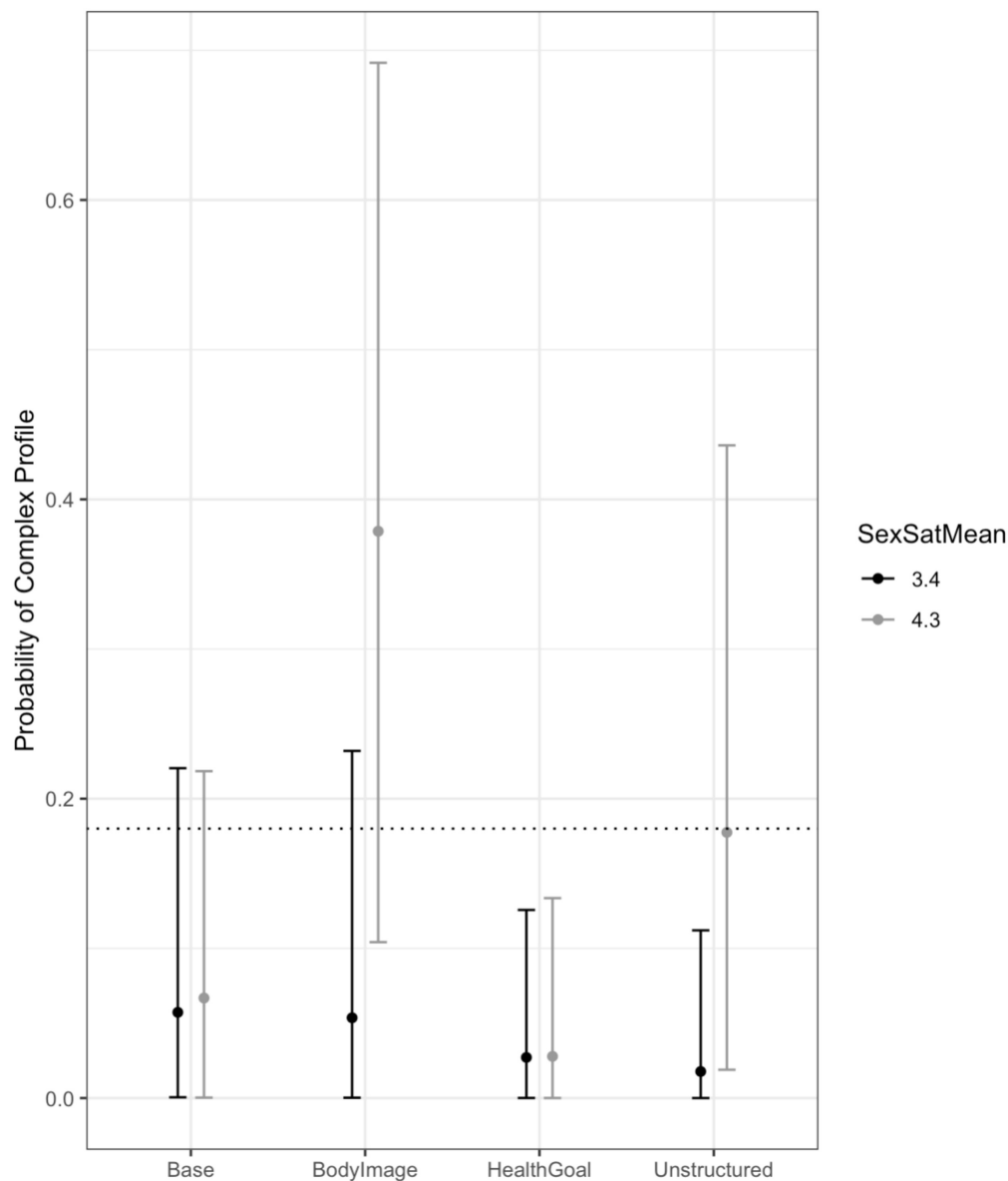


FIGURE 4 | The interaction of average sexual satisfaction and context. The dotted line shows the unconditional probability of being in the complex profile as a reference point. Higher average sexual satisfaction was associated with a higher probability of being in the complex profile during the Body Image conversation.

exploratory nature of our study makes any interpretations speculative, such complex nuances may reflect a highly interactive coregulatory process in which the two partners were experiencing a range of emotions and exerting influence on each other in ways that were ultimately homeostatic.

It is also noteworthy that the simple profile was more common than the complex profile (i.e., 82 vs. 18% of all conversation contexts engaged by all couples). Such high prevalence of PL characterized by stable synchronization may reflect “business as usual” where partners were interacting in relatively unemotional ways not demanding of much self- or other- regulation. This is consistent with existing findings that relatively simple PL patterns can emerge when partners do not have to regulate each

other’s behaviors and emotions (Parkinson, 2011). While this interpretation may account for the simple pattern emerging in the neutral contexts, in the more challenging contexts it is also possible that the simple pattern reflects a lack of engagement and hence a lack of coregulation. These interpretations gain some support from our findings that: (1) higher reports of love were associated with a higher probability of being in the complex profile, regardless of conversational context, and (2) higher reports of sexual satisfaction were associated with a higher probability of being in the complex profile during the body image conversation. Although the partners likely experienced and expressed intense feelings during the emotionally challenging body image conversations, partners experiencing security and

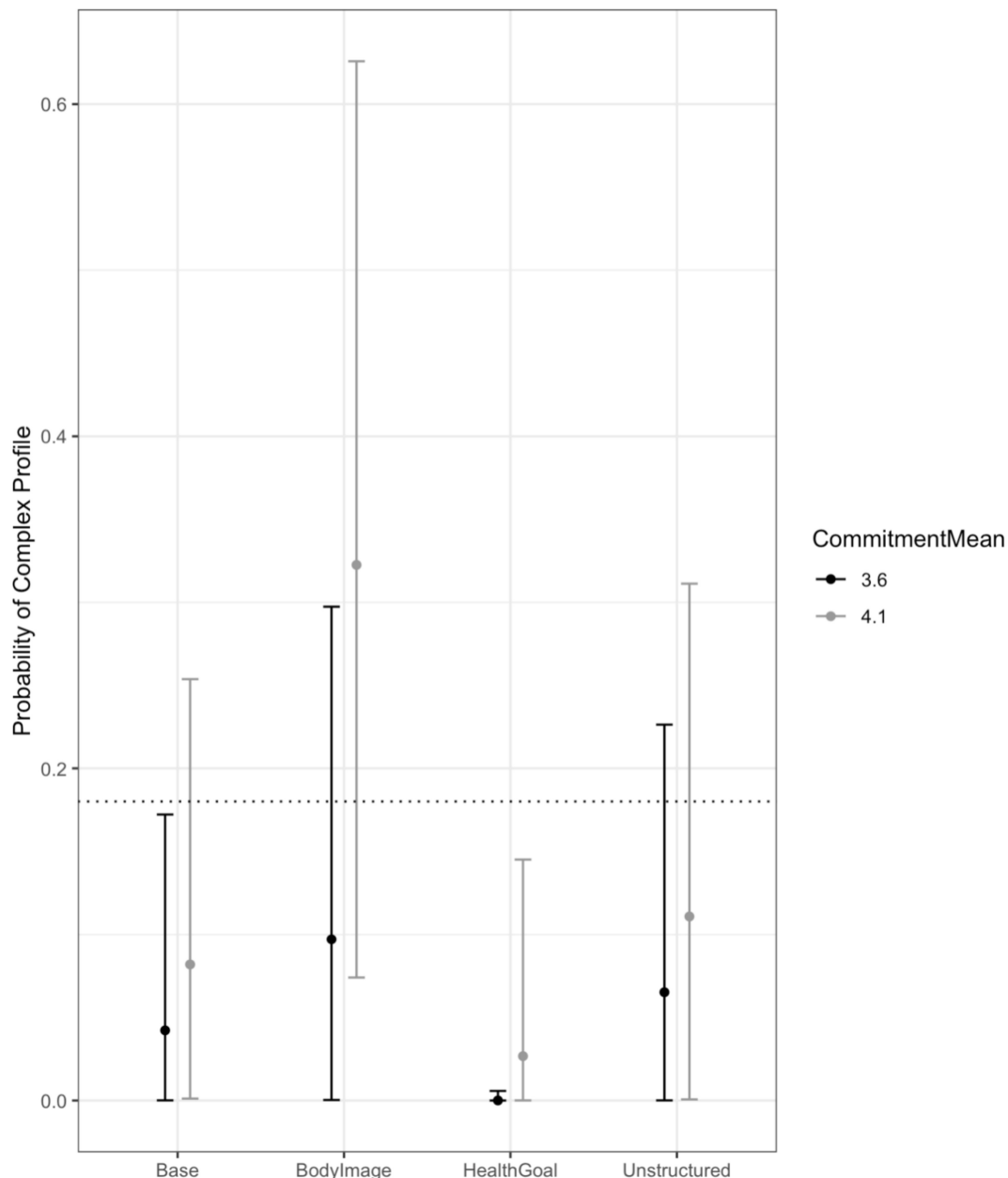


FIGURE 5 | The interaction of average commitment and context. The dotted line shows the unconditional probability of being in the complex profile as a reference point. Higher average commitment was associated with a higher probability of being in the complex profile during the Health Goals conversation, although this is due to low commitment couples having an essentially zero probability of being in the complex profile while discussing health goals, rather than high commitment couples being likely to be in the complex profile during that conversation.

interdependence may have been more effective at regulating each other's emotions and behaviors, both actively and passively simply by providing a secure base for each other (Beckes and Coan, 2011; Timmons et al., 2015). In summary, as expected, the complex PL pattern was most likely to emerge for couples with high relationship quality during the challenging body image conversation, suggesting it may reflect coregulatory processes. In contrast, the simple PL pattern dominated for couples with lower relationship quality across contexts, suggesting a lack

of engagement with each other. The simple PL pattern also dominated for all couples during the neutral baseline and unstructured conversations, suggesting that these contexts did not call for the more intense interpersonal engagement evoked by the body image conversation.

Unexpected Findings

One unexpected finding from our study was that the health goal conversation was not associated with a higher probability of

the complex profile. In fact, although more committed couples showed higher probability of being in the complex profile than low commitment couples when discussing health goals (as expected), all couples were more likely to be in the simple profile during this conversation, similar to the neutral baseline and unstructured conversations. A second unexpected finding was that there was no association between relationship length and the probability of being in the complex profile. On the one hand, there may be theoretical explanations for these null effects. For example, it may be that discussing health goals is not very challenging or engaging for same-sex male couples, especially if they are not very committed to each other. For relationship length, being together longer may reflect a more secure relationship and hence more capacity for coregulation, but it may also reflect a relationship that is hard to perturb and hence result in less coregulation. Such processes may have cancelled out in our study. And of course, as always with null results, they may simply reflect the low power of our relatively small sample. Future work with larger samples will be required to address this issue.

A third unexpected finding is that regardless of the conversational context, larger between-partner differences in their reports of habitual conflict were related to a higher probability of being in the complex profile. One possible interpretation of this finding is that those couples who disagreed on how much conflict they typically experience may have been struggling with the major relational task of constructing a shared reality and shared perceptions of their experiences (Acitelli et al., 1993; Wilson and Huston, 2013). Importantly, the only way to have a large discrepancy in reports of conflict is to have one of the partners reporting a fairly conflict-free relationship, suggesting that although the relationship may be facing a challenge, at least one of the partners is still optimistic about it. From this perspective, a large between-partner difference in the report and perception of conflict (i.e., an important and inevitable experience in couple relationships) may indicate a context in which at least the partner reporting less conflict was still enacting efforts to regulate emotion and behavior in the relationship, which in turn could be related to a high likelihood of complex PL patterns (Sbarra and Hazan, 2008; Holt-Lunstad et al., 2010; Coan and Sbarra, 2015). The unexpected nature of this finding precludes a strong interpretation, but this result suggests future work could systematically vary how much partners agree on key relationship aspects and test whether PL patterns vary as a result.

Limitations and Future Directions

Several limitations of the present study are important to consider. First, we used a couple-centered approach to explore and describe PL patterns within the current sample. Given the relatively small sample size (i.e., 133 contexts completed by 34 couples) and the minority sample (e.g., same-sex male couples), the PL patterns identified cannot reflect the full range of complexity and diversity of PL patterns in interpersonal relationships. Instead, the two qualitatively different patterns identified in the current sample highlight the need for future studies in the field of PL that make use of methods capable of capturing the diversity of possible PL patterns.

Second, during the original data collection IBI was recorded from 72 same-sex male couples, but valid IBI data was only obtained from 34 of them (e.g., the sample used for the present analyses). The high missing data rate was primarily because of unexpected, random issues such as unstable signal transmission, excessive sweating, and movement artifacts. We investigated the potential bias introduced by the missing data with an attrition analysis and found no differences in relationship functioning indices, age, or relationship length between the couples who were included in the present study and the excluded couples. However, we acknowledge that the attrition rate is a unfortunate limitation in the present study.

Third, the measures of relationship functioning used in this study were assessed cross-sectionally before participation in the conversational contexts. Thus, we treated these indicators of relationship functioning as the antecedents for PL during each context. However, given the possible cyclical nature between couple relationship functioning and PL (Butler, 2017), it is inappropriate for us to speak about directionality. For example, it may be that relationship functioning impacted PL (as modeled), but it could also have been PL that influenced couple's relationship functioning at a later time point. Future studies should be designed to assess the association between couple relationship functioning and PL in both directions.

Fourth, guided by social baseline theory and the reactive flexibility perspective, we argued that the emergence of complicated PL patterns may reflect efforts to regulate emotion during highly arousing contexts and among couples in well-functioning relationships, and may represent effective coregulation. In contrast, we speculate that simple patterns may emerge in non-demanding situations or when partners are disengaged from each other. Such explanations are relatively speculative, however, and our exploratory approach can not tell us exactly why a specific pattern occurred. Evidence confirming or refuting these theoretical speculations will need to be gathered in future work using experimental and confirmatory methods. Nevertheless, our exploratory work points the way for such studies by demonstrating how to distinguish diverse PL patterns and suggesting factors that may be either a cause or a consequence of those patterns.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: Data cannot be publicly available but are available upon contacting the fourth and fifth author. Requests to access these datasets should be directed to KA, kristin.august@rutgers.edu and CM, chmarkey@camden.rutgers.edu.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by university of rutgers. The patients/participants

provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XL has finished the analyses and writing up the draft of the whole manuscript as the first author. AK and SB helped with revising the manuscript and searching for literature. KA and CM helped with cleaning up the data and revising the manuscript. EB, as the

anchor author, has supervised XL during the whole process of data analyses, draft writing, and manuscript revising. 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.2020.619255/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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“We Feel Good”: Daily Support Provision, Health Behavior, and Well-Being in Romantic Couples

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Intimate partners are an important source of support when pursuing health goals. A vast amount of literature documents the role of social support in alleviating recipients' distress and facilitating health behaviors. Less studied is the phenomenon that providing support may entail a benefit for the provider, particularly in the context of health behavior change. In the present study, we investigated whether providing social support in daily life would be associated with more health behavior, and emotional and relational well-being that same day, using a sample of romantic couples aiming to become more physically active. Ninety-nine inactive and overweight heterosexual romantic couples (=198 individuals) participated in this dyadic daily diary study. Both partners reported on the provision of social support, positive and negative affect, and relationship satisfaction in electronic end-of-day diaries across 14 consecutive days. Moderate-to-vigorous physical activity (MVPA) was objectively assessed via triaxial accelerometers (Actigraph GT3X+). Using the Actor-Partner Interdependence Model (APIM), dyadic data analyses indicated that providing support to the partner was associated with higher own MVPA, more own positive affect, less own negative affect, and more own relationship satisfaction (actor effects), over and above the effect of support provision on outcomes in the other partner (partner effects). The present findings suggest that the provision of daily social support in couples is strongly associated with enhanced well-being not only at a personal level but also at a relational level. Providing social support may also serve the function of relationship maintenance. Thus, shifting the focus away from the recipient to examine beneficial effects of social support in providers is highly relevant. Future research should address the question of when, why, and how giving support is beneficial.

Keywords: romantic couples, support provision, provider, well-being, health behavior, accelerometer, APIM

INTRODUCTION

Social relationships are widely recognized for their protective role for physical health and psychological well-being (e.g., House et al., 1988; Kawachi and Berkman, 2001; Holt-Lunstad et al., 2010). In particular, a happy romantic relationship has shown to be associated with better health outcomes (e.g., Holt-Lunstad et al., 2008). Romantic partners are an important source to turn to for help (Feeney and Collins, 2003). Social support has been proposed as one potential pathway to better health, via the facilitation of health behaviors and alleviating distress

(Berkman et al., 2000). Indeed, empirical evidence suggests that support from the partner is associated with better health behaviors in recipients, e.g., daily smoking (e.g., Scholz et al., 2016; Lüscher et al., 2017), or daily activity (Khan et al., 2013; Berli et al., 2016). In terms of recipients' well-being, however, findings of actual support receipt are inconsistent (for an overview see Rafaeli and Gleason, 2009). Overall, most focus of the social support literature has been on outcomes in support recipients. The phenomenon that providing support may entail benefits for providers is less understood. This study aims to contribute to evidence on the effects of providing social support in daily life on health behavior and emotional and relational well-being using a dyadic approach with romantic overweight couples intending to increase their physical activity.

Social Support and Health

Social support has been defined as "social resources that persons perceive to be available or that are actually provided to them by nonprofessionals" (Cohen et al., 2001). Social support can be conceptualized as retrospective reports of supportive interactions in the past, reported by either recipients (i.e., *received* support) or by providers (i.e., *provided* support) (Schwarzer and Knoll, 2007). Importantly, this has to be distinguished from *perceived* support that refers to a prospective assessment of help perceived as available should need arise (e.g., Uchino, 2009). Different functions of support include providing comfort or listening (i.e., emotional support) or providing material, practical help (i.e., instrumental support) (Schwarzer and Knoll, 2007). Receiving support has been proposed to result in, among others, improved emotional (e.g., negative and positive emotions), relational (e.g., trust, closeness, feeling valued, and respected), and behavioral (e.g., health and lifestyle behaviors) outcomes (Feeney and Collins, 2015). However, benefits may not be limited to the individual receiving the support. Providing support to one's romantic partner may even be more important for one's health than receiving it (e.g., Knoll et al., 2007).

Benefits for Support Providers

Compelling evidence exists that older adults who provided higher levels of support to others had a reduced risk for mortality 5 years later (Brown et al., 2003) and lower morbidity (Brown et al., 2005), independent of levels of received support. McClellan et al. (1993) had already demonstrated that among dialysis patients with end-stage renal disease, levels of giving support to family and friends were higher in those who survived than those who died 1 year later. Trait support provision was moreover associated with cardiovascular health (e.g., lower ambulatory blood pressure; Piferi and Lawler, 2006). Using an experimental design, Inagaki and Eisenberger (2016) could show that providing support to a friend (i.e., writing a supporting note vs. writing about route to school/work) prior to a stressful experience influenced the physiological stress response by reducing systolic blood pressure but did not have an effect on self-reported psychological stress or salivary cortisol levels.

Moreover, providing support to others has shown to be associated with better mental health in providers, including decreased depressive symptoms in individuals mourning for

a spouse (Brown et al., 2008) and decreased symptoms of depression and anxiety in college students (e.g., Crocker et al., 2010). In couples undergoing in vitro fertilization, spousal provision of support was associated with a decrease in own negative affect and increase in own positive affect (Knoll et al., 2007), suggesting that support provision may bolster the provider's feelings of well-being. The authors assume that providing support to someone else should increase self-esteem and well-being because it makes the provider feel needed, important, and valuable (esteem enhancement; Batson and Powell, 2003). Providing support may further increase the sense of reciprocity within the couple (Ryon and Gleason, 2018). Other mechanisms discussed to explain these positive effects include that providing support may also distract from and facilitate reappraisal of own problems, make providers feel more energized, and efficacious, and strengthen networks (Crocker et al., 2017; Liu et al., 2020).

Providing support also seems important for the development and maintenance of relationships, by cultivating satisfying, trusting, and intimate relationships (Feeney and Collins, 2015). According to Cutrona (1996), social support should be linked with more positive aspects and less negative aspects of relationship quality via reducing conflicts and preventing emotional withdrawal, reducing the risk for depression, and increasing intimacy. Correlational evidence shows that reports of providing support (e.g., Brunstein et al., 1996) as well as observer-rated support provision during couple conversations (Lawrence et al., 2008; Jensen et al., 2013) were positively associated with relationship outcomes in providers, particularly among men. Among newly married couples, wife's support provision during a discussion about a personal stressor predicted relationship satisfaction and distress 2 years later (Pasch and Bradbury, 1998). Prospective positive associations were also found in men receiving radical prostatectomy (Knoll et al., 2009): Patients' accounts of support provision to their partner prior to the operation significantly predicted their relationship satisfaction 1 year after surgery, even after controlling for the patient's accounts of support receipt from their partner, and presurgery levels of relationship satisfaction.

It is important to note, however, that providing support can also be costly. It is well documented that caregiver burden is related to lower indicators of physical health, lower intimacy and relationship quality, and increased stress (see Adelman et al., 2014; Crocker et al., 2017). In particular, providing care for a close other with a chronic condition can be burdensome and limit personal resources (Crocker et al., 2017; Liu et al., 2020). Caregivers may experience multiple stressors including the strain of patients' disabilities, exposure to their suffering, and restricted personal and social life. The burden of caregiving tends to be greater the closer the caregiver is (Rafaeli and Gleason, 2009). However, some studies also extended the positive findings of support provision to the caregiving context. For example, Brown et al. (2009) found that individuals who provided a high number of hours of care to their spouse had lower mortality rates. According to the authors, the perception of the patient's suffering may indeed be harmful, but the caregiver's compassion could still be beneficial for his or her outcomes.

Support Provision in Daily Life

Overall, research indicates that individuals who provide more support to others such as the romantic partner seem to display better physical, emotional, and relational well-being. This approach, focusing on differences in support provision *between* individuals, can answer the question of whether a trait disposition of giving support to others relates to better health. Using a daily diary design can address the question of whether the process of providing support to others in daily life is, *within* persons, associated with health benefits relatively close in time. Gleason et al. (2003) for example found that providing support to the partner one day was associated with less negative mood that same day. Similarly, positive effects on own same-day mood or well-being indicators were found in patients with multiple sclerosis and their partners (Kleiboer et al., 2006), in cancer patients and caregivers following stem cell transplantation (Kroemeke et al., 2019), same-gender undergraduate friend dyads (Morelli et al., 2015), and spouses of individuals with military posttraumatic stress (Carter et al., 2019). Positive effects of daily reports of providing support to the romantic partner on providers' relationship outcomes were also confirmed, e.g., higher daily intimacy in couples coping with breast cancer (Belcher et al., 2011), more feelings of closeness and decreased negative affect in examinees preparing for the bar exam (Gleason et al., 2008), or higher daily relationship satisfaction, but only in the context of positive event disclosure (Gosnell and Gable, 2015). These associations with emotional and relational well-being have, however, so far not been tested in the context of health behavior change.

Support Provision and Health Behavior

What has been less discussed in the literature as a potential explanation for the effects of support provision on physical health is a health behavior path. Providing support might not only impact on health by promoting health behaviors in recipients (cf. Berkman et al., 2000; Feeney and Collins, 2015) but also promote engagement in health behaviors in providers themselves, for example due to strengthened self-regulation. More specifically, providing support to a close other in daily life (e.g., encouraging, reminding of goals, providing information, or appropriate materials) is highly likely to activate goals and trigger self-regulatory strategies (self-monitoring or planning) in providers themselves and help them pursue their own health goals.

So far, a few studies exist that investigated the effects of providing social support on health behavior in the context of substance use, with mixed results. Giving help to other juveniles, as opposed to receiving help, significantly reduced the risk of relapse in alcohol and other drug use during 12 months following an addiction treatment (Johnson et al., 2018). A main effect of providing support through online social support groups on alcohol and drug use 6 and 12 months later was, however, not confirmed (Liu et al., 2020). Using a dyadic approach with dual-smoker couples, Lüscher and Scholz (2017) did not find evidence that female partners who reported providing smoking-specific support to their male partners a month after quitting jointly

were more likely to be abstinent. However, zooming in on a daily perspective based on dyadic daily diary data from the same dual-smoker couples attempting to quit smoking jointly (Lüscher et al., 2017), the authors could show that on days when men and women reported providing more support to their partner than usual (within-person fluctuations in support provision), men and women also reported smoking less cigarettes that day. To the best of our knowledge, no studies have tested the effects of support provision in other health behavior contexts, such as physical activity, and focused comprehensively on provider's own health behavior and emotional and relational well-being.

The Present Study

To summarize, evidence suggests that persons who provide support to a close other also show better health. Existing diary work also suggests that within persons, providing support to another person in daily life is associated with improved own daily emotional and relational well-being. However, so far these associations have not been investigated in support contexts such as pursuing health behavior change. Evidence on the effects of support provision on the provider's own health behavior is mixed and limited to the context of substance use. The aim of the present study is to comprehensively examine the effects of daily support provision on the provider's own health behavior and emotional and relational well-being in romantic overweight couples striving to increase their physical activity in everyday life. To capture the dynamic process of support provision and its relatively short-term effects, we strictly focus on within-person associations, taking between-person means into account. As can be seen in **Figure 1**, we hypothesized that higher daily support provision relates to (a) higher own objective physical activity, (b) higher own positive and lower own negative affect, and (c) higher own relationship satisfaction that same day in male partners and female partners (actor effects "a"). Using the framework of the Actor-Partner Interdependence Model (APIM; Kenny et al., 2006) with reports from both partners will allow to disentangle the effects of one's own and one's partner's support provision on the outcomes.

MATERIALS AND METHODS

The present study is a secondary analysis of data collected at the 6-month follow-up of an intervention study to promote daily physical activity in inactive, overweight, or obese couples intending to become physically active ("DYACTIC;" for details please see Scholz and Berli, 2014). The single-blind randomized controlled trial (ISRCTN15705531) was funded by the Swiss National Science Foundation (PP00P1_133632/1) and approved by the Internal Review Board of the University of Bern, Switzerland (2011-12-36206). In brief, the intervention consisted of an information leaflet with physical activity recommendations at the time of the study (engaging in 30 min or more of at least moderate activity every day, performed in bouts of at least 10 min; BASPO, 2009) for all participants, a goal-setting task, and action control text messages delivered across an intervention period of 14 days. For detailed information on the recruitment, sampling

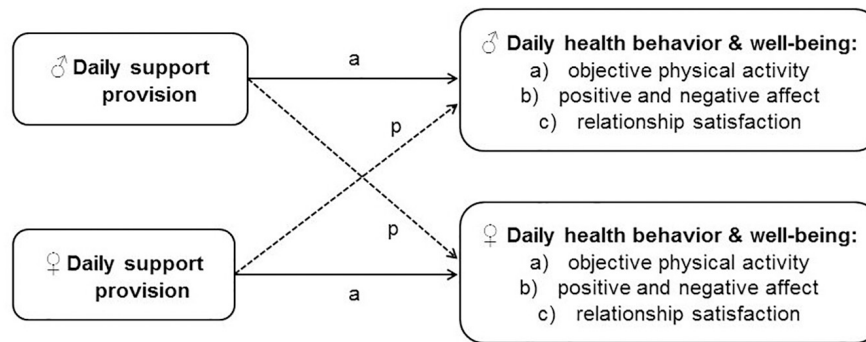


FIGURE 1 | Conceptual model based on the Actor-Partner Interdependence Model (APIM). The model depicts the male (♂) and female (♀) couple members and their reports of the predictor and outcome variables. Continuous lines symbolize the actor effect (a), and dashed lines symbolize the partner effect (p). Separate analyses were conducted for each outcome.

procedure, intervention, and intervention effects of the trial, please see Berli et al. (2016). Below is a concise description of the procedures and measures uniquely relevant for the present study.

Design and Participants

Participants were heterosexual adult couples living in a committed relationship for at least 1 year and cohabitating for at least 6 months. Both partners were overweight or obese (body mass index [BMI] ≥ 25 kg/m²), did not meet physical activity recommendations (BASPO, 2009), but intended to increase their physical activity levels. Eligible couples were recruited from the community via flyers, advertisements, and a market research institution. They were invited to the lab where they provided written informed consent and completed an online questionnaire and were randomized to an intervention group ($n = 61$) or a control group ($n = 62$). After baseline, they completed a 28-day diary period with electronic end-of-day diaries and assessment of physical activity via an accelerometer (14 days of intervention, 14 days of assessments only). One and six months after baseline, they returned to the lab for a follow-up assessment. Following the 6-month follow-up assessment, they completed another 14-day diary period with assessments only. This follow-up diary period provides the basis for the secondary analysis of the present study. For the 14 consecutive days, couple members were instructed to independently fill in electronic end-of-day diaries within 1 h of going to bed. They were asked not to discuss their answers with their partners. Additionally, they were asked to wear an accelerometer to objectively assess daily physical activity. At the end of this period, they returned the devices via mail. Couples completing the study were compensated with a total of CHF 200 (=approximately 114 USD).

Of the 121 couples participating at baseline, 99 couples (82%) completed the follow-up diary assessments and comprised the final sample for this study. On average, couples had been living in a committed relationship for 19.12 years ($SD = 14.31$) and cohabitating for 17.30 years ($SD = 14.39$). 69.7% were married, and 56.6% had children with their partner. On average, women were 45.31 years old ($SD = 13.51$, range: 23–72); men were 47.29 years old ($SD = 13.94$, range: 22–75). The average BMI was

for women 30.87 ($SD = 4.94$, range: 25–50) and for men 31.30 ($SD = 4.98$, range: 25–62). Due to technical issues, two couples did not provide any accelerometer data, which resulted in a sample of 97 couples for the analysis of daily physical activity.

Measures

Across the 14 consecutive days of the follow-up diary, every evening both partners reported on their daily support provision and emotional and relational well-being, with high overall completion rates ($n = 2630$ [94.9%] of 2772 possible diary days). All items were administered in German. The item examples below have been translated into English. **Table 1** gives an overview of the descriptive statistics of the main variables. For affect and social support, we further calculated two reliability estimates (Cranford et al., 2006): A between-person reliability R_{kf} , which indicates whether someone tends to be high or low on a given scale, and a within-person reliability R_c , which indicates the reliability of measuring systematic change in ratings over time across individuals.

Daily Support Provision

Both partners indicated the extent to which they provided activity-specific social support to the other partner that day, with one item each on emotional and practical support (adapted from Bolger et al., 2000): “Today, I provided *emotional* [or: *practical*] support to my partner in terms of his/her physical activity.” The response format was 0 (today not at all true) to five (today completely true). Before answering the items, participants were presented with a short description and some examples of emotional (e.g., comfort or encouragement) and practical (e.g., advice or information) support. A mean score of support provision was calculated due to high correlation of emotional and practical support (between: $r = 0.93$, $p < 0.001$; within: $r = 0.70$, $p < 0.001$). Reliability scores were $R_{kf} = 0.99$ and $R_c = 0.83$.

Daily Positive and Negative Affect

Both partners were asked to rate their affect during that day, using the short form of the Positive and Negative Affect Schedule (Thompson, 2007) with five items each. Example items are “Today I feel excited” for positive affect and “Today I feel

TABLE 1 | Available data, descriptive statistics, and correlations between variables of interest.

| | <i>N</i> | <i>n</i> | <i>M_B</i> | <i>SD_B</i> | <i>SD_W</i> | Range | ICC | 1 | 2 | 3 | 4 | 5 |
|---|----------|----------|----------------------|-----------------------|-----------------------|---------------|------|--------|---------|---------|---------|---------|
| 1. Support provision | 99 (198) | 2630 | 1.37 | 0.92 | 0.82 | 0 – 4 | 0.47 | — | 0.13** | –0.12** | 0.25** | 0.15** |
| 2. Positive affect | 99 (198) | 2630 | 0.57 | 0.14 | 0.11 | 0.12 – 0.93 | 0.56 | 0.08 | — | –0.33** | 0.23** | 0.11** |
| 3. Negative affect | 99 (198) | 2630 | 0.17 | 0.13 | 0.09 | 0.00 – 0.59 | 0.60 | 0.28** | –0.31** | — | –0.26** | –0.08** |
| 4. Relationship satisfaction | 99 (198) | 2630 | 0.72 | 0.17 | 0.13 | 0.22 – 1.00 | 0.55 | –0.03 | 0.33** | –0.33** | — | 0.08** |
| 5. MVPA (in minutes) | 97 (194) | 2428 | 48.26 | 24.40 | 27.02 | 1.25 – 129.43 | 0.37 | –0.03 | 0.02 | –0.06 | 0.05 | — |
| 6. Age (years) | | | | | | | | 0.24** | 0.03 | –0.11 | –0.09 | –0.30** |
| 7. Relationship length (years) | | | | | | | | 0.14† | 0.03 | –0.08 | –0.21** | –0.21** |
| 8. Body mass index (kg/m ²) | | | | | | | | –0.07 | –0.08 | 0.01 | 0.06 | –0.15* |
| 9. Kids (no = 0; yes = 1) | | | | | | | | –0.04 | –0.02 | –0.01 | –0.19** | –0.02 |

N = number of couples (individuals); *n* = number of available diary days; *M_B* and *SD_B* show the mean and standard deviation of person-specific mean levels (between-person level); *SD_W* = average within-person standard deviation (within-person level); ICC = intra-class correlation (variance due to stable between-person variability). Between-person correlations for variables 1 through 9 are shown below diagonal. Within-person correlations for variables 1 through 5 are shown above diagonal.

†*p* < 0.10, **p* < 0.05 ***p* < 0.01.

distressed.” The response format was 0 “today not at all true” to 5 “today completely true.” To facilitate interpretation of results and comparability between the outcome variables, positive and negative affect was rescaled to a 0 to 1 scale (0 = 0, 1 = 0.2, 2 = 0.4, ..., 5 = 1, etc.). Reliability scores were $R_{kf} = 0.99$ and $R_c = 0.75$ for positive affect; $R_{kf} = 0.99$ and $R_c = 0.70$ for negative affect.

Daily Relationship Satisfaction

Both partners indicated the extent to which they were satisfied with their relationship that day, using the following item adapted from the DAS-7 (Hunsley et al., 2001): “How did you experience your relationship today?”. The response format was 0 “Today terrible,” 3 “Today ok,” to 6 “Today wonderful.” To facilitate interpretation of results and comparability between the outcome variables, relationship satisfaction was rescaled to a 0 to 1 scale (0 = 0, 1 = 0.17, 2 = 0.33, 3 = 0.5, 4 = 0.67, 5 = 0.83, 6 = 1).

Daily MVPA (in Minutes)

GT3X+ monitors (ActiGraph, Pensacola, FL, United States) worn at the hip during waking hours were used to assess both partners’ daily moderate-to-vigorous physical activity (MVPA). The GT3X+ measures acceleration on three axes (providing a composite measure, i.e., “vector magnitude”) and is a reliable and valid instrument for measuring physical activity levels (Sasaki et al., 2011). For each participant, the total amount of minutes per day that was spent in at least moderate or vigorous physical activity (>2690 cpm in vector magnitude; Sasaki et al., 2011) was calculated. Non-wear time was filtered and eliminated from further analysis based on an algorithm of ≥ 90 min of consecutive zeros in vector magnitude (Choi et al., 2011). Only days with at least 10 h of wear time were included in the analyses. This resulted in $n = 2,428$ [89.4%] available diary days of 2,716 possible diary days across the 97 couples and served as basis for the analysis of physical activity. For more details on data processing, see Berli et al. (2016).

Data Analysis

Data from the 99 male and female partners (=198 individuals) were analyzed using the Actor–Partner Interdependence Model (APIM; Kenny et al., 2006). Actor (the individual) and partner (the individual’s partner) reports of daily support provision were

used, allowing to estimate the extent to which the outcome is related to one’s own and one’s partner’s predictor scores while controlling simultaneously for the effect of both. To account for the nested data structure with repeated measures among male and female couple members, we employed multilevel modeling using a two-level statistical model for distinguishable dyads (Bolger and Laurenceau, 2013). Male and female partners’ reports of support provision were first decomposed into individual mean levels across the diary days (i.e., between-person variance) and the daily fluctuations around these means (i.e., within-person variance). The between-person predictor variables were grand-mean centered to allow for a meaningful interpretation of the intercept. This allowed us to analyze whether daily fluctuations from an individual’s typical (average) level of support provision were associated with the outcomes (within-person association), while controlling for the individual’s mean level.

We modeled couple members’ outcomes on a given day as a function of their own fluctuation in support provision and their partner’s fluctuation in support provision that same day (within-person actor and partner predictors), adjusting for the mean level of own and partner’s support provision (between-person actor and partner predictors). For model parsimony, we constrained actor and partner effects to be equal across gender. Sensitivity analyses revealed no differences between male and female partners in these effects. We, however, added gender as a covariate and adjusted for linear time trends using a linear time variable centered on the first diary day (day 1 = 0, day 2 = 1, ... day 14 = 13). To rule out confounders of the within-person associations, we included a dummy variable weekdays (= 0) vs. weekends (= 1) in all analyses. In the analysis predicting physical activity, we moreover included hours of device wear time (centered around the grand mean) as a covariate to adjust for the potential impact of varying levels of accelerometer wear time. In all analyses, we specified a maximal random-effects structure (Barr et al., 2013) including random intercept and slopes for all lower-level predictors, using a variance component (VC) covariance structure¹. In case of non-convergence, the random-effects structure was successively reduced, eliminating

¹Because a full random-effects variance–covariance structure (using an unstructured matrix) did not converge, we simplified to a more parsimonious variance component (VC) covariance structure on the random effects, where we

effects with insufficient random variance until convergence was met. For each outcome of interest, we ran a separate linear mixed model using IBM SPSS version 26.

We ran a set of sensitivity analyses [see **Supplementary Tables 1–3**] to test whether results hold when including (1) both partner's reports of received support, (2) reports of daily time spent together, and (3) intervention group² as well as socio-demographic variables that showed to be associated with the respective outcome as covariates in the analysis. In none of the models, results changed, so we reported the more parsimonious models below.

RESULTS

Table 1 displays the descriptive statistics and bivariate associations among the main variables. Intraclass correlations, a measure of the degree of dependence of data points (Kreft and DeLeeuw, 1998), ranging between 0.37 and 0.60 indicate that roughly between one and two thirds of the total variance was due to stable between-person differences. At the within-person level, all outcome variables were significantly associated with each other, with small to moderate negative correlations for daily negative affect and positive correlations for positive affect, relationship satisfaction, and MVPA. At the between-person level, a higher level of positive affect across the 14 days was moderately associated with a lower level of negative affect and higher level of relationship satisfaction, and a higher level of negative affect was moderately associated with a lower level of relationship satisfaction. MVPA was not inter-correlated with the other outcomes.

Using linear mixed models, we tested the assumption that higher daily support provision would relate to male and female partners' (a) higher own MVPA, (b) higher own positive affect and lower own negative affect, and (c) higher own relationship satisfaction that same day (actor effects). For a complete overview of the results, please see **Table 2**.

Daily Moderate-to-Vigorous Physical Activity

As indicated by the intercept (i.e., when all covariates equal zero), participants' average level of MVPA on the first diary day was 48.7 min. Male and female partners did not differ in their MVPA levels ($b = 3.63$, $p = 0.143$). MVPA did not significantly change over time ($b = 0.10$, $p = 0.506$) and was not different on weekend days versus weekdays ($b = -2.61$, $p = 0.206$), providing more support than usual (one unit above the person-specific mean) to the other partner on a given day predicted higher own MVPA ($b = 3.81$ min, $p < 0.001$) that same day. This is in line with Hypothesis 1a on actor effects.

could estimate the variances, but set the covariance between the random effects to zero.

²Preliminary analyses did not reveal any significant differences between participants of the intervention and control group in terms of their mean support provision, positive and negative affect, relationship satisfaction, and MVPA across the 14 diary days (p 's all > 0.05).

In addition, we found that providing more support than usual on a given day also predicted higher MVPA in the other partner ($b = 4.55$ min, $p < 0.001$) that same day (partner effect). There was considerable variation between individuals in their average level of MVPA (random intercept), and the extent to which own support provision related to own MVPA (random slope for actor effect): The corresponding SD of 4.99 ($=\sqrt{24.93}$) for the random slope of provided support indicates that 95% of the population varies between ± 9.79 min ($=1.96 \times 4.99$) of the average effect.

Positive and Negative Affect

As indicated by the intercept (i.e., when all covariates equal zero), the average level of *positive affect* on the first diary day was 0.58 (on a scale from 0 to 1) and male and female partners did not differ in these initial levels ($b = -0.02$, $p = 0.220$). Positive affect did not significantly change over the diary days ($b = -0.002$, $p = 0.081$) and was not different on weekend days vs. weekdays ($b = 0.01$, $p = 0.245$). In line with hypothesis 1b on actor effects, providing more support than usual (one unit above the person-specific mean) to the other partner on a given day, predicted higher own positive affect that same day ($b = 0.02$, $p < 0.001$).

In addition, providing more support than usual on a given day did not predict positive affect in partners ($b = 0.002$, $p = 0.574$) that same day (partner effect). Moreover, there was considerable variation between individuals in their average level of positive affect (random intercept), but not the extent to which own support provision related to own positive affect (random slope for actor effect).

The average level of *negative affect* on the first diary day was 0.18 (on a scale from 0 to 1), and male and female partners did not differ in these initial levels ($b = -0.03$, $p = 0.066$). No significant change over the diary days emerged for negative affect ($b = 0.001$, $p = 0.381$). On weekends, negative affect was lower compared to weekdays ($b = -0.03$, $p < 0.001$). In line with results on positive affect and Hypothesis 1b on actor effects, providing more support than usual (one unit above the person-specific mean) to the other partner on a given day predicted lower own negative affect that same day ($b = -0.01$, $p < 0.01$).

In addition, providing more support than usual on a given day did not predict negative affect in partners ($b = -0.003$, $p = 0.197$) that same day (partner effect). Again, there was considerable variation between individuals in their average level of negative affect (random intercept), but not the extent to which one's own support provision related to own negative affect (random slope for actor effect).

Daily Relationship Satisfaction

The average level of *relationship satisfaction* on the first diary day was 0.70 (on a scale from 0 to 1) and male and female partners did not differ in these initial levels ($b = -0.02$, $p = 0.170$). Relationship satisfaction did not significantly change over time ($b = 0.002$, $p = 0.101$) but was higher on weekend days compared to weekdays ($b = 0.05$, $p < 0.001$). In line with Hypothesis 1c on actor effects, providing more support than usual (one unit above the person-specific mean) to the other partner on a given day predicted higher own relationship satisfaction that same day ($b = 0.03$, $p < 0.001$).

TABLE 2 | Parameter estimates from mixed models testing the effect of support provision on couples' daily MVPA, positive and negative affect, and relationship satisfaction.

| Fixed effects | MVPA (in minutes) | | Positive affect | | Negative affect | | Relationship satisfaction | |
|--|-------------------|----------------|-----------------|---------|-----------------|---------|---------------------------|---------|
| | Estimate | SE | Estimate | SE | Estimate | SE | Estimate | SE |
| Intercept | 48.69*** | 2.41 | 0.58*** | 0.01 | 0.18*** | 0.01 | 0.70*** | 0.01 |
| Gender | 3.63 | 2.45 | −0.02 | 0.02 | −0.03† | 0.02 | −0.02 | 0.02 |
| Time | 0.10 | 0.15 | −0.002† | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 |
| Weekend | −2.61 | 2.06 | 0.01 | 0.01 | −0.03*** | 0.01 | 0.05*** | 0.01 |
| Wear time (in hours) | 2.32*** | 0.40 | — | — | — | — | — | — |
| <i>WITHIN effects</i> | | | | | | | | |
| Own support provision (actor effect) | 3.81*** | 0.94 | 0.02*** | 0.003 | −0.01** | 0.003 | 0.03*** | 0.004 |
| Partner's support provision (partner effect) | 4.55*** | 0.72 | 0.002 | 0.003 | −0.003 | 0.003 | 0.01*** | 0.004 |
| <i>BETWEEN effects</i> | | | | | | | | |
| Own support provision (actor effect) | −1.18 | 1.88 | 0.01 | 0.01 | 0.04*** | 0.01 | −0.004 | 0.01 |
| Partner's support provision (partner effect) | 2.56 | 1.87 | −0.01 | 0.01 | −0.02 | 0.01 | 0.005 | 0.01 |
| Random effects (variances) | | | | | | | | |
| Level 2 (between-person) | | | | | | | | |
| Intercept | 418.85*** | 67.95 | 0.01*** | 0.002 | 0.01*** | 0.001 | 0.02*** | 0.003 |
| Gender | 425.99*** | 83.27 | 0.03*** | 0.004 | 0.02*** | 0.003 | 0.03*** | 0.004 |
| Time | 0.05 | 0.27 | < 0.001*** | < 0.001 | < 0.001† | < 0.001 | < 0.001 | < 0.001 |
| Weekend | 201.31*** | 56.76 | 0.001 | 0.001 | 0.001† | < 0.001 | 0.002** | 0.001 |
| Wear time (in hours) | 1.47 | 2.15 | — | — | — | — | — | — |
| Own support provision (actor effect) | 24.93** | 9.43 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.0004* | < 0.001 |
| Partner's support provision (partner effect) | — ^a | — ^a | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Level 1 (within-person) | | | | | | | | |
| Residual | 746.44*** | 25.49 | 0.01*** | < 0.001 | 0.01*** | < 0.001 | 0.02*** | 0.001 |
| Autocorrelation | 0.004 | 0.03 | 0.22*** | 0.02 | 0.19*** | 0.03 | 0.20*** | 0.03 |

For model on MVPA, $N = 97$ (194) couples (individuals) with a maximum of 28 days, $n = 2259$ available days; for models on positive and negative affect and relationship satisfaction, $N = 99$ (198) couples (individuals) with a maximum of 28 days, $n = 2181$ available days. SE = standard error. Gender is coded as female = −0.5 and male = 0.5.

^aDue to non-convergence, not all random effects could be computed. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Additionally, providing more support than usual on a given day also predicted higher relationship satisfaction in partners ($b = 0.01$, $p < 0.001$) that same day (partner effect). Moreover, there was considerable variation between individuals in their average level of relationship satisfaction (random intercept), and the extent to which own support provision related to own relationship satisfaction (random slope for actor effect): The corresponding SD of 0.02 ($=\sqrt{0.0004}$) for the random slope of provided support indicates that 95% of the population varies between ± 0.04 ($=1.96 \times 0.02$) of the average effect.

Sensitivity Analyses

Importantly, sensitivity analyses revealed that for all outcomes of interest the hypothesized actor effects remained significant when adjusting for both partners' reports of *received* support (see **Supplementary Table 1**). This indicates that the within-person effects of providing support for providers are independent of potential effects of receiving support from the partner. Moreover, results did not change when adjusting for daily time spent together (see **Supplementary Table 2**) or socio-demographic variables and intervention group (see **Supplementary Table 3**).

DISCUSSION

This study was designed to examine whether providing daily support to the romantic partner in the context of pursuing

physical activity goals would be associated with better health behavior and well-being in providers. Using a dyadic approach with overweight and inactive romantic couples, we particularly examined the effects of support provision on a comprehensive set of health behavior and emotional and relational well-being, including an objective assessment of physical activity behavior via accelerometers.

In line with our hypotheses, we found that higher daily support provision was associated with (a) higher own objective MVPA levels, (b) higher own positive affect and lower own negative affect, and (c) higher own relationship satisfaction that same day in men and women (actor effects). These effects were independent of the effect of the other partner's report of support provision (partner effects). Although not the focus of the present paper, partner effects of support provision were found for MVPA, as documented in previous studies (Berli et al., 2018a; e.g., Khan et al., 2013), and relationship satisfaction. No associations between partner reports of support provision and own positive or negative affect emerged, reflecting the rather inconsistent empirical evidence on support and recipient's well-being (Rafaeli and Gleason, 2009).

Overall, the results on actor effects are in line with previous findings on benefits of support provision for providers' physical health (e.g., Brown et al., 2003, 2005) and mental well-being (e.g., Knoll et al., 2007; Brown et al., 2008). They extend current findings by demonstrating that providing support is associated with better health behavior in providers. More

specifically, participants engaged in almost four more minutes of MVPA, respectively, on days they reported providing more activity-specific support to their partners than usual. Given that differences in support provision across days could be up to five units (with a response format of 0 to 5) and physical activity was objectively measured using accelerometers, this effect is quite substantial. It is also comparable to the effect of support provision on recipients' MVPA (around five more minutes of MVPA on days their partners reported providing more support than usual). Possible mechanisms for the effect of providing support could include jointly engaging in activity behaviors (cf. Berli et al., 2018a), increased own self-regulation (e.g., intentions, planning or monitoring), and self-efficacy, possibly via vicarious experience (e.g., the successful partner serves as role model). Previous research has shown that couples' health behavior change (Jackson et al., 2015) as well as self-regulation processes in daily life (Berli et al., 2018b) are highly linked. Social support could be one mechanism that contributes to this link (e.g., reminding you to do x also reminds me to do x). The proposed mechanisms may be particularly likely in the present sample where both partners were overweight and committed to engaging in regular activity. Thus, such robust findings might not generalize to more asymmetrical couple constellations, e.g., when only one partner is overweight and intending to achieve the recommended physical activity levels. The effect on providers' own physical activity behavior is in line with findings from a previous diary study in the context of smoking cessation, demonstrating that in both male and female romantic partners, providing more smoking-specific support on a given day related to less self-reported cigarettes smoked that day (Lüscher et al., 2017). Other studies investigating this association in the context of alcohol and substance use with a between-person focus (Lüscher and Scholz, 2017), across larger time intervals as well as outside the romantic relationship (Johnson et al., 2018; e.g., Liu et al., 2020) resulted in rather mixed evidence.

Together, these results suggest that health behaviors may, apart from physiological processes (e.g., Piferi and Lawler, 2006; Inagaki and Eisenberger, 2016), provide an alternate pathway through which support provision impacts on providers' long-term health outcomes. While health behaviors have been generally acknowledged as one potential pathway from social networks, and more specifically social support, to health (e.g., Berkman et al., 2000), this pathway has been neither explicitly proposed nor tested as being carried, at least in part, also by the support providers. Future studies should test this assumption in the context of other health behaviors.

Moreover, results suggest that providing health-related social support to the romantic partner is also related with providers' higher emotional and relational well-being, supporting and extending previous diary work beyond the context of stress (e.g., Gleason et al., 2008; Carter et al., 2019) or illness (e.g., Kleiboer et al., 2006; Belcher et al., 2011; Kroemke et al., 2019). One explanation may again be that supporting the partner for example by engaging in activity together may foster feelings of companionship and cohesion. Companionship (e.g., participating in shared leisure activities) has also been associated with better psychological and relational well-being independently from social support (Rook, 2015). Findings based on end-of-day

diaries suggest that instances of providing support in daily life are relatively closely linked with daily better mood and higher daily relationship satisfaction. This offers a complementary view to the relationship enhancement model of social support (Cutrona et al., 2005), assuming that perceiving the partner as a consistent and reliable source of support determines relationship quality and stability via increased trust.

As mentioned previously, providing support or care for a close other may not always have positive effects, particularly in the context of chronic conditions. In contrast to caregiving, however, the context of health behavior change does not require providers to provide constant support or physically demanding care. Instead, the decision to provide support can generally be freely made and is thus assumed to be of low cost. According to Inagaki and Orehek (2017), beneficial outcomes of support provision seem to depend on two factors: Whether or not an individual can freely choose to provide support, and whether or not an individual thinks his or her support is effective. Indeed, research has shown that autonomous motivation to help yields benefits for the helper and recipient (e.g., Weinstein and Ryan, 2010). Sensitivity analyses also did not reveal that the effect of daily support provision on well-being was less advantageous for individuals with high overall levels of support compared to individuals with lower overall levels of support. More systematic research should be devoted to the question of when, why, and how giving support is beneficial (cf. Inagaki and Orehek, 2017).

It is also likely that the close relationship context is a rather favorable context for positive outcomes in support providers. Romantic partners, in particular, are at the source of receiving and providing support to each other in daily life, when it is most needed. Due to their shared history, they might be able to provide support responsively. This not only may be linked with more effective support outcomes in recipients but also may make it more likely for providers to feel efficacious, satisfied, and valuable—aspects that have been theorized to explain increased well-being in providers (cf. Knoll et al., 2007; Liu et al., 2020). Yet, the considerable variation in the effect of providing support on own physical activity and relationship satisfaction across individuals suggests that the provider effect is not uniformly strong for everyone and may even be negative. Potential explanations may include characteristics of the relationship (e.g., overall relationship quality, equity), of the individual (e.g., altruistic motives, goal motivation), or of the support interaction (e.g., support reciprocity; Ryon and Gleason, 2018).

Also, type of support, e.g., whether support is overt and visible or covert and invisible (Bolger et al., 2000), could play an important role in determining positive provider effects. For example, it has been shown that invisible support was associated with decreased mood in support providers, particularly when perceived relationship quality was low (e.g., König et al., 2016). This effect can potentially be explained by a lack of acknowledgment of providers' efforts to support the recipient. In contrast, research on support recipients has shown that visible support can be costly for recipients' mood while invisible support appears to avoid such costs, protecting recipients' self-efficacy (e.g., Girmé et al., 2018). Under which conditions which type of support (visible vs. invisible) is associated with most positive outcomes in support providers,

however, needs further examination. This could be a first step toward a better understanding of the relational, individual, and contextual boundary conditions of effective support provision.

Strengths and Limitations

This study has several strengths. To shed light on the daily processes of support provision in romantic couples' everyday life, we collected daily reports from both male and female partners on support and a broad range of health outcomes. Moreover, applying the APIM framework allowed us to disentangle the effects of one's own and one's partner's support provision on both persons' outcomes. With this, the effect of own support provision on one's own daily health cannot be attributed to the effect that the other partner's support provision may have had on one's own health. Moreover, using an objective measure of health behavior to assess daily physical health is a particular advantage that can produce reliable findings by avoiding shared measurement variance. While potential recall bias of self-report measures should have been reduced due to the diary setting, the issue of shared measurement variance remains with the use of self-report measures for support provision and emotional and relational well-being. An objective assessment of support provision would be ideal. While observations in the lab have been conducted in previous studies on support provision and relationship health (e.g., Lawrence et al., 2008; Jensen et al., 2013), a future way to go could lie in naturalistic observations of support instances in daily life via audio recordings (cf. Lüscher et al., 2019), using an electronically activated recorder (EAR; Mehl et al., 2001).

Despite the many benefits of intensive longitudinal data, it is important to note that causality cannot be established. The predictive direction might also be the other way around. Particularly, feeling happier might facilitate support behaviors. Being in a good mood has previously shown to be associated with an increased likelihood to provide support (Iida et al., 2008). Being happy with the partner, due to moments of intimacy, could also enhance the probability to provide support. Previous research has shown that individuals who are satisfied with their relationship expect and perceive their spouses to be more supportive (cf. Frazier et al., 2003); however, reciprocal associations are highly likely. Importantly, in sensitivity analyses we could rule out the possibility that the associations are simply due to spending more time together.

Relatedly, the present data do not allow to detect potential sequential processes of the health outcomes, e.g., that behavioral goal achievement elicits subsequent feelings of well-being or that relationship satisfaction fosters better subsequent mood. Previous research for example indicated that spousal support receipt predicted higher goal progress which predicted increased positive affect and relationship quality and decreased physical symptoms the following day (Jakubiak and Feeney, 2016). However, the authors also noted that a reverse pattern of well-being predicting subsequent goal progress was also supported by the data, suggesting that bidirectional associations are plausible. The relationship enhancement model of support (Cutrona et al., 2005) moreover proposes that relationship satisfaction leads to better physical and mental health in the long run. Whether

such temporal dynamics also unfold at a micro-time level (e.g., from day-to-day) within persons is, however, unclear and needs further investigation. Unfortunately, the present data are not suitable to test such assumptions. More fine-grained assessments (e.g., several within-day assessments) could help to establish a predictive order. However, ideally, experimental designs are warranted.

Implications and Conclusion

The present findings highlight the importance of health-related support interactions in close relationships for providers' health behavior and emotional and relational well-being in daily life. Theoretical frameworks have identified several pathways (e.g., behavioral, physiological, and psychological) through which support impacts on well-being indicators and long-term health (e.g., Berkman et al., 2000; Feeney and Collins, 2015), with a more or less explicit focus on support recipients. Given the accumulating evidence on benefits of support provision, frameworks should more explicitly acknowledge how such pathways flow through support providers.

With evidence accumulating on independent effect of support provision on own health outcomes, implications for intervention work emerge. Apart from interventions that aim to help people feel supported or that are designed to instruct spouses to support the person in need, new interventions need to be developed. This could for example involve to identify possibilities to provide support to others. Dyadic interventions which involve both members of a dyad, and have increasingly been used to improve health (cf. Scholz et al., 2020), might be particularly suitable and could maximize intervention effectiveness.

In sum, shifting the focus away from the support recipient to examine outcomes in support providers is of particular relevance. Providing support in daily life to a close other pursuing health goals seems to be associated with benefits for providers' health in terms of their health behavior, emotional well-being, and relationship.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Internal Review Board of the Faculty of Arts and Social Sciences of the University of Bern, Switzerland. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

US acquired funding and designed the empirical study. CB supervised data collection and led the project administration,

conceptualized the research goals and aims of the present manuscript. CB analyzed the data and wrote the original draft of the manuscript. US and PS critically reviewed and edited the manuscript. All authors approved the final submitted version of the 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.2020.622492/full#supplementary-material>

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Changes in Relationship Commitment Across the Transition to Parenthood: Pre-pregnancy Happiness as a Protective Resource

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The transition to parenthood is both a joyous and a challenging event in a relationship. Studies to date have found mostly negative effects of the birth of the first child on the parental relationship. We propose that partners' pre-pregnancy individual happiness may serve as a buffer against these negative effects. We predicted that parents who are happy prior to pregnancy fare better in terms of relationship commitment after childbirth than unhappy parents. To test our prediction, we used data of a 5-wave longitudinal study among 109 Dutch newlywed couples who had their first child during the study and a comparison group of 55 couples who remained childless. We found that the relationship commitment of fathers with higher pre-pregnancy happiness and fathers with a partner with higher pre-pregnancy happiness increased slightly in the years after childbirth, whereas the relationship commitment of fathers with lower pre-pregnancy happiness and fathers with a partner with lower pre-pregnancy happiness decreased. In addition, the relationship commitment of mothers with a happier partner prior to pregnancy decreased only slightly across the transition to parenthood but showed a steeper decline for mothers with a partner with average or lower pre-pregnancy happiness. In line with the idea that happiness acts as a resource when partners have to deal with relationship challenges, individual happiness predicted changes in relationship commitment for parents, but not for partners who remained childless.

Keywords: transition to parenthood, commitment, happiness, vulnerability-stress-adaptation model, actor-partner interdependence model, Mplus

INTRODUCTION

The transition to parenthood is not only one of the most joyous life events but it can also be a challenging time in the relationship. Having the first child requires adaptation that can be accompanied by parental stress (Perren et al., 2005) and relational turbulence (Theiss et al., 2013). The general view that has dominated the literature is that the transition to parenthood has mostly negative effects on the parental relationship. Indeed, most studies show, on average, a small but reliable decrease in relationship functioning after child-birth (for reviews, see Twenge et al., 2003; Mitnick et al., 2009; Kluwer, 2010; Doss and Rhoades, 2017). Recently, however, it is recognized that there is important variability in how couples respond to the transition to parenthood

(Doss and Rhoades, 2017). Some parents experience a decrease, while others experience no change or even an increase in relationship functioning (e.g., Holmes et al., 2013; Ter Kuile et al., in press). Importantly, emerging research has begun to investigate individual, relationship, and infant characteristics that moderate the magnitude of post-birth changes in the relationship.

The *Vulnerability-Stress-Adaptation* (VSA) model can be used to understand the impact of life events like the transition to parenthood on relationship functioning. According to this model, couples will adapt better to stressful events to the extent that they have fewer vulnerabilities and more personal resources (Karney and Bradbury, 1995). In line with this model, we will argue that *personal happiness* is a psychological resource that affects how well couples adapt to the changes that occur across the transition to parenthood. Happiness has been found to increase adaptability and effective problem solving (Bryan et al., 1996; Fredrickson, 1998; Lyubomirsky et al., 2005). In particular, we will investigate whether personal happiness as a resource affects changes in relationship commitment. Relationship commitment is a multidimensional construct that entails psychological attachment to the relationship, a long-term orientation regarding the relationship, and the intention to persist in the relationship (Rusbult et al., 1998; Arriaga and Agnew, 2001). It is an important indicator of relationship quality and stability (Rusbult, 1983; Le et al., 2010; Stanley et al., 2010), and emerging research has uncovered individual variation in changes in commitment after childbirth (Doss et al., 2009; Kamp Dush et al., 2014; Ferriby et al., 2015).

Despite the importance of commitment in romantic relationships, only a few studies have examined changes in commitment across the transition to parenthood. Understanding whether and when the transition to parenthood changes parental relationship commitment is important because parental relationship quality and stability affects both the psychological and the physical development of children (e.g., Booth and Amato, 2001; Van Eldik et al., 2020). Gaining insight in factors that influence relationship quality and stability across the transition to parenthood informs new parents and the professionals working with them. The main question we aim to answer in the present study is who are the parents that experience changes in relationship commitment across the transition to parenthood? We will test the general hypothesis that parents with more personal happiness prior to pregnancy will experience less change in relationship commitment after childbirth than parents with less prenatal happiness. In addition, we will explore whether happiness also predicts changes in relationship commitment for childless couples.

Commitment Across the Transition to Parenthood

How does the transition to parenthood affect relationship commitment? One prediction would be that commitment decreases after child-birth, in accordance to the often observed declines in relationship satisfaction and relationship functioning. Adapting to the transition and the increases in negative

interactions between partners may erode positive aspects of the relationship, including commitment (Doss et al., 2009). A contrasting prediction is that commitment increases after first childbirth, because the presence of children raises the investments in the relationship and increases the costs of ending a relationship (e.g., Rusbult, 1983; Rusbult et al., 1998). This corresponds to the concept of *constraint commitment* (Stanley et al., 2010): Investments can act as a constraint to ending the relationship, because terminating the relationship becomes more costly economically, socially, personally, or psychologically than staying in the relationship. In line with this idea, commitment has been found to increase with the number of children (Sorokowski et al., 2017). Studies found that parents are less likely to divorce than childless couples (Waite and Lillard, 1991), and that a higher number of children is related to a lower divorce rate (Cherlin, 2010).

The few studies to date on changes in commitment across the transition to parenthood suggest that commitment on average decreases after childbirth (Doss et al., 2009; Kamp Dush et al., 2014; Ferriby et al., 2015), supporting the idea that the transition and the increase in negative interactions between partners negatively affect commitment (Doss et al., 2009). What these studies have in common is that they found a considerable amount of individual variation. Despite the negative average trend, some partners showed stable or increased commitment after childbirth. The *Vulnerability-Stress-Adaptation* (VSA; Karney and Bradbury, 1995) model offers a paradigm for predicting such variability in relationship change across the transition to parenthood (Kluwer, 2010) and is increasingly used as a framework to investigate individual differences in changes across the transition to parenthood (e.g., Doss et al., 2009; Trillingsgaard et al., 2014; Ter Kuile et al., 2017). According to the VSA model, personal enduring vulnerabilities can aggravate the impact of a stressful event on relationship functioning. Vulnerabilities can be practical, such as financial scarcity, or psychological, such as insecure attachment. Based on this model, couples can be expected to fare worse across the transition to parenthood to the extent that partners have more enduring vulnerabilities prior to childbirth that decrease their ability to adapt. Although the focus of the VSA model is on vulnerabilities, research has shown that having *resources* diminishes the impact of the transition to parenthood on the relationship (e.g., Ter Kuile et al., in press) and increases parents' adaptation to parenthood (Ter Kuile et al., 2017). In the current study, we investigate individual happiness as a psychological resource that increases couples' ability to adapt to first-time parenthood.

Happiness as an Individual Psychological Resource

In their review, Lyubomirsky et al. (2005) present evidence that happiness predisposes people to look on the bright side and that it relates to superior coping during difficult times. For example, Lyubomirsky and Tucker (1998) showed that happy participants, as compared to unhappy participants, tended to think about life events more favorably and positively, by seeing humor and didactic value in adversity and by emphasizing

recent improvement in their lives. Fredrickson (1998, 2001) has argued that positive emotions such as happiness have an adaptive purpose by helping to prepare for future challenges. Positive emotions lead to greater creativity, exploration, and social behavior, and thereby increase physical, social, intellectual, and psychological resources (Fredrickson, 2004). These durable resources can diminish the impact of negative events that occur later on, increasing adaptability and resilience (Fredrickson, 2001). Studies have indeed found that positive emotions such as happiness broaden the scope of attention (Basso et al., 1996), cognition (Isen, 2009), and action (Renninger, 1992). Happy adults as well as happy children have been found to be better able to learn new tasks and to show more effective problem solving (Bryan et al., 1996).

Based on the foregoing, happy individuals likely will be better in coping with changes and difficulties they encounter across the transition to parenthood than unhappy individuals. We expect that those with higher levels of happiness are better able to adapt to the transition to parenthood, and therefore the relationship likely suffers less, than those with lower levels of happiness, which translates into more stable vs. declining commitment levels across the transition to parenthood.

We are not aware of previous work showing evidence for the protective effects of personal happiness across the transition to parenthood, although there is evidence for associations between relationship quality (including commitment) and personal happiness (e.g., Demir, 2008). Also, a few studies have examined related constructs as predictors of the effect of childbirth on relationship outcomes, such as life satisfaction and depression. Life satisfaction predicted relationship satisfaction across the transition to parenthood in mothers (Dyrda et al., 2011). A few studies have found that depressive symptoms across the transition to parenthood are a risk factor for greater decreases in relationship quality (Feeney et al., 2003; Whisman et al., 2011; Trillingsgaard et al., 2014).

Traditionally, research on the transition to parenthood literature largely focuses on risk factors (such as depression) and less on potential protective factors (such as happiness). The question is of course whether risk factors and protective factors are two sides of the same coin, and whether the focus on risk factors is warranted. There is some evidence to suggest that happiness and depression are not bipolar opposites (Rafaeli and Revelle, 2006). To explore this question, we included a pre-pregnancy measure of depressive symptoms in additional analyses to test whether this would predict changes in commitment across the transition to parenthood.

The Present Research

The present work aims to investigate how relationship commitment changes across the transition to parenthood, and whether changes in commitment vary as a function of individual pre-pregnancy happiness. Based on earlier research, commitment is theorized to decrease on average, but less so for those with sufficient resources to adapt across the transition to parenthood. We hypothesize that pre-pregnancy happiness predicts changes in commitment across the transition to parenthood, such that more prenatal happiness is related to

a greater increase or smaller decrease in commitment after childbirth. In this study, we included both partners, in contrast to many previous studies. Because of the interdependence between partners (Kashy and Kenny, 2000), it is important to not only examine how parents' relationship commitment is affected by their own happiness, but also by their partner's happiness. This may be especially important across the transition to parenthood, as the intensive caretaking required by infants can foster interdependence even more.

We will compare changes experienced by first-time parents to changes experienced by couples who did not become parents during the course of this study. By including a comparison group of childless couples, the mere passage of time can be ruled out as an alternative explanation for any differences found in changes in relationship commitment (Doss et al., 2009; Lawrence et al., 2010). It enables us to test for possible pre-existing differences between couples that do and couples that do not have children. It also allows us to explore whether happiness is a stronger predictor of differential trajectories for parents than for childless couples. If happiness is indeed a resource that increases partners' adaptation, the effect of happiness on commitment should be stronger among couples who are going through a major life transition than a comparison group of couples who are not.

By including pre-pregnancy measurements, we can rule out that effects are due to changes that may occur during pregnancy (Lawrence et al., 2010). We further include measurements beyond the first year after childbirth to study the longevity of the effects of the transition to parenthood on commitment. Finally, we will explore gender differences as prior research has shown that fathers' commitment was more vulnerable to change across the transition to parenthood than mothers' commitment (e.g., Doss et al., 2009; Kamp Dush et al., 2014; Ferriby et al., 2015).

METHOD

Participants and Procedure

We used data from the Marriage and Well-being Survey that were collected at 5 time points among 199 newlywed couples, as part of a larger study (Finkenauer et al., 2009). T1 took place in 2005 within 2 months of marriage, and there was ~1 year between subsequent time points. During the course of the study, the majority of couples had their first child. Because we wanted to include pre-pregnancy data, 12 couples who already had children or stepchildren at T1 were excluded. In addition, 23 couples became parents between T1 and T2. Because we cannot verify whether these couples were already pregnant at T1 or not, these couples were also excluded. The final sample therefore consisted of 109 couples (66.5%) who became parents during the course of this study at different time points, and a comparison group of 55 couples (33.5%) who did not have children during this time.

Participants were recruited via the municipalities in which they got married. Inclusion criteria were that this was the couple's first marriage, that couples had no children in this marriage or from previous relationships, and that partners were between 25 and 40 years old. Of all couples that fulfilled the criteria, 19% agreed to participate in the study. This response rate is similar to that in other studies recruiting participants from public

records in the United States (e.g., Kurdek, 1991). At all data collections, both members of the couple separately filled out an extensive questionnaire at home in the presence of a trained interviewer. The questionnaire took about 90 min to complete. Partners were instructed not to discuss the questions or answers with each other. At each data collection, couples received 15 euro and a small gift (e.g., a book, a pen set) after they completed their questionnaires. All procedures were in compliance with the research and consent protocol of the Faculty of Social Sciences of the Free University at Amsterdam.

Of the participants, 128 (58.7%) became parents between T2 and T3, 58 (26.6%) between T3 and T4, and 32 between T4 and T5 (14.7%). The comparison group consisted of 110 participants (33.5%) who did not have children during the study. There was a relatively low attrition rate in this longitudinal study. At T2, 320 of the initial 328 couples still participated in the study, T3 consisted of 310 participants, T4 of 268, and T5 of 240 (73.2% of the sample at T1).

The mean age of husbands was 31.88 years ($SD = 4.81$) and the mean age of wives was 29.17 years ($SD = 4.34$) at T1. Couples had been romantically involved for 5.75 years ($SD = 3.05$) on average and had been living together for an average of 3.66 years ($SD = 2.20$) at T1. Nearly all couples had the Dutch nationality (97.6% of the husbands and 94.5% of the wives). Of the husbands, 18.3% was lower educated (high school or less), 18.9% completed community college (technical or vocational education), 29.9% had finished college (bachelor's degree), and 25.0% had finished university (master's degree). Of the wives, 12.7% was lower educated, 17.7% completed community college, 37.8% had finished college, and 24.4% had finished university. At T1, 98.2% of the husbands and 93.0% of the wives had a paid job. The modal number of working hours was 33 to 40 h a week (69.9% of the husbands and 50.6% of the wives). All the pregnancies were planned.

Measures

Commitment

Commitment to the relationship was measured with 8 items, adapted from the investment model scale (Rusbult et al., 1998). The scale demonstrated good convergent and discriminant validity, and predicted later relationship quality and stability in prior studies (Rusbult et al., 1998). An example item is “*I hope that the bond that I have with my partner will stay the way it is now for a long time.*” Answers were rated on a 5-point scale (1 = *never*, 5 = *always*). Cronbach's alpha ranged between 0.87 and 0.90 for men and 0.90 and 0.93 for women across the 5 time points.

Happiness

Global subjective happiness was measured with a 4-item scale developed by Lyubomirsky and Lepper (1999). The scale was found to have a stable and good internal consistency across five different populations in 14 studies (Lyubomirsky and Lepper, 1999). An example item is “*In general, I consider myself:*” and “*Compared to most of my peers, I consider myself:*”. Participants rated their answer on a 7-point scale (1 = *not a very happy person*, 7 = *a very happy person*).

Cronbach's alpha was 0.73 for men and 0.75 for women at T1.

Depression

Depression was measured using the Centre for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977). The scale consists of 20 items that measure how often participants experienced depressed affect, positive affect (reverse coded), and somatic and retarded activity during the past week. Items were rated on a 4-point scale [1 “*Never or rarely (less than 1 day)*” to 5 “*Usually or always (5–7 days)*”]. The CES-D has been found to have a high internal consistency and validity in numerous studies (Eaton et al., 2004). Cronbach's alpha was 0.83 for men and 0.86 for women at T1.

Analyses

To test our predictions, we applied latent growth curve modeling. The intercept in the models corresponded with the average level of commitment at T1 (prior to pregnancy for the parents), and the linear slope represented the changes of commitment across time. Time since childbirth was included as a control variable in the parents' model. Both partners were included in the same model, in analogy to the principles of the Actor-Partner Interdependence Model (APIM; Kashy and Kenny, 2000).

To test our hypothesis that happiness predicts changes in commitment, we regressed the intercept and slope on the predictor happiness. The trajectories of parents and the comparison group of childless couples were analyzed in a multiple group dyadic growth model, allowing us to compare parents' and non-parents' trajectories. The models were first tested with all possible parameters included. The goal of an APIM analysis with distinguishable dyads is to test the fit of more parsimonious models that constrain estimates. Model fit that is not significantly worse after paths are constrained indicates that effects do not differ significantly (Peugh et al., 2013). Ideally, Chi-square is used to test whether changes in model fit are significant. Due to the complexity of this model however, Chi-square testing led to unstable results, depending on the order in which effects were constrained. We therefore placed constraints using model fit, assessed using the comparative fit index (CFI), Tucker Lewis index (TLI) and root mean square error of approximation (RMSEA). Acceptable model fit is generally defined as a cutoff value higher than 0.90 is for the CFI and lower than 0.08 for the RMSEA (Byrne and Crombie, 2003).

Models were estimated using version 7.4 of the statistical program *Mplus* (Muthén and Muthén, 2018). Little (1988) missing-completely-at-random test showed that the pattern of missing data did not fully resemble a completely at random pattern [$\chi^2(187, N = 164) = 200.86, p = 0.03$]. Inspection of this pattern showed it only to be a factor of time, such that attrition increased at each wave. Since this is inherent to longitudinal studies, and missingness was not related to any other main variable or demographics, we included all available data using a Full Information Maximum Likelihood procedure (which already

TABLE 1 | Intercorrelations, means, and standard deviations of variables at T1.

| Variables | 1 | 2 | 3 | M (SD) Fathers | M (SD) Mothers |
|---------------|--------------|-------------|----------------------|------------------------|-------------------|
| 1. Happiness | 0.21* | 0.45** | −0.34** | 5.80 (0.63) | 5.86 (0.69) |
| 2. Commitment | 0.24* | 0.16 | −0.26** | 4.66 (0.39) | 4.73 (0.33) |
| 3. CESD | −0.53** | −0.08 | 0.12 | 1.30 (0.27) | 1.34 (0.31) |
| | | | Childless Men | Childless Women | |
| 1. Happiness | 0.07 | 0.02 | −0.37** | 5.66 (0.90) | 5.73 (0.87) |
| 2. Commitment | 0.28* | 0.14 | 0.06 | 4.64 (0.38) | 4.76 (0.31) |
| 3. CESD | −0.46** | 0.01 | 0.17 | 1.33 (0.27) | 1.45 (0.37) |

* $p < 0.05$, ** $p < 0.01$. Values for women are above the diagonal, values for men are below. Correlations between husbands and wives are presented in bold on the diagonal.

TABLE 2 | Means (intercepts) before pregnancy and changes (slopes) across time.

| Commitment | Intercept (mean level) | | Slope (rate of change) | |
|-----------------|------------------------|----------------|------------------------|----------------|
| | M (SE) | Variance (SE) | M (SE) | Variance (SE) |
| Fathers | 4.64 (0.03) | 0.10 (0.02)*** | −0.01 (0.02) | 0.001 (0.002) |
| Mothers | 4.73 (0.03) | 0.08 (0.01)*** | −0.03 (0.01)** | 0.004 (0.002)* |
| Childless Men | 4.64 (0.03) | 0.10 (0.02)*** | −0.03 (0.01)** | 0.004 (0.002)* |
| Childless Women | 4.73 (0.03) | 0.08 (0.01)*** | −0.03 (0.01)** | 0.004 (0.002)* |

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

provides good estimates with MAR). The output files of all the models are available upon request from the first author.

RESULTS

Growth Model of Average Commitment and Change in Commitment Over Time

We first examined correlations between all the main variables at T1 (see **Table 1**). Happiness and commitment were moderately correlated for parents and childless men, but uncorrelated for childless women. Next, we examined the average intercept (I) at T1 and average slope (S) of commitment for both parents and childless men and women (see **Table 2**). As happiness was not yet included, this model shows the unconditional estimates of mean commitment at T1 and changes in commitment across time. In addition, the variances around these growth factors are estimated. The variance reflects the individual variation in average level or rate of change.

The final model had an acceptable fit, CFI = 0.956, TLI = 0.956, RMSEA = 0.054 (90% CI = 0.000, 0.083). Constraining the intercept (average level of commitment at T1) of fathers and childless men to be equal resulted in an increase model fit, indicating that their intercept did not differ significantly. Constraining the intercept of mothers and childless women similarly increased model fit. Constraining the intercept for men and women to be equal resulted in a decrease in model fit, suggesting their intercepts were not equal. Women reported higher levels of commitment than men at T1. Fathers and childless men had on average relatively high levels of

commitment at the beginning of their marriage ($I = 4.65$, $p < 0.001$; variance = 0.10, $p < 0.001$). Mothers and childless women reported even higher initial levels of commitment ($I = 4.73$, $p < 0.001$; variance = 0.08, $p < 0.001$; see **Table 2**).

There was an increase in model fit when the slope was constrained to be equal for mothers, childless women and childless men as compared to the unconstrained model where all slopes were allowed to differ. This indicates that the slope of commitment (i.e., change over time) did not differ significantly between mothers, childless women, and childless men. Model fit decreased when fathers' slope was constrained to be equal, indicating that fathers' slope differed from mothers and childless men and women. Over time, both; mothers and childless partners experienced a slight but significant decline in commitment over time ($S = -0.03$, $p = 0.001$; variance = 0.004, $p = 0.03$). Fathers' slope was not significant ($S = -0.01$, $p = 0.77$; variance = 0.001, $p = 0.47$), indicating that their commitment did not change over time. Additional analyses with independent samples t -tests showed that there were no significant differences in average commitment between mothers and childless women, or between fathers and childless men, at any timepoint (analyses available upon request).

In sum, parents reported equally high levels of commitment at T1 as childless men and women, but mothers and childless women reported higher commitment at T1. Mothers and childless men and women experienced the same decline in commitment in the years after their marriage, while fathers' commitment remained stable.

Commitment Predicted by Happiness

In the next step, happiness at T1 (prior to pregnancy) was included in the model as a predictor of the intercepts and slopes of commitment (see **Table 3**). The model includes both the effect of the individual's happiness on their own commitment (*actor effect*) as well as the effect on their partner's commitment (*partner effect*) of fathers and mothers and childless men and women. To test our hypothesis, we looked at the predictive effects of actor and partner happiness on changes in commitment across the transition to parenthood for parents and compared them to childless men and women (i.e., the effect of happiness on the slopes).

The original model had a poor fit (CFI = 0.946, TLI = 0.931, RMSEA = 0.065 (90% CI = 0.033, 0.091)). The final model had an acceptable fit, CFI = 0.964, TLI = 0.961, RMSEA = 0.049 (90% CI = 0.000, 0.076). The actor effects of happiness on the intercepts showed that, as predicted, more reported happiness at T1 predicted higher average levels of commitment at T1 for fathers (unstandardized $b = 0.13$, $p < 0.001$; see **Table 3** for standard error SE and standardized β). Model fit improved when this effect was constrained to be equal for childless men ($b = 0.13$, $p < 0.001$), indicating that the effect did not differ between fathers and childless men. The effect of happiness on initial commitment was slightly larger for mothers ($b = 0.25$, $p < 0.001$) and not significant for childless women ($b = 0.02$, $p = 0.69$). The partner effects on the intercepts were not significant, showing that the partner's happiness at T1 did not predict the average level of

TABLE 3 | Actor and partner effects of happiness on the intercept and slope of commitment.

| Commitment | Actor effects of happiness | | | | | | Partner effects of happiness | | | | | |
|-----------------|----------------------------|-----------|---------|----------|-----------|---------|------------------------------|-----------|---------|----------|-----------|---------|
| | Intercept | | | Slope | | | Intercept | | | Slope | | |
| | <i>b</i> | <i>SE</i> | β | <i>b</i> | <i>SE</i> | β | <i>b</i> | <i>SE</i> | β | <i>b</i> | <i>SE</i> | β |
| Fathers | 0.13*** | 0.09 | 0.30 | 0.02** | 0.01 | 0.43 | −0.01 | 0.02 | −0.03 | 0.02** | 0.01 | 0.46 |
| Mothers | 0.25*** | 0.04 | 0.58 | −0.01 | 0.01 | −0.06 | −0.01 | 0.02 | −0.02 | 0.02** | 0.01 | 0.19 |
| Childless men | 0.13*** | 0.04 | 0.32 | −0.01 | 0.01 | −0.17 | −0.01 | 0.02 | −0.03 | −0.01 | 0.01 | −0.17 |
| Childless women | 0.02 | 0.04 | 0.06 | −0.01 | 0.01 | −0.11 | −0.01 | 0.02 | −0.04 | −0.01 | 0.01 | −0.11 |

** $p < 0.01$, *** $p < 0.001$. *b* refers to the unstandardized coefficient, *SE* to the standard error of *b*, and β to the standardized coefficient.

commitment at T1 for parents and childless men and women ($b = 0.01$, $SE = 0.02$, $\beta = 0.06$, $p = 0.66$).

The effects of happiness on the slopes showed that fathers' own pre-pregnancy happiness predicted their change in commitment over time. There were also partner effects: Mothers' pre-pregnancy happiness predicted fathers' slope and fathers' happiness predicted mothers' slope. Model fit increased when fathers' actor effect was constrained to be equal to these partner effects ($b = 0.023$, $p = 0.007$). There was no actor effect for mothers; in other words, mothers' happiness did not predict their own change in commitment over time. Neither did own or partner happiness predict the slope of childless men and women. Model fit improved when mothers' actor effect was constrained to be equal to the partner and actor effects of childless men and women ($b = -0.01$, $p = 0.32$).

As predicted, happiness at T1 positively predicted changes in commitment across the transition to parenthood. Fathers' happiness prior to pregnancy positively predicted changes in their own and their partner's commitment over time, and mothers' happiness also predicted changes in fathers' commitment after childbirth. Happiness did not predict changes in commitment for men and women who did not have children during this time.

As shown in **Figure 1**, the commitment of happier fathers (i.e., +1 SD pre-pregnancy happiness) increased slightly in the years after childbirth. The commitment of fathers with average happiness prior to pregnancy remained stable, and the commitment of unhappier fathers (i.e., −1 SD pre-pregnancy happiness) decreased across the transition to parenthood. Because the effect of fathers' happiness on fathers' commitment was equal to fathers' actor effect, fathers with a happier partner at T1 showed the same increase as happier fathers, and fathers with an unhappier partner showed the same decrease as unhappier fathers (replicating **Figure 1**).

Figure 2 shows that the commitment of mothers with a happier partner prior to pregnancy decreased only slightly across the transition to parenthood and showed a steeper decline for mothers with a partner with average or lower happiness. The commitment of childless men and women decreased at the same rate, regardless of their own or their partner's T1 happiness.

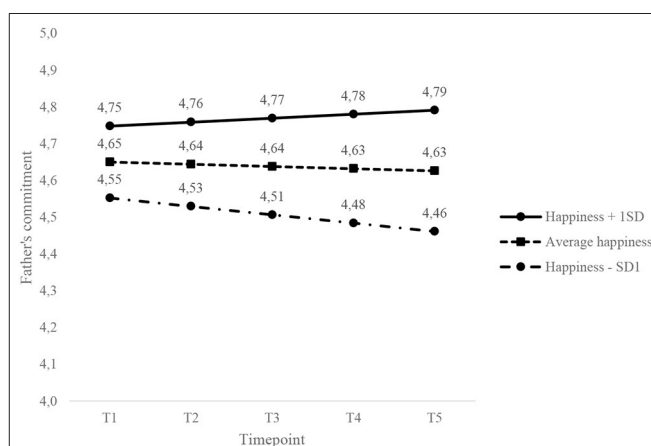


FIGURE 1 | Effect of own happiness on the slope and intercept of fathers' commitment across the transition to parenthood. The y-axis is truncated to improve the visibility of the changes.

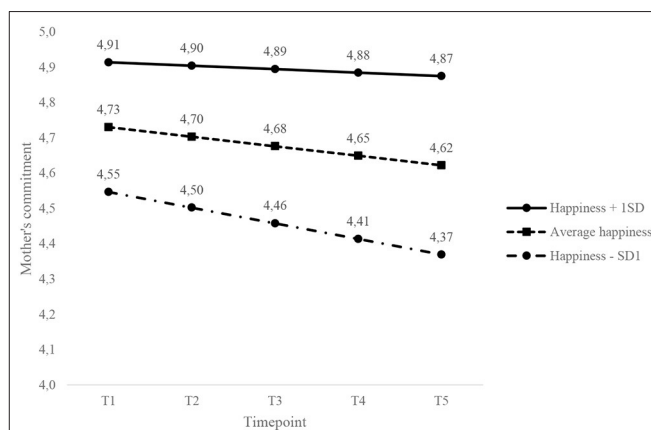


FIGURE 2 | Effect of partner's happiness on the slope and intercept of mothers' commitment across the transition to parenthood. The y-axis is truncated to improve the visibility of the changes.

Commitment Predicted by Depression

An attempt at adding depression as covariate to the happiness model resulted in very poor model fit. Instead, an additional

TABLE 4 | Effects of depressive symptoms on the slope of commitment.

| Commitment | Actor effects of depression on the slope | | | Partner effects of depression on the slope | | |
|-----------------|--|-----------|---------|--|-----------|---------|
| | <i>b</i> | <i>SE</i> | β | <i>b</i> | <i>SE</i> | β |
| Fathers | – | – | – | – | – | – |
| Mothers | – | – | – | –0.05 | 0.03 | –0.17 |
| Childless men | 0.03 | 0.04 | 0.39 | 0.07 | 0.05 | 1.05 |
| Childless women | 0.03 | 0.04 | 0.19 | –0.05 | 0.03 | –0.23 |

Where no effect is reported (–), model fit improved when the effect was constrained to 0, indicating effect did not significantly differ from 0.

b refers to the unstandardized coefficient, *SE* to the standard error of *b*, and β to the standardized coefficient.

model was estimated with depression as a predictor, in order to indirectly compare its strength as a predictor of change in commitment over time to happiness. Model fit was acceptable [CFI = 0.977, TLI = 0.975, RMSEA = 0.038 (90% CI = 0.000, 0.068)]. The results showed that there were no actor or partner effects of depressive symptoms on changes across time in commitment (see **Table 4**). Thus, depressive symptoms before pregnancy did not predict changes in commitment across time for either parents or childless men and women, in contrast to pre-pregnancy happiness as a predictor.

DISCUSSION

The current research extends previous work on relationship changes across the transition to parenthood in two important ways. First, we investigated changes in commitment, a largely unexplored factor despite its crucial importance to relationship stability. Second, we studied the role of individual happiness as a psychological resource and argued that happy partners are better able to cope during difficult times, protecting them against a decrease in commitment across the transition to parenthood.

Mothers and childless men and women experienced a slight but significant decrease in commitment over the first 4 years of their marriage. Interestingly, fathers' commitment remained stable over time. This finding is consistent with findings that women's marital satisfaction declines to a greater extent than men's across the transition to parenthood (Twenge et al., 2003; Kluwer, 2010). Children can be viewed as an investment in the relationship (e.g., Rusbult et al., 1998) and terminating the relationship becomes more costly economically as well psychologically, thereby increasing *constraint commitment* (Stanley et al., 2010). In line with this, and contrary to findings on relationship satisfaction (Twenge et al., 2003), parents did not experience a stronger decrease in commitment than men and women who did not have a child during the course of this 4 year study. This could also be explained by the fact that relationship quality in general tends to decrease over time, regardless of parenthood. Average declines in relationship evaluations are evident across prior studies modeling trajectories of change (e.g., Lavner and Bradbury, 2010; Overall, 2018).

A main contribution of the current research is that we showed that changes in commitment varied as a function of parents' pre-pregnancy levels of happiness. As predicted, the level of happiness prior to pregnancy predicted changes in commitment over time among those who became parents. The commitment of happier fathers (i.e., +1 *SD* pre-pregnancy happiness) and fathers with a happier partner increased slightly in the years after childbirth, whereas the commitment of unhappier fathers (i.e., –1 *SD* pre-pregnancy happiness) and fathers with an unhappier partner decreased across the transition to parenthood. In addition, the commitment of mothers with a happier partner prior to pregnancy decreased only slightly across the transition to parenthood and showed a steeper decline for mothers with a partner with average or lower happiness. Also as hypothesized, personal happiness at the beginning of marriage was a predictor of changes over time in commitment for parents but not for men and women who remained childless. The effects of happiness therefore seem to be stronger in couples who experience a major life change than among those who remained childless.

Our results are in line with the broaden-and-build theory that positive emotions increase adaptability (Fredrickson, 2001). In addition, our findings extend the VSA model (Karney and Bradbury, 1995) that proposed that partners' vulnerabilities exacerbate the effect of stressful situations on the marital relationship, by showing that psychological resources can protect the relationship during a major relationship transition. We acknowledge that our results might only apply to the transition to parenthood, which although undeniably a time of many changes that are potentially stressful, is also experienced as a very positive event by most parents. However, it is also conceivable that successful adaptation to less positive events can lead to improvements in relationships. Relationships have for example been found to become stronger after successful adaptation to negative life events, such as cancer (Gritz et al., 1990). Further research is needed to see whether our findings generalize to less positive relationship transitions.

Additional analyses indicated that happiness was a better predictor of changes in commitment across the transition to parenthood than depressive symptoms, although this could only be compared indirectly. This is in line with the broaden-and-build theory that argues that the function of positive emotions is not the reverse equivalent of the function of negative emotions (Fredrickson, 1998). Positive emotions broaden an individuals' thought-action repertoires, thereby building their personal resources. The personal resources gained through positive emotions can last much longer than the emotional state that initially lead to the increase in positive emotions (Fredrickson, 1998). Our results are in line with this theory, showing that happiness even several years prior to pregnancy relates to changes in the quality of the relationship of parents going through the transition to parenthood, and that these effects are not reverse of the effects of pre-pregnancy depressive symptoms. A possible limitation is the low level of depressive symptoms in this sample, which might cause low correlations due to a floor effect. This probably does not fully explain the lack of impact on commitment however, as depression correlated moderate to strongly with happiness.

Surprisingly, mothers' change in commitment across the transition to parenthood was only predicted by their partner's happiness, but not by their own happiness prior to pregnancy. It is possible that happier fathers are more involved in child care. The wives of fathers who report higher paternal involvement in child care tend to be more satisfied with their relationship, leading to greater marital stability (Kalmijn, 1999). The effect of fathers' happiness on changes in mother's commitment may therefore reflect mothers' satisfaction with fathers' contribution to child care. Future research could explore paternal child care involvement as a mediator of changes in mothers' relationship quality across the transition to parenthood. In addition, future research should continue to explore and compare factors that predict how parental relationships fare across the transition to parenthood. The VSA model (Karney and Bradbury, 1995) suggests that many different factors can act as strengths or vulnerabilities for a couple, including both personal and situational characteristics. Which of these many possible factors has the greatest impact on how relationships fare across the transition to parenthood? Are personal characteristics stronger predictors of relationship quality after childbirth than situational factors? This would increase our understanding of how and when becoming parents has a negative or a positive impact on romantic relationships.

STRENGTHS AND LIMITATIONS

This research makes an important contribution to the existing literature by focusing on explaining individual variability in relationship commitment across the transition to parenthood. The majority of studies on the transition to parenthood has found a negative impact of child-birth on the marital relationship (Twenge et al., 2003). As is being increasingly argued (e.g., Kluwer, 2010; Doss and Rhoades, 2017), studies that move beyond the study of average trajectories of change and focus on identifying important predictors of individual changes, can provide greater understanding of the underlying mechanisms of change across the transition to parenthood.

We used refined methodology to increase the strength of our conclusions. Firstly, we included pre-birth measurements of the predictors and outcome variable, allowing for a more reliable baseline than measures during pregnancy when many changes may have already taken place (Lawrence et al., 2010). Secondly, our inclusion of similar married couples who did not have children allowed for a comparison of relationship changes across the transition to parenthood to changes unrelated to childbirth. Lastly, the data included measurements up to 4 years after childbirth, enabling to study the stability of the changes that occurred after childbirth.

A methodological limitation is that due to the complexity of the model (a latent growth model with two groups, with a predictor) it was not possible to use Chi-square to test and compare effects. However, in most cases this limitation had little effect in our analyses because model fit often improved when a constraint was placed, indicating that the constraint is reasonable because the model is both more parsimonious as well as having better fit. When a constraint decreased model fit, we used the CFI, TLI and RMSEA to determine whether to keep a constraint

or not. In this case, the decision was more subjective. Because of this limitation, future studies should replicate these findings with larger groups in order to make Chi-square testing possible. A replication with a larger control group is also necessary to confirm the differences we found between couples who became parents and childless couples. The differences found in this study may be due to the size of the control group being smaller than the parent group, limiting the power to find effects.

Another limitation is the relative homogeneity of our sample; all couples were married, all pregnancies were planned, and the majority of participants was highly educated. For example, the number of unmarried parents is quite high in the Netherlands (in 2015 four out of 10 Dutch children were born to unmarried women; Dutch Central Bureau of Statistics, 2016). This sample is therefore not completely representative of the Dutch population of new parents. We expect that a more diverse sample would show greater variation in changes in commitment across the transition to parenthood. This would limit ceiling effects, and could result in finding stronger effects. Perhaps because of this issue, the changes in commitment that parents experienced were relatively small, and the difference between happier and unhappier parents, although significant, were also small. Future research is needed to determine whether these differences are meaningful. For example, how do decreases in commitment develop over time beyond the fourth year of marriage? And do happier parents, whose commitment increases or remain stable, separate or divorce less often than unhappier parents who experience stronger decreases in commitment?

CONCLUSION

The results suggest that happiness prior to pregnancy may play a protective role across the transition to parenthood, by increasing the adaptability of first-time parents. Unhappier fathers, fathers with unhappier partners, and mothers with unhappier partners appeared to become more vulnerable to decreases in commitment after childbirth, while the commitment of happier fathers, fathers with a happier partner and mothers with a happier partner showed stability or even increases in commitment. Changes in commitment across the transition to parenthood were a function of pre-pregnancy happiness levels. Happiness only predicted changes in commitment for couples who became parents, but not for couples who remained childless. These findings support the idea that happiness is a resource with an adaptive function, playing a role in relationships during major life transitions. In addition, the findings showed that changes in the relationship of parents across the transition to parenthood can be predicted long in advance, even prior to pregnancy. This suggests that prenatal detection of couples in need of support is possible.

DATA AVAILABILITY STATEMENT

There is no public use file available for the data used in the present study. Requests to access the present data should be directed to martin.brunner@uni-potsdam.de.

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.

AUTHOR CONTRIBUTIONS

HT, EK, and TL developed the research question. CF designed the study and collected the data. HT conducted the analyses and wrote the first draft of the paper. EK revised the manuscript. EK, TL, and CF provided feedback and approved the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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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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The Association Between Cardiac Illness-Related Distress and Partner Support: The Moderating Role of Dyadic Coping

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Managing cardiac illness is not easy because it dramatically disrupts people's daily life and both the patient and his/her spouse are at risk for experiencing distress, which, in turn, may affect the support provided by the partner as caregiver. The partner, in fact, is the main source of support, but his/her support may sometimes be inadequate. In addition, dyadic coping (i.e., the way partners cope together against stress and support each other in times of difficulty) could likely be a moderating factor. The main aim of the present study was to examine the role that dyadic coping (DC, in terms of positive, negative, and common dyadic coping responses) plays in moderating the link between patient and partner cardiac illness-related distress (in terms of anxiety and depression) and partner support (in terms of overprotection, hostility, and partner support for patient engagement). The study included 100 married couples faced with cardiac illness who completed a self-report questionnaire. We analyzed our data in PROCESS using multiple regressions in order to assess the moderating effects of DC responses in the relationship between the couple's cardiac illness-related distress and partner support. With regard to patient distress, results showed that higher levels of patient anxiety and depression were linked with ineffective partner support (i.e., overprotection and hostility). With regard to partner distress, higher levels of partner depression were linked with hostility; higher levels of partner depression and anxiety were associated with less partner support for patient engagement. Moreover, the association between distress and partner support was moderated by the quality of DC. In particular, low positive DC represented a risk factor for both the patient and the partner during a cardiac illness, as low positive DC exacerbated the link between patient and partner distress and less effective partner support styles. Also, higher levels of negative DC were risky for couples: The association between distress and less adequate partner supportive behaviors was stronger in the case of higher negative DC. These results imply a need for psychosocial interventions for couples in cardiac illness, especially for couples lacking relational competences, such as positive dyadic coping.

Keywords: couple distress, dyadic coping, patient engagement, cardiac illness, partner support

INTRODUCTION

Cardiac illness is a stressful situation because it disrupts daily life and demands many lifestyle changes (e.g., diet, physical activity, smoking and alcohol consumption, medical check-ups, prescription drug compliance, etc.). Evidence supports the view that cardiac patients suffer from stress in managing their clinical condition (Jackson et al., 2018). Still, illness management does not happen in isolation, and successfully coping with a cardiac disease significantly depends on the individual's perceived social support, particularly that of the partner (Donato et al., 2009; Iafrate et al., 2009; Rapelli et al., 2020c). The partner usually provides emotional and practical support to the cardiac patient by constantly monitoring the patient's medication adherence, making appointments, accompanying the partner to the regular medical visits, and detecting signs of cardiac symptoms. The partner, moreover, is the main person responsible for the patient's low-salt diet, takes charge of the tasks that previously were done with or by the patient, and contributes actively to making decisions on health care (Tulloch et al., 2015). According to Bertoni et al. (2015), when the partner is able to provide adequate support (i.e., balancing emotional and practical support, involving the patient in discussions, not substituting for the patient, but reinforcing the patient's autonomous capacities), the patient is more engaged in his/her treatment with benefits in terms of psychological well-being (see, for a review, Bertoni et al., 2017), disease management, and quality of life (Greene et al., 2015; Shortell et al., 2017). The cardiac event has significant implications for both the patient and his/her partner after the diagnosis and during the recovery. In fact, following a cardiac event, both the patient and his/her spouse are at risk of experiencing distress and face a number of challenges, including the fear surrounding the patient's health and illness progression, the novelty and unpredictability of the cardiac event, disruption of goals, caregiving demands, and decreased perceived control over the patient's illness (Leigh et al., 2014). The support provided by the partner, however, may often be inadequate because of his/her burden and because the caregiver may not know how to effectively support the patient (Dekel et al., 2014; Bertoni et al., 2015; George-Levi et al., 2017). The literature on cardiac patients has actually highlighted that the caregiver may implement overprotective or hostile support styles, both of which are associated with worse patient health outcomes. In particular, an overprotective partner underestimates the patient's capabilities, resulting in unnecessary help, excessive praise for accomplishments, or attempts to restrict activities, thereby resulting in worse outcomes for the patient (Bertoni et al., 2020), such as decreased quality of life and self-efficacy (Joeke et al., 2007; Ziv et al., 2017). Instead, partners' hostile behaviors are not just unskillful, but openly unsupportive and characterized by criticism, coldness, and blame (Fiske et al., 1991). Hostility is associated with decreased patient engagement in his/her care (Rapelli et al., 2020a), increased psychological distress, and higher risk of relapses (Fiske et al., 1991). Evidence exists for the partner's (un)supportive behaviors to be associated with (low) patient well-being and (low) self-efficacy, but whether and how patients' and partners' distress is associated with specific types of support has

not yet been clarified. In addition, research is needed on factors that can reduce or exacerbate the negative interplay between the patients' and partners' cardiac illness-related distress and the partner's unsupportive behaviors.

Recent studies of stress and coping that account for the importance of social relationships in the coping process have increasingly emphasized a dyadic perspective on illness management (Bertoni et al., 2015; Donato and Bertoni, 2018; Rentscher, 2019). In couples, mutual coping processes with external stressors, such as an illness, are covered by Bodenmann's concept of dyadic coping (1997; 2005), that is, the process through which partners cope together, as a couple, with daily stressors. In fact, when one partner's individual resources are insufficient for coping with a stressor, he/she may share the stressful situation with the partner, who then interprets the stress signals and responds to the shared information with a behavioral response that can be either positive or negative (Bodenmann, 2005). Bodenmann (2005) distinguished three forms of dyadic coping: Positive dyadic coping, which refers to one partner's attempts to assist the other's coping efforts, including delegated dyadic coping (one partner asks the other to take over certain tasks and duties in an effort to reduce his or her stress experienced in the situation); negative dyadic coping that is composed of superficial, ambivalent, or hostile reactions to the partner's stress; and common dyadic coping, in which both partners participate in the coping process, more or less symmetrically (e.g., through shared problem solving or mutual encouragement). Abundant research has found that positive and common dyadic coping are associated with lower levels of stress and higher levels of couple satisfaction, while the opposite was found for negative dyadic coping (Hilpert et al., 2016; Parise et al., 2019). Good dyadic coping competences, therefore, should protect the partner against the negative effects of (one's own and the patient's) distress on his/her support behaviors, in at least three ways. First, couples showing good dyadic coping skills should be able to better cope with the stress caused by the illness and, therefore, should be less affected by its negative impact. Second, dyadic coping is generally associated with better relationship quality as it is an indicator of how much the partners jointly commit to each other's relationship satisfaction, quality of life, and mutual well-being (Bertoni et al., 2018). Therefore, partners with a better relationship quality and higher relationship satisfaction should present more benevolent interpretations of the patient's distress and negative behaviors and rely less than dissatisfied partners do on self-defensive reactions (Bradbury and Fincham, 1990). Finally, partners with good dyadic coping skills are especially able to appraise the illness as a couple, rather than individual, problem (Falconier and Kuhn, 2019); consequently, they are more prone to respond with positive behaviors to cope with an illness that is *not only "yours," but also "ours."* No studies, however, have examined the potential moderating effects of dyadic coping in the link between (patient's and partner's) cardiac illness-related distress and the quality of partner support in the context of cardiac illness.

Given the serious stress experienced by both patients and partners when facing cardiac illness, the crucial role played by the quality of partner support for the patient's physical and

psychological outcomes, and the potential for dyadic coping to function as a protective factor in this context, the main aim of the present study was to examine the role that dyadic coping plays in moderating the relation between patient's and partner's cardiac illness-related distress and partner support in 100 married couples faced with cardiac illness. This is the first study, to our knowledge, to analyze the above associations and to do so within a dyadic framework, which may help gain a deeper understanding of the role of the quality of interpersonal relationships in shaping cardiac disease management processes. In particular, positive, negative, and common dyadic coping were examined as moderators of the links between patient's and partner's distress (in terms of anxiety and depression) and the quality of partner support (Figure 1). In addition, the quality of partner support was assessed in terms of three (un)supportive behaviors already investigated in the cardiac population: Hostility (openly unsupportive behaviors; Coyne and Smith, 1994; Rapelli et al., 2020a), overprotection (well-intended, but unskillful support; Vilchinsky et al., 2010), and support for patient engagement (positive and skillful form of partner support aimed at increasing the patient's autonomous skills in treatment; Bertoni et al., 2015).

In light of the literature reviewed above, we tested the following hypotheses:

Hypothesis 1: Patient cardiac illness-related distress (Hp1a) and partner cardiac illness-related distress (Hp1b) will be positively associated with partner hostility and partner overprotection and negatively associated with partner support for patient engagement;

Hypothesis 2: These associations will be stronger for patients (Hp2a) and partners (Hp2b) who perceive themselves and/or their partners to display low positive dyadic coping, high negative dyadic coping, and low common dyadic coping.

MATERIALS AND METHODS

Participants and Procedure

One hundred and fifty patients were originally recruited within a larger research project on cardiovascular patients' well-being: One hundred thirty-three of them were in a committed couple relationship. Only couples in which both patients and partners completed the questionnaire were selected for the current study, which resulted in a final sample composed of 100 heterosexual couples.

The socio-demographic characteristics of the sample are shown in Table 1. Patients ($N = 100$; 83% male) ranged in age from 34 to 85 years ($M = 62.97$, $SD = 11.25$); partners ($N = 100$; 83% female) were slightly younger on average, ranging in age from 31 to 87 years ($M = 59.85$; $SD = 11.36$). The couples were married or in a committed relationship for 3 to 60 years ($M = 36.99$; $SD = 13.45$). The main diseases for which patients were hospitalized were ischemic heart disease including angina pectoris and acute coronary syndrome

(ST-segment elevation myocardial infarction–STEMI; non-ST-segment elevation myocardial infarction–NSTEMI) (75%), and acute heart failure (25%).

Participants were contacted and interviewed during the patient's hospitalization for an acute cardiac event. A set of two questionnaires (one for the patient and one for the partner) was administered 2 days before discharge. Signed informed consent was obtained from all participants. Criteria for study inclusion were as follows: (1) Admission for acute cardiac illness (e.g., Ischemic heart diseases like myocardial infarction and acute coronary syndrome); (2) no mental disability, assessed with a short version of the Mini Mental State Examination (MMSE); and (3) ability to understand Italian and complete the questionnaire autonomously. The Psychology Research Ethic Committee of the Institution approved the study (cod. 37-18).

Measures

The description of measures and internal consistency reliability coefficients (Cronbach's alpha) for patients and partners are shown in Table 2.

Cardiac Illness-Related Distress

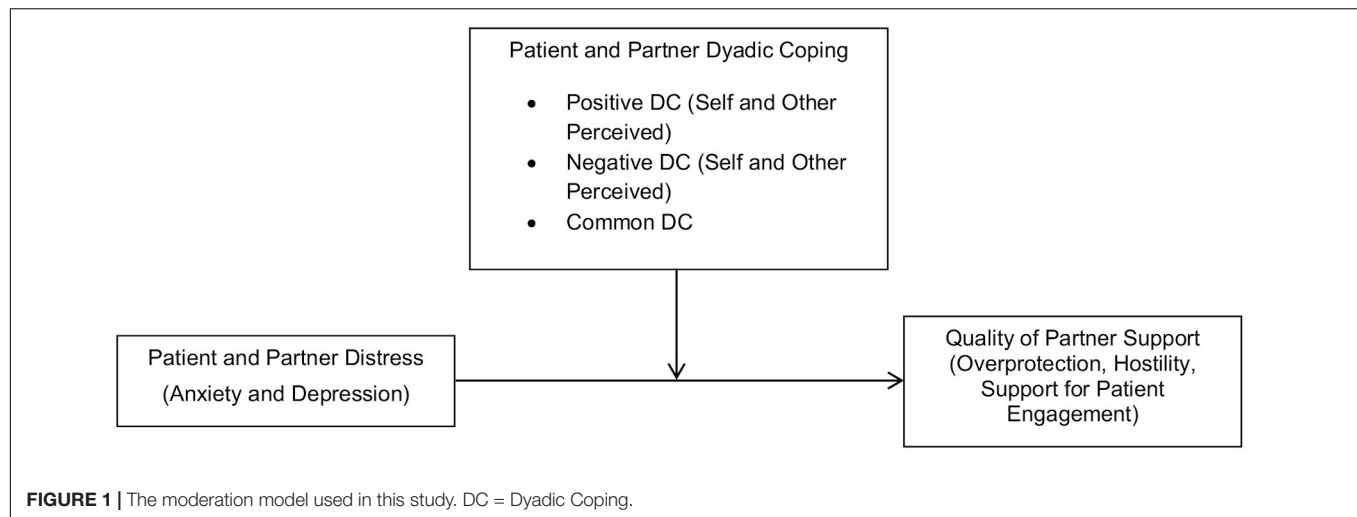
Cardiac illness-related distress of both the patient and the partner was measured by a 25-item version of the Hopkins Symptom Checklist (HSCL-25; Mattsson et al., 1969). The scale consisted of 25 items measuring symptoms of anxiety, depression, and somatization. Both patients and partners were asked to rate the symptoms they experienced during the past week as ranging from 1 = *never* to 4 = *often* [e.g., Item # 1 for anxiety: (*In the past week, to what extent did you worry or stress for this symptom...*) "Suddenly scared for no reason."; Item # 25 for depression: (*In the past week, to what extent did you worry or stress for this symptom...*) "Difficulty in falling asleep and in sleeping?"]. The total score of the subscales (anxiety and depression) are computed by averaging the items: Higher scores indicated more psychological distress. The cut-off clinical score was set at 1.70, according to the validation study (Mattsson et al., 1969).

Partner Hostility

The partner's hostile attitude toward the patient was measured by the Spouse Hostility Scale from the Michigan Family Heart Questionnaire (Fiske et al., 1991). It consisted of five items which were included in the questionnaire filled in by the partner (e.g., Item # 5: "My spouse doesn't try hard enough to help himself/herself."). All responses were coded on a 5-point Likert-type scale ranging from 1 = *never* to 5 = *very often*. The total score of the scale was computed by averaging the five items: A higher score indicated a higher level of hostility.

Partner Overprotection

The partner unrequired protection and interference with the patient's behaviors and decisions was measured by the Spouse Overprotection Scale from the Michigan Family Heart Questionnaire (Fiske et al., 1991). It consisted of four items which were included in the questionnaire filled in by the partner (e.g., Item # 4: "I find myself stepping in and doing things that my spouse can do for himself."). All responses were coded on a 5-point



Likert-type scale ranging from 1 = *never* to 5 = *very often*. The total score of the scale was computed by averaging the five items: A higher score indicated a higher level of overprotection.

Partner Support for Patient Engagement

The partner's supportive behaviors aimed at promoting the patient's active engagement into his/her treatment was measured with 11 *hoc* items on a 5-point Likert-type scale ranging from 1 = *strongly disagree* to 5 = *strongly agree* (e.g., Item # 11: "I help my partner to recognize when he/she needs medical care and when he/she can manage the problem on his/her own."). The total score was created by averaging the items after reverse coding negatively keyed items: A higher score indicated a higher level of support for patient activation by the partner.

Patient and Partner Dyadic Coping

Dyadic coping of both the patient and the partner was measured with the Italian version of the Dyadic Coping Inventory (Fragebogen zur Erfassung des Dyadischen Copings als Tendenz FDCT-N; Bodenmann, 1997; Donato et al., 2009). This 41-item questionnaire measures the propensity of each partner to offer help, emotional support, and empathy in response to the other's expression of stress together with the couple's joint attempts to cope with common stressors. The scale considers the three forms of dyadic coping: Positive (e.g., "My partner is on my side and

tells me that he/she knows how it feels to be stressed and that he/she cares about me."), negative (e.g., "My partner helps me, but does so unwillingly and unmotivated."), and common (e.g., "We try to cope with the problem together and search for practical solutions."). For positive and negative dyadic coping, we considered both self-perceptions (from now on "dyadic coping self-perceived") (e.g., "When my partner is stressed, I communicate my understanding to him/her.") and the perceptions of the other (from now on "dyadic coping other-perceived") (e.g., "When I'm stressed, my partner gives me the feeling that he/she understands me."). The items were administered on a 5-point Likert-type scale from 1 = *never* to 5 = *very often*.

Statistical Analyses

Descriptive statistics were obtained from the sample in terms of socio-demographic data. Pearson's correlations were used to calculate the relationship between study variables. In order to test for differences between patients and partners on study variables, paired sample *t*-tests were calculated.

To examine the moderating effects of partners' dyadic coping responses (moderators) in the link between patients' and spouses' distress (independent variables) and their partners' support (dependent variable), we used PROCESS, a freely available computational tool for SPSS and SAS developed by Hayes (2017). To examine moderation effects in this study, we performed the analyses corresponding to PROCESS Model 1. A moderated model was tested in which patient and partner distress in terms of anxiety and depression were hypothesized to be associated with the quality of partner support in terms of overprotection, hostility, and support for patient engagement, as well as the moderating role of dyadic coping responses (positive, negative, and common) in these associations. Prior to model analyses, all predictors and moderators were mean-centered to reduce collinearity between the interaction term and its constituents (Aiken et al., 1991). Regression analyses were conducted in which coefficients were bootstrapped using 5,000 bootstrap samples. The coefficients were tested for statistical significance by means

TABLE 1 | Socio-demographic characteristics of couples (*N* = 100).

| Variable | Patients | | | Partners | | |
|-------------------------------|----------|-----------|-------|----------|-----------|-------|
| | <i>M</i> | <i>SD</i> | Range | <i>M</i> | <i>SD</i> | Range |
| Age | 59.85 | 11.36 | 31–87 | 60.50 | 11.30 | 31–87 |
| Years of Education | 14.1 | 2.9 | 5–20 | 14.0 | 2.9 | 5–20 |
| Relationship Duration (years) | 36.99 | 13.45 | 3–60 | 36.99 | 13.45 | 3–60 |
| Presence of Children (%) | 88.6 | | | | | |
| First Marriage (%) | 92.6 | | | 89.4 | | |
| Male (%) | 83 | | | 17 | | |
| Employed (%) | 51.0 | | | 52.3 | | |

TABLE 2 | Measures and alpha's coefficients.

| Patient | | Partner |
|-----------------------------------|--|-----------------------------------|
| α | Construct and scale's characteristics | α |
| Individual Functioning | | |
| Anxiety Self-Perceived: 0.81 | Cardiac Illness-Related Distress Hopkins Symptom Checklist-25 (HSCL-25) (Mattsson et al., 1969) Clinical cutoff score for Anxiety and Depression = 1.70 Range = 1–4 | Anxiety Self-Perceived: 0.83 |
| Depression Self-Perceived: 0.82 | | Depression Self-Perceived: 0.87 |
| Relational Functioning | | |
| N/A | Partner Overprotection Michigan Family Heart Questionnaire (Fiske et al., 1991) Range = 1–5 | Self-Perceived: 0.69 |
| N/A | Partner Hostility Michigan Family Heart Questionnaire (Fiske et al., 1991) Range = 1–5 | Self-Perceived: 0.66 |
| N/A | Partner Support for Patient Engagement (<i>ad hoc</i>) Range = 1–5 | Self-Perceived: 0.63 |
| Positive DC Self-Perceived: 0.89 | Dyadic Coping (DC) (Dyadic Coping Inventory; DCI) (Bodenmann, 1997) Range = 1–5 | Positive DC Self-Perceived: 0.77 |
| Positive DC Other-Perceived: 0.72 | | Positive DC Other-Perceived: 0.89 |
| Negative DC Self-Perceived: 0.58 | | Negative DC Self-Perceived: 0.69 |
| Negative DC Other-Perceived: 0.83 | | Negative DC Other-Perceived: 0.57 |
| Common DC Self-Perceived: 0.75 | | Common DC Self-Perceived: 0.86 |

of the percentile confidence intervals, and a significant effect is said to occur if the 95% confidence interval excluded 0.

RESULTS

Descriptive Statistics

Table 3 shows the means and correlations for the selected psychological variables. Anxiety was high and above the clinical cut-off score (1.70) for both patients ($M = 1.72$; $SD = 0.56$) and their partners ($M = 1.83$; $SD = 0.58$); depression was lower than the clinical cut-off score (1.70) (Patients: $M = 1.66$; $SD = 0.51$; Partners: $M = 1.69$; $SD = 0.56$). Of the three support styles, hostility and overprotection were moderate compared to the scale range (Hostility: $M = 2.14$; $SD = 0.75$; Overprotection: $M = 2.85$; $SD = 0.86$), partner support for patient engagement was high ($M = 3.79$; $SD = 0.66$) compared to the scale range. Positive dyadic coping self-perceived (Patients: $M = 3.67$; $SD = 0.68$; Partners: $M = 3.69$; $SD = 0.63$) and other-perceived (Patients: $M = 3.88$; $SD = 0.79$; Partners: $M = 3.37$; $SD = 0.88$) were high. Furthermore, partners reported receiving significantly less positive dyadic coping responses from the other than patients did [$t(95) = 4.12$; $p = 0.008$]. Negative dyadic coping self-perceived (Patients: $M = 1.83$; $SD = 0.82$; Partners: $M = 1.96$; $SD = 0.95$) and other-perceived (Patients: $M = 1.88$; $SD = 0.69$; Partners: $M = 1.95$; $SD = 0.69$) were low. Common dyadic coping was high (Patients: $M = 3.47$; $SD = 0.76$; Partners: $M = 3.40$; $SD = 0.89$).

Table 3 also shows the correlation analysis among study variables. For patients, anxiety and depression were negatively correlated with partner support for patient engagement and hostility showed a weak positive association with depression. The associations between the support styles and dyadic coping were low to moderate in size.

For partners, anxiety was weakly and positively correlated with overprotection and hostility; depression was weakly and positively correlated with hostility and weakly and negatively correlated with partner support for patient engagement. The associations between the support styles and dyadic coping were low to moderate.

Testing Moderating Effects

To test whether dyadic coping (i.e., self and other-perceived positive dyadic coping, self and other-perceived negative dyadic coping, and common dyadic coping) moderated the association between the patient's and the partner's cardiac illness-related distress and the partner's support quality (i.e., overprotection, hostility, and partner support for patient engagement), we conducted several hierarchical regression analyses. To test whether these effects varied significantly across the levels of the moderators, the differences in the effects for high and low levels of the moderator were computed and tested for significance by determining the bootstrapped confidence limits of the difference. As suggested by Aiken et al. (1991), low and high levels of the moderators were defined as minus one standard deviation and plus one standard deviation of the moderators, respectively. The results for patients and for partners were presented separately. We reported only significant interaction effects.

Results for Patients' Distress (Hp1a and Hp2a)

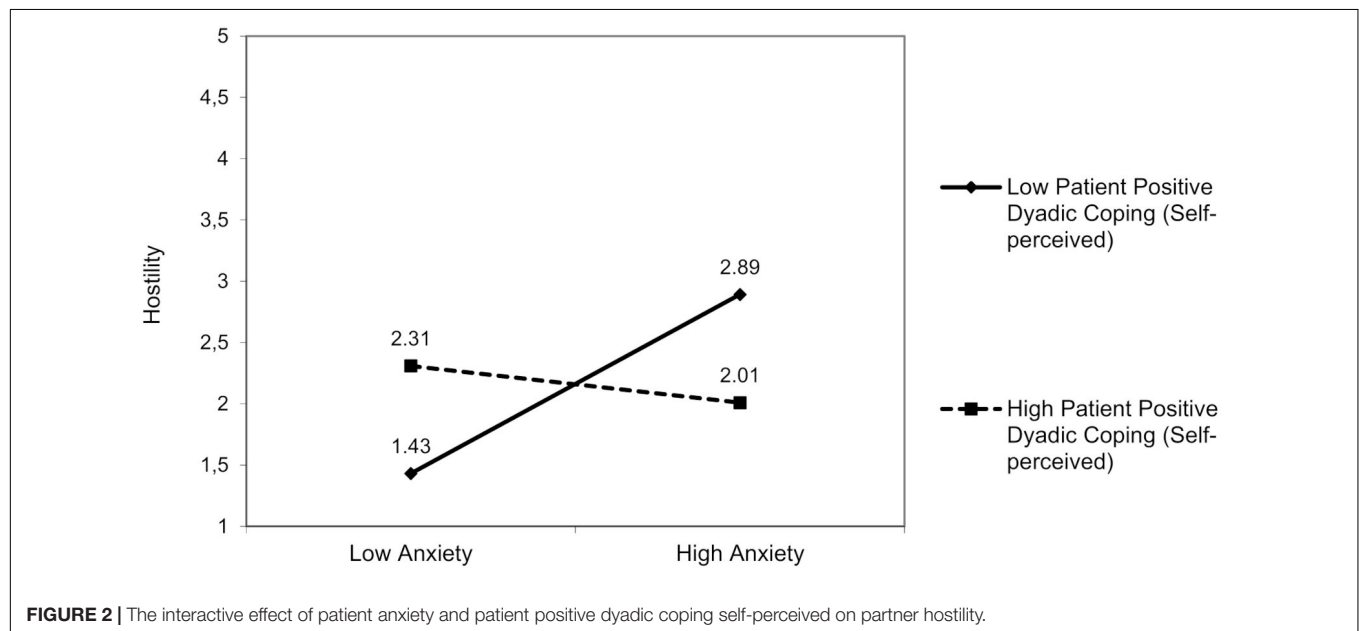
Partner Hostility

A significant interaction effect between patient anxiety and patient positive dyadic coping (self-perceived) was found on partner hostility [$F(3,92) = 2.81$, $p = 0.04$]: Patient positive dyadic coping (self-perceived) moderated the effect of patient anxiety $\beta = -0.22$; 95% bootstrap CI (-0.42 , -0.02)] on partner hostility (Figure 2). Patient anxiety was positively associated with partner

TABLE 3 | Means and intercorrelations among study variables.

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1. Anxiety | – | 0.71** | 0.14 | 0.16 | –0.19* | –0.03 | –0.07 | –0.01 | 0.03 | –0.01 |
| 2. Depression | 0.72** | – | 0.08 | 0.28** | –0.20* | –0.02 | –0.06 | 0.08 | 0.13 | 0.04 |
| 3. Partner Overprotection | 0.24** | 0.14 | – | 0.42** | –0.01 | 0.02 | 0.28** | 0.01 | –0.16 | 0.12 |
| 4. Partner Hostility | 0.28** | 0.21* | 0.42** | – | –0.23* | –0.03 | –0.02 | 0.23* | 0.19 | 0.02 |
| 5. Partner Support to Patient Engagement | 0.06 | –0.19* | –0.01 | –0.23* | – | 0.42** | 0.40** | –0.47** | –0.49** | 0.33** |
| 6. Positive DC (self-perceived) | –0.01 | –0.01 | 0.31* | –0.15 | 0.25* | – | 0.46** | –0.20* | –0.23* | 0.60** |
| 7. Positive DC (other-perceived) | –0.01 | 0.04 | –0.01 | –0.30** | 0.18 | 0.34** | – | –0.26** | –0.34** | 0.59** |
| 8. Negative DC (self-perceived) | 0.14 | 0.11 | –0.02 | 0.43** | –0.29** | –0.10 | –0.11 | – | –0.53** | –0.32** |
| 9. Negative DC (other-perceived) | 0.23* | 0.08 | –0.08 | 0.36** | –0.25* | –0.19 | –0.03 | 0.51** | – | –0.31 |
| 10. Common DC | 0.12 | 0.11 | 0.04 | –0.21* | 0.11 | 0.50** | 0.45** | –0.01 | –0.13 | – |
| Patients M (SD) | 1.72 (0.56) | 1.66 (0.51) | N/A | N/A | N/A | 3.67 (0.68) | 3.88 (0.79) | 1.83 (0.82) | 1.88 (0.69) | 3.47 (0.76) |
| Partners M (SD) | 1.83 (0.58) | 1.69 (0.56) | 2.85 (0.86) | 2.14 (0.75) | 3.79 (0.66) | 3.69 (0.63) | 3.37 (0.88) | 1.96 (0.95) | 1.95 (0.69) | 3.40 (0.89) |
| <i>t</i> | –0.51 | –0.47 | N/A | N/A | N/A | 0.72 | 4.12** | –1.03 | –0.76 | 0.99 |

N = 100. Means and standard deviations of study variables for patients and partners are reported separately. Correlations for patients are above the diagonal; correlations for partners are below the diagonal. DC = Dyadic Coping **p* < 0.05; ***p* < 0.01.

**FIGURE 2 |** The interactive effect of patient anxiety and patient positive dyadic coping self-perceived on partner hostility.

hostility only when patients reported low positive dyadic coping, $\Delta R^2 = 0.05$, $\Delta F(1,92) = 2.16$, $p = 0.04$. For patient anxiety, we did not find any other moderating effects of dyadic coping.

For patient depression, a significant interaction effect, resulting from patient depression and patient positive dyadic coping (both self and other-perceived), was found on partner hostility. The first model was significant [$F(3,94) = 5.32$, $p = 0.01$]: Patient positive dyadic coping (self-perceived) moderated the effect of depression [$\beta = -0.25$; 95% bootstrap CI (–0.42, –0.08)] on partner hostility (Figure 3), $\Delta R^2 = 0.08$, $\Delta F(1,94) = 3.05$, $p = 0.01$. In addition, in the second model [$F(3,93) = 3.74$, $p = 0.01$], patient positive dyadic coping (other perceived) moderated the effect of depression [$\beta = -0.18$; 95% bootstrap CI (–0.01, –0.37)] on partner hostility (Figure 4), $\Delta R^2 = 0.03$, $\Delta F(1,94) = 3.05$, $p = 0.01$. The patient depression was positively associated with partner hostility only when patients reported

engaging in low positive dyadic coping and perceived their partner as adopting low positive dyadic coping.

Partner Overprotection

No interactions involved patient anxiety. A significant interaction effect was found for patient depression and patient positive dyadic coping (other-perceived) on overprotection [$F(3,94) = 4.96$, $p = 0.01$]. The patient's depression was negatively associated with overprotection, but only in those patients who perceived that their partners had adopted low positive dyadic coping [$\beta = -0.15$; 95% bootstrap CI (–0.31, –0.02); Figure 5], $\Delta R^2 = 0.04$, $\Delta F(1,94) = 0.66$, $p = 0.04$. Furthermore, we found an interaction between patient depression and partner-reported positive dyadic coping (self-perceived) on overprotection [$F(3,93) = 5.15$, $p = 0.01$]. The patient's depression was negatively associated with overprotection, but only in patients whose

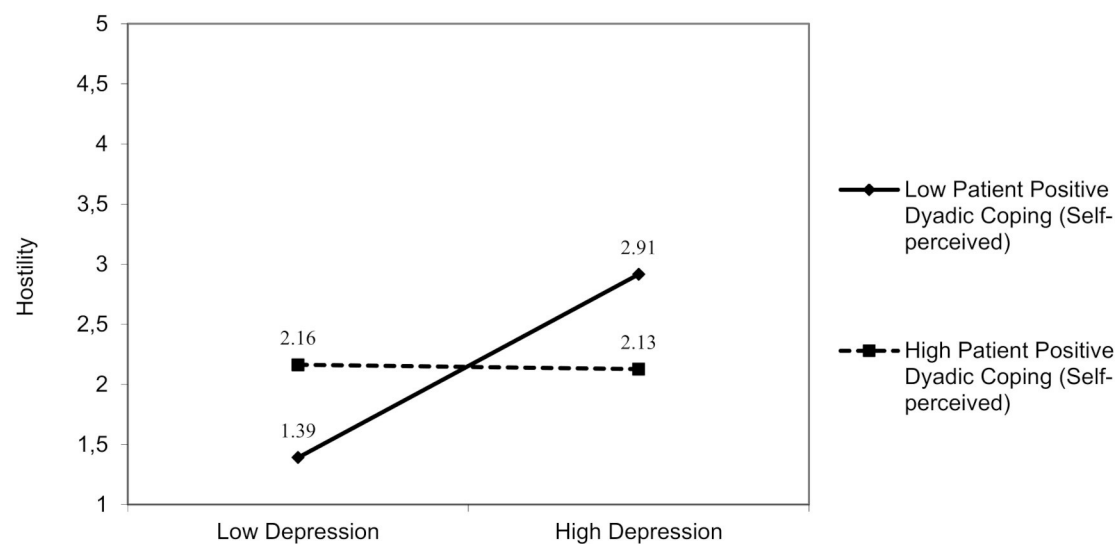


FIGURE 3 | The interactive effect of patient depression and patient positive dyadic coping self-perceived on partner hostility.

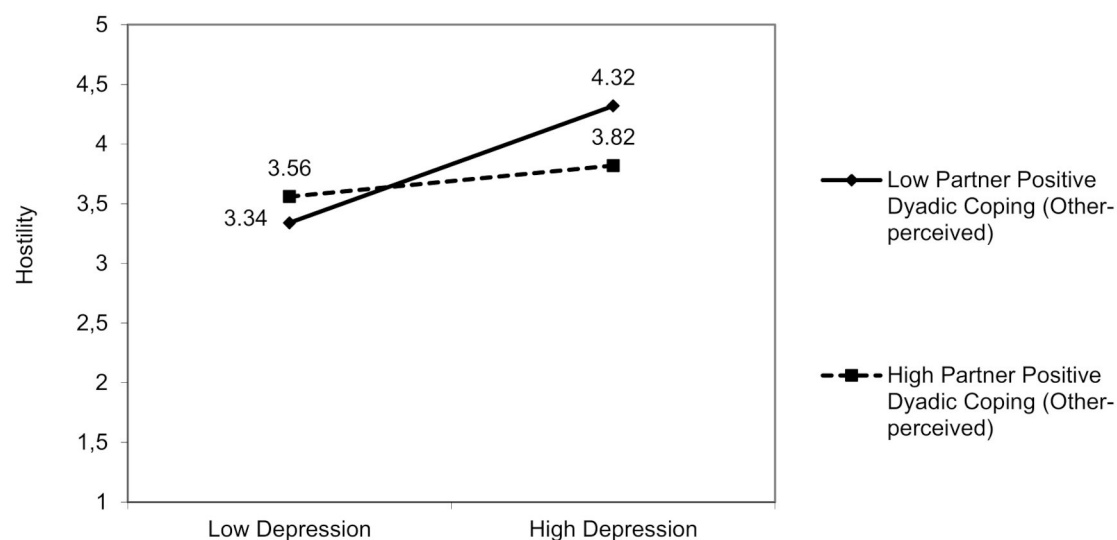


FIGURE 4 | The interactive effect of patient depression and patient positive dyadic coping other-perceived on partner hostility.

partners reported low positive dyadic coping [$\beta = -0.15$; 95% bootstrap CI $(-0.30, -0.01)$; **Figure 6**], $\Delta R^2 = 0.04$, $\Delta F(1,94) = 1.37$, $p = 0.04$.

Partner Support for Patient Engagement

For partner support for patient engagement, we did not find any moderating effects of dyadic coping.

Results for Partners' Distress (Hp1b and Hp2b)

Partner Hostility

No interactions involved partner anxiety. For partner depression, a significant interaction effect was found resulting from partner depression and partner positive dyadic coping (other-perceived) on hostility [$F(3,94) = 6.72$, $p = 0.01$]. The partner's depression

was positively associated with hostility, but only in those partners who perceived that the patient adopted low positive dyadic coping [$\beta = -0.18$; 95% bootstrap CI $(-0.36, -0.01)$; **Figure 7**], $\Delta R^2 = 0.04$, $\Delta F(1,94) = 1.24$, $p = 0.03$.

Partner Overprotection

For partner overprotection, we did not find any other moderating effects of dyadic coping.

Partner Support for Patient Engagement

There was a significant interaction effect resulting from partner anxiety and partner positive dyadic coping (self-perceived) on partner support for patient engagement [$F(3,92) = 5.47$, $p = 0.01$]: Partners' positive dyadic coping (self-perceived) moderated the

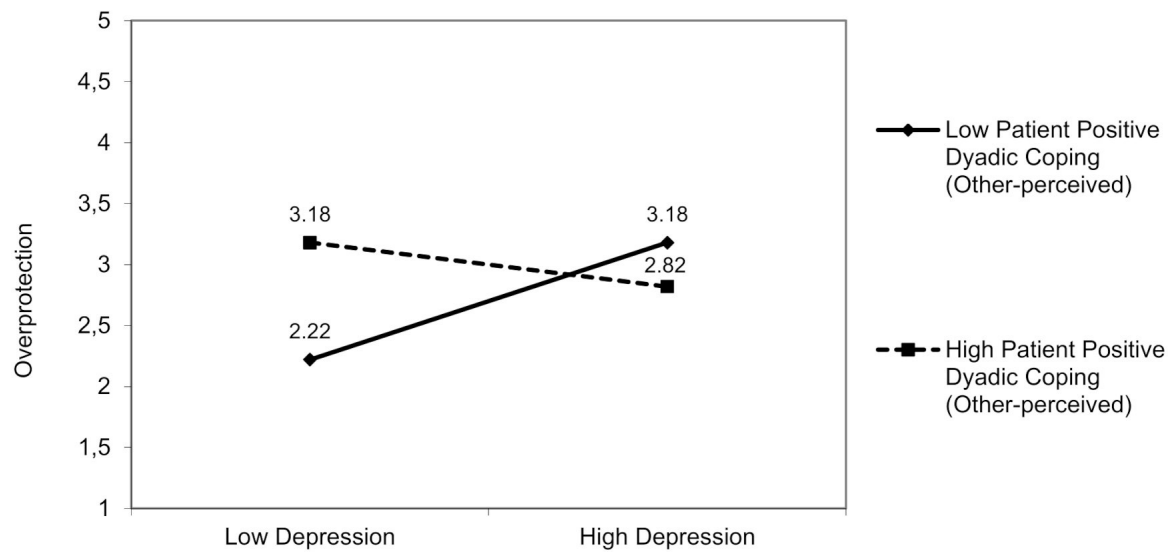


FIGURE 5 | The interactive effect of patient depression and patient positive dyadic coping other-perceived on partner overprotection.

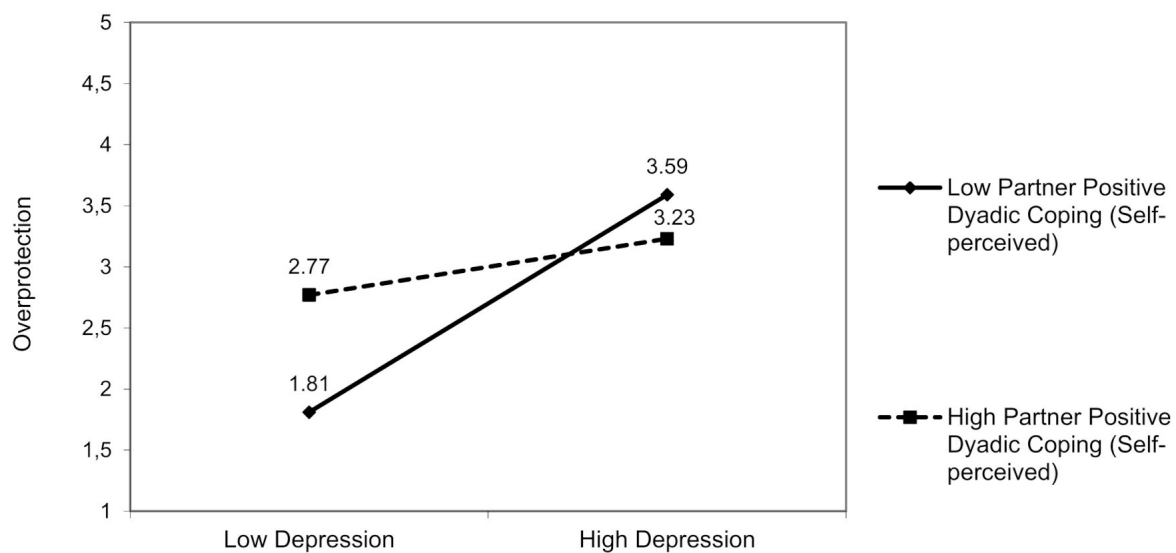


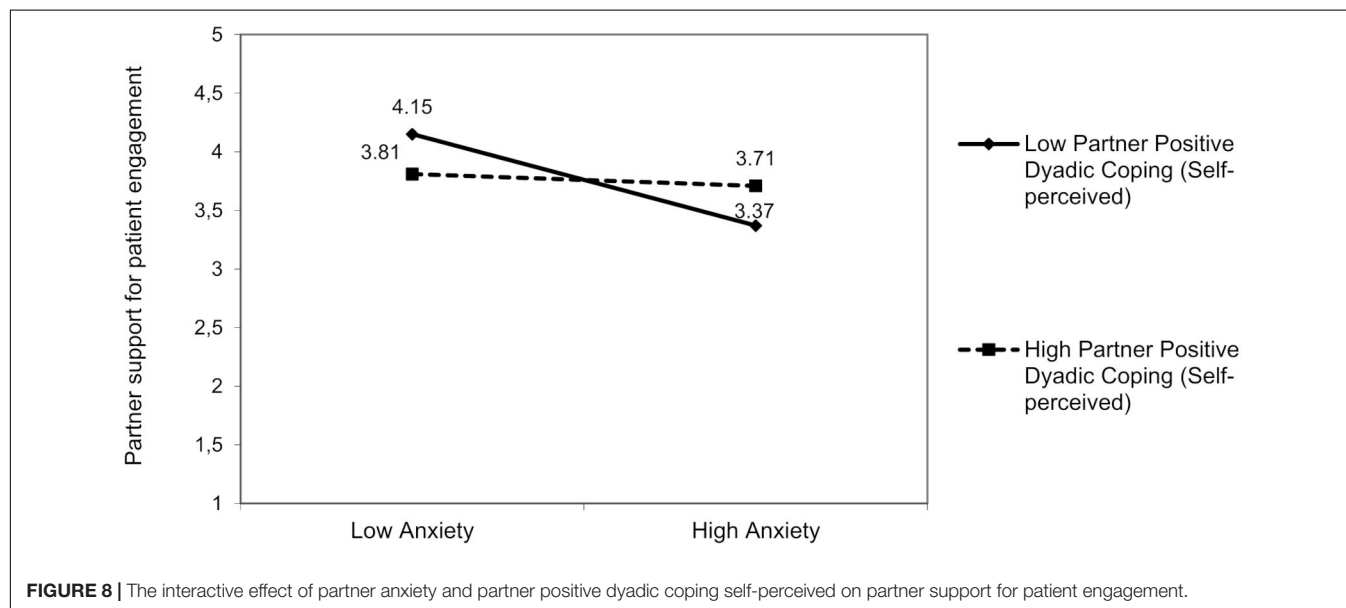
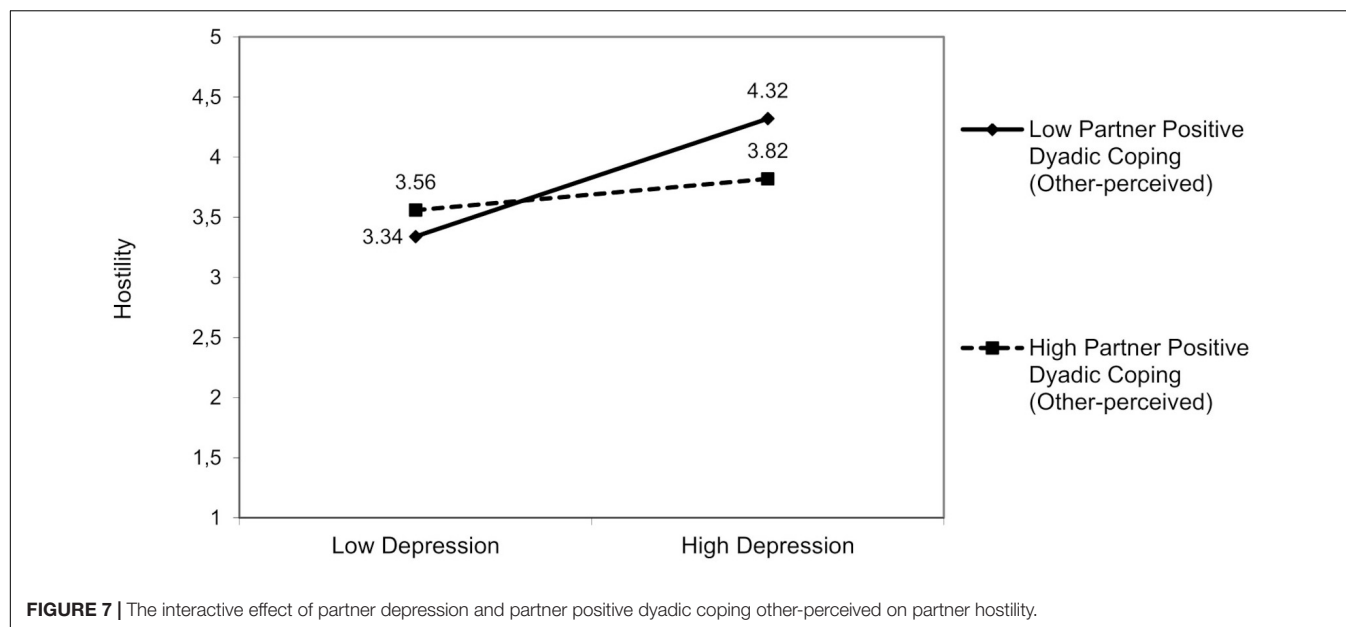
FIGURE 6 | The interactive effect of patient depression and partner positive dyadic coping self-perceived on partner overprotection.

effect of their anxiety [$\beta = -0.17$; 95% bootstrap CI ($-0.36, -0.01$)] on partner support for patient engagement (**Figure 8**). The partner anxiety was negatively associated with partner support for patient engagement, but only in partners who reported low positive dyadic coping, $\Delta R^2 = 0.04$, $\Delta F(1,94) = 1.28$, $p = 0.04$. For partner anxiety, we did not find any other moderating effects of dyadic coping. Furthermore, also patient-reported negative dyadic coping (other-perceived) moderated the link between partner depression and partner support for patient engagement [$F(3,93) = 5.36$, $p = 0.01$]. The partner's depression was negatively associated with partner support for patient engagement, but only when patients reported that their partners adopted negative dyadic coping relatively often [$\beta = -0.17$;

95% bootstrap CI ($-0.37, -0.01$); **Figure 9**], $\Delta R^2 = 0.03$, $\Delta F(1,93) = 1.33$, $p = 0.04$.

DISCUSSION

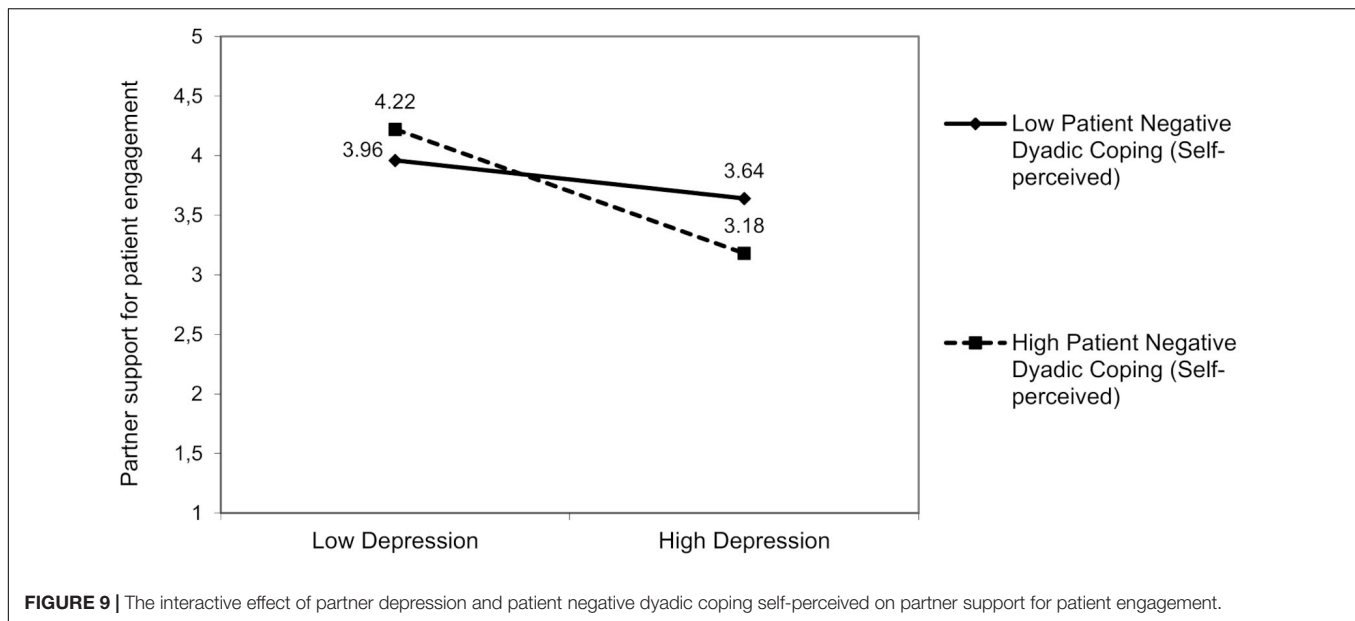
The present study examined whether the couple's cardiac illness-related distress, measured separately for patients and their partners in terms of anxiety and depression, was associated with three types of partner support (overprotection, hostility, and support for patient engagement) and whether dyadic coping skills moderated this association. Although dyadic coping is highly predictive of relationship quality and stability



(e.g., Donato et al., 2014, 2015; Falconier et al., 2015), which are factors considered as protective both for the cardiac patient in terms of survival (Coyne et al., 2001; Rohrbaugh et al., 2002) and for the caregiver's psychological well-being (Dekel et al., 2014), no studies to date have considered dyadic coping as a moderator of the link between patient and partner distress and partner support.

Our hypotheses were that patient's and partner's cardiac illness-related distress would be associated with the quality of partner support. In fact, partner support may sometimes be detrimental and ineffective in the presence of patient and/or partner cardiac illness-related distress (George-Levi et al., 2016). Indeed, on the one hand, the partners are not experts in providing the care and may suddenly find themselves supporting the sick partner without knowing what to do, which could

be difficult for them especially if the patient is anxious or depressed. The patient's emotional distress could consequently aggravate the caregiver's burden and cause inadequate support (Rapelli et al., 2020b). On the other hand, anxious or depressed partners may struggle to provide adequate support, because they themselves are challenged by the stress of the disease. This underlines that partner distress could have a negative impact on the quality of support provided and consequently on patient outcomes, as assumed by the literature (e.g., Franks et al., 2006; Bertoni et al., 2015; Rapelli et al., 2020a). Our results are in line with this scenario. In fact, higher levels of patient anxiety and depression were associated with higher ineffective partner support such as overprotection and hostility; higher levels of partner depression were linked with higher hostility, and higher



levels of partner depression and anxiety were associated with less support for patient engagement. In addition, because our results found more significant patterns for patient cardiac illness-related distress than for partner cardiac illness-related distress, we could say that patient's cardiac illness-related distress is more associated with unsupportive partner behaviors than partner's psychological state. Moreover, we hypothesized that dyadic coping could work as a protective factor in the link between patients' and partners' distress and partner support. A distinction was made between positive, negative, and common dyadic coping (Bodenmann, 1997, 2005). In a recent review, Falconier and Kuhn (2019) documented that all positive dyadic coping strategies, including common dyadic coping, were significant positive predictors of individual outcomes and relationship satisfaction for both patients and partners, whereas all negative dyadic coping strategies were significant negative predictors. In particular, we expected positive and common dyadic coping to alleviate the effects of patients and partners' distress on partner support, but negative dyadic coping to exacerbate it.

Results showed different interactive effects from dyadic coping, in particular, positive and negative forms of dyadic coping were significant moderators of the relationship between patient and partner cardiac illness-related distress and partner support. Our results suggest at least three reflections on the role of dyadic coping as a protective factor during an illness.

First, to better face the challenge of heart disease and stress, both the patient and the partner should show each other good dyadic skills, because the sharing of difficulties and the perception of the marital relationship as supportive and useful (Rusu et al., 2020) may increase the feeling of trust, intimacy, and reciprocity and decrease the negative impact of both partners' stress on each other (Falconier and Kuhn, 2019).

Second, both self- and other-perceived dyadic coping moderated the link between partners' cardiac illness-related distress and support, which means that the process by which

cardiac illness-related distress was associated with support was truly relational. In addition, this finding suggests that not only the reported behaviors, but also the perceptions of partners' responses are crucial for positive relationship exchanges, even during an illness. In particular, it is important for patients and their partners to reciprocate in showing some form of support for each other, whether instrumental or emotional, thereby restoring the balance within the relationship. In fact, not only should the caregiver support the patient in a one-way direction, but the amount of support the patient is able to give to the spouse is extremely important.

Indeed, perceived inequity and lack of reciprocity among partners was found to predict lower couple satisfaction (Iafrate et al., 2012a). In addition, the complementarity of dyadic coping efforts can be functional for the couple's well-being (Revenson, 2003), especially in illness situations. In the present sample, the partner reported that the patient provided a significantly lower positive dyadic coping score than the one provided by the partner himself/herself, thereby suggesting a potential for perceived inequity. This result could be also explained by the fact that partners in our sample mostly comprised women and, according to the literature, women are more "relation-oriented" and more sensitive than men to the relationship aspects (Iafrate et al., 2012a).

Third, the moderating effect of dyadic coping was played in most interactions by positive dyadic coping; in particular, the effects of distress on unsupportive partner behaviors, such as hostile or overprotective styles, were particularly deleterious when they were combined with low self-perceived or other-perceived positive dyadic coping; conversely, high negative dyadic coping exacerbates the link among partner distress and lower support for patient engagement. Beyond the studies that detect the negative impact of negative dyadic coping (e.g., Gasbarrini et al., 2015; Falconier and Kuhn, 2019), the present study suggests that even low positive dyadic coping could have

harmful effects, especially in a disease situation. This means that increasing the positive aspects of a marital relationship, such as the partners' ability to understand each other, to look at stress from a different perspective, to encourage the partner, and help him/her concretely to solve the stressful problem, is crucial also during an illness. This is in line with recent literature showing the important role for couples of positive relational processes, for example, capitalization (Pagani et al., 2015, 2020; Donato et al., 2018).

Limitations of the present study should be noted. First, the cross-sectional nature of the design does not allow for inferences about the etiology of patient's or partner's cardiac illness-related distress, about whether distress drives perceptions of partner support or partner support drives distress, or about how distress may have coevolved with the partners' functioning as a couple. In addition, the lack of a gender-balanced sample does not allow us to test gender differences in patients and partners. In fact, although heart disease has a higher incidence in the male population, a more balanced sample would help disentangle gender and role (patient and partner) effects. Moreover, our sample was mostly composed of stable couples and relatively limited in the age-range of participants: We could not test, therefore, whether interaction effects may differ as a function of relationship duration and partners' age. Finally, we analyzed data through multiple regressions, but further studies based on structural equation modeling are needed to evaluate simultaneously multiple relationships among variables (e.g., Rusu et al., 2015). To our knowledge, however, this is the first study that investigates the relationship between distress, partner support, and the moderating role played by dyadic coping in a cardiac population; furthermore, it is a dyadic study; therefore, the perceptions of the distress and dyadic coping received and provided by both the patient and the partner are analyzed.

The present findings have also implications for interventions designed for couples facing cardiac illness. First, the involvement of partners in cardiac recovery programs recommended also as a best practice routine by the Italian Association for Cardiovascular Prevention, Rehabilitation, and Epidemiology (GICR-IACPR; Sommaruga et al., 2018). Secondly, the clinical importance of improving the dyadic coping skills in the couple, in accordance with Iafra et al. (2012b), both in marital distress prevention programs and in marital therapy for couples facing a cardiac illness. In line with the literature (Falconier and Kuhn, 2019), in fact, strengthening positive dyadic coping and decreasing negative dyadic coping in a couple facing cardiac disease, beyond the effects on partners' and couples' well-being, could contribute

to a more sustaining relationship, with consequent improvement of physical and psychological outcomes.

To conclude, the results of our study suggest the importance of including relational variables as moderators in the link between individual's psychological state and the support provided by the partner. In fact, by distinguishing between the dyadic coping levels, it is possible to recognize individuals most at risk. In particular, in our study the patients and partners most at risk of receiving or implementing ineffective support for the patient seem to be those with high levels of distress combined with a low positive dyadic coping or high negative dyadic coping. This could suggest that a low positive dyadic coping and high negative dyadic coping exacerbate the association between patient and partner distress and ineffective partner support; consequently, in order to help the caregiver in his/her supportive role, it could be important to be engaged in a marital relation in which partners usually cope together with daily stress, show mutual empathy, encourage and help each other to put the problem in perspective, are committed to improve marital adjustment and well-being of the other, and can delegate to the other.

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 Psychology Research Ethics Committee of Università Cattolica del Sacro Cuore di Milano. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GP and SD contributed to the development of the theoretical framework, to the performance of the statistical analyses, to the analysis of the results, and to the writing of the manuscript. AP, MP, RI, GP, EG, and GC contributed to the development of the theoretical framework and to the writing of the manuscript. AB supervised the writing of the manuscript. All authors contributed to the article and approved the submitted version.

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Disability as an Interpersonal Experience: A Systematic Review on Dyadic Challenges and Dyadic Coping When One Partner Has a Chronic Physical or Sensory Impairment

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Chronically disabling health impairments affect an increasing number of people worldwide. In close relationships, disability is an interpersonal experience. Psychological distress is thus common in patients as well as their spouses. Dyadic coping can alleviate stress and promote adjustment in couples who face disabling health impairments. Much research has focused on dyadic coping with cancer. However, other health problems such as physical and sensory impairments are also common and may strongly impact couple relationships. In order to promote couples' optimal adjustment to impaired health, the identification of disability-related relationship challenges is required. Furthermore, ways in which dyadic coping with these challenges may benefit couples could inform researchers and practitioners how to support couples in coping with health impairments. Accordingly, the aims of this study were to systematically review dyadic challenges and dyadic coping when one partner has a chronically disabling physical or sensory impairment. Out of 873 articles identified through database searches, 36 studies met inclusion criteria. The disability-related dyadic challenges identified in the review were changed roles and responsibilities within the couple, altered communication, compromised sexual intimacy, and reduced social participation. These challenges were reported to burden both partners and the couple relationship. Dyadic adjustment benefitted from a we-perspective, i.e., when couples viewed the disability as a shared challenge and engaged in conjoint dyadic coping. The results suggest that patient/care recipient and partner/caregiver roles should be de-emphasized and that disability should be recognized as an interpersonal experience.

Keywords: health impairments, dyadic coping, chronic illness, interdependence, couples, disability, dyadic challenges, mutual sharing

INTRODUCTION

Over a billion people worldwide are estimated to live with some form of disability. The most important causes of disability are impairments associated with chronic health conditions, e.g., visual impairment as a secondary consequence of diabetes. Due to population aging, chronic health conditions and associated disability are expected to steadily increase in the future (World Health Organization, 2015). In the European Union, for instance, 1 in 10 adult citizens reports severe physical or sensory disability (Eurostat, 2020) and almost two thirds of all adults are married or cohabiting (Corselli-Nordblad and Gereoffy, 2018). With more people living with disability, more relationship systems will be impacted by the consequences of disability. The aim of this study is thus to systematically review the challenges couples face when one partner has a chronically disabling physical or sensory impairment and what is known about dyadic coping in this context.

Psychosocial Consequences of Disability in Patients and Spouses

Chronic health impairments and disability can cause significant psychological distress for patients. For instance, symptoms of depression or pronounced anxiety are common across a seemingly diverse range of conditions including multiple sclerosis (Dennison et al., 2010), spinal cord injury (Le and Dorstyn, 2016), or vision loss (Nyman et al., 2012). Although initially intense emotional reactions to symptom onset and diagnosis may be followed by more moderate distress, the chronicity of impairments and the often progressive course of the underlying health condition urge the patient to permanently adjust to living with the impairments and their consequences (e.g., in multiple sclerosis; Desborough et al., 2020). Adjustment to a “new normal” requires patients with chronic health conditions to cope with disabling health impairments on a daily basis, for example, by following a treatment regimen, managing the financial impact of treatments, or changing leisure time activities and social interactions to accommodate the impairment (Stanton et al., 2007; Badr and Acitelli, 2017).

Disability is an interpersonal experience as it also affects the people patients are close with. Close relationship partners exhibit similar levels of psychological distress as patients. For instance, meta-analytic evidence suggests that patient and spouse psychological distress are comparable, i.e., distress does not significantly differ between patients and partners. Both partners, however, exhibit higher prevalence of depression and anxiety compared with healthy controls (Hodges et al., 2005; Mitchell et al., 2013). While other family members also suffer, romantic partners are particularly prone to experiencing distress related to the patient's impairment. Firstly, spouses are strongly affected because the impairment and its consequences represent a threat to the health and well-being of someone close to them and to the life they have built together. For instance, partners of breast cancer patients often exhibit harm/loss appraisals and intrusive thoughts in relation to cancer, indicating intense preoccupation related to their partner's health condition (Steiner et al., 2014). Secondly, cohabiting partners often take over

caregiving tasks and help the patient manage treatment regimens. This provision of practical support to the patient can be experienced as distressing (Adelman et al., 2014). Thirdly, spouses are generally the patients' main confidant (Collins and Feeney, 2000). Being empathetic to the patient's distress, partners may experience contagion with (negative) emotions (Coyne et al., 1987; Bodenmann, 1995; Revenson et al., 2016). Also, as patients confide in them, romantic partners are often the primary source of emotional support for patients (Revenson, 1994). However, the expectation that they should provide emotional support may cause additional distress for partners.

These pathways show how a stressor pertaining originally to the patient, the health impairment, can come to affect the patient's romantic partner as well. The pathways are consistent with the Systemic Transactional Model (STM; Bodenmann, 1995, 1997, 2005) of stress and coping. The STM details how within a committed romantic relationship, certain situations can cause stress beyond the person originally faced with the situation and how, therefore, stress may affect the couple as a unit. The joint affectedness of both members of the couple suggests that chronically disabling health impairments ought to be conceptualized as “we-stress.”

We-Stress and Conjoint Forms of Dyadic Coping

We-stress describes any stress directly concerning the couple as a unit, e.g., the birth of a child or financial hardship (Bodenmann, 1995; Bodenmann et al., 2016). In the context of serious illness, the term “we-disease” has been suggested (Kayser et al., 2007). Both terms underline that couples face severe life stressors such as chronic disease of one partner as shared interpersonal experiences (Leuchtmann and Bodenmann, 2017). Chronically disabling health impairments match the criteria of we-stress well because their consequences clearly affect both partners, as outlined above, and they require permanent (re)adjustments in the couples' everyday lives.

However, we-stress not only implies the shared experience of stress within the couple, but it also suggests that the couple holds shared resources to counteract their stress. One such resource is dyadic coping. Dyadic coping encompasses supportive actions from one partner to the other as well as conjoint coping efforts of both partners (Bodenmann, 1995). In community samples, dyadic coping was found to be beneficial for individual (e.g., Gabriel et al., 2016) and dyadic adjustment (e.g., Falconier et al., 2013; Randall et al., 2016). However, common dyadic coping (CDC), a conjoint form of dyadic coping, is most suitable in response to we-stress. In CDC, both partners are involved in coping with stress that affects them both. Symmetrical engagement in CDC not only lowers stress in both partners, but it also strengthens their mutual identification as a unit, i.e., their sense of we-ness (Bodenmann, 2005). Meta-analytic evidence suggests that conjoint forms of dyadic coping such as CDC are the strongest predictor of relationship satisfaction in community samples when compared with other forms of dyadic coping (Falconier et al., 2015). In the context of chronic health impairments, systematic reviews similarly show that conjoint

dyadic coping is consistently associated with good relationship functioning (Traa et al., 2015). In couples coping with the wife's breast cancer, higher CDC was associated with higher relationship quality and fewer depressive symptoms in both patients and partners (Rottmann et al., 2015) and with lower psychological distress in partners (Meier et al., 2019). In couples coping with diabetes, CDC was related to patients' adherence to dietary and exercise regimens which is vital to avoid serious complications (Johnson et al., 2013). This further underlines the close links between relational and individual health. Another form of conjoint dyadic coping is communal coping. Communal coping refers to collaborative efforts to cope with a shared stressor that affects more than one individual (Lyons et al., 1998), i.e., we-stress. In couples facing type 2 diabetes, communal coping was related to better relationship quality perceived by the patient and reduced patient and partner distress (Helgeson et al., 2017), further supporting the relevance of conjoint forms of dyadic coping in adjusting to health impairments.

Dyadic Coping Across Health Impairments

Although dyadic stress and coping frameworks have received growing interest in the context of chronic health impairments, the range of health conditions that have received scholarly attention is relatively narrow. Analyzing included studies in a comprehensive review of couples' coping with chronic illness (Berg and Upchurch, 2007), cancer populations are by far the most studied, particularly breast cancer patients and their spouses (e.g., Feldman and Broussard, 2006). Other, much less frequently studied conditions included cardiovascular diseases (e.g., Coyne and Smith, 1991) and arthritis (e.g., Keefe et al., 1999). A recent systematic review on dyadic coping showed a similar picture indicating that the health conditions dyadic coping research focuses on have not changed much over the last decades (Falconier and Kuhn, 2019). A bias toward cancer research in the literature may be explained by funding priorities due to high prevalence and mortality rates of cancer. However, knowledge on dyadic coping in the context of a broader range of health impairments is needed. For example, multiple sclerosis is among the most important causes of disability among young adults in their child-rearing years (Kingwell et al., 2013). As such, it poses specific dyadic coping challenges for couples as do other health conditions. More knowledge is therefore needed, for instance, to develop targeted interventions for couples coping with multiple sclerosis and other chronically disabling impairments. Discerning what stressors and mechanisms in dyadic coping are comparable across impairments and what might be specificities of others requires a better understanding of factors like the duration and intensity of the stress experience caused by the impairment (Randall and Bodenmann, 2009) and other contextual factors such as controllability and predictability of symptoms (for an overview of contextual factors, see, e.g., Berg and Upchurch, 2007). For instance, in the context of cancer, couples may face a highly stressful acute illness phase which is usually followed by a remission phase with decreasing stress levels in the best case or lethal development in the worst case. Accordingly, changes in quality of life of cancer patients and their partners appear to be a function of the

phase of illness/survivorship and stressors associated with the respective phase (Song et al., 2011). Integrating evidence on health conditions with differing contextual characteristics that pose unique challenges for couples may therefore productively expand research on stress and dyadic coping in the context of health.

Although some relationship challenges such as heightened uncertainty about the future may be comparable across many chronic health conditions (e.g., Rolland, 1994), there may be specific dyadic challenges and relationship strains due to impairments that lead to irreversible physical and/or sensory disability. Their potential relationship impact is very high due to the interference of physical or sensory impairments with key domains of romantic relationships such as sexual function or couple communication. For example, erectile dysfunction has been reported in up to 80% of males with spinal cord injury (Jia et al., 2016). In couples where one partner has multiple sclerosis, fatigue and fear of pain are often reported as barriers to satisfying sexual relationships (Marck et al., 2016). Evidence also suggests low levels of sexual activity in couples where one partner had acquired deafblindness (Lehane et al., 2017b). Sensory dysfunction might interfere with dyadic communication, e.g., reducing the patient's ability to perceive subtle visual or auditory cues of sexual interest in their partner. This, in turn, could lead to reduction in sexual activity. Dyadic communication can also be altered when the couple is faced with physical impairments that affect verbal and/or non-verbal expression. For example, problems with motor speech production are common in Parkinson's disease and frequently cause communication breakdown in dyads (Altaher et al., 2020). Furthermore, physical and sensory disability impact the mobility and independence of the affected individual. Mobility restrictions may challenge couples' established division of responsibilities. For example, couples may need to find new ways to distribute household tasks or leisure time (e.g., Hodgson et al., 2004). These examples show the interpersonal relevance of physical and sensory disability as they can lead to significant dyadic challenges in affected couples (i.e., we-stress). Previous reviews have established associations between physical and sensory disability and individual psychological well-being in couples (e.g., Ennis et al., 2013; Lehane et al., 2017a), supporting the notion that physical and sensory disability cause we-stress. However, to our knowledge, the specific dyadic challenges that cause such we-stress and how couples dyadically cope with chronically disabling health impairments have not been systematically reviewed yet. We will thus address the examination of dyadic challenges and dyadic coping related to physical and sensory disability in the current study.

Need for Integration of Quantitative and Qualitative Evidence

Another concern in the field of dyadic coping with chronic health impairments that we aim to address is the lack of integration of quantitative and qualitative evidence. Empirical work based on traditional dyadic coping frameworks such as the STM has mainly relied on quantitative data using validated scales to

measure the related constructs (e.g., Dyadic Coping Inventory; Bodenmann, 2008). Qualitative evidence on how couples adjust to chronic health impairments has steadily increased in parallel. Yet, few qualitative studies have made explicit reference to dyadic coping frameworks. This parallel development of quantitative and qualitative research poses the risk that findings are not sufficiently integrated for the development of theory and interventions for couples coping with chronically impaired health. One exception is the study of Kayser et al. (2007) that integrated qualitative analyses of couple interviews with existing dyadic coping theory. They identified key aspects of coping with breast cancer as a couple including appraisals of cancer as *we-stress*. The term *we-disease* was deduced from this qualitative study and has thereby, in turn, enriched quantitative research. The study further underlined the importance of reciprocal communication to identify each partner's emotional response to the situation and their coping needs and coordination of individual and joint coping responses. Sallay et al. (2019) also used qualitative methodology to study dyadic coping in the context of chronic health impairments. Their interviews with family members of chronically ill individuals revealed how dyadic coping in the families was shaped by the sociophysical environment, e.g., how spatial arrangements were used to communicate stress and how they contributed to coping by creating distance or closeness. Both examples highlight the important insight qualitative evidence can add to research on couples who are coping with chronically impaired health and how the integration of quantitative and qualitative evidence contributes to stimulating future research.

The Present Study

Chronically disabling health impairments will become more frequent as populations worldwide age. More and more couple relationships are urged to cope with the dyadic challenges and stress that are caused by one partner's disability. Irreversible physical and sensory disability in particular can have a significant impact on romantic relationships but have, however, not been a major focus of dyadic coping research so far. Furthermore, existing quantitative and qualitative research on couples coping with chronically impaired health have been poorly integrated despite innovative potential of such integration. Consequently, the present study aims to (1) systematically review dyadic challenges in couples coping with chronically disabling physical and sensory impairments and to (2) synthesize existing research on dyadic coping in these couples.

METHODS

The systematic review followed the recommendations in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Liberati et al., 2009) and the subsequent PRISMA-P 2015 checklist for review protocols (Moher et al., 2015).

Search Strategy

The literature search was conducted in July 2020 using the databases APA PsycINFO, CINAHL, Medline, and PSYINDEX

accessed via EBSCOhost. The combination of databases allowed for diversity in disciplinary backgrounds of studies given that research on interpersonal relations in the context of health impairments lies at the intersection of different fields, e.g., social psychology, rehabilitation nursing, and communication sciences. All searches were limited to research published after 1990 when dyadic coping frameworks had started to emerge. For the purpose of deriving search terms concerning health impairments, sensory impairments were defined as functional losses of sight or hearing. Physical impairments were defined as limitations on a person's physical functioning and mobility that are primarily rooted in functional changes to the neuromusculoskeletal system. Chronic illnesses that may result in limitations of patients' physical functioning and mobility as a secondary consequence of the primary diagnosis were excluded to clearly delineate the scope of this review from previous reviews on dyadic coping with chronic illness in general (e.g., Berg and Upchurch, 2007). Health conditions causing such impairments were identified and the respective keywords derived. The search terms for the first aim on dyadic challenges consisted of a combination of (1) types of health conditions or impairments, as defined above; (2) keywords for a dyadic/couple/relationship focus; and (3) keywords for dyadic adjustment. An example search string to be found in the title or abstract of a study was as follows: ("spinal cord injury" or paraplegia or tetraplegia or hemiparesis or hemiplegia or "traumatic brain injury" or "multiple sclerosis" or arthritis or parkinson* or stroke) AND (couple* or dyad* or spous* or "significant other*" or wife or wives or husband* or marital or married or marriage or "committed relationship*") AND (adjustment or "relationship satisfaction" or "relationship quality"). The search terms for reviewing literature for the second aim on dyadic coping with chronically disabling physical and sensory impairments consisted of a combination of (1) the types of health conditions or impairments relevant to this review and (2) keywords for dyadic coping. An example search string to be found in either the title or abstract of a study was as follows: ("sensory loss" or "sensory impairment" or "sensory dysfunction" or "vision loss" or "visual impairment" or "visually impaired" or "vision impairment" or "low vision" or blind* or "hearing loss" or "hearing impairment" or "hearing impaired" or "hard of hearing" or deaf* or "dual sensory loss" or "vision disorder*" or "eye disorder*" or "hearing disorder*") AND ("dyadic coping" or "communal coping" or "collaborative coping" or "coping congruence" or "cooperative coping" or "couple coping" or "relationship-focused coping" or "spousal support" or "partner social support"). Complete search strings can be found in the **Supplementary Material**. Additional articles were subsequently identified through hand searches and by inspecting the reference lists of articles identified by the original search queries and review articles on dyadic coping (Berg and Upchurch, 2007; Falconier and Kuhn, 2019).

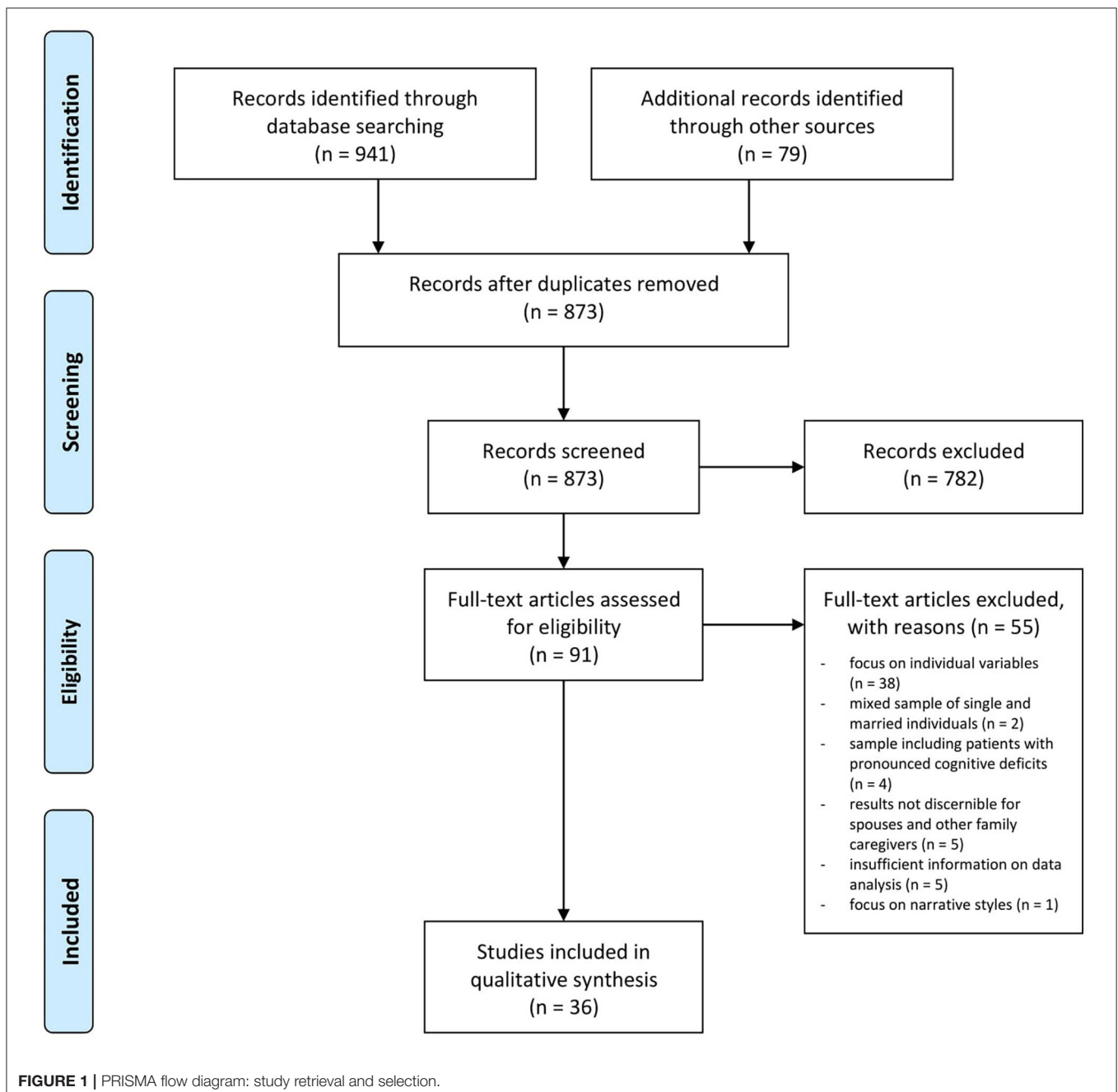
Study Selection

Inclusion criteria for the review covered the following: (a) peer-reviewed journal article reporting on an empirical study or a systematic review, (b) full text available in English, (c) sample consisting of persons with an acquired chronic or progressively

worsening physical or sensory impairment (see search terms) or their romantic partners, and (d) focus on dyadic processes or dyadic outcomes, e.g., relationship satisfaction, sexual intimacy, and dyadic coping. The inclusion criteria were chosen to identify studies with a genuinely dyadic perspective on the implications of the selected health impairments for the couple relationship. Exclusion criteria were (a) study protocol or psychometric article, (b) non-progressive congenital impairment, (c) focus on individual processes or outcomes only, and (d) dyadic variable studied solely as predictor of individual outcomes. Thus, we wanted to ensure that genuinely dyadic studies were included

as opposed to studies that only considered dyadic variables in one individual of the couple and studied its association with purely individual outcomes, e.g., depressive symptoms. Lastly, we also excluded studies if (e) their results were not discernible for romantic partners and other family caregivers. Studies in which all or part of the results were clearly identifiable as pertaining to romantic partners were retained. No restrictions on study type were made to ensure that evidence from qualitative and quantitative research would be considered.

Based on the above criteria, titles and abstracts of the database-identified articles were screened for relevancy by the first author



(ICB) and three independent screeners. In case of insufficient information from the title and abstract, full texts were retrieved and screened for relevancy. Random double-checks of screening decisions were conducted to ensure the quality of the screening process. Following the initial title and abstract screening process, the first author and two screeners checked the full articles for eligibility. Information on study sample, study design, and phenomena of interest or study variables were inserted into a database. Screeners noted their decision on inclusion or exclusion for every full text. In case of doubts, the respective full text was discussed among the screening team until consensus was reached.

Data Extraction

After title and abstract screening, the first author and two data extractors completed information in the database for all included articles and randomly double-checked entries. Data extraction included authors, year of publication, setting, sample, study design and methods, investigated variables or phenomena, findings, and conclusions. Quality assessments were added for quantitative and qualitative studies separately. Quality assessment of quantitative studies relied on an adapted version of the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies proposed by the National Institute of Health (2020). Of the tool's 14 original questions, three were dropped because they were only applicable to cohort studies. Eleven questions were retained covering the following quality criteria: clear statement of research question or objective, sufficient description of study population, appropriateness and uniform application of inclusion and exclusion criteria for participants, provision of sample size justification, measurement of independent variables (IV) prior to measurement of dependent variables (DV), sufficient time frame between measurements of IV and DV, variation in IV, good validity and reliability of IV, multiple assessment of IV, good validity and reliability of DV, and measurement and statistical control of confounders. Assessors answered with "yes," "no," or "cannot determine" to those questions. Study quality was rated as "good" when assessors answered "yes" to 10 or more questions; "adequate" in case of seven, eight, or nine "yes" answers; or "poor" in case of less than seven "yes" answers. Quality assessment of qualitative studies was based on the checklist from the Critical Appraisal Skills Programme (Critical Appraisal Skills Programme, 2018). The CASP Qualitative Checklist requires assessors to answer "yes," "no," or "cannot tell" to 10 questions relating to whether research aims are clearly stated, to the appropriateness of methodology, study design, recruitment strategy and data collection method, to the consideration of the relationship between researchers and participants, ethical considerations, rigor in data analysis, clarity of presentations of study findings, and overall value of the research. As proposed by Lehan et al. (2017a), studies received a "good" quality rating when assessors answered "yes" to eight or more questions, an "adequate" rating for six or seven "yes" answers, and a "poor" rating for less than six "yes" answers. Mixed methods studies were rated according to both assessment tools, and assessors discussed the overall quality rating until consensus was reached. As the aim of this review was to integrate evidence

across research designs, disciplines, and health impairments, the authors did not limit reporting of results to studies with better quality assessment.

RESULTS

The included articles contained a high proportion of qualitative studies (64%) that focused on the processual nature of coping with one partner's impairment over time. As such, these studies reported findings relevant to both review aims of identifying (1) dyadic challenges in couples confronted with physical or sensory impairment and (2) dyadic coping with these impairments. To avoid redundancy, the authors decided to merge the search results of both literature searches and conduct a unified analysis for both research questions. A flowchart illustrating the article selection process for the unified analysis is provided in **Figure 1**. The initial database searches yielded a total of 941 articles for screening. After removal of duplicates and addition of results from the hand searches, the titles and abstracts of 873 articles were screened. Of those, 91 were retained for eligibility screening of full texts. Fifty-five full texts were excluded (see detailed reasons in **Figure 1**). The final number of included articles was 36.

Study Characteristics and Health Impairments

Detailed characteristics of studies included in this review can be found in **Table 1**. Two included articles were reviews. One review summarized evidence on couples coping with stroke in the community (Ramazanu et al., 2020), and the other review focused on the consequences of sensory loss for couples' well-being (Lehane et al., 2017a). Overlap between included studies with the current review was evident for five studies (see **Table 1**). The two reviews, within their respective health impairment focus, had a broader scope than the present review and included also studies with couples reporting on individual outcomes such as individual psychological well-being. In the present results section, we will report only on results related to dyadic processes or outcomes retained in the two reviews. Of the empirical studies included in this review, 23 applied a qualitative design, 2 used mixed methods, and 10 applied quantitative methodology. Cross-sectional designs ($n = 29$) were more frequent than longitudinal designs ($n = 5$). Samples sizes ranged from $N = 2$ to $N = 320$ individuals. In seven manuscripts, raters identified quality concerns that led to an overall quality assessment of "poor" (see **Table 1**). Most "poor" quality assessments were due to the use of cross-sectional data in quantitative studies and concerned studies from the 1990s. The most frequent quality concern in qualitative studies was the lack of a critical discussion of the role of the researchers during all stages of the research. In the following, all included articles will be considered for the synthetization of the results.

Most studies ($n = 34$) focused on a single health condition. The health conditions primarily related to physical disability were stroke ($n = 8$), spinal cord injury (SCI; $n = 7$), multiple sclerosis (MS; $n = 6$), Parkinson's disease (PD; $n = 4$), traumatic/acquired

TABLE 1 | Characteristics and findings of empirical studies included for review.

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|-------------------------------------|------------------------|---|---|--|--|-----------------------------|
| Sensory impairments | | | | | | |
| Burton et al. (2015) | Vision loss due to AMD | 1 couple, both partners with AMD and comorbidities Ages: 82 and 77 years RD: 60 years | Longitudinal case study with 3 time points Semistructured joint interviews | Diagnosis and couple life since, daily activities, thoughts about the future, relationship | The couple had to adjust everyday activities and manage mutual loss of independence. There were no references to enjoyment in everyday activities. Couple demonstrated a sense of “we” and experienced resilience and unity due to sharing a diagnosis. | Adequate (qualitative) |
| Lehane et al. (2018) | Dual-sensory loss | 45 spouses M_{age} : 69.21 years M_{RD} : 71.7 years M_{TSD} patients: 20.3 years | Cross-sectional Questionnaire | Couples' Illness Communication Scale, Couples' Satisfaction Index, Medical Outcomes Study Social Support Survey | Significant association between sensory-loss-related communication, RS, perceived support, and psychological well-being. Perceived support mediated the association between communication and well-being. | Adequate (quantitative) |
| Glade (2018) | Hearing loss | 6 couples Age range of patients: 60–79 years | Cross-sectional Semistructured individual interviews | Communication with spouse and in social situations prior to and after cochlear implants (CI), experience with auditory rehabilitation | Prior to use of cochlear implants, communication caused frustration and tension within the couples and impeded satisfying social interactions. Social interactions improved following cochlear implant, but adjustment was an extended process. | Good (qualitative) |
| Scarinci et al. (2008) ^a | Hearing loss | 10 spouses M_{age} : 70.2 years M_{RD} : 44.6 years | Cross-sectional Semistructured individual interviews | N/A | The partner's hearing impairment meant overall reduction in communication, frequent communication breakdown, increased relationship tension, reduced time spent together, and less opportunities for experiencing togetherness. | Adequate (qualitative) |
| Yorgason et al. (2007) ^a | Hearing loss | 8 couples M_{age} of patients: 68 years | Cross-sectional Semistructured joint interviews | Relational experiences surrounding hearing loss, meaning of hearing loss, what could help the couple thrive in their relationship despite impairment | Hearing-related stressors included negative emotions and conflict related to impaired hearing, reduced communication opportunities and embarrassment in group settings, and loss of shared activities. Couples experienced resilience through individual and dyadic meaning-making and attunement to needs for interdependence and autonomy. | Adequate (qualitative) |
| Physical impairments | | | | | | |
| Zhaoyang et al. (2018) | Arthritis | T1: 142 couples; T2: 132 couples M_{age} of patients at T1: 65.78 years M_{RD} at T1: 34.71 years M_{TSD} at T1: 16.42 years | Longitudinal Questionnaire | Items on disclosure and holding back adopted from Porter et al. (2008), Dyadic Adjustment Scale | Holding back at T1 was associated with decreases in own RS in patients and partners. Increases in disclosure were associated with increases in own RS. No partner effects from holding back or disclosure on partner RS. | Good (quantitative) |
| Schembri Lia and Abela (2019) | Locomotor disability | 3 couples RD range: 23–47 years | Cross-sectional Semistructured individual and joint interviews | N/A | Couples showed sensitivity and attunement to each other's feelings and needs and had a clear vision of remaining together. | Adequate (qualitative) |

(Continued)

TABLE 1 | Continued

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|--------------------------|-------------------|--|---|--|--|-----------------------------|
| Blackmore et al. (2011) | MS | 81 patients M_{age} : 46.9 years M_{TSD} : 10.3 years | RCT; pre-/post-design Questionnaire | Sexual Disabilities section of Guy's Neurological Disability Scale, UCLA Social Support Scale, Sexual Satisfaction Inventory | Major struggles included altered sexual intimacy and unease with imbalance in support provision. Increases in perceived positive partner support and decreases in negative partner support were associated with improvements in sexual satisfaction. | Adequate (quantitative) |
| Boland et al. (2012) | MS | 7 couples Median age of patients: 53 years Median RD: 29 years Median TSD: 10 years | Cross-sectional Semistructured individual interviews | Description of own coping approach, changes/adjustment in coping over time | Coping with MS had ups and downs and couples constantly needed to bring their coping efforts in sync. Coping occurred over a long time and changed depending on disease stage. Maintaining faith that the relationship was worthwhile independent of the changes helped couples cope. | Good (qualitative) |
| Ghafari et al. (2014) | MS | 25 patients M_{age} : 38 years M_{TSD} : 9 years | Cross-sectional Semistructured individual interviews, field notes | Relationship with partner, partner's support to adapt to disease | Patients expressed a higher need for emotional support than instrumental support while they perceived spouses to provide mainly instrumental support. They strove for functional independence to maintain a balance between partners. Mutual understanding helped create and maintain a satisfying relationship despite inevitable changes. | Good (qualitative) |
| Samios et al. (2015) | MS | T1: 160 couples; T2: 98 couples M_{age} of patients at T1: 49.65 years M_{TSD} : 10.43 years | Longitudinal Questionnaire | Dyadic Adjustment Scale | RS decreased from T1 to T2. Patient and partner RS were significantly related at T1 and T2. Significant partner effects from RS T1 to RS T2. | Good (quantitative) |
| Starks et al. (2010) | MS | 8 couples Age range of patients: 40–69 years RD range: 1.2–47 years TSD range: 1–21 years | Cross-sectional Questionnaire, semistructured individual and joint interviews | Perceived Social Support Scale, Dyadic Adjustment Scale | Four couples were “in-sync,” i.e., had compatible world views and communication styles, worked together to solve challenges moved forward together. Four couples were “out-of-sync,” i.e., had contrasting coping styles, focused on different priorities and adjusted at different paces, but were committed to the relationship. Patients from in-sync couples had longer time since diagnosis, mostly gradual onset of MS and retained high levels of independence. | Adequate (mixed methods) |
| Wawrziczny et al. (2019) | MS | 6 couples M_{age} of patients: 39.17 years M_{RD} : 17.17 years M_{TSD} : 8 years | Cross-sectional Semistructured joint interviews | Experience of disease, relationship history, changes in relationship and adjustments in daily life since disease onset, social support | Disease progression made couples' lives increasingly revolve around MS. Different challenges for patients and spouses and their inability to mutually share and validate each other's experience led to withdrawal and alienation. | Adequate (qualitative) |

(Continued)

TABLE 1 | Continued

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|--------------------------|-------------------|---|---|---|---|-----------------------------|
| Carter and Carter (1994) | PD | Group A: 20 PD patients, 20 ill spouses; group B: 26 PD patients, 26 well spouses M_{age} of patients: 65.7 years M_{PD} : 39.3 years | Cross-sectional Questionnaire, sentence completion task | Projective Sentence Completion, Dyadic Adjustment Scale | No group difference on marital adjustment. Cohesion in PD couples higher than norms, consensus lower. Effects of illness on marriage mostly positive, good marriage considered essential in PD. | Poor (quantitative) |
| Martin (2016) | PD | 21 patients, 23 spouses M_{age} : 67 years M_{PD} : 38 years M_{TSD} : 6 years | Cross-sectional Semistructured individual interviews | Impact of PD on self, partner and relationship | The main relational stressors implied by PD included financial strain, shifts in relational roles, changed sexual intimacy and overall closeness between partners, less leisure and social activities, and resulting uncertainty about whether the relationship would continue. | Adequate (qualitative) |
| Smith and Shaw (2017) | PD | 4 couples, 1 widowed spouse Age range: 67–85 years TSD range: 2–21 years | Cross-sectional Semistructured individual interviews | Reactions to diagnosis, life changes due to PD | PD put strain on relationships, especially due to changes in responsibilities for tasks, but made participants realize how much they valued their relationships. Couples adjusted best when they assimilated PD and retained agency despite difficult changes. | Poor (qualitative) |
| Wootton et al. (2019) | PD | 9 couples RD range: 4–45 years | Cross-sectional Semistructured individual interviews | Relationship and health history, experiences and relational impact of facial masking, coping with the impacts | Patients' muted and slowed facial expressions led to partners' difficulties understanding intentions and feeling. They were often misinterpreted as disinterest in the relationship and led to emotional distance and disconnection. To counteract, couples used more touch and gesture and verbal communication to clarify misunderstandings. | Adequate (qualitative) |
| Chan (2000) | SCI | 66 patients, 40 spouses M_{age} of patients: 45.18 years M_{TSI} : 13.27 years | Cross-sectional Semistructured individual interviews | Impact of SCI on family and marital relationships, sources of stress, life satisfaction, caregiving burden | Relationship stressors included financial strain, role changes and worries about the future, increased conflict, changes in feelings (love to sense of care, sympathy), difficulties communicating about needs, and reduced social circle. Maintenance of marriage was "no stress-free process"; required mutual understanding and support, patience and acceptance of disability and its consequences. | Adequate (qualitative) |

(Continued)

TABLE 1 | Continued

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|--------------------------------------|-------------------|--|--|--|--|-----------------------------|
| Dickson et al. (2010) | SCI | 11 spouses M_{age} : 51.4 years Mean time as caregiver: 6.5 years | Cross-sectional Semistructured individual interviews | Experience of becoming a spousal SCI caregiver, life changes due to caregiver role | Participants reported a sense of loss of their partner and pre-injury life. They experienced drastic role changes from spouse and lover to parental caregiver figure, especially linked to loss of physical intimacy. Appreciation for each other increased and contributed to improved relationships in some couples. | Good (qualitative) |
| Engblom-Deglmann and Hamilton (2020) | SCI | 11 couples | Cross-sectional Semistructured individual and joint interviews | Most significant stressors in marriage, initial cognitive processes following injury, coping with losses related to SCI, positive impact of SCI on relationship | Central challenges for couples were altered sexual function, negotiation of care needs and social disconnection following SCI. Adaptability in couples ranged from connection/flexibility to constriction/stagnation. | Good (qualitative) |
| Freeman et al. (2017) | SCI | 5 couples M_{RD} : 16 years | Cross-sectional Semistructured joint interviews | Couple's experience of inpatient rehabilitation (IR) and its influence on relationship, strategies to maintain relationship, intimate and sexual expression during IR | Couples emphasized being a unit and expressed disappointment about healthcare staff who did not acknowledge them as a dyad. Physical and emotional fatigue and loss of spontaneity meant that sexual intimacy was not a priority during inpatient rehabilitation. | Adequate (qualitative) |
| Jeyathevan et al. (2019) | SCI | 19 patients, 15 family caregivers (9 spouses, 6 parents) Age range of patients: 22–65 years | Cross-sectional Semistructured individual interviews | Changes in relationship post-injury, adjustment of family to SCI, impact of SCI on family roles, handling of sex and intimacy post-injury, perceived affectedness of caregiver | In some cases, post-injury relationships deteriorated due to asymmetrical dependencies, protective behaviors of caregivers and loss of sexual and emotional intimacy. Relationships were maintained or rebuilt when partners were interdependent, creatively shifted commonalities and routines, i.e., when they established a “new normal.” | Good (qualitative) |
| Kreuter et al. (1994) | SCI | 49 spouses Median age: 34 years Median RD: 6 years Median TSI: 5.5 years | Cross-sectional Questionnaire | Self-designed Sexual Interest, Activity and Satisfaction Scale, Sexual Behavior Scale, Emotional Quality of the Relationship Scale | Majority of spouses satisfied with relationship and current sex life, although almost half of the sample reported decline in sexual activity. One third reported problems discussing sex with their partner. | Poor (quantitative) |
| Yim et al. (1998) | SCI | 30 SCI couples; 30 able-bodied couples M_{age} of patients: 39.80 years M_{RD} : 12.90 years | Cross-sectional, group comparison Questionnaire | Short Marital Instability Scale, culturally adjusted Dyadic Adjustment Scale, Marital Agendas Protocol | No significant group difference between marital adjustment and RS. Cohesion and marital stability higher in SCI couples. Sex as the most serious problem in SCI couples. | Poor (quantitative) |
| Anderson et al. (2017) ^b | Stroke | 18 couples M_{age} of patients: 62.6 years M_{RD} : 34.4 years | Cross-sectional Semistructured individual or joint interviews | Couples' history, current roles, current relationship, strategies to make marriage work, immediate post-stroke experience | Satisfied couples reported having adequate resources to reconstruct role identities, good discussions and focusing on love while dissatisfied couples experienced role overload and disengagement and reported mutual insensitivity to each other's feelings and lack of listening. | Good (qualitative) |

(Continued)

TABLE 1 | Continued

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|--|-------------------|--|---|--|---|-----------------------------|
| Croteau et al. (2020) | Stroke | 9 couples M_{age} of patients: 69 years RD range: 27–63 years TSD range: 1.1–7.6 years | Cross-sectional Semistructured individual interviews | Modes and frequency of communication before and after stroke, content of conversations | Most participants reported a decrease in the frequency, duration, and variability of conversations. Communication became associated with negative emotions due to difficulties. Spouses took on a speaker role, patients adopted a listener role, with difficulty establishing equilibrium in conversation. | Good (qualitative) |
| Korpelainen et al. (1999) | Stroke | 192 patients, 94 spouses M_{age} of patients: 59.1 years Median TSD: 23 months | Cross-sectional Questionnaire | Self-designed items for sexual function and explanatory factors | Decreased libido in more than half of patients and spouses. Marked increase in sexual dissatisfaction post-stroke. | Poor (quantitative) |
| McCarthy and Bauer (2015) ^b | Stroke | 31 couples M_{age} of patients: 61.81 years M_{RD} : 26.09 years M_{TSD} : 9.23 years | Cross-sectional Unstructured individual interviews | Ways in which stroke has disrupted own life, spouse's life and couple relationship | Stroke marked a disruption and pausing of normal life course. Relationship challenges included compromised physical intimacy, shifts in marital roles, social isolation, and uncertainty about the future due to perceived unpredictability. Couples with shorter relationship duration handled role changes better. Couples drew on existing relationship strengths to cope. | Adequate (qualitative) |
| Quinn et al. (2014) ^b | Stroke | 8 couples Age range of patients: 36–61 years M_{RD} : 26 years M_{TSD} : 4.5 years | Cross-sectional Semistructured joint interviews | Pre-stroke relationship, immediate experience following stroke, life and relationship changes post-stroke | Couples reported a transition to roles as carer and cared for, for some adopting characteristics of a parent–child relationship. Both partners were reluctant to fully accept the changed roles. | Good (qualitative) |
| Robinson-Smith et al. (2016) | Stroke | EG: 5 couples; CG: 5 couples M_{age} of patients: 65.2 years | Pilot intervention study, pre-/post-design Questionnaire, field notes from home visits | Dyadic Coping Inventory; field notes on couples' thoughts and feelings regarding post-stroke relationships | Dyadic coping by oneself increased in stroke patients following intervention. Positive dyadic coping increased in EG spouses. Patients reported changes in roles and reciprocity between partners. Attempts at maintaining intimacy included talking and reminiscing more | Poor (mixed methods) |
| Schmitz and Finkelstein (2010) | Stroke | 15 patients, 14 spouses Median age of patients: 65 years Median TSD: 45 months | Cross-sectional Semistructured individual interviews | Experience of having stroke, sexuality after stroke, discussion of sexuality with rehabilitation professionals | Decreased sexual desire or activity post-stroke were linked to physical and emotional challenges, disrupted roles within relationship and discomfort discussing sex with the partner. | Good (qualitative) |
| Bodley-Scott and Riley (2015) | TBI | 5 spouses Age range of patients: 29–42 years RD range: 6–22 years TSI range of patients: 0.75–7 years | Cross-sectional 1 narrative and 1 evaluative semistructured interview per participant | Account of partner's injury and subsequent changes, evaluation of relationship changes | Spouses experienced direct negative emotional impact of partner's TBI associated with sense of loss for their "old" partner. Shift from lovers to carer and care recipient led some to consider ending the relationship. Love was replaced by a sense of care. Loss of sexual intimacy and shared enjoyment contributed to emotional distance. | Good (qualitative) |

(Continued)

TABLE 1 | Continued

| References | Health impairment | Participants | Design and data collection | Measures/ interview topics | Findings | Quality rating (study type) |
|------------------------|-------------------|--|--|--|--|-----------------------------|
| Kreutzer et al. (2016) | TBI | 42 couples M_{age} of patients: 49.8 years M_{TSI} : 2.2 years | Cross-sectional Questionnaire | Marital Status Inventory, Revised Dyadic Adjustment Scale | 24% of patients and 29% of spouses considered their marriage as unstable. Half of the sample reported clinically significant levels of marital dissatisfaction. | Poor (quantitative) |
| O'Keeffe et al. (2020) | TBI | 5 patients, 6 spouses RD range: 9–32 years TSI range: 4–8 years | Cross-sectional Semistructured individual interviews | Perceptions of changes, challenges, and positive aspects of relationship post-injury | Both partners experienced a sense of loss regarding pre-injury relationship caused by role changes, altered communication, increased conflict, reduced sexual intimacy and emotional connectedness. Couples negotiated a new equilibrium based on respect, loyalty, understanding, and hope. | Good (qualitative) |

AMD, age-related macular degeneration; CG, control group; EG, experimental group; N/A, information not available; M, mean; MS, multiple sclerosis; RD, relationship duration; RS, relationship satisfaction; SCI, spinal cord injury; TBI, traumatic/acquired brain injury; TSD, time since diagnosis; TSI, time since injury.

^a The study was also included in the review by Lehan et al. (2017a).

^b The study was also included in the review by Ramazanu et al. (2020).

brain injury (TBI; $n = 3$), and arthritis ($n = 1$). Studies on sensory disability investigated hearing loss ($n = 3$), vision loss due to age-related macular degeneration ($n = 1$), and dual-sensory loss ($n = 1$). Only two studies used combined samples: different locomotor disabilities in one case and mixed sensory loss (i.e., vision loss, hearing loss, and dual-sensory loss) in the other case. Further details on study characteristics, e.g., developmental-contextual factors such as mean relationship duration or time since diagnosis, can be found in Table 1.

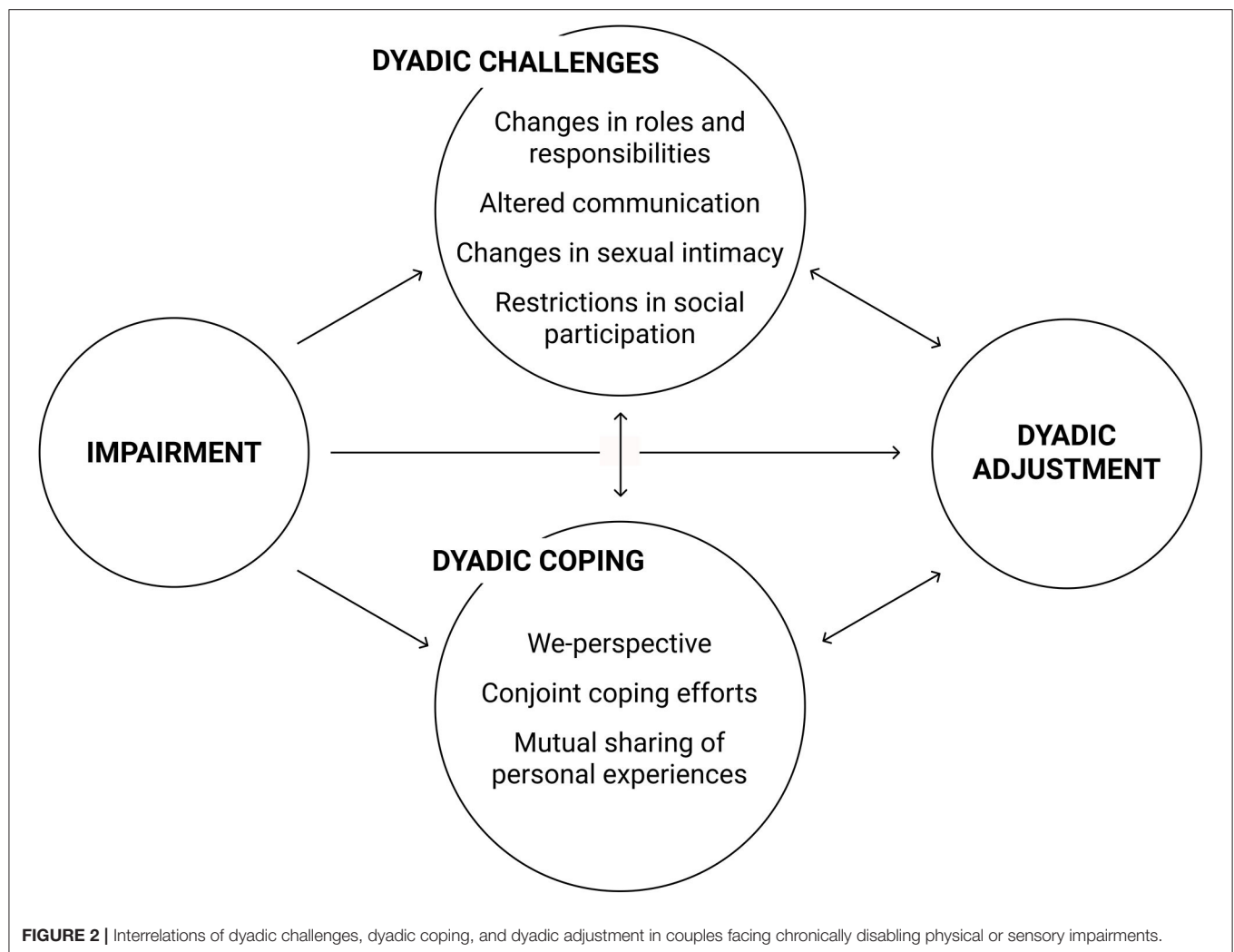
Dyadic Challenges Related to the Health Impairment

Both reviews and most studies supported the notion that disability was an interpersonal experience. The relationship impact of physical or sensory impairments identified across all the reviewed studies was substantial. This was evident, for instance, in one of the five themes identified by Ramazanu et al. (2020) review about couples coping with stroke: Marital relationships were found to be “at a point of change” (p. 479) in the majority of couples. Similarly, Smith and Shaw (2017) paraphrased their participants’ experience of PD as “learning to live in a new way” (p. 16)—not only for the patient, but for the couple as a unit. Changes across different areas of the relationship challenged couples to renegotiate established patterns of interaction. Most consistently reported challenges across health impairments were changes in roles and responsibilities, altered communication, changes in sexual intimacy, and restrictions in social participation. Figure 2 illustrates these dyadic challenges and how they interact with dyadic coping to contribute to dyadic adjustment according to the findings of the current review.

Changes in Roles and Responsibilities

Changes in roles and responsibilities were reported across all health impairments. Some patients were forced into early retirement or to significantly reduce work hours due to their ill health. When the patient had been the primary provider within the couple, this resulted in substantial shifts in responsibility for generating family income (Chan, 2000; Robinson-Smith et al., 2016; Engblom-Deglmann and Hamilton, 2020). As was shown in couples coping with stroke, shifts in marital roles were especially challenging for couples who had been together for a long time, i.e., who had more firmly established roles. Also, the patient’s sudden inability to work for pay was more of an issue for working-age than for elder couples (McCarthy and Bauer, 2015). Some spouses reported experiencing role overload due to the sudden surge in responsibilities inside and outside the couple’s home. Role overload was reduced when the couple had the financial means to pay for professional assistance (Anderson et al., 2017).

An imbalance between the two partners was often described. Such imbalance may be inherent in the notion of role overload in that one partner adopts different roles and associated tasks while the other partner, usually the patient, is forced to renounce past roles. For instance, Jeyathevan et al. (2019) used the theme “asymmetrical dependency” to describe the relationship of individuals with SCI and their family caregivers. The couples in the study of Dickson et al. (2010) referred to the “one-sidedness” of many couple interactions post-SCI. Stroke survivors described changes in reciprocity between them and their spouses (Robinson-Smith et al., 2016). Inequities in giving and taking were also evident as a stressor across the studies included in a review on couples coping with sensory loss (Lehan et al., 2017a). In patients, the perceived imbalance between



partners was reported to cause feelings of guilt (Schembri Lia and Abela, 2019), fears of being perceived as a burden (Robinson-Smith et al., 2016; Anderson et al., 2017), and a perceived threat to autonomy (McCarthy and Bauer, 2015). A sense of loss of control over their own life also threatened the autonomy of partners (Dickson et al., 2010) and was more pronounced in couples with shorter relationship duration (McCarthy and Bauer, 2015).

The most stressful change of roles for most couples was the perception of transitioning from romantic partners to caregiver and care recipient. The majority of partners in Engblom-Deglmann and Hamilton (2020) study talked about the “transition from lover 1 day to caregiver the next day” being very difficult. A seeming incompatibility of the romantic partner and caregiver roles was evident across health impairments, e.g., in couples coping with stroke (Quinn et al., 2014; McCarthy and Bauer, 2015; Ramazanu et al., 2020), TBI (Bodley-Scott and Riley, 2015), and PD (Martin, 2016). Some couples described that their relationships had, to a varying degree, adopted the dynamics of a parent–child relationship (Dickson et al., 2010; Quinn et al.,

2014). This was in part due to substantial changes in the couples’ sexual intimacy which will be discussed below.

The vast majority of studies concluded that changes in roles and responsibilities were perceived as stressful by couples coping with physical or sensory impairments. For instance, the perception that partners and patients experienced very different struggles in coping with MS depending on their roles led some couples to withdraw. Coupled with an inability to openly discuss differing experiences, this ultimately increased emotional distance (Wawrziczny et al., 2019). Similarly, many couples reported that the changes in roles and responsibilities meant losing their pre-disability relationship. This sense of loss was associated with negative emotions (e.g., O’Keeffe et al., 2020). It should, however, be noted that one study on the caregiving experience in SCI explicitly mentioned that some individuals perceived changes in roles and responsibilities as beneficial because they were perceived to rebalance asymmetries that had existed between the partners prior to the injury (Chan, 2000).

Altered Communication

Several health conditions or subsequent impairments reviewed here directly impact on communicative abilities. For instance, hearing loss strongly affects speech comprehension as an important part of verbal communication. Consistently, all three qualitative studies focusing on couples coping with hearing loss reported difficulties in couples' communication due to the hearing impairment (Yorgason et al., 2007; Scarinci et al., 2008; Glade, 2018). Scarinci et al. (2008) summarized these difficulties in the theme "You can't carry on a normal conversation" (p. 144) and mentioned the following effects of hearing impairment on couples' communication: the perception of verbal communication as tiring and unenjoyable; reduced amount of prolonged conversations between partners; reduced spontaneous verbal interactions such as short, trivial remarks; and the inability to share secrets. The review of Lehane et al. (2017a) on the consequences of sensory loss for couples also concluded that communication difficulties and misunderstandings were frequent and might be related to both individual and dyadic adjustment, e.g., feelings of frustration or withdrawal from couple interactions.

While in sensory loss, the associations between impairment and communication are straightforward, characteristic presentations of physically disabling health conditions may not appear to directly relate to communicative abilities. However, there are symptoms of these conditions that do impact couples' communication. For example, in PD patients, hypomimia or facial masking describes a decrease in voluntary control and spontaneous movement of the muscles in the face. As Wootton et al. (2019) showed, muted and slowed facial expressions by PD patients made it hard for spouses to read facial expression. Muted and slowed facial expressions reduced the availability of non-verbal cues that would be used to make inferences about emotional content or intentions of the patient. This, in turn, was reported to lead to misunderstandings that were frustrating for both partners and contributed to an increase in emotional disconnection. Croteau et al. (2020) focused on a subset of stroke couples where patients presented with chronic stroke-related aphasia, i.e., impairments in language comprehension and/or production. Couples reported that the frequency and duration of their conversations had decreased due to aphasia, conversational topics were narrowed down, conversations became more superficial, and patients participated less in conversation than pre-stroke. Although not all couples provided a negative account of their post-stroke communication, communication changes were evident for most couples.

Changes in Sexual Intimacy

Changes in sexual intimacy due to impaired health are reported in many studies. Generally compromised physical intimacy was reported in couples facing SCI (Engblom-Deglmann and Hamilton, 2020), stroke (McCarthy and Bauer, 2015), and TBI (Bodley-Scott and Riley, 2015). More specifically, almost all spouses of individuals with SCI reported sexual functioning of the patient had been altered post-injury. One third of the spouses wished for more frequent sexual activity. However, almost half of the spouses considered their sex life post-injury to be as

good as or better than pre-injury (Kreuter et al., 1994). More than half of participants who had divorced a person with SCI post-injury named decreased sexual ability post-injury as the main cause for their divorce (Chan, 2000). Similarly, stroke patients and spouses of stroke patients both reported marked declines in their libido and sexual activity following the stroke. Sexual dissatisfaction was reported by 49% of patients and 31% of spouses. Functional disability, unwillingness to participate in sexual activity, and an unease to discuss sexuality with the partner were significant predictors of sexual dissatisfaction in these stroke couples (Korpelainen et al., 1999). Interviews with stroke patients and their romantic partners supported the finding that most participants experienced decreases in sexual desire or activity. They linked this decrease to physical and emotional challenges, e.g., erectile dysfunction and fear of sexual activity causing another stroke. However, participants stressed their continued need for touch and emotional connection (Schmitz and Finkelstein, 2010).

Besides functional disability, the suggested pathways through which physical and sensory disability affect sexual intimacy in couples mostly referred to complex changes in the couple relationship. Three of the 10 interviewed spouses of individuals with hearing impairment reported a reduction in intimate talk and increased tension, which ultimately affected their sexual relationships (Scarinci et al., 2008). The role changes perceived by many couples across health impairments were also important contributors to reduced sexual intimacy. Some spouses reported experiencing role conflicts between being a caregiver and being a romantic, sexual partner (Jeyathevan et al., 2019; O'Keeffe et al., 2020). The loss of a sexual relationship caused some spouses in SCI couples to feel like their role had changed to a parental role, underlining the interrelations between role changes and sexual intimacy changes (Dickson et al., 2010). In general, global changes in the couple relationship and dyadic interactions were more important for sexual satisfaction than functional ability or individual well-being (Blackmore et al., 2011). For example, support transactions between partners also seem to affect sexual intimacy. MS patients who had received telephone-administered psychotherapy for depression reported improvements in sexual satisfaction when positive partner support had increased from baseline to post-treatment and when negative partner support had decreased. This remained true when controlling for sexual dysfunction and depression severity (Dickson et al., 2010).

Another contributor to struggles in maintaining sexual intimacy was insecurities in partners around mutual attractiveness. Females with locomotor disability reported struggling to feel feminine and sexually attractive for their partners (Schembri Lia and Abela, 2019). Conversely, their spouses reported difficulty feeling sexual attraction when they saw their partner experiencing physical pain and perceived them as fragile. Similar accounts were reported in couples coping with PD. Insecurities of the patients whether they remained attractive as partners caused some couples to feel less secure about the stability of their relationship and thus less close to their spouses, emotionally and sexually (Martin, 2016).

Lastly, structural barriers to a fulfilling expression of intimacy including sexual intimacy were reported by Freeman

et al. (2017). Focusing on couples' experiences of relationship maintenance during acute SCI rehabilitation, they found that the inpatient environment limited couples' privacy and, thus, their opportunities to express intimacy. While couples perceived themselves as a unit going through rehabilitation, healthcare professionals were reported to engage in behavioral patterns that undermined the couples' sense of unity.

Restrictions in Social Participation

While the challenges posed by the health impairment had an impact on the couple relationship as such, it also affected the couple's opportunities to jointly participate in social life outside the home. A general feeling of being "isolated from the broader world" was reported for younger couples coping with stroke (McCarthy and Bauer, 2015). SCI was related to reduced social esteem and thus reduced social circle in couples from Hong Kong (Chan, 2000). Dickson et al. (2010) reported that some spouses of individuals with SCI felt they had become invisible to other people following their spouse's injury. Similarly, some SCI couples reported increased social disconnection post-injury due to accessibility issues and because they experienced friends to feel uncomfortable interacting with the couple (Engblom-Deglmann and Hamilton, 2020). Accessibility issues were also reported to reduce opportunities to socialize with friends in PD couples (Martin, 2016). Restrictions in social participation were also an important issue in couples coping with sensory loss. Communication problems seemed to induce embarrassment in social situations leading the couples to socialize less (Yorgason et al., 2007; Scarinci et al., 2008; Lehane et al., 2017a). In hearing loss, cochlear implants were reported to improve social interactions that had been difficult pre-implant (Glade, 2018). One strategy to counteract a lack of social participation was for partners of individuals with SCI to establish social lives separate from their partners. This, however, meant a loss of shared activities for the couple (Engblom-Deglmann and Hamilton, 2020). Spouses of TBI patients reported that a reduction in opportunities for shared enjoyment contributed to an increasing distance between them and their partners (Bodley-Scott and Riley, 2015). Loss of shared activities and spending less time together was also reported in couples coping with hearing loss (Yorgason et al., 2007; Scarinci et al., 2008) and PD (Martin, 2016) and contributed to a decrease in closeness of the partners.

Dyadic Coping

Dyadic coping reported in the included studies was found to help buffer the stress couples experience due to chronically impaired health (see **Figure 2**). In the following, the most helpful dyadic coping strategies reported by couples are presented.

Mutual Sharing of Personal Experiences

Holding back from disclosing personal experiences seemed to be a prevalent phenomenon in couples coping with physical and sensory disability of one partner. Studies suggested that avoidance of certain topics, cautious communication and holding back, feeling uncomfortable sharing one's emotions, and protective buffering were common in couples coping with SCI (Chan, 2000; Jeyathevan et al., 2019), stroke (Croteau et al., 2020),

MS (Wawrziczny et al., 2019), and TBI (O'Keeffe et al., 2020). Holding back from sharing personal experiences seemed to be relationship-compromising. In a longitudinal dyadic study on knee osteoarthritis (OA), patients and their spouses reported the extent to which they disclosed or held back from discussing their concerns with their partner. Holding back concerns regarding symptoms and treatment, activity limitations due to OA, disease progression, own negative feelings, relationship with the spouse and others, and financial strain was associated with decreases in one's relationship satisfaction over a 1-year period for both patients and spouses (Zhaoyang et al., 2018).

While holding back from sharing personal experiences was relationship-compromising, mutually sharing personal experiences appeared to be relationship-enhancing. In the OA sample, increased disclosure of concerns was associated with increases in relationship satisfaction over the course of 1 year (Zhaoyang et al., 2018). Higher scores of mutual sensory loss-related communication were also positively associated with relationship satisfaction in spouses of individuals with dual-sensory loss. Perceived reciprocity in spouses' willingness to discuss sensory loss together was also associated with perceived support, suggesting partners' willingness to share their experiences of sensory loss contributed to the spouse's feeling of being cared for in the relationship (Lehane et al., 2018). Similarly, MS patients considered the ability to talk with their spouses about personal difficulties and needs essential to establishing and maintaining a comforting relationship (Ghafari et al., 2014). Couples who were found to be satisfied with the reconstruction of their relationships after one partner's stroke reported how they had continued or learned to talk together about their difficulties and needs following stroke. In contrast, dissatisfied couples seemed to remain stuck in patterns of mutual holding back and withdrawal from communication (Anderson et al., 2017).

We-Perspective and Conjoint Coping Efforts

Couples who adopted a "we-perspective" with regard to coping with the consequences of the health impairment seemed to adjust well. The couples' sense of togetherness helped them cope with stressors associated with the disease. For example, Bolland et al. (2012) noted that the MS couples in their study shared a perception that "they would cope better together than if they were separated" (p. 1,371). Both partners' perception that they were "in it together" was also named as an important factor in maintaining or re-establishing satisfying relationships in couples coping with vision loss (Burton et al., 2015) and SCI (Freeman et al., 2017). For instance, individuals with SCI and their family caregivers both emphasized the need to mutually rely on each other and their joint responsibility to rebuild the relationship post-injury. They considered both relationship partners to be interdependent, reflecting a strong we-perspective (Jeyathevan et al., 2019). Conversely, in couples coping with MS, a main finding was that each spouse withdrew and fought the disease individually. These couples lacked a we-perspective and did not engage in conjoint coping efforts. The participating couples were described as "alienated," indicating that their individual approaches to coping took a toll on the relationship (Wawrziczny et al., 2019). Similarly, mutual

withdrawal or disengagement from coping contributed to feelings of disconnection and a loss of we-perspective in TBI couples (O’Keeffe et al., 2020), PD couples (Wootton et al., 2019), and partners of individuals with SCI (Dickson et al., 2010). Accordingly, MS couples who were considered “in-sync” by Starks et al. (2010, p. 198) were portrayed to frequently work as a team in relation to problem-solving while “out-of-sync” couples only rarely worked as a team. Conjoint coping efforts were also important for re-establishing relationship satisfaction following stroke. Couples who reported mutual awareness of each other’s feelings and resolved conflict by discussing problems together adjusted best. Such efforts to understand each other’s experience and act in the best interest of the couple reflected a we-perspective in partners. In contrast, couples from the same study who had divorced or remained married despite considerable dissatisfaction described how mutual unwillingness to learn about each other’s experiences contributed to increasing escalation of conflicts (Anderson et al., 2017).

Factors Favoring and Hindering Mutual Sharing, We-Perspective, and Conjoint Coping

Some studies indicated characteristics and processes that favored the positive forms of dyadic coping summarized above, i.e., mutual sharing, we-perspective, and conjoint coping. Firstly, participants from several studies emphasized the relevance of pre-impairment relationship quality. Couples coping with locomotor disability of the wife all pointed out that a strong relationship basis prior to the development of the wife’s impairments was paramount to adjusting well as a couple (Schembri Lia and Abela, 2019). Similarly, PD patients and spouses considered “a good marriage” to be essential for coping with PD (Carter and Carter, 1994) and couples coping with stroke reported drawing on existing relationship strengths to cope with the changes associated with the stroke (McCarthy and Bauer, 2015). The compatibility of preexisting communication and coping styles also favored positive dyadic coping in MS couples. “In-sync” couples from the sample of Starks et al. (2010), i.e., couples who had adjusted well to living with MS, were often characterized by compatible world views and communication styles. In contrast, Boland et al. (2012) reported that some couples who had difficulty adjusting to MS presented with coping styles that had once been complimentary, but became oppositional in the face of added stress due to the health problem. That is, while differing coping styles were functional pre-impairment because they complemented each other well, these differences went on to cause tension and friction between partners once MS generated more stress for the couple.

A second factor that seemed to favor positive dyadic coping was sensitivity between partners. Being attuned to each other’s feelings and needs helped couples cope with locomotor disability (Schembri Lia and Abela, 2019), and mutual understanding and patience were central to coping with SCI (Chan, 2000). Noticing one’s own negative behaviors toward the partner and actively engaging to counteract them, e.g., by countering negative comments with expressions of affection, was an indicator of sensitivity reported in couples coping with one partner’s hearing loss (Yorgason et al., 2007). In contrast, communication

breakdown in MS couples seemed to occur as a consequence of repeated insensitivities when one partner negated the other’s experiences, e.g., by trivializing them or by offering unsolicited positive reevaluation (Wawrziczny et al., 2019). Insensitivities of the partner were also experienced by individuals with SCI. Patients generally reported that they needed more emotional than instrumental support while they perceived their spouses to mainly provide instrumental support (Ghafari et al., 2014).

Thirdly, acceptance of the disability and its consequences also seemed to favor positive dyadic coping. For instance, Smith and Shaw (2017) concluded that PD couples fared well when they assimilated PD into their lives, that is, when couples acknowledged that PD required changes to their lifestyle. This allowed patients to retain more agency and thus provided them with more opportunities to be involved in coping. In contrast, lack of acceptance hindered constructive dyadic coping. Some stroke survivors rejected the role changes within their relationships, particularly their own role as care recipient, thus potentially abstaining from expressing their needs for support (Quinn et al., 2014). Similarly, some couples coping with MS reported they did not want to give much space to the disease, i.e., they were not willing to acknowledge its place within the relationship. Consequently, communication and mutual support between the partners deteriorated over time (Wawrziczny et al., 2019).

Other, less frequently mentioned factors that particularly hindered sharing of personal experiences included fear that one’s feelings would get hurt (Jeyathevan et al., 2019) and the perceived unpredictability of the partner’s reaction (O’Keeffe et al., 2020).

Dyadic Adjustment

As depicted in **Figure 2**, several studies indicated that dyadic challenges and dyadic coping are related to overall dyadic adjustment following disability. Early quantitative findings on couples coping with SCI suggested that most partners (84%) were overall satisfied with their relationship (Kreuter et al., 1994). Marital adjustment and marital satisfaction did not differ between SCI couples and couples with two healthy partners, whereas SCI couples even reported significantly higher marital stability (Yim et al., 1998). Overall marital adjustment in couples coping with PD was not significantly different from population norms. However, when considering subscales, consensus was significantly lower and cohesion was significantly higher in PD couples than in the general population (Carter and Carter, 1994). Data from couples coping with TBI suggested that about half of patients and partners reported clinically significant levels of marital dissatisfaction. However, ratings of marital instability were lower with roughly one quarter of participants reporting their marriage was unstable (Kreutzer et al., 2016). There was evidence for a decline of relationship satisfaction over 1 year for couples coping with MS. However, whether this decline was directly related to coping with MS is difficult to establish given that baseline measurements were taken at a mean number of 15.66 years (SD = 10.62) since onset of symptoms (Samios et al., 2015).

Qualitative studies focused more on the unfolding and often circular process of dyadic challenges and the related stress

experience, dyadic coping, and adjustment. They often concluded that couples experienced phases of crisis when stress exceeded available dyadic coping resources and phases of (re-)adjustment when couples were able to balance out stress through coping efforts. Some studies came to the overall conclusion that couples did not adjust well to physical or sensory disability, as is evidenced, for example, by the theme of “the alienated couple” reported by Wawrziczny et al. (2019) in MS couples. Other examples include permanently altered communication in couples coping with stroke (Croteau et al., 2020), or the finding that the majority of spouses of TBI patients felt their love had changed toward a caring relationship lacking romantic aspects (Bodley-Scott and Riley, 2015). Other qualitative studies in this review, however, presented a more balanced account. The relationships of couples coping with TBI were captured by the somewhat opposing themes of “broken bonds” and “new dynamics” (O’Keeffe et al., 2020). Similarly, SCI couples’ adjustment post-injury was described as laying on a continuum from “constriction/stagnation” to “connection/flexibility” (Engblom-Deglmann and Hamilton, 2020). Some couples witnessed a deterioration of their relationships, while others were able to maintain or rebuild their relationships (Jeyathevan et al., 2019). Accounts of (intermittent) deterioration of the relationship with subsequent adjustment to varying degrees were most common (Chan, 2000; Dickson et al., 2010; Boland et al., 2012; McCarthy and Bauer, 2015; Martin, 2016; Anderson et al., 2017; Smith and Shaw, 2017; Glade, 2018).

DISCUSSION

The aims of this review were to identify dyadic challenges due to one partner’s chronically disabling physical or sensory health impairment that may strain the couple relationship and to summarize evidence regarding dyadic coping with these challenges. Findings from qualitative and quantitative research were integrated to provide a comprehensive account of available evidence. Thirty-six publications matched the inclusion criteria. The results clearly underline that impairments and their consequences affect both members of the couple and generate *we*-stress (Bodenmann, 2005). In other words, disability is an interpersonal experience in close relationships. This has repeatedly been found in other chronic health conditions such as cancer (Hagedoorn et al., 2008), diabetes (Lister et al., 2013), and cardiovascular disease (Trump and Mendenhall, 2017). The review also indicated that dyadic challenges were largely comparable across health impairments. Couples experienced similar challenges although they were not coping with the same diagnosis. This supports theoretical work on how couples coping with one partner’s health condition are faced with a series of common stressors due to changes in the relationship (Rolland, 1994). The type of health condition may influence the relevance and burden of certain changes, but the factors related to maintaining a balanced relationship remain comparable for all couples.

The most frequent dyadic challenges identified in this review were changes in roles and responsibilities of the partners,

altered communication, compromised sexual intimacy, and restricted social participation. Altered communication due to functional impairments was particularly relevant in couples coping with sensory disability, whereas sexual intimacy was most strongly compromised in the context of physical disability. This underlines the relevance of contextual factors to fully understand dyadic coping in the context of impaired health (e.g., Berg and Upchurch, 2007). In accordance with the similarity of dyadic challenges, the current review also showed that adaptive dyadic coping strategies were comparable across health impairments. Adopting a *we*-perspective and conjoint involvement of both partners in coping were crucial for couples. Partners’ willingness and effort to mutually share and listen to each other’s personal experiences supported conjoint dyadic coping and were beneficial for dyadic adjustment. In other words, couples coping with chronically disabling physical or sensory impairment of one partner fare best when partners stay connected and remain sensitive to each other’s experiences and when they join their forces to counteract the potentially deleterious effects of the impairment on their relationship and well-being (see Figure 2).

De-Emphasizing the “You” and “Me”

Changes in roles and responsibilities are almost inevitable when one partner in a couple faces chronically impaired health. For example, impairments can cause patients who previously worked for pay to reduce or cease their professional activities. Similarly, the transition from romantic partners to caregiver and care recipient is a common experience for most couples. Despite being common, these changes should not be neglected as they strongly contribute to the experience of chronic stress in both partners. Chronic everyday stress, in turn, can have detrimental effects for individual and relational well-being (Bodenmann, 2005; Randall and Bodenmann, 2009). For instance, forced retirement often means a loss of social status and opportunities for social integration for the patient with potential negative effects on their self-esteem (van der Heide et al., 2013). Partners, on the other hand, may need to step in to avoid financial strain for the couple or family. This increases workload and stress for partners. Furthermore, across different health conditions, partners often report feeling overwhelmed with their new “identity” as caregivers and with caregiving tasks (Kang et al., 2011; Mausbach et al., 2012; McCarthy and Bauer, 2015). Patients, on the other hand, may experience frustration when they become dependent on care provided by their spouse. In particular, overprotection of partners toward patients can threaten patients’ sense of autonomy and control. The frustration about their undermined autonomy contributes to the experience of stress in patients and can trigger conflict in the couple (Kuijjer et al., 2000; Dalteg et al., 2011).

Beyond generating chronic stress for both partners, the role changes couples experience when coping with chronic health impairments in one partner disturb the delicate balance of autonomy and (inter-)dependence within a couple. Such imbalances occur as a function of ascribing a diagnosis to one partner. This partner is labeled as “the patient” who is normatively expected to be the recipient of care and support. The

other partner becomes “the partner” who is expected to provide care and support (Leuchtmann and Bodenmann, 2017). Such a juxtaposition of role expectations may jeopardize the perceived balance of support, e.g., the equity of dyadic coping. Inequity in support transactions can undermine individual and relational well-being. For example, receiving support without reciprocating it was associated with poorer mood in the recipient (Gleason et al., 2003) and inequity of dyadic coping was associated with lower personal health and relationship satisfaction (Gmelch and Bodenmann, 2007; Iafrate et al., 2012). These associations also hold in times of heightened stress. Inequity of dyadic coping was associated with more depressive symptoms in couples shortly after the birth of their first child (Meier et al., 2020), in couples facing a kidney transplantation (Tkachenko et al., 2019), and in patients with a major depressive episode (Meier et al., 2021). Couples thus seem to have a continued need for equitable coping contributions of both partners even when factors such as chronically impaired health of one partner challenge balanced coping efforts.

Couples’ continued need for balanced contributions to coping underlines the importance of conjoint dyadic coping efforts. As the results of this review showed, coping together rather than individually is crucial for couples to best adjust to chronically impaired health of one partner (e.g., Starks et al., 2010). This is consistent with the findings that conjoint forms of dyadic coping are strongly related to better individual and dyadic adjustment in couples coping with impaired health (e.g., Traa et al., 2015). However, normative role expectations for patients and partners contradict conjoint and balanced involvement of both partners in dyadic coping. The view that the patient presents with the impairment and needs care and support while the healthy partner provides any care and support the patient may need contributes to a focus on the “you” and “me” in couples and neglects couples’ interpersonal experience of disability. De-emphasizing patient and partner roles, instead, allows for a much more nuanced perspective on couples coping with impaired health: Both partners experience suffering related to the consequences of the impairment, but they also both have resources to jointly cope with these consequences (Leuchtmann and Bodenmann, 2017). De-emphasizing patient and partner roles and de-emphasizing the “you” and “me” will help couples focus on their united strength and resilience.

Couples themselves, their immediate social environment as well as healthcare and social service providers can all contribute to de-emphasizing rigid patient and partner roles. Healthcare and social services generally have one client, namely the person with a health impairment, who is assigned medical or other assistance. However, providers can support a dyadic perspective in various ways. For instance, they can address possible impacts of the impairment on the couple relationship in consultation. Studies indicate that this is a commonly expressed need. For instance, in a study on couples coping with stroke included in this review, most participants said they felt that the rehabilitation team should initiate conversations about post-stroke sexuality. However, only 3 of 29 interview participants reported that a physician or psychologist had discussed sexual adjustment with them (Schmitz and Finkelstein, 2010). Similar

discrepancies between needs for discussion of sexual adjustment post-diagnosis have been reported in cancer (e.g., Lindau et al., 2011; Sporn et al., 2015). Further options for healthcare staff to de-emphasize patient and partner roles include, among others, explicitly asking the patient to bring their spouse to appointments or discussing the option of referral to couple counseling or psychosocial interventions targeted at couples coping with health impairments (see, e.g., Martire et al., 2010; Badr and Krebs, 2013). The immediate social environment can also contribute to de-emphasizing patient and partner roles. They may, for example, ask about all family members and whether they need support. In a study reviewed here, the wife of a man who had sustained SCI talked about how people in their social circle usually asked only about her husband, leaving herself to feel unrecognized (Dickson et al., 2010). Couples also experienced their social circle gradually diminishing because friends would not know how to openly talk about the injury (Engblom-Deglmann and Hamilton, 2020). Events like these may be reduced if couples’ friends and kin are educated about the impairment, how they can talk about its consequences for the couple and how to support the couple. The couple can enhance others’ understanding by addressing such topics openly with their social network to increase awareness for their experiences. The partners can further contribute to de-emphasizing their respective roles by mutually inquiring about each other’s experiences.

Strengthening the “We”

When the “you” and “me” are de-emphasized, couples can focus on strengthening the “we.” The results of this review show that chronically disabling health impairments of one partner strongly affect both partners. Consequently, our results highlight that adopting a we-perspective is most beneficial when coping with dyadic challenges related to the impairment (e.g., Freeman et al., 2017). In line with the notions of we-stress and we-disease (Kayser et al., 2007; Bodenmann et al., 2016) and with communal coping theory (Lyons et al., 1998; Helgeson et al., 2018), focusing on the health impairment as “our” problem contributes to good dyadic and individual adjustment. The works of Skerrett (1998, 2003) and Fergus (2011) on couples coping with cancer have shown that viewing cancer as “our problem” is an important source of resilience and promotes optimal functioning of the couple in the face of adversity. Similarly, when couples considered diabetes to be a shared problem and both partners were involved in diabetes management, patients reported better relationship quality and partners reported lower distress (Helgeson et al., 2017). First-person plural noun use (“we-talk”) as a proxy for a we-perspective has been linked to positive health outcomes in patients with heart or lung problems (Rohrbaugh et al., 2012) and heart failure patients (Rohrbaugh et al., 2008). Spouses’ higher shared appraisals of diabetes were related to weaker associations between patients’ self-efficacy and distress. In other words, patients with low self-efficacy were buffered against poor adjustment when their spouses considered diabetes a shared problem (Zajdel et al., 2018).

As adopting a we-perspective to coping with chronic health impairments is clearly beneficial for couples, investigating how such a we-perspective develops is crucial. Findings from

the current review suggest that partners' mutual sharing of their personal experiences may be one factor that contributes to developing a we-perspective (e.g., Anderson et al., 2017). Previous research shows beneficial effects of mutually sharing personal experiences for relational functioning in general. In daily diaries of healthy couples, self-disclosure and partner disclosure contributed to same-day perceived intimacy (Laurenceau et al., 2005). In breast cancer patients and their cohabiting partners, mutual expression and discussion of feelings related to cancer around the time of surgery was associated with greater relationship satisfaction 9 months later (Manne et al., 2006). Positive associations between mutual constructive communication and relationship functioning were confirmed in a systematic review on couples coping with cancer (Traa et al., 2015). One explanation for the high relevance of mutual sharing may be the couples' need to negotiate cognitive representations of the health impairment. These representations shape their approach to coping—more individual vs. more dyadic coping. The representations can, however, not be expected to be congruent between partners given, for example, that the patient directly experiences symptoms while the partner only has indirect access to experiences related to the impairment. Thus, mutually sharing their personal experiences helps both partners align their respective cognitive representations of the health impairment more closely so that they can jointly develop the most effective approaches to coping (Badr and Acitelli, 2017). However, future research is needed to gain more insight into the cognitive and communicative processes involved in developing couples' we-perspectives when coping with impaired health.

Furthermore, future research should focus on holding back from sharing personal experiences related to impaired health. Findings from this review suggest that holding back from sharing can undermine a we-perspective by increasing emotional distance between partners. This is consistent with the assumption that holding back is relationship-compromising (Manne and Badr, 2008) which is, for instance, supported by a negative association of holding back with relationship intimacy in couples coping with prostate cancer (Manne et al., 2015). Protective buffering, i.e., efforts to hide or deny concerns from one's partner (Coyne and Smith, 1991), also seemed to have adverse psychosocial effects in couples coping with cancer. The more participants buffered their partners and the more they felt buffered by their partner, the lower their relationship satisfaction (Langer et al., 2009). Data from ecological momentary assessment in cancer couples' daily lives confirmed the negative association between holding back and one's own relationship satisfaction. They also suggested interpersonal effects, i.e., holding back was negatively associated with one's partner's relationship satisfaction (Langer et al., 2018). Protective buffering also had negative effects on intimacy in cancer couples (Perndorfer et al., 2019). These findings support the assumption that holding back from sharing personal experiences may signal distancing of the partners and thus erode couples' sense of being a unit. However, future research is needed to disentangle the differential contributions of mutual sharing and holding back to developing a we-perspective. Furthermore, investigating conditions that favor mutual sharing and reasons

for holding back will foster our understanding of the we-perspective.

In sum, strengthening the “we” in couples coping with chronic health impairments contributes to dyadic adjustment by focusing the couples' attention on shared coping resources. This can be achieved when both partners reciprocally share their experiences, concerns, and needs generating a narrative of being “in it together.”

Strengths and Limitations

This review adds to our understanding of disability as an interpersonal experience. It represents an important step to identifying similarities and differences in dyadic coping and dyadic adjustment across different health impairments with varying contextual factors such as disease progression that have been rather neglected in dyadic coping research. The review considers qualitative and quantitative studies to ensure a comprehensive synthesis of available evidence and comparison of findings across research designs. This allows to check more in depth for the robustness of findings. In this review, qualitative studies were particularly helpful to explore changes in the couple relationship in detail. They also captured the temporal unfolding of dyadic coping as a prolonged process. In contrast, quantitative studies helped to frame the significance of identified dyadic challenges and coping elements by indicating how frequent and pronounced these phenomena were. The findings clearly suggest that stressors for couples are comparable across chronically disabling health impairments as are dyadic coping strategies that foster good dyadic adjustment despite chronic stress. This can inform the development of psychosocial interventions which aim to enhance couple relationships strained by impaired health.

Nonetheless, there are several limitations to this systematic review. First, although cognitive impairments and their impact on the couple relationship were not the focus of this review, some of the reviewed studies may have included patients who presented with cognitive impairments. Cognitive impairments pose specific challenges for couples. For instance, in dementia, relationship functioning seems to be strongly related to behavioral problems of the patient (Quinn et al., 2009). However, except for one study that focused on stroke-related aphasia and its impact on couples' communication (Croteau et al., 2020) and two studies suggesting that personality changes in TBI patients might have contributed to emotional distance between the partners (Bodley-Scott and Riley, 2015; O'Keeffe et al., 2020), no studies showed indications that cognitive impairments were responsible for the relationship challenges summarized in this review. Second, the current review focused on dyadic processes and their relation to dyadic outcomes. As such, studies investigating individual variables (e.g., illness perceptions, depressive symptoms) in relation to dyadic variables (e.g., relationship satisfaction, dyadic coping) were excluded. Such studies make a unique contribution to our understanding of the relevance of couple relationships for individual well-being. In the current review, however, the unit of analysis is the couple and the emphasis lies on the interdependence of both partners' cognitions, emotions, and actions. Third, the focus on dyadic processes and outcomes may have favored the inclusion of qualitative over quantitative

research. The semistructured interview is the most common method of qualitative data collection. It offers researchers the opportunity to jointly interview partners, thus creating a setting that fosters exchange on dyadic experiences. The quantitative questionnaire, in contrast, requires respondents to answer separately and is thus more prone to capturing individual experiences. However, most of the included qualitative studies separately interviewed partners and did thus not benefit from the potential advantages of the dyadic setting. Fourth, we included studies with samples consisting of spousal caregivers and other (family) caregivers. To ensure findings were not confounded with stressors relevant to other forms of close relationships than the spousal/romantic type, we only extracted results that were clearly attributable to romantic relationships, either based on topic (e.g., sexual activity) or respondent (e.g., quotes from spouses vs. parents of patients). Fifth, for the majority of the studies included in this review, we identified concerns about methodological quality. Due to the novel approach of integrating evidence across research designs, we did not limit reporting of results to studies with high-quality ratings. Conclusions drawn from the review's findings should thus be appraised with caution. The identified quality concerns show that the field is in need of continued high-quality research efforts. It will particularly benefit from studies, quantitative and qualitative, taking into consideration the development of the discussed processes over time. For instance, studies with cohorts of couples with varying time since onset of symptoms can give more insight into developmental phases in dyadic coping with impaired health. Longitudinal studies in which couples report on dyadic challenges, dyadic coping, and adjustment across several time points can further add to the existing evidence.

Suggestions for Future Research

The interpersonal experience of disability in close relationships is an innovative area of research that will greatly profit from intensified research efforts. For instance, in line with the above rationale for more cohort and longitudinal studies on couples coping with disabling health impairments, further research is needed to identify factors that contribute to the development or erosion of a we-perspective in couples coping with chronically impaired health. Investigating the differential contributions of mutually sharing and holding back from sharing personal experiences is one avenue for future research. The findings from this review further suggest that substantial changes in couples' sexual relationships may undermine partners' emotional connectedness. Feeling increasingly disconnected from one's partner may gradually erode a previously established we-perspective. The complex relationship between sexual intimacy and dyadic adjustment in the case of chronic health impairments should thus be investigated more in depth. Similarly, couples in this review often reported restrictions in social participation. This contributed to a lack of shared enjoyment that may also jeopardize closeness and a sense of we-ness. Participation restrictions are often related to insufficient accessibility of public or private spaces. Improving accessibility can thus greatly reinforce couples' opportunities for shared leisure time experiences that strengthen their we-perspective. The effects

of social and health policy on couple relationships thus warrant further investigation. Lastly, although a we-perspective is generally beneficial in coping with chronic health impairments, future research should consider cases where a we-perspective may need to be de-emphasized, e.g., in terminal illness. Also, as equity is important in support transactions, congruence or incongruence between partners' we-perspectives and how they relate to dyadic coping can be investigated.

Practical Implications

The results of this review provide important directions for clinicians who aim to foster couples' coping with chronically disabling health impairments. Most importantly, they suggest that the individual-centered view in standard biomedical care should be paralleled with an interpersonal view of health impairments and disability (Leuchtmann and Bodenmann, 2017). De-emphasizing the roles of patient and partner is in line with couples' perceptions of going through treatment together (e.g., Freeman et al., 2017). Involving both partners in interventions acknowledges this interpersonal experience and shows better efficacy than individual care. For example, in interventions to remedy the psychosocial effects of chronic illness, involving both partners was more beneficial than standard medical care and psychosocial interventions for partners only (Martire et al., 2004, 2010). Viewing the couple as the target of an intervention contributes to de-emphasizing patient and partner roles and practitioners can build on relationship-enhancement interventions for community samples, e.g., the Couples Coping Enhancement Training (CCET; Bodenmann and Shantinath, 2004). The central elements of CCET are communication and conflict resolution, psychoeducation about the deleterious effects of stress, and practical training of dyadic coping skills. Fostering open communication and partners' conjoint dyadic coping efforts resonates with the general importance of strengthening the "we" in couples coping with chronic health impairments. CCET has been adapted for use in couples coping with breast or gynecological cancer (Heinrichs and Zimmermann, 2007), and it has proven to be effective at improving individual well-being and dyadic skills to cope with cancer.

However, findings from this review also suggest some specificities of chronically disabling physical and sensory impairments that should be considered for optimal care: Firstly, some impairments alter communicative abilities of patients. In order to mitigate potential aversive consequences for couple communication, couples need information on specific treatment options such as speech-language therapy or audiological rehabilitation. Secondly, physical impairments and symptoms such as fatigue may interfere with sexual function and sexual activity across a wide variety of health conditions. Healthcare providers should thus actively discuss sexual intimacy with couples and address ways to deal with such changes. Thirdly, couples often experience restrictions in social participation. They should thus be empowered to openly address such issues, for example, in the family or social circle. Additionally, improving accessibility of public spaces can greatly improve couples' opportunities for social participation, underlining the role of public policy for individual and community health.

Overall, interdisciplinary networking seems to be crucial to foster optimal adjustment to chronically disabling conditions beyond the individual patient.

In general, when interacting with couples facing health impairments, professionals across disciplines should be vigilant to detect indications of stressful dyadic changes such as sudden role changes or reduced opportunities for social participation. Conversely, they may also want to validate beneficial, relationship-enhancing behaviors. For example, they may praise partners who share their feelings and struggles with regard to their partner's impairment rather than discourage such sharing by exclusively focusing on the person with the impairment. Professionals may also encourage couples to share their experience not only with each other but with their friends and kin as well. Couples expressing apprehensions that sharing personal experiences, especially negative ones, may hurt or burden others may be informed about research pointing to the contrary. Barriers to sharing and open communication may be countered with various types of supportive interventions, e.g., communication or social competence training, self-help groups, or online communities. All these measures require professionals to develop their own sensitivity with regard to the interpersonal dimension of impaired health. Consistently integrating elements of systemic thinking into professional training in healthcare and beyond is thus crucial.

Finally, while we strongly urge to de-emphasize the roles of patient and partner in the healthcare system, their partly differing experiences are undeniable and should not be negated. Instead, the partners need reassurance that temporal shifts and imbalances between partners are inevitable (e.g., Rolland, 1994), but that they also have the ability to renegotiate roles and responsibilities within their relationship. This may empower couples to overcome times when the stress related to coping with chronically impaired health feels overwhelming.

CONCLUSIONS

In close relationships, disability is a profoundly interpersonal experience. Dyadic challenges due to disability are manifold and they are comparable across different underlying impairments. If couples do not exert the necessary dyadic coping, changes in roles and responsibilities, communication, sexual intimacy, and

social participation can lead to deterioration of the relationship. Couples cope best when they adopt a we-perspective, that is, when they engage in open communication about both partners' experiences and when they join their forces to develop new outlooks for the relationship. De-emphasizing the roles of patient and partner in favor of viewing both partners as resourceful contributors to each other's well-being thus strengthens the couple as a unit.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

ICB and GB conceptualized the review. ICB conducted the systematic literature search, assessed article eligibility, extracted data, structured the results, and wrote the first draft of the manuscript. ICB, FM, and GB revised the manuscript. GB supervised the review. All authors have read and approved the final version of the manuscript for submission.

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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.2021.624609/full#supplementary-material>

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Spillover Effects When Taking Turns in Dyadic Coping: How Lingering Negative Affect and Perceived Partner Responsiveness Shape Subsequent Support Provision

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When experiencing personal distress, people usually expect their romantic partner to be supportive. However, when put in a situation to provide support, people may at times (still) be struggling with issues of their own. This interdependent nature of dyadic coping interactions as well as potential spillover effects is mirrored in the state-of-the-art research method to behaviorally assess couple's dyadic coping processes. This paradigm typically includes two videotaped 8-min dyadic coping conversations in which partners swap roles as sharer and support provider. Little is known about how such dyadic coping interactions may feed back into one another, impacting the motivation and ability to be a responsive support provider. In three behavioral studies, we examined how sharers' experiences may spill over to affect their own support provision in a subsequent dyadic coping interaction. We hypothesized that the extent to which sharers perceive their partner as responsive to their self-disclosure increases the quality of their own subsequent support provision (Hypothesis 1), whereas sharers' lingering negative affect reduces the quality of their own subsequent support provision (Hypothesis 2). In line with our first hypothesis, perceived partner responsiveness predicted the provision of higher-quality support, though primarily as perceived by the partner. Sharers who perceived their partner to have been more responsive were somewhat more likely to subsequently engage in positive dyadic coping and were rated as more responsive by their partners. Negative dyadic coping behavior was unaffected. Evidence for our second hypothesis was mixed. While lingering negative affect did not affect positive dyadic coping behavior or perceived support, it did increase the chances of negative dyadic coping behavior. However, given the very low occurrences of negative affect and negative dyadic coping, these findings should be interpreted with caution. Taken together, these findings suggest that support interactions may feed back into one

another, highlighting the complex and interdependent nature of dyadic coping. The strongest and most consistent findings concerned the spillover effect of perceived partner responsiveness on subsequent perceived support quality, speaking to the key role of *believing* that one's partner is responsive to one's needs in promoting healthy relationship functioning.

Keywords: dyadic coping, support provision, perceived responsiveness, negative affect (NA), interpersonal emotion regulation, behavioral observation

INTRODUCTION

Imagine coming home after a rough day at work, where your boss unexpectedly just fired one of your favorite colleagues. Your partner gives you a hasty kiss, after which they fires away with a long story on their concerns about his or her mother's deteriorating health. How do you respond? While you might normally be a very attentive listener, trying to gauge his or her needs to best support him or her, you may find yourself preoccupied with lingering anger, sadness, and confusion about your colleague's dismissal. Also, you might perceive your partner to be unresponsive, not sensing your current mood, or asking about your day, but simply showering you with his or her own concerns. As a result, you may find yourself unable or unwilling to be a responsive partner in this situation.

One of the core features of close relationships concerns sharing one's intimate emotional experiences with one's partner (e.g., Laurenceau et al., 2004). This type of self-disclosure is crucial for fostering intimacy and hinges on the partner's responsiveness to sharer's needs (for overviews, see Laurenceau et al., 2004; Reis et al., 2004, 2017; Reis and Gable, 2015). The process of dyadic coping describes how one partner's emotional expression allows the couple to evaluate the nature and implications of the distressing situation together, paving the way for support provision (i.e., dyadic coping, see systemic transactional model; Bodenmann, 1995; Bodenmann et al., 2016). Positive dyadic coping, which includes attentive listening and various forms of emotional (e.g., empathy), cognitive (e.g., reappraisal), and instrumental support (e.g., practical assistance), has been shown to be crucial for relationship satisfaction (see a meta-analysis by Falconier et al., 2015). However, as illustrated in the scene above, when one's own support provision is requested, people may at times (still) be struggling with issues of their own. An overlooked issue is how these support interactions may feed back into one another, impacting the quality of support provision. This interdependent nature of dyadic coping interactions as well as potential spillover effects is mirrored in the state-of-the-art research method to behaviorally assess couple's dyadic coping processes. This paradigm typically includes two videotaped 8-min dyadic coping conversations in which partners swap roles as sharer and support provider. These interactions are typically studied as independent while they likely are not (see Laurenceau et al., 2004; Joseph and Afifi, 2010; Joseph et al., 2016; Leuchtmann et al., 2018).

In three behavioral studies, we examine whether and how the nature of a preceding dyadic coping interaction shapes support provision in a subsequent interaction. Several cognitive

and motivational factors have been theorized to shape how romantic partners provide support, some of which may be more global (e.g., problem-solving skills or relationship satisfaction) and others more situational (e.g., current available resources or evaluations regarding the need for support; Bodenmann, 1995; Falconier et al., 2015; Bodenmann et al., 2016). The extent to which sharers still experience lingering negative affect and the perceived responsiveness of their partner might constitute two such situational factors that may impact their (cognitive) ability and motivation to provide support when acting as a listener in the next conversation. More specifically, we hypothesize that the extent to which sharers perceive their partner to have been responsive to their self-disclosure of a personal stressor increases the quality of their own subsequent support provision, whereas the sharers' lingering negative affect reduces the quality of own their subsequent support provision. Reflecting potential interdependence between two subsequent dyadic coping interactions, these hypothesized dynamics have methodological implications for the conclusions that can be drawn from data relying on this paradigm, as well as broader theoretical implications for support interactions in daily life.

Spillover Effects of Perceived Partner Responsiveness

When experiencing personal distress, people usually expect their romantic partner to be supportive (Clark et al., 2001; Feeney and Collins, 2001; Reis et al., 2004; Hampel and Vangelisti, 2008). When partners respond to this distress in a way that makes sharers feel validated, understood, and cared for, sharing interactions may foster perceived partner responsiveness, which has been defined as "the process by which individuals come to believe that relationship partners both attend to and react supportively to central, core defining features of the self" (Reis et al., 2004, p. 203). A wealth of literature has shown that when people experience their partners as being responsive to their emotional disclosures, they feel better, more secure in the relationship, and closer to their partner (Laurenceau et al., 1998; Feeney and Collins, 2001, 2003; Manne et al., 2004; Reis et al., 2004; Lemay et al., 2007; Maisel and Gable, 2009; Kuhn et al., 2018; Pagani et al., 2019). Conversely, when people perceive their partner to be less responsive than desired, they experience greater negative affect, reduced positive affect, and reduced relationship satisfaction (Siewert et al., 2011; Afifi et al., 2013; Priem and Solomon, 2015; Joseph et al., 2016).

Crucially, these emotional and relational outcomes of support interactions likely set a cyclical dynamic in play. When people

perceive their partner to be responsive, they may be motivated to reciprocate this benevolence, to be compassionate and responsive to their partner when the tables turn and they themselves are put in a situation to provide support (see Reis, 2014). Most pieces of evidence for such upward spirals of perceived partner responsiveness shaping enhanced pro-relational behavior come from studies examining these dynamics on a trait level over longer periods of time (e.g., Wieselquist et al., 1999; Feeney and Collins, 2003; Lemay and Clark, 2008). However, one set of studies supports the cyclical nature of responsiveness and compassionate motivation, showing that when people perceived their roommate to be more responsive, they experienced greater compassionate goals, which in turn predicted greater reciprocal responsiveness toward their roommate (Canevello and Crocker, 2010). Together, these studies point to the dynamic nature of support provision and suggest that one partner's experiences as a sharer may shape his or her own support provision when the roles are reversed.

Spillover Effects of Negative Affect

Another consequence of this dynamic interplay of switching between seeking support and providing support may be that personal stressors cause lingering negative affect to spill over into the next support interaction. Such sequences of stress expression are likely to occur in couples' lives on a regular basis (e.g., when both partners come home from work) and are also reflected in the frequently adopted methodological paradigm in which couples engage in two subsequent dyadic coping interactions. Spillover effects of negative affect are particularly likely to occur when people have recently shared their emotional experience, as discussing one's own emotional experience reactivates and prolongs the emotional experience (Rimé, 2009; Verduyn et al., 2009, 2011). Furthermore, negative affect might even be increased when people perceive their partner as unresponsive to their sharing (e.g., Joseph et al., 2016). Consequently, the (lingering) experience of negative emotions—whether due to the personal stressor or the sharing experience with one's partner—may impede people's ability and motivation to provide responsive support to one's partner in several ways.

First, emotional arousal may reduce cognitive abilities that are necessary for being there for one's partner, for example, by attentive listening, perspective taking, or accurately perceiving his or her emotions (see Epley et al., 2004; Israelashvili et al., 2020a). Negative emotional experiences might trigger a ruminative process in which people keep thinking about the negative emotional experience (Curci et al., 2013). This ruminative process impairs working memory capacity that would otherwise be available for attending responsively to one's partner (Curci et al., 2013; English and John, 2013) or for downregulating one's own emotions (Schmeichel et al., 2008; Raio et al., 2013; Schmeichel and Tang, 2015). Particularly expressive suppression, that is, trying not to show one's feelings (in this case, to one's partner), has been shown to be cognitively demanding (e.g., Webb et al., 2012; Franchow and Suchy, 2015). Consequently, trying to suppress one's emotions may distract one from attending to one's interaction partner, which may result in behavior that seems distracted or uninterested (i.e., superficial dyadic coping;

Bodenmann, 2005). In line with this idea, Butler et al. (2003) showed that those who suppressed their negative emotions (compared to those who did not) engaged in less responsive behavior, which led their partners to feel less close to them (see English et al., 2013).

Furthermore, preoccupation with one's own negative emotions may elicit overarousal in response to one's partner's negative emotions, causing personal distress (Eisenberg and Eggum, 2011). Personal distress impairs the ability to accurately gauge one's partner's emotions (Israelashvili et al., 2020b) and may induce a primary motivation to reduce one's own distress rather than one's partner's distress (see Eisenberg and Eggum, 2011). Such self-focused caregiving motivations have been found to be associated with ineffective forms of support, in contrast to more altruistic motivations, which are associated with more responsive caring (Feeney and Collins, 2001, 2003). Further supporting this notion, prior work shows that the experience of greater personal distress is associated with a reduced motivation to be compassionate toward others (Crocker et al., 2010), decreased emotional and instrumental support, and greater negative dyadic coping behavior (e.g., criticizing, inattention, disengagement, unhelpful advice; Devoldre et al., 2010; Iida et al., 2010). Taken together, the experience of lingering negative affect may thus temporarily impair both the ability and motivation to be a responsive support provider.

Overview of the Present Research

Romantic relationships are characterized by the dynamic, dyadic nature of their efforts to cope with emotional distress, with partners continuously switching between the roles of sharer and support provider. While a wealth of research demonstrates the benefits of obtaining responsive support, it remains relatively elusive what predicts whether partners will *provide* responsive support (see Canevello and Crocker, 2010; Crocker et al., 2010; Collins et al., 2014). Considering exactly this dynamic interplay of dyadic coping, the present set of studies aimed to examine how the nature of a (prior) support-seeking experience shapes the motivation and ability to provide responsive support when roles are reversed. Hereby, we focused on potential spillover effects of two key factors: perceived partner responsiveness and lingering negative affect. More specifically, we hypothesized that the extent to which sharers perceived their partner to have been responsive in a first dyadic coping interaction increases the quality of their own subsequent support provision (Hypothesis 1), whereas lingering negative affect of the sharer after the first dyadic coping interaction reduces the quality of his or her own subsequent support provision (Hypothesis 2). It should be noted that the present research focused solely on sharers disclosing a personal stressor that is unrelated to the partner.

To test these hypotheses, we present three behavioral studies (total $N = 728$ male–female couples) in which romantic partners engaged in two subsequent videotaped 8-min dyadic coping interactions. In the first interaction, one partner started as a sharer, telling his or her partner about a stressful experience external to the relationship. Roles were swapped in the second conversation. Quality of support was assessed in three different ways. First, we examined the quality of support as perceived

by the partner (i.e., perceived responsiveness; Reis and Gable, 2015). Second, we included two behavioral measures of support quality: the frequency of positive and negative dyadic coping behavior, reflecting high and low quality of support, respectively. Observed behavior was coded by trained coders with a well-established coding system (i.e., Coding System for Dyadic Coping; Bodenmann, 2000). Studies 2 and 3 served as replications of Study 1. All hypotheses and analyses were preregistered on OSF (see here for Study 1 and here for Studies 2 and 3).

STUDY 1

Methods

Participants

The data of Study 1 were part of a longitudinal study including 11 waves (Bodenmann et al., 2019). This research project examines couples' transition to parenthood and included a randomized controlled trial for two couple-focused interventions. The current dataset constituted the first wave of this project, in which participants had not received any intervention yet and were in the third trimester of pregnancy with their first child. Recruitment took place by distributing leaflets or approaching expecting couples directly in different hospitals, gynecological practices, and pregnancy yoga courses, as well as through different social media platforms, newspaper ads, and newsletters. Eligibility criteria included (1) being in a committed romantic relationship of at least 1 year, (2) the female being up to 27 weeks pregnant of their first child, (3) both partners agreeing to participate in the study, (4) understanding and speaking German, and (5) not currently being in treatment for physical or psychological illness. A total of 284 mixed-gender couples took part in Study 1.

As described in our preregistration (see here), we excluded participants from the analyses when they had a predefined number of missing values on the variables that were relevant for that particular analysis. Since most of our measures were averaged composite scores, as a standard, predefined rule across all our three studies, we included participants who had valid data for at least two thirds of the items or video segments per construct. For 34 couples, we did not have behavioral (video) data due to technical reasons and some couples not giving permission to use their video data. This resulted in a total sample of 236 couples for the analyses predicting positive and negative dyadic coping and 262 couples for the analyses predicting perceived responsiveness. On average, women were 31.9 years old ($SD = 3.6$, range = 21–42 years) and men were 34.0 years old ($SD = 5.1$, range = 23–63 years). Most participants reported a relationship duration of 1–5 years (~45%) or 5–15 years (~52%). Most of the couples were married (55.4%), and almost all couples (98.2%) were cohabiting.

Procedure

After providing informed consent, participants first filled out an online questionnaire about their relationship (including other constructs that are beyond the scope of the current study but can be found here in the study protocol). Next, couples were visited at home, where they took part in three videotaped

interactions. First, they had a conflict interaction (irrelevant to the present study) after which they engaged in two dyadic coping interactions. In the first dyadic coping interaction, one partner was randomly assigned the role of the sharer. Before the conversation, sharers rated the extent of burden they experienced in response to a list of topics external to the relationship. Sharers were then asked to talk about the most burdensome topic that still affected them (e.g., that they were still thinking or feeling bad about) that was not directly associated with the partner or the relationship (i.e., an external stressor) and they felt comfortable discussing in front of the camera. The support provider was not instructed to respond in a certain way. Both were instructed to behave in a way they usually do (apart from being asked not to leave the room). In the second dyadic coping interaction, the roles were reversed. After each interaction, sharers rated their negative affect and the extent to which they perceived their partner to have been responsive throughout the conversation. The procedure is visually displayed in **Figure 1**. The study was approved by the ethics committee of the Department of Psychology of the University of Zurich.

Materials

Negative affect

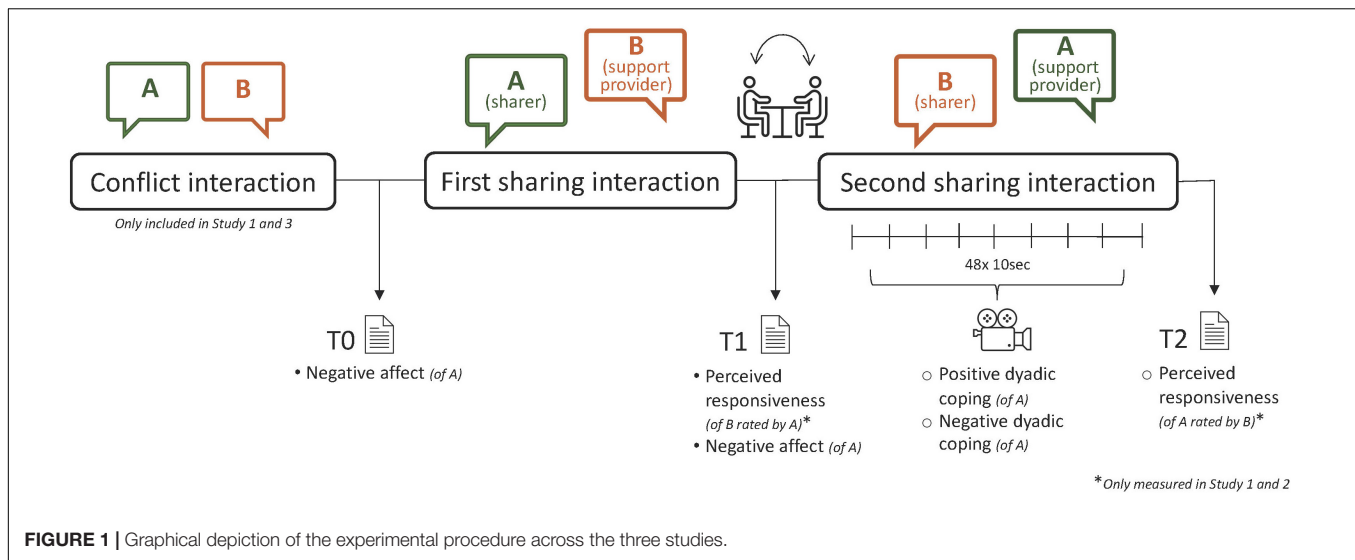
Before (T0) and after (T1) the first dyadic coping interaction, sharers rated the extent to which they experienced nine negative emotions (i.e., unwell, distressed, bad, annoyed, angry, agitated, anxious, restless, stressed, sad) on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much). These items were averaged to reflect a pre- and post-sharing negative affect composite score.

Perceived responsiveness

After each dyadic coping interaction, sharers rated the extent to which they perceived their partner to have been responsive. More specifically, sharers rated the following two items on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much): "In the conversation with my partner, I felt supported" and "In the conversation with my partner, I felt understood." An average was used as an indicator of perceived responsiveness, with the measure after the first dyadic coping interaction (T1) serving as a key predictor and the measure after the second dyadic coping interaction (T2) serving as a dependent variable.

Positive and negative dyadic coping

As behavioral measure of support quality, we examined the frequency of positive and negative dyadic coping behaviors using a well-established coding system (Coding System for Dyadic Coping; SEDC; Bodenmann, 2000). Coders were trained to a criterion of 0.90 on interrater agreement, assessed by Cohen's kappa, requiring a minimum of 60 h of coding. Each video was coded by two coders who focused on either partner. Each 8-min interaction was divided into 48 sequences of 10 s each, which were coded for the presence (1) or absence (0) of various positive and negative dyadic coping behaviors. Proportion scores for positive and negative dyadic coping were calculated over the total number of validly coded 10-s sequences. This thus resulted in two final individual scores ranging from 0 to 1, with 0 reflecting no positive (negative) dyadic coping at all and 1 reflecting positive (negative) dyadic coping throughout the entire conversation.



Positive dyadic coping was composed of three subcategories: attentive listening, problem-focused dyadic coping, and verbal emotion-focused dyadic coping. Attentive listening required the support provider to be oriented toward the sharer and make eye contact and also included nodding, backchanneling (e.g., “mmm,” “yeah”), and reinforcing questions about the sharer’s emotional experience (e.g., “How did that make you feel?”). Problem-focused dyadic coping included any attempt to help solve the problem, such as giving advice or providing assistance in dealing with the problem (e.g., “Maybe you could try to work a bit more slowly next time”). Emotion-focused dyadic coping included any attempt to help the partner cope with the emotions elicited by his or her problem, such as by conveying understanding and validation (e.g., “I understand this must be difficult for you”), expressing faith in his or her partner (e.g., “I know you can do it”), and helping to reappraise the situation (e.g., “I understand that this is bad for you, but if you see the whole thing in a bigger context, it is not as important as it seems at first glance”).

Negative dyadic coping consisted of any support behavior that was hostile, ambivalent, dismissive, or superficial. These negative forms of dyadic coping could be manifested verbally, such as by sarcastic or critical responses to the partner’s stress expression, or nonverbally or para-verbally, such as when a verbally supportive response was accompanied by a disinterested face or tone of voice, averted gaze, or posture.

Data Analytic Approach

Statistical models

In all our models, we included sharers’ negative affect before the first dyadic coping interaction (T0) as a control variable and negative affect after the first dyadic coping interaction (T1) and perceived partner responsiveness rated after the first dyadic coping interaction (T1) as key predictors of their subsequent support quality when acting as a support provider in the second dyadic coping interaction (T2). It should also be noted that we ran several supplemental and exploratory analyses as specified in our preregistrations. These are reported

in the **Supplementary Material** and included controlling for relationship satisfaction and stress expression of the partner in the second dyadic coping interaction and the examination of any potential moderation effects by gender, potential interaction effects between our key predictors, and any potential effects of the experimental order of the two dyadic coping interactions. All predictors were centered, and missing values were removed (separately for each dependent variable) before entering them in the analyses.

To account for the fact that positive and negative dyadic coping behavior were quantified as proportions scores, including zeros (behavior is never displayed) and ones (behavior is always displayed), we used zero-one-inflated beta regression models for the analyses predicting dyadic coping. Specifically, we used the R package *brms* (Bürkner, 2017) to fit the Bayesian zero-one-inflated regression models and the R package *BayesFactor* (Morey et al., 2018) to fit standard Bayesian linear regression models predicting perceived support. In the Bayesian framework, evidence is quantified by means of a Bayes factor that reflects the extent to which the data support the presence vs. absence of the effect of interest. We expected a directed effect for all specified hypotheses (i.e., a one-sided test) and thus adjusted the Bayes factors accordingly. For each hypothesis, a Bayes factor BF_{10} was calculated. The subscripts on the Bayes factor refer to the hypotheses being compared, with the first subscript referring to the one-sided hypothesis of interest (i.e., a positive or negative effect) and the second subscript referring to the null hypothesis. For instance, $BF_{10} = 2$ indicates that the data are two times more likely under the alternative hypothesis that there is a (positive or negative) effect than under the null hypothesis that there is no effect. Notably, the Bayesian paradigm allows one to distinguish between “absence of evidence” (i.e., the data are uninformative regarding the absence or presence of an effect; $BF_{10} = 1$) and “evidence of absence” (i.e., evidence in favor of the null hypothesis that there is no effect, or put differently, evidence *against* an effect; $BF_{10} < 1$). As the evidence is quantified on a continuous scale, we also present the results as such.

Nevertheless, we included a verbal summary of the results by means of the interpretation categories for Bayes factors proposed by Lee and Wagenmakers (2013) based on the original labels specified by Jeffreys (1939). As a rough guideline, we consider Bayes factors larger than 10 as compelling evidence for the effect of interest, Bayes factors between 3 and 10 as weak to moderate evidence for the effect, Bayes factors between 1/3 and 3 as no to weak evidence, and Bayes factors smaller than 1/3 as weak to moderate evidence *against* the effect of interest.

Prior specification

As we expected modestly sized effects, we used weakly informative prior distributions for the key predictors in the zero-one-inflated beta models (i.e., a normal distribution with a mean of 0 and a standard deviation of 0.5). For the zero-one-inflated beta regression models, default priors in brms were used for the intercepts. These include a Student-*t* prior with 3 degrees of freedom, a mean of 0 and a scale of 2.5 on the overall intercept, and a logistic(0,1) prior on the intercepts for the zero-one inflation and conditional-one inflation. For the normal linear regression models, the default settings in the BayesFactor package were used (Rouder and Morey, 2012; Rouder et al., 2012), that is, a Cauchy prior with a scale of $\frac{\sqrt{2}}{4} \approx 0.35$ on the key predictors.

Results

Spillover Effects of Perceived Partner Responsiveness

With regard to the first hypothesis, we assessed the evidence for an effect of perceived partner responsiveness during the first dyadic coping interaction on the three different measures of quality of support provided during the second dyadic coping interaction (i.e., positive dyadic coping, negative dyadic coping, and perceived responsiveness as rated by the partner). First, there was little evidence for a positive effect of perceived responsiveness (T1) on subsequent positive dyadic coping behavior (T2): Individuals who experienced higher levels of partner responsiveness during the first interaction may or may not have been more likely to engage in positive dyadic coping behavior themselves when they were listening to their partner in the subsequent interaction [$BF_{10} = 3.57$; $B = 0.07$ on the logit scale, 95% credible interval $(-0.11, 0.24)$; **Figure 2A**]. For negative coping behavior (T2), however, we found strong evidence in favor of a negative effect of perceived responsiveness (T1): Individuals who experienced higher levels of partner responsiveness during the first interaction were less likely to subsequently engage in negative dyadic coping behavior themselves [$BF_{10} = 47.19$; $B = -0.33$ on the logit scale, 95% credible interval $(-0.67, -0.01)$; **Figure 2B**]. Finally, there was strong evidence for a positive effect of perceived responsiveness at T1 on subsequent perceived support at T2: Individuals who experienced higher levels of partner responsiveness during the first interaction were rated as more responsive by their partner in the subsequent interaction [$BF_{10} = 507.26$; $B = 0.19$ on the response scale, 95% credible interval $(0.08, 0.30)$; **Figure 2C**]. A summary of the Bayes factor analyses for all three studies is given in **Table 1**, the coefficients are displayed in **Figure 3**, and the estimated effects are visualized in **Figures 2, 4**. Additional

descriptive statistics for all three studies are provided in **Supplementary Tables 1–4**.

Spillover Effects of Negative Affect

With regard to the second hypothesis, we assessed the evidence for an effect of residual negative affect after the first dyadic coping interaction (T1) on the quality of support provided during the second dyadic coping interaction (T2). First, the Bayes factor model comparison indicated strong evidence that individuals who experienced higher levels of negative affect after talking about a personal stressor in the first interaction were less likely to engage in positive dyadic coping behavior themselves when they were listening to their partner in the subsequent interaction [$BF_{10} = 70.11$; $B = -0.29$ on the logit scale, 95% credible interval $(-0.57, -0.03)$; **Figure 4A**]. Second, these data indicated strong evidence in favor of a positive effect of negative affect on subsequent negative dyadic coping behavior: Individuals who experienced higher levels of residual negative affect after their own sharing interaction were more likely to subsequently engage in negative dyadic coping behavior themselves [$BF_{10} = 37$; $B = 0.43$ on the logit scale, 95% credible interval $(0.00, 0.86)$; **Figure 4B**]. Third, the data indicated moderate evidence for a negative effect of residual negative affect on subsequent perceived responsiveness (T2): Individuals who experienced higher levels of negative affect after their own sharing interaction may have been rated as less responsive by their partner in the subsequent interaction [$BF_{10} = 5.74$; $B = -0.17$ on the response scale, 95% credible interval $(-0.35, 0.01)$; **Figure 4C**].

STUDY 2

Study 2 served as a replication of Study 1. The procedures and materials were almost identical to those of Study 1, with one exception: Participants did not first engage in a conflict interaction. Furthermore, participants were constituted of adolescent and emerging adult (rather than adult) couples, including one female and one male partner.

Methods

Participants and Procedure

A total of 181 couples registered for participation. The data of Study 2 come from a project on romantic relationships in adolescence and emerging adulthood, for which adolescent couples were recruited by means of local newspapers, schools, recreational facilities, and social media. For the purpose of that study, the following eligibility criteria were relevant: Participants had to be (1) in a romantic relationship for a minimum of 1 year; (2) between 16 and 22 years of age; (3) able to read and speak German; (4) and both partners had to agree to participate in the study. This resulted in a total sample of 130 eligible adolescent couples, of which 125 couples were included for the analyses predicting positive and negative dyadic coping and 121 couples for predicting perceived responsiveness. Couples had an average relationship duration of 2.0 years ($SD = 1.0$). Adolescent females were on average 18.9 years old ($SD = 1.6$, range = 16.2–22.8 years), and adolescent males were 19.6 years

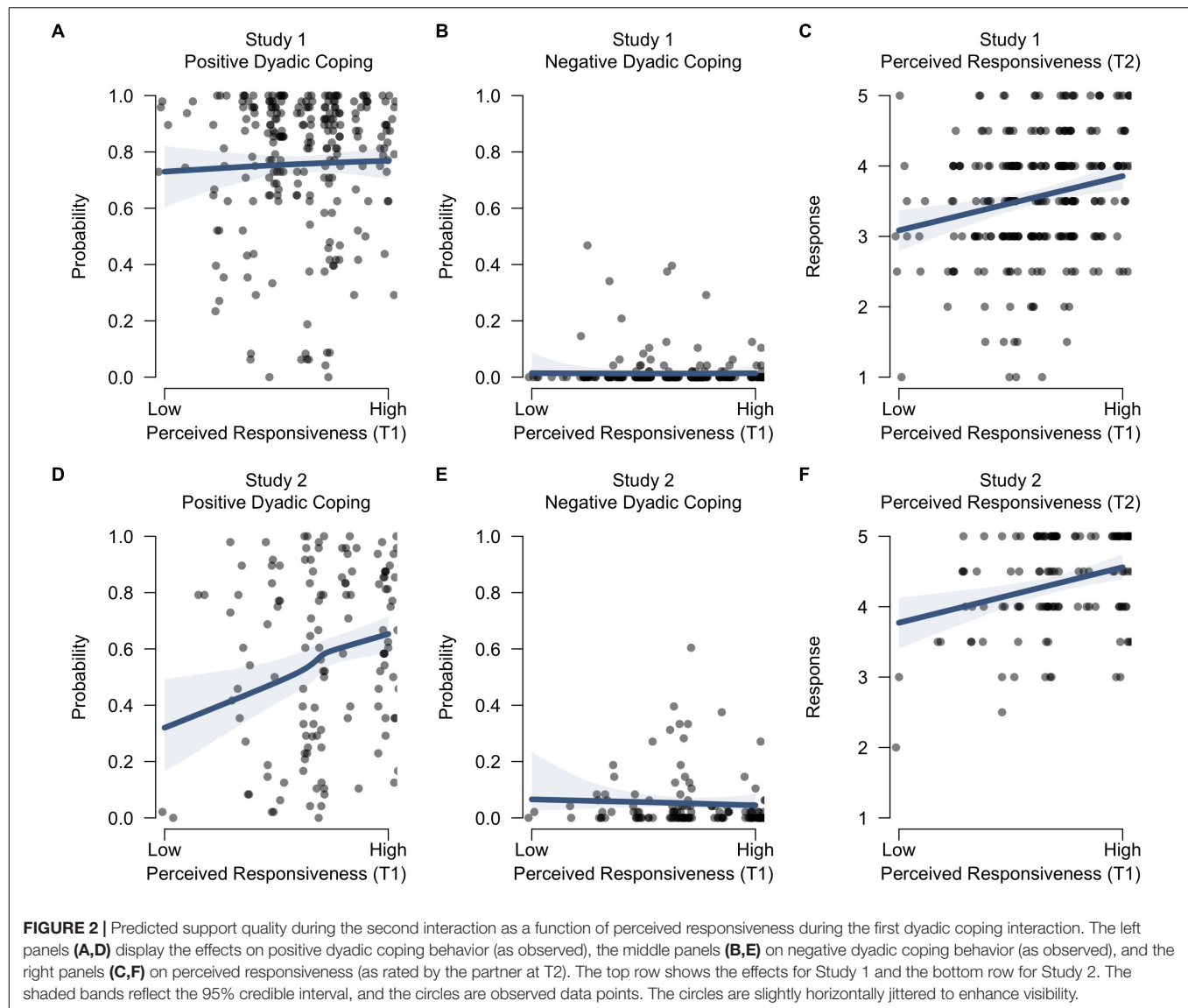
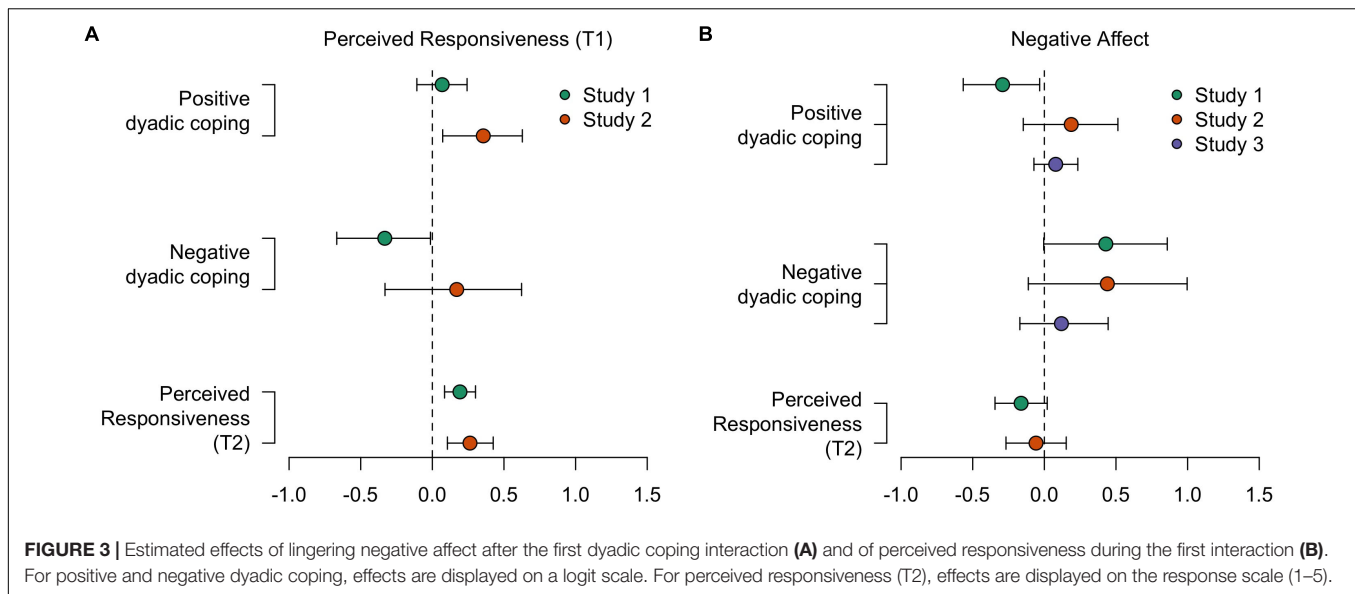


TABLE 1 | Bayes factors in favor of lingering effects on the quality of subsequent support provision per study.

| Predictor | Outcome | | | | | |
|--------------------------------------|------------------------|------------------|------------------------|------------------|-------------------------------|------------------|
| | Positive dyadic coping | | Negative dyadic coping | | Perceived responsiveness (T2) | |
| | N | BF ₁₀ | N | BF ₁₀ | N | BF ₁₀ |
| Perceived responsiveness (T1) | | | | | | |
| Study 1 | 243 | 3.57 | 243 | 47.2 | 264 | 507 |
| Study 2 | 129 | 151 | 129 | 0.31 | 121 | 271 |
| Negative affect | | | | | | |
| Study 1 | 243 | 70.1 | 243 | 37.0 | 264 | 5.74 |
| Study 2 | 129 | 0.15 | 129 | 15.7 | 121 | 1.21 |
| Study 3 | 342 | 0.18 | 342 | 3.46 | — | — |

Bayes factors give the evidence for the model including the relevant predictor [perceived responsiveness (T1); negative affect] versus the null model for each study. Bayes factors printed in bold pass the threshold for substantial evidence in favor of the presence of an effect. Bayes factors are order-constrained based on the hypothesized direction of the effects. Note that perceived responsiveness (T1 and T2) was not measured in Study 3. N refers to the number of participants included in each particular analysis.



old ($SD = 1.6$, range = 16.0–22.8 years). Most adolescents were living with their parents (85.2%), and few lived alone (0.8%) or shared an apartment with peers (9.2%). Only 4.8% of the couples cohabited. The study protocol was approved by the ethics committee of the Department of Psychology of the University of Zurich.

Materials

Negative affect

Before (T0) and after (T1) the first dyadic coping interaction, sharers rated the extent to which they experienced six emotions (i.e., distressed, annoyed, angry, agitated, stressed, sad) on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much). We averaged these items to reflect pre- and post-sharing negative affect.

Perceived responsiveness and dyadic coping

Perceived responsiveness (T1 and T2) and positive and negative dyadic coping were measured in an identical way to Study 1.

Data Analytic Approach

Statistical models and prior specification were identical to the data analytic approach as specified in Study 1.

Results

Spillover Effects of Perceived Partner Responsiveness

In line with our first hypothesis, the Bayes factor model comparison indicated strong evidence in favor of a positive effect of perceived responsiveness (T1) on subsequent positive coping behavior (T2): Individuals who experienced higher levels of partner responsiveness during the first interaction were more likely to engage in positive dyadic coping behavior themselves when listening to their partner in the subsequent interaction [$BF_{10} = 151.38$; $B = 0.36$ on the logit scale, 95% credible interval (0.07, 0.63); **Figure 2D**].

For negative coping behavior (T2), however, there was weak evidence *against* a negative effect of perceived responsiveness (T1): Individuals who experienced higher levels of partner responsiveness during the first interaction were *not* less likely to subsequently engage in negative dyadic coping behavior themselves [$BF_{10} = 0.31$; $BF_{01} = 3.23$; $B = 0.17$ on the logit scale, 95% credible interval (−0.33, 0.62); **Figure 2E**]. It should be noted that the observed effect was in the opposite direction as hypothesized. Finally, in line with our hypothesis, there was strong evidence for a positive effect of perceived responsiveness at T1 on subsequent perceived responsiveness at T2: Individuals who experienced higher levels of partner responsiveness during the first interaction were rated as more responsive by their partner in the subsequent interaction [$BF_{10} = 270.66$; $B = 0.26$ on the response scale, 95% credible interval (0.11, 0.42); **Figure 2F**].

Spillover Effects of Negative Affect

Contrary to our second hypothesis, there was moderate evidence *against* a negative effect of residual negative affect (T1) on positive dyadic coping (T2): Individuals who experienced higher levels of negative affect after their own sharing interaction were *not* less likely to engage in positive dyadic coping behavior themselves when listening to their partner in the subsequent interaction [$BF_{10} = 0.15$; $BF_{01} = 6.66$; $B = 0.19$ on the logit scale, 95% credible interval (−0.15, 0.51); **Figure 4D**]. Again, it should be noted that the observed effect went in the opposite direction. However, in line with our hypothesis, the data indicated strong evidence in favor of a positive effect of residual negative affect (T1) on subsequent negative dyadic coping behavior (T2): Individuals who experienced higher levels of negative affect after their own sharing interaction were more likely to subsequently engage in negative dyadic coping behavior themselves [$BF_{10} = 15.74$; $B = 0.44$ on the logit scale, 95% credible interval (−0.11,

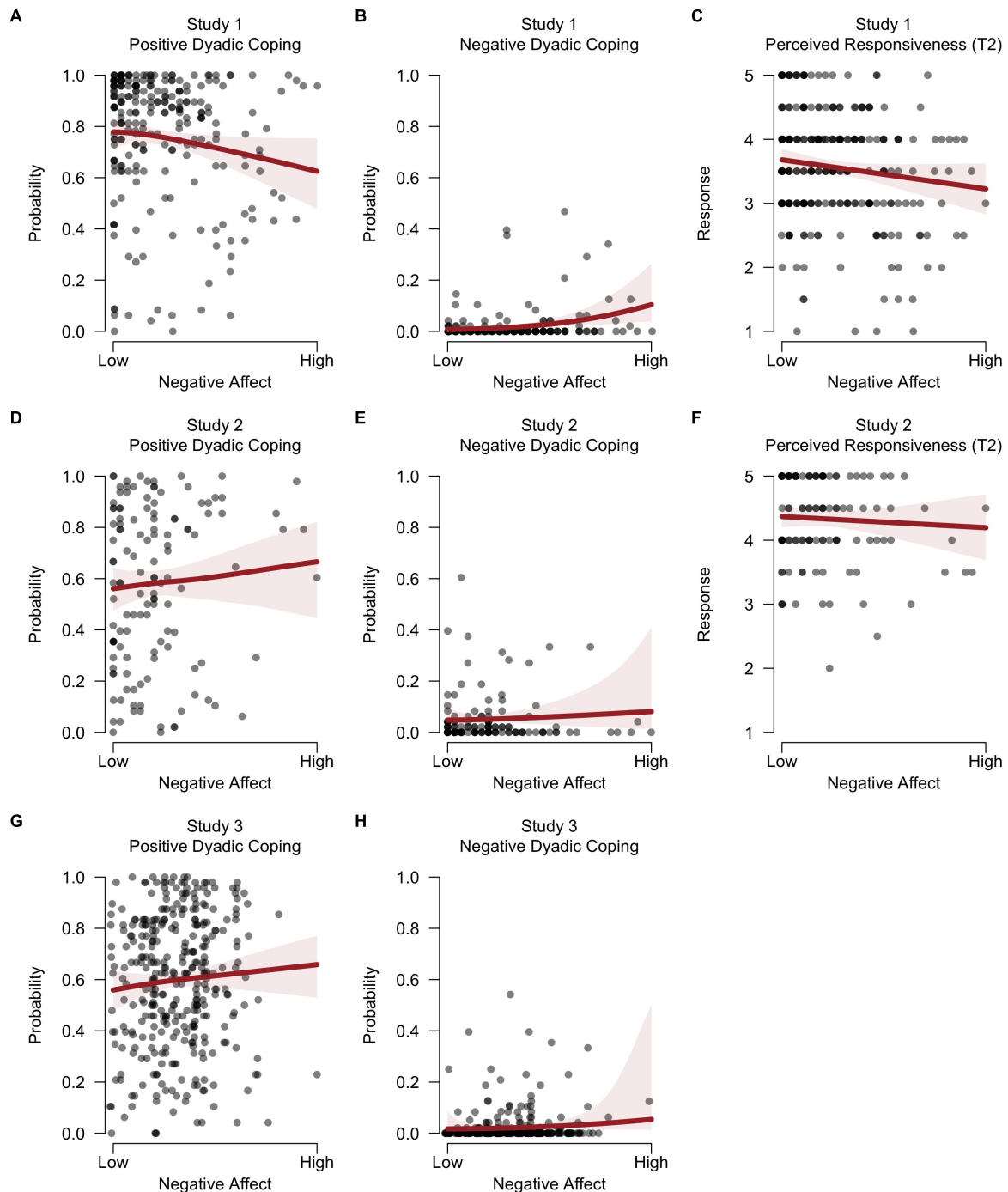


FIGURE 4 | Predicted support quality during the second dyadic coping interaction as a function of lingering negative affect after the first dyadic coping interaction. The left panels (**A,D,G**) display the effects on positive dyadic coping behavior (as observed), the middle panels (**B,E,H**) on negative dyadic coping behavior (as observed), and the right panels (**C,F**) on perceived responsiveness (as rated by the partner at T2). The top row shows the effects for Study 1, the middle row for Study 2, and the bottom row for Study 3. The shaded bands reflect the 95% credible interval, and the circles are observed data points. The circles are slightly horizontally jittered to enhance visibility.

1.00); **Figure 4E**]. Finally, the data indicate no evidence for an effect of negative affect (T1) on subsequent perceived responsiveness (T2): Individuals who experienced higher

levels of negative affect after their own sharing interaction may or may not have been rated as less responsive by their partner in the subsequent interaction [$BF_{10} = 1.21$;

$B = -0.06$ on the response scale, 95% credible interval $(-0.27, 0.15)$; **Figure 4F**].

STUDY 3

Study 3 served as a partial replication of Study 1. The procedures and materials were again highly similar to those of Study 1, except that this study did not include any measures of perceived responsiveness and included a different measure of negative affect. Consequently, Study 3 did not allow us to test our hypotheses including perceived responsiveness as a predictor nor as a dependent variable.

Methods

Participants and Procedure

A total of 368 couples participated in Study 3, which constituted the first wave of a multi-wave project examining the impact of stress on the development of (adult) couple relationships. Couples were recruited through advertisements in newspapers and broadcasting. Inclusion criteria were (1) being in a committed relationship for at least 1 year, (2) speaking and understanding German, (3) both partners being willing to participate, and (4) having no records of mental disorders. Three couples did not have observational data (one couple refused to participate in the interaction task, one couple wanted to delete their video after the task, and one video was missing due to technical problems). For two couples, the order of the three interactions was different from the rest of the participants, and their data were therefore excluded from our analyses. Finally, for eight couples, we did not know who was the sharer or the support provider, thereby forcing us to exclude these couples. This yielded a final sample of 355 couples, of which 341 couples were eligible for our analyses (i.e., met our preregistered criteria regarding a maximal number of missing values). Women were on average 46.6 years old ($SD = 18.3$, range = 19–80 years), and men were 48.5 years old ($SD = 18.2$, range = 20–82 years). Their relationship duration was on average 21.1 years ($SD = 17.3$, range = 1–58 years). Most of the couples were married (64.8%; 83.5% was cohabiting). The procedure of the study was identical to that of Study 1. The study protocol was approved by the ethics committee of the Department of Psychology of the University of Zurich.

Materials

Negative affect

Before (T0) and after (T1) the first dyadic coping interaction, sharers rated their current emotional state on four bipolar dimensions (adapted from Eid et al., 1994): “good mood versus upset,” “placid/serene/relaxed versus irritated/provoked/angry,” “cheerful/happy versus sad/in low spirits,” and “calm/at ease versus stressed/nervous” (scale: 1 = very much, 2 = much, 3 = a little, 4 = a little, 5 = much, 6 = very much). These four items were averaged, with higher scores reflecting greater negative affect.

Dyadic coping

Behavioral quality of support during the second dyadic coping interaction (T2) was measured in an identical fashion to Studies 1 and 2, yielding a positive and negative dyadic coping score.

Data Analytic Procedure

In Study 3, perceived responsiveness was not measured. Therefore, we only examined the effects of lingering negative affect (T1) on positive and negative dyadic coping (T2). All other details, including the prior specification, were identical to the data analytic approach as specified in Study 1.

Results

Spillover Effects of Negative Affect

Contrary to our second hypothesis, the Bayes factor model comparison indicated moderate evidence *against* a negative effect of residual negative affect (T1) on positive dyadic coping (T2): Individuals who experienced higher levels of negative affect after their own sharing interaction were *not* less likely to engage in positive dyadic coping behavior themselves when listening to their partner in the subsequent interaction [$BF_{10} = 0.18$; $BF_{01} = 5.49$; $B = 0.08$ on the logit scale, 95% credible interval $(-0.07, 0.23)$; **Figure 4G**]. Furthermore, the data indicated little evidence for a positive effect of residual negative affect (T1) on subsequent negative dyadic coping behavior (T2): Individuals who experienced higher levels of negative affect after their own sharing interaction may or may not have been more likely to subsequently engage in negative dyadic coping behavior themselves [$BF_{10} = 3.46$; $B = 0.12$ on the logit scale, 95% credible interval $(-0.17, 0.45)$; **Figure 4H**].

DISCUSSION

Main Findings

The present set of studies aimed to examine how experiences of one dyadic coping interaction may spill over to affect the dynamics in a subsequent dyadic coping interaction. We hypothesized that the extent to which sharers perceive their partner to have been responsive to their self-disclosure and still carry lingering negative affect shapes their motivation and ability to support their partner when the tables turn and they themselves are put in a situation to provide support. In line with our first hypothesis, sharers who perceived their partner to have been more responsive subsequently engaged in higher-quality support themselves. This enhanced support quality was reflected in partner ratings of perceived responsiveness, as well as observations of positive dyadic coping behavior (though this latter effect was merely weak in Study 1). We did not find consistent evidence for an effect of perceived partner responsiveness on negative dyadic coping behavior. It should be noted that this hypothesis could only be tested in two studies.

The findings regarding our second hypothesis concerning negative affect were mixed. We found no compelling evidence for an effect of higher lingering negative affect on positive

dyadic coping behavior or responsiveness as perceived by the partner. Yet, in line with our predictions, higher lingering negative affect did predict an increase in negative dyadic coping behavior in Study 1—an effect that was replicated in Study 2 but only weakly supported in Study 3. Finally, it is worth mentioning that, overall, our effects were not moderated by gender (see **Supplementary Table 6**), suggesting that the presence (or absence) of spillover effects is similar across men and women.¹ Taken together, our findings lend support to the notion that perceived partner responsiveness shapes subsequent support quality, though primarily as perceived by the partner. Furthermore, our data suggest that lingering negative affect increases subsequent negative dyadic coping behavior.

Theoretical and Methodological Implications

It should be noted that a strong floor effect occurred for lingering negative affect, as well as for negative dyadic coping behavior (see **Supplementary Figures 1, 2**). These floor effects may be partly explained by the videotaped and structured support interactions, which may have led sharers to not fully immerse themselves in the emotional situation as they would be in daily life and support providers to act somewhat socially desirable. Furthermore, throughout our three studies, most couples experienced relatively high relationship satisfaction, which may have partly driven the low occurrence of negative dyadic coping. Even though we took the low frequency of negative dyadic coping into account by running zero-inflated beta regressions, the extremely low variance still reduced the reliability with which our effects could be estimated. Given the prior literature showing that negative affect impairs cognitive functioning (e.g., Curci et al., 2013; Raio et al., 2013) and reduces the motivation to be responsive to one's partner (e.g., Crocker et al., 2010), it remains possible that negative affect may spill over from one support interaction to the next, impeding the motivation and ability to engage in constructive forms of dyadic coping (see Crocker et al., 2010; Iida et al., 2010). While the current data hint at such effects, they do not allow us to draw firm conclusions.

Our findings suggest that perceiving one's partner as responsive in turn leads one to be more supportive to one's partner as well. This is compatible with equity theory, which states that people value fair treatment and therefore are motivated to maintain fairness in their relationships (Walster et al., 1973; Meier et al., 2020). Furthermore, our findings are in line with prior research showing that perceived partner responsiveness predicts an increased willingness to invest in the relationship (Murray et al., 2006), more pro-social behavior toward the partner (Wieselquist et al., 1999), and greater support provision (Lemay and Clark, 2008). These pro-relational behaviors may be explained by the enhanced positive

affect, intimacy, and relationship satisfaction that individuals experience as a result of perceived partner responsiveness (e.g., Gable et al., 2006; Debrot et al., 2013; Neal and Lemay, 2014; Lemay and Clark, 2015).

Importantly, the fact that the positive effect of perceived partner responsiveness was most pronounced for subsequent support as perceived by the partner (rather than coded dyadic coping behavior) underlines the important role of perceptions and beliefs regarding others' responsiveness (see also Uchino, 2009). Prior research shows that these perceptions are partly shaped by the actual responsiveness as enacted by the partner but also substantially biased by motivated interpretation, such as projections of one's own responsiveness and relationship evaluations (Lemay et al., 2007; Lemay and Clark, 2008, 2015; Maisel et al., 2008; Canevello and Crocker, 2010; Debrot et al., 2012; Neal and Lemay, 2014; Hui et al., 2020). The relatively low correlations between perceived responsiveness and positive and negative dyadic coping behavior observed throughout our studies (see **Supplementary Tables 2–4**) speak to the subjective nature of these perceptions. Nonetheless, it should be noted that the observed effects of perceived partner responsiveness on subsequent perceived support quality remained qualitatively equivalent when controlling for relationship satisfaction, demonstrating that the observed spillover effects cannot simply be explained by individual differences in relationship quality.

Together, these findings speak to the complex and dynamic nature of dyadic coping interactions, which is mirrored in Reis's definition of perceived partner responsiveness (Reis et al., 2004). As described by Reis et al. (2004), perceived partner responsiveness is a *process* that is dyadic and thereby cyclical in nature. One partner's self-disclosure shapes the other's (ideally responsive) support, which builds trust, elicits reciprocal self-disclosure, and creates intimacy through a bidirectional loop among *both* partners (Wieselquist et al., 1999; Bodenmann, 2005; Cutrona et al., 2007; Rimé, 2009; Finkenauer and Righetti, 2011; Reis et al., 2011; Rossignac-Milon and Higgins, 2018). Furthermore, both the definition and our current findings underline that the emotional and relational consequences of this dyadic process hinge on whether the perceiver *believes* that the response has been understanding, validating, and caring (Reis, 2014; Donato et al., 2015). To the extent that these beliefs are positive, a wealth of personal and relational benefits is brought about (see Lemay and Clark, 2015, for an overview).

Finally, the current findings also have methodological implications. The currently adopted paradigm, which includes several sequential dyadic interactions, is the state-of-the-art paradigm used to study both conflict and support interactions in romantic couples. As our findings show, these interactions are not always independent, even though they are usually studied as such. We find that individuals' lingering emotions and perceptions of their partner's behavior shape their own behavior in a subsequent interaction both as perceived by the partner and as observed by coders. It may thus be important for future studies to assess participants' self-reported experiences before and after (and perhaps even during) each interaction (see Sels et al., 2019). Knowing both partners' (emotional and cognitive)

¹One exception was observed in Study 3: Women were more strongly affected by lingering negative affect in their own negative dyadic coping behavior than men. However, given that we did not find this moderation effect in Studies 1 and 2, and prior research shows an opposite effect (Bodenmann et al., 2015), we conclude that, overall, there is no compelling evidence for gender differences in spillover effects.

state upon entering a new interaction may contribute to a better understanding of their subsequent behavior.

Limitations, Strengths, and Future Directions

Several limitations of the present research are worth noting. First, our measures of negative affect were not identical across the three studies, which may partially explain its somewhat inconsistent effect on support quality across studies. Future research may examine the role of specific emotions in spilling over and affecting responsiveness to one's partner. Different emotions are associated with different appraisals, physiological responses, and behavioral tendencies (Roseman et al., 1994), and these elements may shape the motivation and ability to support one's partner. For example, anger is typically associated with a social distancing function (e.g., wanting to confront, attack, or criticize another), whereas sadness is typically associated with an affiliative function (e.g., seeking help and support from others; Fischer and Manstead, 2016), which could have opposite effects on subsequent responsiveness to one's partner. Furthermore, high arousal emotions, such as anger and worry, may impair situational cognitive capacity (and thereby support provision) to a greater extent than low arousal emotions such as sadness or dejection (see Raio et al., 2013). And to come back to our example in the opening of this article, it may be similarly important to separate lingering negative affect that is caused by a stressor external to the relationship (e.g., the dismissal of one's favorite colleague) from negative affect that is caused by the partner (e.g., perceiving one's partner as unresponsive; see also Randall and Bodenmann, 2009). While the present set of studies targeted negative affect caused by external stressors, it does not entirely allow distinguishing between these two different sources of negative affect, as part of the lingering negative affect may have been due to perceiving one's partner as unresponsive. It should be pointed out, though, that our exploratory analyses indicated that the effects of negative affect were independent of perceived responsiveness (see **Supplementary Material**).

Several other differences between the three studies merit attention. First, in Studies 1 and 3, participants engaged in an 8-min conflict interaction before engaging in the two dyadic coping interactions, whereas in Study 2, participants did not. In this conflict interaction, partners were instructed to talk about a topic that created problems within their relationship and stressed both partners. The three most frequent topics included communication problems with the partner, annoying habits of the partner, and finances. While the presence of a conflict interaction may have caused lingering negative affect experienced toward the partner, we controlled for baseline levels of negative affect prior to the first dyadic coping interaction. Furthermore, given that the pattern of findings is not consistently different between the studies with versus without a preceding conflict interaction, we do not believe this is of concern for the interpretation of the current findings. Second, the samples of the three studies varied in average age, relationship length, and living situation, with Study 2 focusing on adolescents and emerging adults not (yet) cohabiting with their partners and Studies 1 and 3 focusing on adult relationships of varying lengths,

in which most partners cohabited. We did not have *a priori* theoretical predictions regarding any potential differences across these samples, and we also did not find any consistently different patterns. Consequently, we consider the use of these three different samples as a strength, allowing us to examine the robustness of our findings.

We examined how experiences of one dyadic coping interaction may spill over to a second dyadic coping interaction by letting partners switch roles as sharer and support provider. In real life, however, these interpersonal dynamics are more complex and involve continuous waves of intrapersonal and interpersonal processes that overlap and interact (Butler and Randall, 2013; Frey et al., 2019). Furthermore, these processes may play out over various time spans including temporally fine-grained dynamics within one conversation (see Frey et al., 2019) but also extended periods that constitute the relational context (see Boiger and Mesquita, 2012). Particularly, potential spillover effects of perceived partner responsiveness form a clear example of how these effects may shape both temporary and more chronic motivations to be a supportive partner. For example, one study showed that day-to-day fluctuations in perceived partner responsiveness were associated with a greater motivation to bond with one's partner on the same day, as well as on the next day (Iida et al., 2010), which may thus translate into enhanced support provision (e.g., Canevello and Crocker, 2010). Furthermore, repetitive positive or negative sharing interactions with one's partner likely shape more temporally stable beliefs about one's partner's responsiveness, and these (potentially biased) beliefs shape both one's own support-seeking and support provision behavior (for an overview, see Lemay and Clark, 2015).

Regarding spillover effects of negative affect, we would predict these to be a function of the emotional intensity. Consequently, such spillover is likely to diminish over time, as negative affect typically decreases over time (e.g., Verduyn et al., 2009). While our studies showed spillover effects taking place within minutes, another study showed that negative mood decreased emotional support provision the next day (though it is unclear to what extent negative mood also persisted on the next day; Iida et al., 2010). Furthermore, when negative affect takes the shape of chronic distress, more temporally stable negative effects on support provision are predicted to occur (e.g., Bodenmann et al., 2004; Crocker et al., 2010). Relatedly, it should be noted that spillover effects of negative affect in daily life need not be limited to instances in which sharers disclosed a personally upsetting event but may also be the result of unshared (or perhaps suppressed) negative affect that may subsequently impair support provision. This latter effect is likely to occur frequently in real life: Partners may find themselves in a situation where their own support provision is requested, while not having the motivation or capacity to be responsive due to their own experienced negative affect.

It thus remains an empirical question over what time span these spillover effects play out and what these effects would look like in more real-life contexts. One way of addressing these questions involves examining the microdynamics within one interaction, for example, by using both coded video fragments and self-reports with video-mediated recall (VMR;

see Welsh and Dickson, 2005; Kuhn et al., 2017). Another highly fruitful avenue for future research that could shed light on the temporal boundary conditions of potential spillover effects includes examining dyadic coping in people's daily lives using experience sampling methods (ESMs; see Colombo et al., 2020). Both VMR and ESM studies would additionally allow the examination of within-couple processes that may be different from between-couple processes as targeted in the present article (see Hilpert et al., 2018). Furthermore, by using repeated measures throughout the day that are closer in time to the actual experience, ESM studies enhance the chances of observing naturally occurring emotions. Most importantly, they would also allow testing the dynamic, reciprocal nature of the two partners' emotions and behaviors continuously impacting one another over time (see Butler and Randall, 2013).

Notwithstanding the limitations and outstanding future research questions, we think the present research is characterized by several strengths. First, we examined support quality in three ways: Couples engaged in two actual, videotaped dyadic coping interactions, allowing us to code their positive and negative dyadic coping behaviors, as well as to obtain partners' perceptions of the support that they received. As such, our data go beyond classic research that is often limited to self-report, which is crucial given how partner perceptions appear to be highly biased (see Lemay and Clark, 2015). Second and relatedly, our studies explicitly address the inherently dyadic nature of the coping process (Bodenmann, 1995; Bodenmann et al., 2016): Our findings show that one partner's experiences subsequently shape how responsive the other partner (as well as independent coders) perceive them to be. Finally, we preregistered all our analyses and examined the robustness of our findings in three independent studies using the same methodological paradigm. These studies involved three different samples, thereby representing both adolescent as well as adult couples with varying relationship lengths.

Concluding Remarks

Throughout three behavioral studies, we showed how the experiences of one dyadic coping interaction may spill over and affect support provision in the next interaction. Our findings lend support for the notion that perceived partner responsiveness shapes subsequent support quality, though primarily as perceived by the partner. Furthermore, our data hint at the potentially detrimental effect of lingering negative affect impairing support provision. Thus, how people feel after sharing their emotions with their romantic partner may impact the way they themselves in turn respond to their partner's concerns. Together, these findings highlight the dynamic and interdependent nature of dyadic coping. Support interactions are always embedded in the context of the relationship, where partners continuously switch roles as sharer and support provider. Given the importance of dyadic coping for individuals' emotional and relational well-being (Bradbury and Karney, 2004; Rafaeli and Gleason, 2009; Falconier et al., 2015), obtaining a better understanding into the predictors of helpful (and unhelpful)

support is crucial. Our findings speak to a key role of *believing* that one's partner is responsive to one's needs in fostering reciprocated responsiveness, which is key in promoting healthy relationship functioning.

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 Department of Psychology, University of Zurich. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

LP and AM developed the study concept and formulated the hypotheses and analysis plan for the preregistrations. FM, VR-A (Study 1), CB, AM (Study 2), and MN (Study 3) were involved in data collection. SH analyzed the data. LP wrote the Introduction, Methods, and Discussion. SH wrote the Results and **Supplementary Material**. AM, MM, GB, and FM provided valuable feedback on all sections of the manuscript. All authors approved the final version of the manuscript for submission.

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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.2021.637534/full#supplementary-material>

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Affective Behavior in Parent Couples Undergoing Couple Therapy: Contrasting Case Studies

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Being in a romantic relationship is characterized by a high degree of intimacy and affective involvement. Affective behavior indicates the emotional content in couple interactions and therefore promotes an understanding of the evolution of romantic relationships. When couples are also parents, their affective behavior reflects their romantic and coparental bonds. In this paper, we present an observation of parent couples' affective behavior during a coparenting conflict discussion task to document whether and how much it improved during couple therapy. Two contrasting cases of affective behavior change are included. Observational coding of affective behavior within pre- and post-intervention coparenting conflict discussion tasks was carried out to compute means and CIs for each partner in both cases. In addition, the partners' coparental and romantic satisfaction were evaluated through validated self-report questionnaires in pre- and post-intervention assessments; this helped document whether the partners' coparental and romantic satisfaction were dissimilar between the two cases. Finally, a clinical analysis of both cases was realized with the contribution of the therapists to investigate possible differences within therapy sessions. Statistical analyses revealed negative means of affective behavior for couple A in the pre-intervention assessment and positive means in the post-intervention assessment. Partners from couple B had negative means of affective behavior in the pre- and post-intervention assessments. Results concerning coparental and romantic satisfaction differed: Couple A's coparental satisfaction slightly increased and the romantic satisfaction somewhat decreased, whereas couple B's coparental satisfaction remained stable and the romantic satisfaction slightly increased between the pre- and post-intervention assessments. The clinical analysis revealed that the interactional quality of couple A slightly improved within therapy sessions and that both partners succeeded in working together as coparents, notwithstanding their romantic distress. Couple B conveyed coparental distress and exhibited poor interactional quality throughout therapy sessions (e.g., repeated criticism and contempt). This study contributes to enriching the more traditional empirical research methods in the field of couple psychotherapy, as it takes into account microlevel affective changes within parent couples' interactions in addition to self-reported data. Furthermore, the analysis of therapy sessions supports the importance of working with affective behavior in couple therapy.

Keywords: couple therapy, couple interactions, affective behavior, coparental satisfaction, romantic relationship, observational coding

INTRODUCTION

Adult romantic partners experience intense emotions related to their relationships and have to cope with their emotional lives, both individually and as couples (Mirgain and Cordova, 2007; Sanford and Grace, 2011). When showing emotion, one communicates to their partner how they perceive a situation or might react (Sanford and Grace, 2011). Coan and Gottman (2007) defined the apparent and observable features of emotional content in couple interactions as affective behavior. Affective behavior can manifest itself in positive and negative nonverbal and/or verbal behaviors, such as affection, validation, interest, withdrawal, belligerence, and criticism (Coan and Gottman, 2007). Empirical literature shows that affective behavior is an important sign of what is going on in couple interactions (e.g., Gottman and Krokoff, 1989; Ben-Naim et al., 2013; Bloch et al., 2014). Previous research has demonstrated that couple interactions (specifically affective behavior) are linked with romantic satisfaction (e.g., Kim et al., 2007; Bloch et al., 2014).

In the context of parent couples, interactions between partners can reflect emotions experienced both in their romantic and coparental relationships. Romantic partners who are also parents share a romantic bond, but as they are responsible for the upbringing of one or more children, they are also bound by a coparental relationship (Feinberg, 2003). Existing data highlight that coparental interactions are linked with the coparental relationship. Prior research results have shown that positive coparental interactions (i.e., coparents being empathic and loving) are linked with a positive coparental relationship (i.e., coparental cooperation; Kolak and Volling, 2007).

Coparental interactions (i.e., interactions between two coparents regarding coparenting issues) have mainly been investigated within community samples, even though a significant number of couples seeking couple therapy are also parents (Klann et al., 2011). Therefore, studying improvements in coparental interactions and in the coparental relationship of parent couples undergoing couple therapy appears to be relevant. This study is an effort to investigate affective behavior in parent couple interactions in couple therapy and its relationship with the coparental and romantic relationships in a clinic setting.

In terms of associations between couple interactions in general (with both partners considered romantic partners or coparents), several outcomes can be found in couple research literature. The most widespread studies focus on the link between couple interactions and romantic satisfaction, showing that positive couple interactions are related to higher relationship satisfaction (e.g., Gottman and Krokoff, 1989; Rogge et al., 2006; Friend et al., 2017). Other studies have explored the link between couple interactions and outcomes, such as (1) depressive symptoms, in which negative interactions were related to higher reports of depressive symptoms (e.g., Brown and Harris, 2012); (2) family functioning, in which conflictual power dynamics in couple interactions were associated with lower family functioning (e.g., Lindahl et al., 2004); and (3) children's reports of perceived threats and insecurity toward interparental conflict, in which negativity in parental conflict was linked with children's perceptions of threats and insecure family

representations (e.g., Zemp et al., 2016). Among this body of research, couple interactions have been investigated at various life stages, such as in the transition to marriage (e.g., Markman et al., 2010), transition to parenthood (e.g., Tanner Stapleton and Bradbury, 2012), or in elderly couples (e.g., Story et al., 2007). Furthermore, the majority of studies have been conducted within community samples, whereas others have addressed couple interactions within clinic samples.

Data specific to relationships between couple interactions using observational measurements and treatment responses within a clinic sample are indeed scarce. Previous research results concern the study of affective quality in general, without specifying the type of population (romantic or parent couples) or the addressed topic of discussion (romantic and/or coparental). One study of a sample of 55 married couples receiving behavioral or insight-oriented couple therapy showed that a lower proportion of nonverbal positive listening behaviors in a post-intervention conflict discussion task were associated with more distress 4 years after completing therapy (Snyder et al., 1993). Another study (Baucom et al., 2015) examined the link between couple interactions and treatment response as measured by relationship outcomes in a sample of 134 distressed couples randomly assigned to receive either integrative behavioral couple therapy or traditional behavioral couple therapy. Couples' treatment responses were assessed based on their interactions during problem discussions (as rated by naïve coders) and the participants' self-reports of romantic satisfaction. Results indicated (1) improvements in communication from pre- to post-therapy for couples in both therapeutic groups and (2) a positive link between improvement in couple communication and treatment outcomes. Thus, greater improvements in communication from pre- to post-therapy and better communication at post-therapy were related to better relationship outcomes. Given that a significant number of distressed couples initiating couple therapy are parents and that previous research conducted on clinic samples investigated affective quality in general without indicating whether the couples were in a romantic or coparenting relationship, further research is needed to explore coparental interactions of parent couples undergoing couple therapy.

Previous research has stressed the importance of considering the coparental relationship when studying romantic couples who also coparent. The act of coparenting involves coordination among adults responsible for the care and education of children (Feinberg, 2003). Coparental interactions have been studied in relation to several variables (e.g., child outcomes, family functioning, romantic satisfaction, and coparental satisfaction). One way to investigate coparental interactions of parent couples undergoing couple therapy is to explore the link between their affective behavior during a coparenting discussion and coparental satisfaction. Only a few studies have specifically evaluated this link in community samples. Findings relating to coparental affective interactions – either self-reported or observed – have shown an association between the quality of these interactions and of the coparental relationship. Kolak and Volling (2007, p. 468) investigated self-reported emotional expressiveness, which the authors define as reflecting “a stable pattern of how individuals communicate emotions within the family context”,

and the quality of the self-reported coparental relationship in a sample of 57 community couples. Their results showed (1) positive links between fathers' and mothers' reported positive expressiveness (i.e., openness and being empathic, loving, and concerned) and perceived coparental cooperation as well as (2) positive associations between fathers' and mothers' reported negative expressiveness and perceived coparental conflict (Kolak and Volling, 2007). Hence, when partners reported experiencing more positive emotions and less negative emotions, they also appeared to perceive more cooperation and less conflict in their coparental relationship (Kolak and Volling, 2007). The second study consisted of an observation of parents' affective interactions and the links between those interactions and observed coparenting behavior during family play. In a sample of 47 married community couples, McHale (1995) demonstrated an association between observed coparenting conflicts in couples' interactions (i.e., partners blaming one another) in couple interviews, during which the parents were asked to discuss their home lives and the stresses experienced since the birth of their child/ren, and observed hostile-competitive coparenting within a family play situation. Results showed that partners blaming each other when interacting as a dyad were more likely to show hostile-competitive patterns of coparenting within the family, even after controlling for general romantic distress in the sample (McHale, 1995).

To date, studies on couples' affective interactions have primarily been focused on interactions between romantic couples. However, in the context of parent couple interactions, both partners can be involved as romantic partners or coparents in discussing topics related to the upbringing of their child/ren. Furthermore, the partner's affective behavior may be different in romantic or coparental interactions; for example, parent couples may be in conflict at the romantic level but share positive affective interactions at the coparental level or vice versa. To our knowledge, no data exist specifically concerning the quality of coparenting interactions in couple therapy settings. Therefore, further investigation within the field of clinical and couple psychology is needed to explore whether the results observed in community samples apply to particularly distressed couples, such as couples seeking help through couple therapy. To address these gaps in existing research, an ongoing randomized controlled trial (RCT) investigates the efficacy of an integrative brief systemic intervention for parent couples, specifically exploring coparental dynamics and their progress for parent couples undergoing couple therapy (de Roten et al., 2018). For the purpose of this study, two contrasting cases were drawn from the ongoing RCT sample of 65 parent couples based on the observation of the partners' affective behavior within pre- and within post-intervention discussion tasks. The aims of this study were to: (1) explore observed affective behavior within pre- and post-intervention discussion tasks in which the parent couples discussed a disagreement regarding their coparental relationship to assess whether these couples could be differentiated on their affective behavior change; (2) analyze whether the different coparental affective behavior change patterns were also apparent in the pre- and post-intervention self-reported coparental and romantic satisfaction questionnaires,

and (3) integrate the clinical analysis of the therapeutic processes of both cases to investigate whether the couple's affective behavior change was also reflected in therapy sessions. Based on previous findings, we assumed that negative affective behavior would be associated with lower coparental and romantic satisfaction post-intervention. Moreover, we expected to identify explanatory markers of the couples' change of positive and negative interactions within therapy sessions.

MATERIALS AND METHODS

Participants

Both heterosexual couples were drawn from a sample of 65 parent couples participating in an ongoing RCT. Change patterns were calculated for a subsample of 25 couples based on available coded data for pre- and post-intervention affective behavior coding. Three change patterns were observed within the subsample: (1) nine couples experienced a positive change in their affective behavior; (2) eight couples did not undergo a change (i.e., their affective behavior remained positive or negative in both assessments); and (3) eight couples experienced a negative change. Couple A belonged to the group experiencing a positive change and couple B to the group with no change (their affective behavior remained negative in both assessments). Both couples were chosen from the subsample to: (1) compare affective behavior change in couples whose affective behavior was negative in the pre-intervention assessment, and (2) investigate whether a positive change vs. no change could also be observed in the couples' questionnaires and therapy sessions. Data liable to identify the couples, such as name, age, profession, gender, and children's ages, have been modified.

Partners from couple A, Marc and Emily, have been together for 8 years and have a 4-year-old son. They sought couple therapy because of issues related to their romantic intimacy. Couple B was composed of Arthur and Julia, who have been together for 35 years and have a 15-year-old daughter. Reasons for consulting were issues in their communication and disagreements regarding the upbringing of their child. Both couples were Swiss, living in Switzerland and belonging to the middle class. Each couple underwent a total of six systemic therapy sessions.

Therapists and Treatment

Both therapists were experts in systemic therapy and clinical sexology. The couple therapy took place in a couple counseling service.

The therapists delivered brief systemic therapy to both couples. Brief systemic treatment refers to standard brief systemic couple therapy lasting from 6 to 12 months maximum. In our sample, each couple underwent a total of six therapy sessions, each approximately one month apart. This time interval provides enough time to initiate a process of change within the couple's dynamic in between sessions and ensures that the therapist does not interfere negatively with the spontaneous change process (Selvini Palazzoli, 1980). This type of therapy mainly focuses on

the romantic relationship and the difficulties couples face. However, therapists are likely to address other types of relationships, such as the parent-child or coparental relationship, as well as family functioning and families of origin. The therapists were free to use concepts and techniques from different schools of systemic psychotherapy, such as the structural, strategic, or transgenerational models (Haley, 1963; Minuchin, 1974; Selvini Palazzoli, 1988).

Procedure

The study was conducted with the approval of the ethics committee of the University of Lausanne. Inclusion criteria for all participants from the ongoing RCT were that (1) partners were living together, (2) had at least one child not more than 16 years old, and (3) were involved in a coparenting relationship regarding the child or children. Couples were excluded from the study if they did not fulfill all three inclusion criteria or if they were in a crisis situation in which participation in the research could harm the therapeutic process. Participants were recruited through the clinics providing the treatment, and all gave written and informed consent to either audiotape or videotape the therapy sessions as well as to being filmed during couple discussion tasks before and after therapy. Before the first therapy session, a member of the research team contacted the couples to carry out the pre-intervention assessments. Participants filled out self-report questionnaires and took part in discussion tasks before the first therapy session and after the last. The pre- and post-intervention questionnaires were administered by the research team and completed privately by the participants. Therapy sessions took place in the clinic, while the discussion tasks took place either at the couples' homes or in the clinic. In the observational discussion task (Gottman and Levenson, 1992; Baker et al., 2010), participants were asked to discuss a disagreement regarding their coparental relationship. Both parents received a list of topics related to coparenting (e.g., education, bedtime, outings, or mealtime). Each parent had to identify three disagreement topics, either from the list or they could write down their own. The research member conducting the task then collected the topic sheets and checked if the partners had a topic in common. If so, they suggested that the parents discussed the topic they had in common. If not, the research member selected a topic identified by one of the parents and asked the other parent if they would feel comfortable in discussing this topic. The couples received the following instruction: "Discuss [chosen subject], a topic on which you disagree as parents or that has caused arguments or tension. Start by discussing the subject and what could have caused the argument, and then try to think about ways to solve the disagreement. The objective is not that you end up finding one solution, but that you try to work together toward a resolution. You now have 5 min." The procedure was repeated for the post-intervention discussion task. The couples were provided financial compensation for their participation at the end of the post-intervention measurements.

Measures

Affective Behavior

Nonverbal and verbal affective behaviors within the pre- and post-intervention coparental discussion tasks were coded using

an adapted version of the microanalytical Specific Affect Coding System (SPAFF; Gottman and Krokoff, 1989; Bodenmann, 2011). The SPAFF has been widely used and is an attested and externally validated approach to the coding of observational data, particularly for affective behavior in couples (Johnson, 2002; Zemp et al., 2017). This adapted system allowed the coding of discrete behaviors and is comprised of observational scales divided in five main categories: nonverbal positivity, nonverbal negativity, verbal positivity, verbal negativity, and neutral/nothing (Zemp et al., 2016). The verbal positivity category is composed of five subcategories: interest, validation, affect/caring, emotional disclosure, and constructive criticism. Verbal negativity consists of seven subcategories: criticism, defensiveness, domineering, stonewalling, speech interruption, contempt, and belligerence. The values for the various types of affective behavior in the positive subscale are hierarchical (interest = 1; constructive criticism = 5), with constructive criticism representing the person being the most emotionally involved in the conflict and thus a more negative affective behavior than interest/curiosity. The values for the various types of affective behavior in the negative subscale are also hierarchical (criticism = 6; belligerence = 12), with belligerence being the most intense negative affective behavior. The values of the nonverbal affective behavior categories are as well hierarchical (nonverbal positivity = 1; nonverbal negativity = 2). The value given for the category neutral/nothing was 88 and missing data were coded 99. The categories were coded separately for women and men, as previous literature has accounted for gender differences in communication patterns. The observational coding procedure involved three steps: (1) watching the video without coding, (2) coding the nonverbal behavior, and (3) coding the verbal behavior. These steps were repeated for the coding of the second partner. This coding method demonstrated good validity in previous studies (Kuster et al., 2015; Zemp et al., 2016, 2017), and rater teams achieved a high interrater reliability (i.e., Cohen's kappa ≥ 0.90) in previous research (Zemp et al., 2017; Leuchtmann et al., 2019). A master coder from the University of Zurich trained the first author. After 12 h of training, 4 h of supervision, and 60 h of coding training tapes, the first author demonstrated high interrater reliability (i.e., Cohen's kappa ≥ 0.90).

Coparental Satisfaction

The three dimensions of coparental satisfaction (support, conflict, and triangulation) were assessed with two questionnaires to get a comprehensive representation of this variable. The first questionnaire, the Parenting Alliance Measure (PAM), measured support, whereas the second, the Coparenting Inventory for Parents and Adolescents (CIPA), evaluated triangulation and conflict.

Parenting Alliance Measure

Coparental support was assessed by evaluating the strength of the perceived alliance between parents with the PAM (Konold and Abidin, 2001). The 20-item self-report questionnaire measured parenting aspects such as to what extent the parents are cooperative, communicative, and mutually respectful with

regard to caring for their children. Scores on the PAM range from 20 to 100, with higher scores indicating a stronger and more positive parenting alliance. Internal consistency was excellent for mothers and fathers (mothers: $\alpha = 0.95$; fathers: $\alpha = 0.95$). We determined the Reliable Change Index (RCI) values for men and women using the data provided by Delvecchio et al. (2015): 15.11 for women and 15.29 for men.

Coparenting Inventory for Parents and Adolescents

The parents' perceptions of conflict and triangulation were measured with the 16-item CIPA (Teubert and Pinquart, 2011). Scores range from 0 to 4, with higher scores indicating more conflict and triangulation. Internal consistency was good for mothers and fathers (mothers: $\alpha = 0.84$; fathers: $\alpha = 0.87$). Following recommendations of Jacobson and Truax (1991), we calculated the RCI values for men and women using the data provided by Teubert and Pinquart (2011): 2.06 for women and 1.78 for men.

Romantic Satisfaction

The quality of the romantic relationship was evaluated with the 32-item Dyadic Adjustment Scale (DAS; Spanier, 1976). The global adjustment scores range from 0 to 151, with higher scores indicating a better adjustment. Scores underneath the cut-off score of 97 (Jacobson and Truax, 1991) and indicate that the partner is experiencing distress in the romantic relationship. Internal consistency was excellent for women and good for men (women: $\alpha = 0.91$; men: $\alpha = 0.89$). Following recommendations of Jacobson and Truax (1991), we calculated the RCI values for men and women using the data provided by Baillargeon et al. (1986): 12.2 for women and 13.51 for men.

Statistical Analyses

The observational data were entered in R (R Core Team, 2020), and the categories of the nonverbal behavior were re-coded as follows: positive nonverbal behavior = 1, negative nonverbal behavior = -1, and neutral/missing behavior = 0. Verbal behavior was re-coded as follows: Negative verbal affective behaviors were characterized by negative numbers (criticism = -1, defensiveness = -2, domineering = -3, stonewalling = -4, speech interruption = -5, contempt = -6, and belligerence = -7), thus representing gradually more negative affective behaviors. Positive numbers were used to identify the positive verbal affective behaviors (constructive criticism = 1, emotional disclosure = 2, affect/caring = 3, validation = 4, and interest/curiosity = 5), with higher numbers illustrating that the person displayed a more positive affective behavior. Each partner's nonverbal and verbal behavior raw scores were separately plotted within the pre- and post-intervention assessments. For each time interval, the vertical unit matched the affective behavior code displayed by the participant, and the horizontal distance unit matched the time sequence. Therefore, if the affective behavior was positive, the point was above zero, and if the affective behavior was negative, the point was below zero. Greater numbers indicate more intense affective behavior. Means and CIs were computed for

each partner, and the mean affective behavior of each partner was represented by a horizontal line in the plots. Then, paired student *t*-tests were calculated to contrast the partners' means between the pre- and post-intervention assessments. The null hypothesis stipulated both means to be equal, while the alternative hypothesis postulated a difference between the means.

Clinical Analysis

The clinical analysis was conducted in two steps, after the coding of the affective behavior. First, the first two authors (both psychotherapy researchers) summarized and analyzed all audiotaped therapy sessions (i.e., six sessions for each couple). Within each therapy session, particular attention was paid to specific markers, such as the couple's affective interactional dynamics (e.g., voice tone, specific verbal cues, and speaking turns) and the therapist's interventions (e.g., work on the romantic and/or coparental relationship, downregulation of the couple's negative interaction cycles, and work on the couple's affective behavior dynamics). Then, in the second step, these analyses were shared with the two therapists who validated the analyses or suggested revisions (e.g., they refined the content or gave additional information on the couple's affective interactional dynamic).

RESULTS

Results are presented in three parts: affective behavior change, coparental and romantic satisfaction changes, and clinical analysis.

Affective Behavior Change

The plotted raw scores for couple A, as depicted in **Figure 1**, indicate that the partners' nonverbal and verbal affective behavior was substantially negative within the pre-intervention discussion task and mainly positive within the post-intervention discussion task. Regarding couple B's plotted raw scores, both partners' nonverbal and verbal affective behavior were above all negative within the pre- and post-intervention discussion tasks, as illustrated by **Figure 2**. For both figures, the time interval is represented on the X-axis and the raw scores of affective behavior on the Y-axis.

Table 1 displays results of the partners' affective behavior means and their respective CIs. The means summarize each partner's nonverbal and verbal affective behavior in terms of the 5-min discussion task. Analyses showed negative means in the nonverbal and verbal affective behavior for partners from couple A within the pre-intervention discussion task and positive means for the nonverbal and verbal affective behavior of both partners within the post-intervention discussion task. Results for couple B indicated negative means for both partners in the nonverbal and verbal affective behavior within the pre- and post-intervention discussion tasks.

To compare each partner's affective behavior change between the pre- and post-intervention discussion tasks, we computed paired student *t*-tests. For couple A, results revealed that the woman displayed substantially more positive nonverbal and verbal affective behavior in the post-intervention discussion

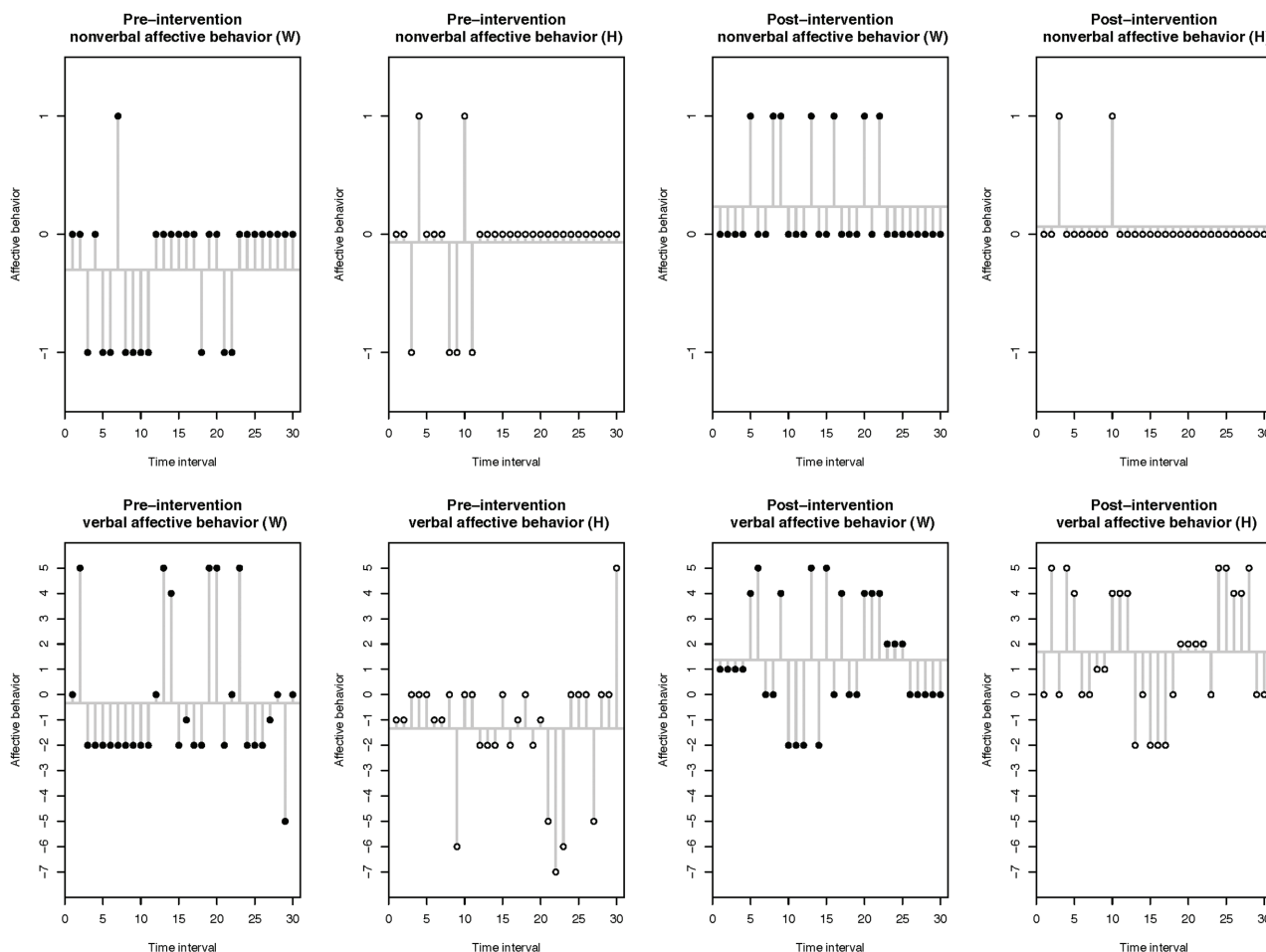


FIGURE 1 | Couple A: raw scores of the observed nonverbal and verbal affective behavior within the pre- and post-intervention discussion tasks.

task [nonverbal: $t(29) = -3.76$, $p < 0.001$, 95% CI $(-0.82, -0.24)$; verbal: $t(29) = -2.66$, $p = 0.013$, 95% CI $(-3.01, -0.39)$]. Even though the man's non-verbal affective behavior mean was positive in the post-intervention assessment, analyses indicated that his mean did not differ from the pre-intervention assessment [$t(29) = -1.44$, $p = 0.161$, 95% CI $(-0.32, 0.06)$]. However, the man showed significantly more positive verbal affective behavior in the post-intervention assessment [$t(29) = -5.01$, $p < 0.001$, 95% CI $(-4.27, -1.79)$]. For couple B, results from the paired student t -tests suggested that the woman's nonverbal and verbal behavior means did not differ in the post-intervention discussion task [nonverbal: $t(29) = 0.27$, $p = 0.79$, 95% CI $(-0.22, 0.28)$; verbal: $t(29) = -0.48$, $p = 0.636$, 95% CI $(-1.93, 1.20)$], thus suggesting that her nonverbal and verbal affective behavior remained negative in the post-intervention assessment. The man showed significantly more negative nonverbal affective behavior in the post-intervention discussion task [$t(29) = 2.11$, $p = 0.043$, 95% CI $(0.01, 0.52)$], whereas there was no difference in his mean verbal affective behavior [$t(29) = 1.35$, $p = 0.188$, 95% CI $(-0.71, 3.44)$], therefore indicating that his verbal affective behavior stayed negative.

Coparental and Romantic Relationship Satisfaction Changes

Table 2 displays coparental and romantic satisfaction scores for couples A and B in the pre- and post-intervention assessments. In the post-intervention assessment, couple A reported a more positive coparenting alliance and less conflict and triangulation, as well as less romantic satisfaction. In couple B, the woman reported a similar and the man a lower score of coparenting alliance and both reported less conflict and triangulation. In addition, both partners reported higher scores of romantic satisfaction. Although partners from couples A and B reported changes in their coparental and romantic satisfaction, none of these can be considered as clinically significant.

Clinical Analysis

Specific change markers within therapy sessions, such as the couples' interactional dynamics, were identified to shed light on the couples' affective behavior analysis. The results revealed that Marc and Emily (couple A) were able to foster a supportive coparenting relationship despite still experiencing romantic

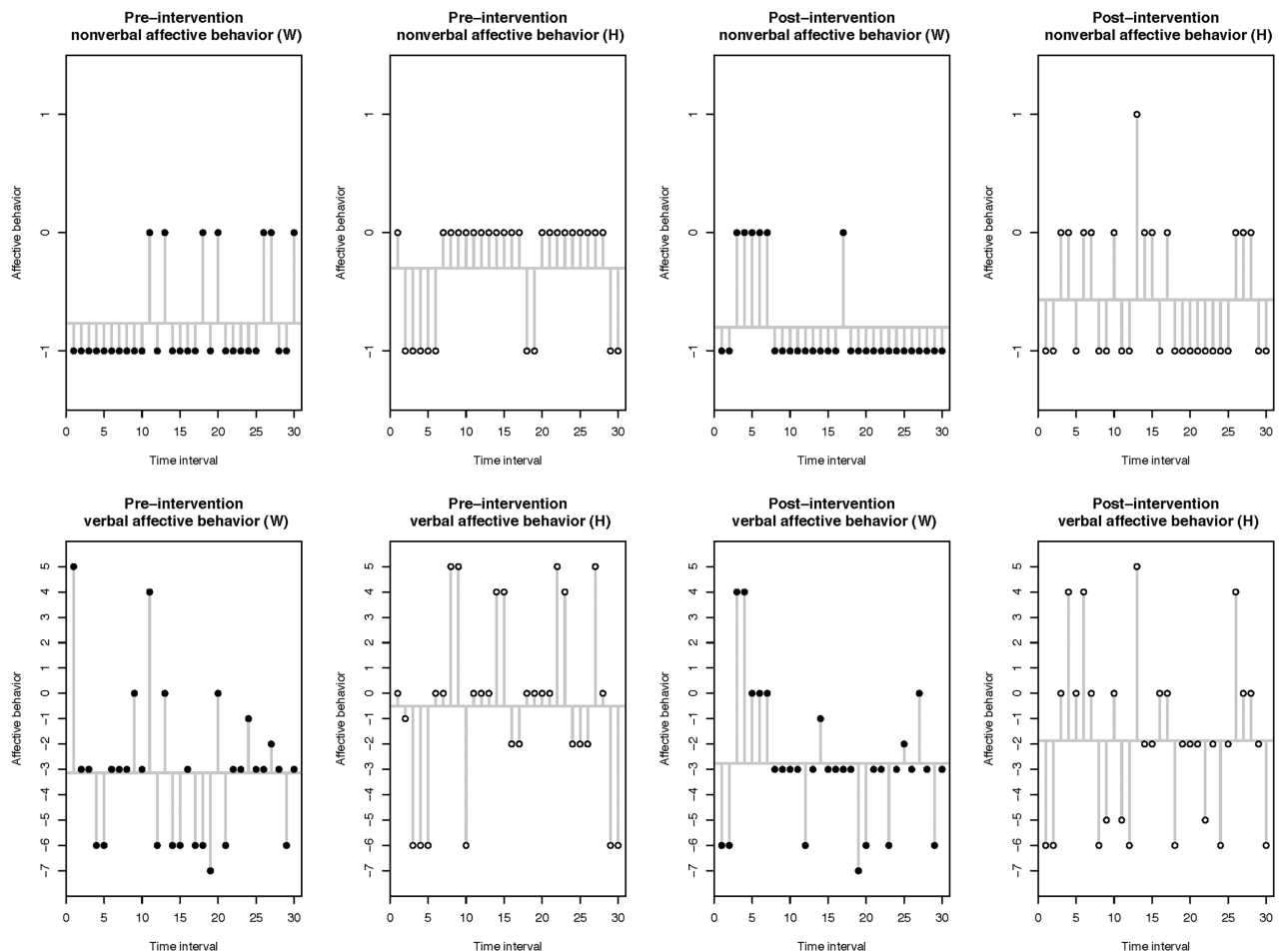


FIGURE 2 | Couple B: raw scores of the observed nonverbal and verbal affective behavior within the pre- and post-intervention discussion tasks.

distress at the end of therapy. Their interactional dynamic underwent a slight positive change throughout the therapy sessions. For Arthur and Julia (couple B), the clinical analysis revealed the continuous presence of several coparental conflicts throughout the therapy sessions, which mainly remained irreconcilable. The interactional dynamic stayed negative, with the presence of frequent criticism and contempt throughout the therapy sessions.

Couple A

Marc and Emily's therapy indicated that they shared a supportive coparental bond, even though their romantic distress remained. Faced with a couple who came to therapy highly romantically distressed, the therapist sought to support and strengthen their coparental resources to preserve the coparental relationship. More broadly, the therapist also worked on the couple's interactional dynamic: e.g., Marc frequently criticized Emily, and Emily was mainly closed off and sometimes defensive. This interactional dynamic changed throughout therapy sessions, and at the end of the therapy, Marc was more validating and Emily became more assertive.

During the first session, the therapist was confronted with two different demands and a highly negative and destructive interactional dynamic. When the therapist explored both demands, it appeared that Marc wished for more physical intimacy and sex, whereas Emily desired less tension and more dialog in general. The nature of the couple's conflict around their romantic life was related to sexual desire discrepancies. During the couple's interactions within the first session, both partners generally expressed themselves in monologues (i.e., both spoke to the therapist and not to one another); additionally Marc often overtly criticized Emily in front of the therapist, while Emily often broke down in tears and did not speak.

In the following therapy sessions, the therapist worked on the partners' demands and explored their needs. Unfortunately, it appeared that the deleterious interactional dynamic between the partners challenged the progression of the couple's romantic relationship. For instance, in Session 3, Marc overtly criticized Emily's general knowledge in front of the therapist. As a response to Marc's aggressive behavior, Emily started crying and tried to defend herself, but she often could not finish her sentences. The therapist also explored the coparental relationship

through the couple's transition to parenthood and everyday life. It seemed that the atmosphere lightened when Marc and Emily tackled coparental topics within therapy sessions; both partners agreed more and sounded less tense. Given this context, the therapist put her focus on the positive aspects of the couple's relationship – for instance, their coparental relationship – and worked on soliciting and reinforcing this resource.

In the last therapy session, the therapist and the couple investigated the couple's progress during the therapy. It seemed that, notwithstanding the couple's romantic distress and the impossibility of reconciling both partners' demands, Marc and Emily's interactions changed positively throughout therapy. Both partners recollected communicating substantially more throughout therapy sessions. Furthermore, Emily confirmed that the sessions helped her open up and become more assertive. As for Marc, he seemed to be able to listen more and to validate his partner's feelings to a greater extent. The therapist supported and validated this improvement. Finally, both partners felt they had made a step toward improvement

and did not feel the need to continue therapy. Therefore, the therapy stopped after six sessions.

Couple B

Julia and Arthur's therapy analysis indicated they had several disagreements about their romantic and coparental relationships that could not be solved through therapy. It appeared that Julia and Arthur had different expectations of their romantic relationship and dissimilar educational values regarding their daughter's upbringing. Confronted with the repeated presence of criticism and contempt within the couple's interactions, the therapist attempted to reduce the negative interactional dynamic throughout therapy sessions. Moreover, the therapist sought to explore and reconcile both partners' needs. Nonetheless, this conflict and negativity appeared to have been in place for a long time in the couple's interactional dynamic and did not change in spite of the therapy sessions.

In the first session, the therapist's exploration of both partners' goals for therapy showed that they came because of their recurrent problematic communication and frequent disagreements in their everyday life. Further exploration indicated that Julia was the main source of the therapeutic demand: she wished for the couple's problematic interactions to change. During this session, the therapist was confronted with Julia and Arthur's conflicts and lack of empathy toward each other; therefore, she intervened to comment on the negative dynamic between the couple and worked on reducing their conflicts in both their romantic and coparental relationships.

In subsequent sessions, the couple's interactional dynamic remained generally negative. Julia and Arthur appeared to communicate high coparental distress and exhibit poor interactional quality when interacting in therapy sessions. Both partners frequently criticized and interrupted each other and showed a substantial lack of empathy toward each other by exchanging dismissive remarks. The therapist worked on the couple's goals (i.e., changing the negative interactional dynamic) by intervening and reframing the couple's interactions. For instance, the therapist used the "positive connotation technique" (i.e., responding from another angle to a patient's statement

TABLE 1 | Means and CIs for nonverbal and verbal affective behavior within the pre- and post-intervention discussion tasks for couples A and B.

| Affective behavior | Couple A | | Couple B | |
|--------------------------|----------|----------------|----------|----------------|
| | <i>M</i> | 95% CI | <i>M</i> | 95% CI |
| Pre-intervention | | | | |
| Woman | | | | |
| Nonverbal | −0.30 | (−0.50, −0.10) | −0.77 | (−0.93, −0.61) |
| Verbal | −0.33 | (−1.38, 0.72) | −3.13 | (−4.21, −2.06) |
| Man | | | | |
| Nonverbal | −0.07 | (−0.23, 0.10) | −0.30 | (−0.47, −0.13) |
| Verbal | −1.33 | (−2.23, −0.43) | −0.50 | (−1.85, 0.85) |
| Post-intervention | | | | |
| Woman | | | | |
| Nonverbal | 0.23 | (0.07, 0.39) | −0.80 | (−0.95, −0.65) |
| Verbal | 1.37 | (0.53, 2.21) | −2.77 | (−3.77, −1.77) |
| Man | | | | |
| Nonverbal | 0.07 | (−0.03, 0.16) | −0.57 | (−0.78, −0.35) |
| Verbal | 1.70 | (0.80, 2.60) | −1.87 | (−3.12, −0.61) |

TABLE 2 | Pre- and post-intervention scores of coparental and romantic satisfaction for couples A and B.

| | Couple A | | | | | | Couple B | | | | | |
|----------------------------|----------|------|------|------|------|------|----------|------|------|-------|-------|------|
| | Woman | | | Man | | | Woman | | | Man | | |
| | Pre | Post | Δ | Pre | Post | Δ | Pre | Post | Δ | Pre | Post | Δ |
| Alliance | 72.0 | 78.0 | 6.0 | 85.0 | 96.0 | 11.0 | 76.0 | 76.0 | 0.0 | 85.0 | 82.0 | −3.0 |
| Conflict and triangulation | 0.6 | 0.2 | −0.4 | 0.8 | 0.3 | −0.5 | 1.6 | 1.3 | −0.3 | 1.7 | 1.1 | −0.6 |
| Romantic satisfaction | 83.0 | 77.0 | −6.0 | 95.0 | 90.0 | −5.0 | 96.0 | 99.0 | 3.0 | 109.0 | 112.0 | 3.0 |

Δ corresponds to the score difference between the post-intervention and pre-intervention assessments. Alliance scores range from 20 to 100, with higher scores indicating a more positive alliance; Reliable Change Index (RCI) values were 15.11 for women and 15.29 for men (Delvecchio et al., 2015). Conflict and triangulation scores range from 0 to 4, with higher scores suggesting more conflict and triangulation; RCI values were 2.06 for women and 1.78 for men. Romantic satisfaction scores range from 0 to 151, with higher scores showing a better adjustment; RCI values were 12.2 for women and 13.51 for men.

by re-labeling in a positive way a situation that was initially labeled negatively). This means intervening in the following way: the therapist interrupted an argument and meta-communicated about what was happening by saying that the ongoing conflict was a sign that their relationship was still important to both of them. This allows partners to view their conflict in a different way and is seen in the systemic approach as a lever for change (Haley, 1963; Jackson, 1968; Selvini Palazzoli et al., 1978). The therapist also explored the couple's coparental functioning during the transition to parenthood and in their everyday life. It turned out that Julia and Arthur seemed not only to have different needs but also dissimilar or even opposed educational values. To reconcile both partners' needs and values, the therapist explored each partner's motivations to hang on to their individual values. In positively reframing the contributions of both partners by saying that they actually pull on the same string but not at the same time, the therapist worked on promoting a sense of unity between the coparents to strengthen the coparental relationship.

In the last session, Julia and Arthur argued anew about topics related to their coparental relationship, as was generally the case throughout therapy. This detrimental interactional dynamic led the therapist to interrupt both partners on several occasions to reduce the tension between them. At the end of the session, the therapist encouraged the couple to work together toward a solution by identifying what they could do to communicate their needs better and adapt to their partner's needs. As no significant change had occurred within the couple's interactional dynamic – and due to the couple's willingness to continue working on their demands – the therapist and the couple agreed to schedule additional therapy sessions outside of the research frame.

DISCUSSION

Results from the contrasted cases indicate that the affective behavior change patterns that could be observed in the coparental discussion tasks (positive change vs. no change) were not systematically related to similar coparental and romantic questionnaire results. Couple A displayed a positive affective behavior change in the coparental discussion task which was reflected in the coparental satisfaction questionnaire but not in the romantic satisfaction questionnaire. Couple B's affective behavior change remained negative after therapy in the coparental discussion task, whereas both partners reported moderately high coparental satisfaction both in the pre- and post-intervention questionnaires and their romantic satisfaction increased between the pre- and post-intervention assessments.

The association between couple A's positive change of affective behavior and the increase in the coparental satisfaction questionnaires is in line with previous research demonstrating that more positive coparenting interactions are related to a higher quality of coparental relationship (Baker et al., 2010). It is of interest to note that the coparental positive change was stronger in the affective behavior microlevel coding than in the self-report questionnaires, which suggests that microlevel analysis gives results that are slightly different from self-reported

measurements. The fact that couple A's positive affective behavior change was not reflected in the romantic satisfaction questionnaires contrasts with previous research showing that the quality of couple interactions is associated with the quality of romantic satisfaction (e.g., Rogge et al., 2006). Hence, we can assume that changes in couple A's affective behavior are not just as much a function on an improvement in overall satisfaction.

Couple B's results contrast with previous research suggesting that negative interactions are related to hostile-competitive coparenting (McHale, 1995) and lower relationship satisfaction (Friend et al., 2017). A discrepancy is therefore also observed here between observational results and questionnaires. Self-report questionnaires provide information on an individual's perceptions, whereas observational methods capture relational dynamics by providing direct data on them (Baucom and Crenshaw, 2019). Therefore, data collected *via* observational coding by a third party are also independent from potential memory or social desirability bias, which could be present in couple B's self-reports. Finally, this gap in the results highlights that observational measurements enable researchers to capture unique and specific dynamics of couples' interactions, which provide additional information to data collected through self-report measures. Therefore, future studies should consider more frequently integrating observational methods in addition to self-report measurements to investigate couple interactions (Darwiche and de Roten, 2015).

The clinical analysis showed that the interactional dynamic of couple A slightly and positively evolved within therapy sessions. Marc and Emily's coparental interactions and relationship seem to have been reinforced during therapy. However, their romantic distress remained after terminating therapy. We could hypothesize that during therapy sessions, the couple recognized their coparental relationship as a strength which might have led them to consolidate their coparental interactions and relationship. Both parents may have been particularly motivated to improve their coparenting relationship for their children's benefit. For couple B, the clinical analysis revealed the presence of several coparental conflicts that could not be settled during the six therapy sessions. We can hypothesize that the brief therapeutic setting might not have been enough psychoeducational and suitable for a couple that appeared chronically distressed.

Taken together with previous research, our study was intended to explore processes within the coparental relationship in addition to those present in the romantic relationship in a sample of parent couples undergoing couple therapy. To date, empirical literature describing how communication influences relationship outcomes has mainly focused on interactions taking place within romantic relationships and their links with romantic satisfaction. Investigating the evolution of the coparental relationship remains an atypical scope in couple therapy. Our findings support previous research results indicating that the coparental and romantic relationships do not necessarily evolve jointly (Le et al., 2016). Therefore, future studies should consider exploring the romantic and coparental relationships separately.

In the context of frequent separations between couples, research efforts highlighting changes in the coparental relationship within

couple therapy appear highly relevant and important (for a systematic review and meta-analysis of coparenting programs, see Eira Nunes et al., 2020). Literature has demonstrated broadly that coparental satisfaction is significantly linked with well-being, child rearing, and child adjustment (Bodenmann, 2016). Parents having constructive coparental interactions and reporting satisfaction in their coparental relationship seem more likely to define parenting goals together and provide mutual support related to child rearing (Holland and McElwain, 2013). Finally, results from a meta-analysis underline that coordination among adults responsible for the care and education of children is significantly related to fewer internalizing and externalizing symptoms within their child/ren (Teubert and Pinquart, 2010). Therefore, reinforcing the coparenting relationship can constitute a protective factor for children whose parents consider separation or divorce.

The present study has some limitations. First, this contrasting case study is a first exploration and step, and the results will need to be replicated with a subsample of 65 parent couples for whom data for pre- and post-intervention analyses of affective behavior are available within the ongoing RCT's expected total sample of $N = 80$ couples with pre-post intervention data. This will allow further testing of our hypothesis that affective behavior in parent couples' interactions before entering couple therapy could be predictive of their progress in romantic satisfaction, coparental satisfaction, and overall individual symptomatology (e.g., propensity to anxiety and depressive symptoms) between pre- and post-intervention assessments. Second, due to the small sample size, we analyzed the partners' nonverbal and verbal affective behavior independently. Nonetheless, as our data were drawn from couples, we can still postulate an interdependence and interconnectedness within our findings. The broader sample from the ongoing RCT will additionally make it possible to: (1) use data analytic models specifically suited to dyadic data, such as actor-partner interdependence models or growth-curve modeling (Kenny et al., 2006), and (2) analyze different patterns of affective behavior change, including a positive to negative affect behavior change. Third, we cannot rule out that a therapeutical approach focused on affective behavior (e.g., Halford et al., 2003; Gottman and Schwatz Gottman, 2008; Bodenmann et al., 2014) might have led to other results. The systemic approach incorporates the observation of affective behavior; nevertheless, it does not involve systematic therapeutic work on this aspect as do other models. One limitation is that the therapists had general guidelines for their interventions, which makes it difficult to know whether the treatment received by the couples was comparable. Another important limitation is related to the fact that only the first author coded the affective behavior; this limitation is balanced by the fact that the first author was qualified as an expert coder. Furthermore, the affective behavior coding might have influenced the clinical analysis, given that it was conducted by the same members of the research team. However, the potential bias is compensated by the therapists' contribution to the clinical analyses. Finally, we cannot exclude the possibility that external factors or factors specific to the participants influenced the results, such as between-session events or participants' disposition toward change, as we only integrated an analysis of the processes within therapy sessions.

Our study is a first step toward investigating coparental relationships through observed coparental interactions with parent couples within a clinical setting. Observing couples' interactions makes it possible to apprehend a couple's conflict in a somewhat realistic setting, compared to self-report measures. The results are therefore meaningful to clinicians and clinical training. Previous research has stressed the importance of teaching clinicians to detect negative nonverbal affective behavior within couples' interactions (Patterson et al., 2012). Our results can prompt couple therapists on the importance of considering micro-observational research results on nonverbal and verbal affective behavior to allow them to identify their clients' affective behavior changes. In the last few decades, research has highly been influenced by narrative therapy and other postmodern approaches, and their reluctance to observe, comment upon, and intervene with couple's interactive behavior. Hence, our study can contribute to the existing body of research that focuses on specific practices for working with affective exchanges in couple therapy (e.g., Epstein and Zheng, 2017; Johnson, 2020).

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

JD contributed to the conception and design of the study. EL and J-PA performed the statistical analyses. EL and JD contributed equally to writing of the manuscript. J-PA, A-SR, and LP read and revised sections of the manuscript. All authors contributed to the article and approved the submitted version.

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Adverse Childhood Experiences and Early Maladaptive Schemas as Predictors of Cyber Dating Abuse: An Actor-Partner Interdependence Mediation Model Approach

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The increasing role that new technologies play in intimate relationships has led to the emergence of a new form of couple violence, cyber dating abuse, especially among adolescents and young adults. Although this phenomenon has received increased attention, no research has investigated predictors of cyber dating abuse taking into account the interdependence of the two partners. The study examines adverse childhood experiences (abuse, neglect, and witnessed intimate partner violence) and early maladaptive schemas (emotional deprivation and abandonment) as possible predictors of young adults' perpetrated and suffered cyber dating abuse. Adopting a dyadic approach, mediational models in which adverse childhood experiences were assumed to be related to individual and partner's cyber dating abuse through individual early maladaptive schemas were tested. 134 couples completed online self-reports of the variables of interest, including a bidimensional measure of cyber dating abuse assessing pressure-aggression and control-monitoring. Actor-partner interdependence mediation model analyses were conducted. Results indicated that the emotional deprivation schema mediated the association between adverse childhood experiences and cyber dating abuse, whereas the abandonment schema did not. Specifically, more frequent experiences of emotional abuse and physical neglect during childhood were indirectly related to increased likelihood of perpetrating cyber dating pressure-aggression as well as of perpetrating and suffering cyber dating control-monitoring in both males and females. These associations were mediated by a stronger internalization of the emotional deprivation schema and were supported by both self-reported and partner-reported data. Also, a strong and direct association was found between childhood exposure to intimate partner violence by the opposite-sex parent and cyber dating pressure-aggression by females or control-monitoring by both males and females. These findings help to clarify the potential negative effects of specific adverse childhood experiences and early maladaptive schemas on the tendency to perpetrate and suffer cyber abuse in romantic relationships. The implications for prevention and treatment programs are noted and avenues for future research are described.

Keywords: cyber dating abuse, ACEs, early maladaptive schemas, actor-partner interdependence mediation model, romantic couples, young adults

INTRODUCTION

The couple is a third physical and psychic entity that emerges at the meeting place between two worlds, embodied by the individual partners who constitute it. Due to the increasing role that new technologies play in our society, especially among adolescents and young adults, the meeting between partners, the construction of the couple, and even the implementation of dysfunctional dynamics damaging to individual health and relationship quality, take place online as well as offline.

Thus, more and more frequently people tend to use social networks or messaging apps to deepen their knowledge of potential partners. This is because the distance given by social networks is perceived to facilitate the disclosure of one's feelings, reduce problems caused by one's shyness, and limit the sadness and the sense of defeat deriving from a possible refusal. Similarly, once the couple is created, new technologies are often the medium used not only to maintain dating relationships, but also to express one's anger toward the partner or verify the trust given to him/her through digital control (Burke et al., 2011). This often entails negative and dysfunctional behaviors, such as falsifying one's identity, engaging in aggressive acts, and violating privacy, which can be more easily enacted online than offline due to the higher levels of detachment and self-centeredness and lower levels of empathy and accountability which characterize online interactions (Draucker and Martsolf, 2010; Runions and Bak, 2015).

For this reason, understanding couple violence among adolescents and young adults necessarily involves investigating Cyber Dating Abuse (CDA). CDA is an emerging form of abuse which consists of using mobile phones and digital social networks to control the partner, limit his/her freedom, mock, denigrate, threaten, and/or force him/her to perform or suffer unwanted sexual acts (Zweig et al., 2013, 2014; Borrajo et al., 2015a; Reed et al., 2016) for a review see Caridade et al. (2019). This phenomenon is becoming a public health issue, as existing studies (e.g., Borrajo et al., 2015b; Reed et al., 2016, 2017) have found victimization and perpetration of CDA in at least 50% of participants. Italian data do not differ, as the only study in Italy documented the presence of psychological violence online in 60% of adolescents and young adults (Morelli et al., 2018).

Some data show that CDA is related to but distinct from Intimate Partner Violence (IPV) due to the characteristics of the medium through which CDA occurs (e.g., Zweig et al., 2013; Dick et al., 2014; Borrajo et al., 2015a; Marganski and Melander, 2015; Sargent et al., 2016; Temple et al., 2016; Deans and Bhogal, 2019). Regarding abuse perpetration, for example, digital technologies make it easier to commit violent acts and reduce social emotional cues, which may elicit less empathy and greater violence. Concerning victimization, the fact that violence can be carried out continuously increases the victim's perception of vulnerability. Furthermore, the possibility that CDA is perpetrated in a public domain, characterized by the persistence of written or posted content, increases exponentially the negative effects of the damage suffered and raises the probability of re-victimization experiences (Bennet et al., 2011; Lucero et al., 2014; Borrajo et al., 2015a,b,c; Peskin et al., 2017). For this reason, more

studies are needed both to better understand CDA and to clarify whether it is a new form of violence or simply an evolution of IPV.

Like any phenomenon in a dyadic relationship, CDA is linked to individual traits and experiences as well as to relational dynamics, manifested as a series of emergent characteristics, which arise from the encounter between the subjectivities of the two partners. Thus, in relationships, individual behaviors are not only determined by intra-individual characteristics and events but undergo a series of modulations that depend on the couple (Framo, 1992). In particular, although personality traits or personal experiences can predispose a person to perform certain behaviors, the partner can facilitate or inhibit these behaviors, depending on his or her own personality traits and experiences. Therefore, with specific reference to the study of CDA, knowing the predisposition of each partner toward the perpetration of this form of violence could be insufficient, because it does not take into account the variations that the behavior of one partner could undergo depending on the behavior of the other partner. Thus, for example, a person with a low predisposition to control could be induced to implement online controlling behaviors if involved in a relationship with a particularly secretive partner and therefore be capable of instilling feelings of jealousy and fear of betrayal. Similarly, a person not particularly predisposed to submission could be consciously the victim of online control by a partner who, moved by an excessive fear of betrayal and abandonment, tends to evaluate as negative and dangerous his or her partner's attempts to establish an appropriate level of autonomy in the relationship. To the best of our knowledge, CDA has not been investigated from such a dyadic perspective. However, a few studies have examined IPV as a function of both partners' characteristics like adult attachment styles, borderline personality traits, and the perceived fulfillment of basic psychological needs (Maneta et al., 2013; Sommer et al., 2016; Petit et al., 2017). Therefore, one goal of our study is to consider the role played by individual variables in predicting involvement in violent relationships while taking into account the interdependence between the partners.

Research on CDA etiology is in its infancy, but evidence on IPV, to which CDA is related, suggests that adverse childhood experiences (ACEs) and early maladaptive schemas may be distal predictors of CDA.

ACEs, defined as negative, stressful, and traumatic experiences during childhood and adolescence (Felitti et al., 1998), are undoubtedly some of the most studied risk factors for involvement in violent relationships. This construct is multidimensional and includes multiple traumatic experiences, which impair the psycho-physical development of the individual, including physical abuse, sexual abuse, emotional abuse, physical neglect, emotional neglect, witnessed violence, cohabitation with a family member suffering from psychiatric pathologies or addiction to alcohol or drugs, and the imprisonment of a family member (Felitti et al., 1998; Anda et al., 2002; Bernstein et al., 2003; Chapman et al., 2004; World Health Organization (WHO), 2018). Among these negative experiences, the most studied as predictors of IPV are the various forms of abuse and neglect and, in recent years, witnessed violence. The overwhelming majority of research has found that all forms of abuse, neglect,

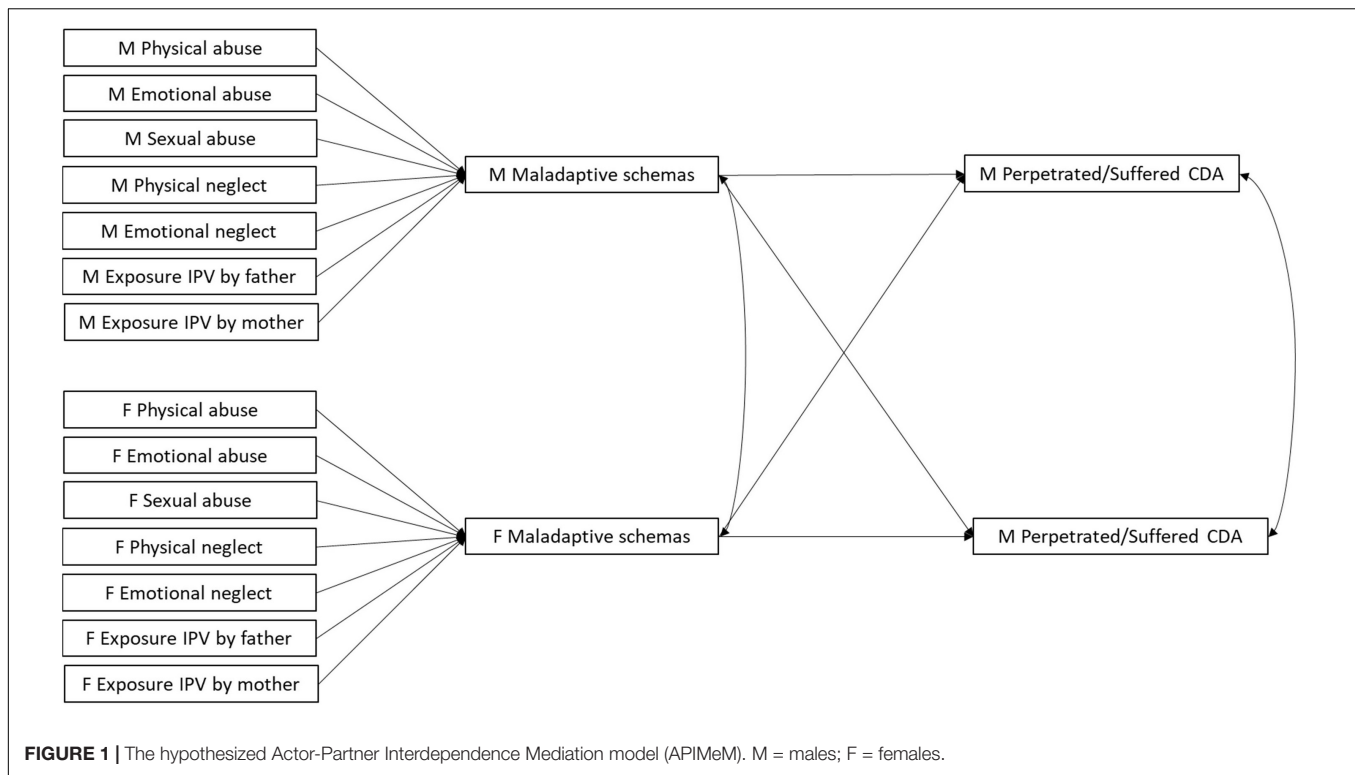
and witnessed violence increase the likelihood of victimization and perpetration of violence within couples (Whitfield et al., 2003; Garrido and Taussig, 2013; Karakurt et al., 2013; Iverson et al., 2014; Eriksson and Mazerolle, 2015; McMahon et al., 2015; Machisa et al., 2016; Madruga et al., 2017; Voith et al., 2017; Kimber et al., 2018; Li et al., 2020; Yan and Karatzias, 2020).

Early maladaptive schemas constitute the fundamental construct of Schema Therapy, an epistemological and psychotherapeutic model developed by Young and colleagues in the 1990s with the goal of making cognitive-behavioral therapy (CBT) more suitable for treating people with pathological traits or personality disorders. According to Young et al. (2007), schemas are dysfunctional emotional and cognitive structures that people use to understand and give meaning to oneself, to others, and to the events that occur. These patterns arise during childhood and adolescence based on somatic sensations, emotions, memories, and thoughts connected to experiences. The circumstances that favor the emergence and consolidation of maladaptive schemas are the frustration of at least one of the following five fundamental human needs: (1) need for stable ties with other people (need for protection, stability, care, and acceptance); (2) need for autonomy, sense of competence, and identity; (3) need to be able to freely express needs and emotions; (4) need for spontaneity and play; and (5) need for realistic limits and self-control. Young et al. (2007) identified 18 schemas, classifiable into five categories or “domains,” depending on the fundamental frustrated need to which they are linked. These domains are the following: (1) Disconnection and rejection, (2) Impaired Autonomy and/or Performance, (3) Other-Directedness, (4) Over vigilance/Inhibition, and (5) Impaired Limits. More recently, Bach et al. (2018) have found support for a model with four domains: (1) Disconnection and rejection, (2) Impaired autonomy and performance, (3) Excessive responsibility and standards, and (4) impaired limits. IPV research has shown that the domain most commonly connected to the experiences of victimization and perpetration of couple violence is Disconnection and rejection (Gay et al., 2013; Falahatdoost et al., 2014; Atmaca and Gencoz, 2016; Taşkale and Soygüt, 2017; Calvete et al., 2018; Borges and Dell’Aglia, 2020). This domain describes people unable to build lasting, safe, and fulfilling relationships because they are always convinced that others will not be able to satisfy their needs for stability, security, care, love, and acceptance. In response to patterns belonging to this domain, people may adopt maladaptive styles of coping based on overcompensation, which cause them to establish a morbid bond with their partner and experience any estrangement as dangerous due to excessive jealousy and fear of betrayal and abandonment. The theory of early maladaptive schemas (Young and Flanagan, 1998) holds that they are found in people who grew up in families which were unstable (abandonment/instability), violent (distrust/abuse), inadequately affectionate (emotional deprivation), overly demanding (inadequacy/shame), or socially isolated (social exclusion) and who often suffered real trauma. This etiological explanation links the internalization of the schemas belonging to the Disconnection and rejection domain to childhood and adolescent experiences marked by adverse experiences like ACEs and gives rise to the hypothesis that early

maladaptive schemas may mediate the relationship between ACEs and IPV. In line with this reasoning, Gay et al. (2013) showed that the schemas in the Disconnection and rejection domain mediate the relationship between emotional abuse and victimization or perpetration of IPV.

To our knowledge, little research has analyzed whether predictors and mediators of IPV play a similar role in CDA. Only two studies investigate the link between ACEs and CDA (Smith-Darden et al., 2016; Ramos et al., 2017). Both yielded results consistent with those relating to IPV; they showed that physical, sexual, and psychological abuse, family aggression, and family problems (e.g., family member incarceration, family member drug or alcohol use, family member mental illness) were connected with a greater likelihood of perpetrating CDA (Smith-Darden et al., 2016; Ramos et al., 2017). No study has attempted to document a connection between maladaptive schemas belonging to Disconnection and Rejection and CDA or a possible mediating role of Disconnection and rejection maladaptive schemas in the relationship between ACEs and CDA. Any attempt to address these issues must take into account the interdependence of the two partners, and their dual role as possible perpetrators and victims. Such an approach is critical for at least three reasons. First, it offers the important advantage of taking into account the predictive effects that schemas and, indirectly, ACEs have on CDA both within and across partners. As we have previously argued, CDA, like most of the dynamics occurring in a couple relationship, is likely to be perpetrated and suffered depending not only on one’s own characteristics and experiences, but also on those of the romantic partner. In line with this argument, Maneta et al. (2013) showed that offline perpetration of psychological aggression was predicted by both partners’ attachment avoidance and that offline perpetration of sexual coercion was influenced by both partners’ attachment anxiety. Therefore, a dyadic approach promises to offer a more comprehensive explanation of the phenomenon investigated. Second, many CDA studies have assumed gender asymmetries to justify the investigation of victimization only among females and of perpetration only among males. Not infrequently, however, levels of perpetration by females were similar and, in the context of control, sometimes even higher than those of males (Burke et al., 2011; Kellerman et al., 2013; Zweig et al., 2013; Borrajo et al., 2015a; Reed et al., 2017). Third, comparing the experiences of the two partners with respect to perpetration and victimization can show patterns of opinions and experiences (e.g., reciprocity, convergence, complementarity, contrast) which are fundamental to understanding well-being at the level of the couple. In line with this, Reed et al. (2017) found that females show a more tolerant attitude toward monitoring and males do the same with sexting behaviors, but within an overall negative perception of CDA. Furthermore, females experience any form of CDA suffered (monitoring, direct aggression, sexual cyber abuse) in a more negative way than males.

Consequently, our study investigated whether ACEs predict both perpetrated and suffered CDA through the mediation of Disconnection and Rejection maladaptive schemas. Because of partner interdependence, maladaptive schemas were expected to predict CDA both within and across partners. In order



to take into account the interdependence between partners, the hypothesized mediational models were tested by using the couple as the unit of analysis and by simultaneously estimating individual and partner effects using the Actor-Partner Interdependence Model (APIM; Kenny et al., 2006). Individual or actor effects refer to the effects a respondent's predictors have on his/her outcomes. Partner effects refer to the effects of one partner's predictors on the other partner's outcomes and represent the interdependence that exists between the dyad members (Kenny et al., 2006). Specifically, the Actor-Partner Interdependence Mediation Model (APIMeM) tested (see **Figure 1**) posits both actor and partner effects from maladaptive schemas to CDA dimensions, consistent with the IPV literature previously reviewed showing that early maladaptive schemas belonging to the Disconnection and rejection domain might predict perpetrated and suffered CDA both within and across partners (Gay et al., 2013; Falahatdoost et al., 2014; Ramos et al., 2017; Taşkale and Soygüt, 2017). However, the model posits only actor effects from ACEs to maladaptive schemas because, according to the theory of early maladaptive schemas (Young and Flanagan, 1998), the construction of maladaptive schemas is directly connected to early personal experiences which are likely to precede meeting the romantic partner. Thus, the APIMeM proposed by Ledermann et al. (2011) was adapted so that partner effects were hypothesized only from the mediating to the outcome variables, and not from the independent to the mediating variables.

Informed by the IPV literature, the following hypotheses were examined. First, the more subjects had experienced forms of abuse and neglect in their family of origin and had been exposed

to intimate partner violence enacted by their parents, the more: (a) they were likely to have developed early disconnection and rejection schemas, according to which others are perceived as unable to satisfy their needs for stability, security, care, love, and acceptance; and (b) they themselves as well as their romantic partner were likely to perpetrate and suffer CDA (see Eriksson and Mazerolle, 2015; Smith-Darden et al., 2016; Ramos et al., 2017; Calvete et al., 2018; Borges and Dell'Aglia, 2020). Second, early maladaptive schemas mediate the link between ACEs and CDA, so that, independently of ACEs, the more subjects developed early disconnection and rejection schemas the more likely they and their partner were to perpetrate and suffer CDA (see Gay et al., 2013; Corral and Calvete, 2014; Falahatdoost et al., 2014; Taşkale and Soygüt, 2017).

MATERIALS AND METHODS

Participants

One hundred seventy-eight non-cohabiting couples took part in the study. However, 29 couples were excluded from the analyses because one or both partners had omitted some answers. Furthermore, since only 15 of the 149 remaining couples were made up of homosexuals and bisexuals, we considered this group too small to be compared with that of heterosexual couples. Thus, our final sample comprised 134 non-cohabiting heterosexual couples.

Participants were almost exclusively white (99.3% of males, 100% of females), Italian (95.5% of males, 98.5% of females), and mostly resided in northern Italy (51.5% of males, 49.3%

of females). The average age was 23.49 (SD = 2.88; range: 18–30) for males and 21.89 (SD = 2.57; range: 18–29) for females. The most frequent educational qualifications were high school diploma or equivalent (56.7% of males, 59% of females) and bachelor degree (23.9% of males, 22.4% of females). In terms of working condition, the majority of females were students (63.4%), while most males were students (41%) or full-time workers (25.4%). The average daily number of hours spent on the internet, social networks, and messaging applications was 4.14 (SD = 2.33; range: 0.75–13) for males and 3.51 (SD = 0.33–13.67) for females. Finally, the couple relationship in which the participants were involved averaged about 3 years (M = 33.2 months; SD = 26.12; range: 3–118).

Procedure

Participants were contacted through the publication of a post on the walls of university groups registered on Facebook. The message presented the study as one on the impact of new technologies on late adolescent and young adult couple relationships and informed participants about the anonymous nature of the survey. It also specified the inclusion criteria (being aged between 18 and 30, having a romantic relationship lasting at least three months, not living with the partner), the average response time (approximately 30 min), and how to fill in the survey (each partner would have to answer the questions individually). The data collection was limited to non-cohabiting partners because dating relationships are more common among Italian adolescents and young adults. We also chose to focus on romantic relationships lasting at least 3 months because understanding the effect of mutual influence between partners' maladaptive schemas requires couples who have had the time to build sufficiently consolidated and recursive relational dynamics. Finally, the post contained the link to an online survey and thanked the participants for their collaboration. Before completing the survey, all respondents reviewed, signed, and submitted an informed consent form. All participants were treated according to the ethical guidelines established by the Italian Psychological Association (AIP, 2015). These guidelines include obtaining informed consent from participants, maintaining ethical treatment and respect for their rights, and ensuring the privacy of participants and their data.

Measures

ACEs

The adverse childhood experiences were measured through five subscales from the Italian version of the Childhood Trauma Questionnaire – Short Form (CTQ-SF; Bernstein et al., 2003; Petrone et al., 2012; Sacchi et al., 2018), which is one of the most used retrospective instruments for detecting adverse experiences in the family of origin during childhood or adolescence, as well as through six *ad hoc* items assessing violence witnessed in the family during the same period. The CTQ-SF subscales measure: physical abuse (five items; e.g., “People in my family beat me so hard they left bruises or marks on me”), emotional abuse (five items; e.g., “People in my family used to offend and insult me”), sexual abuse (five items; e.g., “Someone tried to get me to do sexual things or watch sexual things”), physical neglect

(five items; e.g., “I didn’t have enough to eat”), and emotional neglect (five items; e.g., “People in my family felt very close” – reverse item).

The six *ad hoc* items assessed physical and psychological IPV perpetrated by parents and witnessed by respondents (e.g., “I saw/heard my mother being insulted, denigrated, humiliated, or verbally assaulted by my father”). In line with Eriksson and Mazerolle (2015), who verified that the effects of witnessed violence can change according to the gender of the child and to that of the abusive parent, three items measured violence perpetrated by the father against the mother and three items assessed violence perpetrated by the mother against the father. From here on, we will refer to these two forms of violence respectively as “exposure to IPV acted by the father” and “exposure to IPV acted by the mother.”

Participants were asked to respond to all items by reporting on a 5-point Likert scale how many times the behavior described had occurred during childhood and adolescence (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = very often).

All scales showed good reliability (physical abuse: $\alpha = 0.78$ for males and 0.70 for females; emotional abuse: $\alpha = 0.88$ and 0.92; sexual abuse: $\alpha = 0.88$ and 0.88; physical neglect: $\alpha = 0.79$ and 0.71; emotional neglect: $\alpha = 0.89$ and 0.79; exposure to IPV acted by the father: $\alpha = 0.82$ and 0.87; exposure to IPV acted by the mother: $\alpha = 0.79$ and 0.80).

We excluded sexual abuse from our analyses because it was rarely experienced in our sample (4% of women and 7% of men).

Early Maladaptive Schemas Belonging to the Disconnection and Rejection Domain

Early maladaptive schemas belonging to the Disconnection and rejection domain were measured through the Italian version of the Young Schema Questionnaire Short Form 3 (YSQ-S3; Young, 2005; Baldetti et al., 2015), which asks subjects to use a 6-point Likert scale, ranging from “Completely false for me,” to “It describes me perfectly,” to express their degree of agreement with 13 statements.

The early maladaptive schemas that the theory and the aforementioned questionnaire assessed are: Abandonment, Mistrust/abuse, Emotional deprivation, Defectiveness/shame, and Social Isolation/alienation. However, the analyses of the internal structure of the scale, previously carried out on 263 Italian young adults (Celsi, 2019, unpublished), yielded only two of the five hypothesized factors for this domain: emotional deprivation, including four items (e.g., “I didn’t have anyone to look after me, open up to me, or cared deeply for whatever happened to me”; $\alpha = 0.84$) and abandonment, including three items (e.g., “I find myself clinging to the people I’m close to because I’m afraid they’ll leave me”; $\alpha = 0.84$). Consequently, only items belonging to the abandonment and emotional deprivation dimensions were retained in the present study. The two dimensions, which were moderately correlated ($r = 0.33$ for males and 0.35 for females), showed good internal consistency in the present study (emotional deprivation: $\alpha = 0.84$ for females and 0.81 for males; abandonment: $\alpha = 0.80$ for both females and males).

Perpetrated and Suffered Cyber Dating Abuse

Perpetrated and suffered CDA within the current romantic relationship was measured using 40 items (20 for perpetration and 20 for victimization, e.g., “I pressured my partner to have sex or engage in sexual activity with me via webcam” and “My partner pressured me to have sex or engage in sexual activity with him/her via webcam”). 22 were created for this study, 12 were derived from the Reed et al. (2017) scale, and six were taken from the Cyber Dating Abuse Questionnaire (Borrajó et al., 2015a). Both the Reed and Borrajó instruments, two of the most used CDA measures, have shown poor psychometric properties when applied to Italian samples (Celsi, 2019, unpublished), therefore necessitating use of a new CDA questionnaire. The new set of items collected information about various types of CDA: aggression, threats, control, privacy intrusion, identity theft, and pressure for sexual behaviors or for sharing sexual images. Participants were asked to report on a 7-point Likert scale how many times the behavior described by each item had occurred in the relationship with the romantic partner (0 = never, 1 = one time, 2 = two times, 3 = between three and five times, 4 = between six and ten times, 5 = between eleven and twenty times, 6 = more than twenty times).

Both the new set of items and the rating scale were refined on the basis of a pilot study that tested the discriminative power of each item on a sample of 216 young adults. Exploratory and confirmatory factor analyses, which were conducted on an additional 263 young adults using a polychoric matrix due to the non-normal item distribution, revealed two correlated factors: one including 11 items assessing cyber monitoring and control (e.g., “I/my partner looked at private information to check up on my partner/me without permission,” “I/my partner checked my/my partner’s location and online activities”) and one including nine items measuring psychological or sexual pressure and aggression (e.g., “I/my partner sent a threatening message to my partner/me,” “I/my partner pressured my partner/me to have sex or engage in sexual activity with him/her/me via webcam.”). The two-factor solution was confirmed in the present study (CDA perpetrated by males: $S-B\chi^2(169) = 202.762$, $p = 0.039$, $R-CFI = 0.992$, $R-RMSEA = 0.039$; CDA perpetrated by females: $S-B\chi^2(169) = 270.662$, $p = 0.000$, $R-CFI = 0.989$, $R-RMSEA = 0.067$; CDA suffered by males: $S-B\chi^2(169) = 218.337$, $p = 0.006$, $R-CFI = 0.995$, $R-RMSEA = 0.047$; CDA suffered by females: $S-B\chi^2(169) = 44.391$, $p = 1.000$, $R-CFI = 1.000$, $R-RMSEA = 0.000$). Factor loading were all greater than 0.50 and 14 out of 20 items were invariant across males and females¹ (perpetrated CDA: $S-B\chi^2(748) = 853.027$, $p = 0.005$, $R-CFI = 0.994$, $RMSEA = 0.033$; suffered CDA: $S-B\chi^2(750) = 446.320$, $p = 1.000$,

$R-CFI = 1.000$, $R-RMSEA = 0.000$). The internal consistency was very good for all dimensions (perpetrated control-monitoring: $\alpha = 0.91$ and 0.94 for males and females, respectively; perpetrated pressure-aggression: $\alpha = 0.95$ and 0.95 ; suffered control-monitoring: $\alpha = 0.95$ and 0.92 ; suffered pressure-aggression: $\alpha = 0.95$ and 0.95).

Data Analysis

Preliminary analyses were conducted, including multiple regression analyses in which all investigated ACEs were regressed on other study variables. Only ACEs that were uniquely and significantly related with the self-reported mediators or self-reported/other-reported outcomes for either males or females were included in the mediational models.

Eight APIMeMs were then tested: in four of them emotional deprivation was assumed to mediate the relationships between ACEs and pressure-aggression or control-monitoring, either perpetrated or suffered by males and females, whereas in the other four models abandonment was posited to mediate the same links. All exogenous variables in a model (i.e., ACEs) were allowed to correlate. To estimate these models, we used structural equation modeling with measured variables (EQS6.4; Bentler, 2008). Inspection of Mardia’s (1970) coefficients suggested significant deviations from multivariate normality; to reduce the impact of non-normality we relied on Satorra and Bentler (2001) scaled estimates in rescaling the standard errors and the chi-square statistics into the Satorra–Bentler scaled chi-square ($S-B\chi^2$) statistic. Fit indexes, like the comparative fit index (CFI) and the root-mean-square error of approximation (RMSEA), were also adjusted for non-normality by incorporating the $S-B\chi^2$ into their calculations. We refer to them as robust estimates (i.e., $R-CFI$, $R-RMSEA$).

Before estimating APIMs, the study variables were standardized with means and standard deviations computed across males and females so as to have coefficients comparable across dyad members (Kenny et al., 2006). To evaluate whether individual and partner effects differed across dyad members, we constrained the four individual and the two partner parameters to be equal and then assessed the degree to which each constrain worsened the fit of the model via a χ^2 difference test ($S-B\Delta\chi^2$). In case of a non-significant $\Delta\chi^2$, the path was held equal across dyad members for model parsimony.

A bootstrapping procedure was used to estimate and test the indirect effects due to their non-normal distributions (Preacher and Hayes, 2008). The multivariate Lagrange Multiplier (LM) test (Bentler, 2008) was used to determine whether our full mediation models provided a better fit to the data than alternative partial mediation models, in which direct paths from ACEs to CDA dimensions were added.

Finally, to provide further support for our hypothesized APIMeMs, alternative models in which outcomes and mediators were reversed were also tested. In fact, considering the cross-sectional nature of our data and the fact that young adulthood is not so far from the childhood and adolescence period during which early maladaptive schemas are supposed to arise, it cannot be ruled out *a priori* that CDA may mediate the links between ACEs and maladaptive schemas. The hypothesized

¹Three items were not invariant across gender for pressure-aggression (“My partner said things to my friends through SMS/emails/social networks to turn them against me,” “My partner pressured me to send him/her photos of me naked or in sexually explicit poses,” “My partner pressured me to do sexting”) and three were not invariant for control-monitoring (“My partner made me delete from my friends list the accounts of people he/she considered inappropriate,” “My partner wanted to know and monitored who my friends are on social networks,” “My partner pressured me to respond quickly to his/her calls, SMS or other messages”). Specifically, the last two control-monitoring items were not invariant when assessing suffered CDA, whereas the other four items were not invariant when assessing perpetrated CDA.

models were compared to the alternatives using the robust Akaike Information Criterion (R-AIC; Akaike, 1973; Burnham and Anderson, 2002). When comparing non-nested models estimated from the same data, the model with the smaller AIC value is considered best.

RESULTS

Preliminary Analyses

Descriptive statistics for CDA dimensions (see Table 1) indicated that mean levels of perpetrated and suffered pressure-aggression and control-monitoring were quite low, although there was high variability. Repeated measures ANOVA and *post hoc* tests using the Bonferroni correction revealed that control-monitoring was significantly more common than pressure-aggression [$F(1, 133) = 10.095, p = 0.002; \eta^2 = 0.07$] and that this difference was stronger for perpetrated than for suffered CDA [$F(1, 133) = 9.130, p = 0.003; \eta^2 = 0.06$]. In addition, bivariate correlations among CDA dimensions (see Table 1) indicated that control-monitoring was more strongly correlated across partners ($r = 0.52$ and 0.69 , for perpetrated and suffered CDA, respectively) than pressure-aggression ($r = 0.33$ and 0.29), suggesting a higher actual reciprocity in control-monitoring than in pressure-aggression. Similarly, perpetrated and suffered control-monitoring were more strongly correlated within partners ($r = 0.69$ and 0.66 , for males and females, respectively) than perpetrated and suffered pressure-aggression ($r = 0.42$ and 0.44), indicating a higher perceived reciprocity in control-monitoring than in pressure-aggression. Also, correlational analyses revealed high inter-partner agreement on the occurrence of CDA ($r_s \geq 0.73$), with the exception of pressure-aggression by males ($r = 0.30$).

When estimating within-dyad reciprocity and agreement through intraclass correlations (r_I) (Kenny et al., 2006), we obtained similar patterns of results: reciprocity was higher for control-monitoring ($r_I = 0.51, p = 0.000$, and $r_I = 0.67, p = 0.000$, for perpetrated and suffered CDA respectively) than for pressure-aggression ($r_I = 0.11, p = 0.190$, and $r_I = 0.24, p = 0.004$) and inter-partner on the occurrence of CDA was high ($r_s \geq 0.71, p = 0.000$), with the exception of pressure-aggression by males ($r_I = 0.27, p = 0.001$).

Multivariate regression analyses showed that all ACEs investigated were uniquely related with self-reported

maladaptive schemas (abandonment and emotional deprivation) or with self-reported or partner-reported CDA, with the exception of males and females' physical abuse which was therefore excluded from subsequent analyses (see Table 2). Also, regression analyses results were in line with the assumption that ACES could predict CDA not only within but also across partners. In fact, some ACEs reported by one partner – namely, emotional abuse, exposure to IPV by the opposite-sex parent, and (for males only) physical neglect – were significantly related to CDA reported by the other partner.

APIM Models

ACEs → Emotional Deprivation → Perpetrated Pressure-Aggression

When individual and partner effects were constrained to be equal, the APIMeM positing emotional deprivation as mediator of the link between ACEs and perpetrated pressure-aggression yielded quite a good fit [$S-B\chi^2(37) = 68.8425, p = 0.001$; R-CFI = 0.954; R-RMSEA = 0.080; R-AIC = -5.157]. However, the χ^2 difference test indicated that the model fit could be significantly improved by allowing the paths from emotional deprivation to individual perpetrated pressure-aggression to be freely estimated across gender [$S-B \Delta\chi^2(1) = 9.739, p = 0.002$]. Also, the LM test indicated that the model fit could be significantly improved by adding a direct path from females' exposure to IPV acted by the father to individual perpetrated pressure-aggression [$S-B \Delta\chi^2(1) = 7.292, p = 0.007$]. The final model had an excellent fit [$S-B\chi^2(35) = 33.388, p = 0.497$; R-CFI = 1.000; R-RMSEA = 0.000] and explained a greater amount of variance in females' ($R^2 = 0.34$) than in males' ($R^2 = 0.17$) perpetrated pressure-aggression (see Figure 2). According to the model, emotional deprivation predicted pressure-aggression perpetrated by the respondent, but not pressure-aggression perpetrated by the partner; this individual effect was significantly stronger for females than for males. Also, for both males and females, emotional deprivation significantly mediated the association of emotional abuse and physical neglect with individual pressure-aggression, whereas emotional deprivation mediated the association between emotional neglect and individual pressure-aggression for males only (see Table 3). Finally, females' exposure to IPV acted by

TABLE 1 | Descriptive and bivariate correlations among CDA dimensions.

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | M | SD | Range |
|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|------|------|----------|
| 1. M perpetrated pressure-aggression | – | | | | | | | 0.10 | 0.19 | 0 – 1 |
| 2. F perpetrated pressure-aggression | 0.33*** | – | | | | | | 0.35 | 0.58 | 0 – 2.45 |
| 3. M perpetrated monitoring-control | 0.39*** | 0.31*** | – | | | | | 1.66 | 1.34 | 0 – 5.22 |
| 4. F perpetrated monitoring-control | 0.27** | 0.61*** | 0.52*** | – | | | | 1.36 | 1.48 | 0 – 5.78 |
| 5. M suffered pressure-aggression | 0.42*** | 0.73*** | 0.43*** | 0.63*** | – | | | 0.27 | 0.48 | 0 – 2 |
| 6. F suffered pressure-aggression | 0.30*** | 0.44*** | 0.26** | 0.30*** | 0.29*** | – | | 0.17 | 0.28 | 0 – 1.55 |
| 7. M suffered monitoring-control | 0.39*** | 0.49*** | 0.69*** | 0.81*** | 0.65*** | 0.23** | – | 1.17 | 1.43 | 0 – 5.11 |
| 8. F suffered monitoring-control | 0.29*** | 0.46*** | 0.77*** | 0.66*** | 0.45*** | 0.40*** | 0.69*** | 1.53 | 1.39 | 0 – 5.11 |

M = males; F = females; CDA = Cyber Dating Abuse. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 2 | Multivariate regression analyses predicting self-reported maladaptive schemas and self- and partner-reported CDA.

| Outcome Predictors | M abandonment | M emotional deprivation | M perpetrated pressure-aggression | F perpetrated pressure-aggression | M perpetrated pressure-aggression | F suffered pressure-aggression | M perpetrated monitoring-control | F perpetrated monitoring-control | M suffered monitoring-control | F suffered monitoring-control |
|-----------------------------|---------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|
| M Physical abuse | -0.05 | 13 | 0.17 | 0.05 | -0.03 | -0.09 | 0.00 | -0.07 | -0.07 | 0.17 |
| M Emotional abuse | 0.27 | 23* | -0.05 | 0.28 | 0.23 | 0.31* | 0.30* | 0.41** | 0.50** | 0.17 |
| M Physical neglect | 23 | 0.43** | 0.30* | 0.19 | 0.22 | 0.19 | 0.27* | 0.02 | 0.18 | 0.35** |
| M Emotional neglect | -22 | 0.15 | 0.00 | -0.14 | -0.11 | 0.04 | -0.41** | 0.03 | -0.28 | -0.15 |
| M Exposure to IPV by father | 0.24* | -0.01 | -0.04 | 0.20 | 0.04 | 0.15 | -0.02 | 0.13 | 0.05 | 0.12 |
| M Exposure to IPV by mother | -0.14 | 0.07 | 0.12 | -0.20 | 0.04 | -0.37** | 0.32** | -0.06 | 0.11 | -0.10 |

| Outcome Predictors | F abandonment | F emotional deprivation | M perpetrated pressure-aggression | F perpetrated pressure-aggression | M perpetrated pressure-aggression | F suffered pressure-aggression | M perpetrated monitoring-control | F perpetrated monitoring-control | M suffered monitoring-control | F suffered monitoring-control |
|-----------------------------|---------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|
| F Physical abuse | 0.11 | 0.01 | -0.20 | 0.13 | 0.16 | 0.02 | -0.07 | 0.21 | 0.03 | -0.05 |
| F Emotional abuse | 0.54** | 0.51*** | 0.08 | 0.20 | 0.23 | -0.42* | 0.36* | 0.27* | 0.38** | 0.42** |
| F Physical neglect | 0.23 | 0.20* | 0.22 | 0.15 | 0.01 | 0.10 | 0.21 | 0.05 | 0.14 | 0.31** |
| F Emotional neglect | -0.40* | 0.18 | 0.16 | -0.04 | -0.01 | 0.20 | -0.13 | -0.12 | -0.17 | -0.23 |
| F Exposure to IPV by father | -0.37** | -0.19 | 0.12 | 0.39** | 0.42*** | 0.32* | 0.10 | 0.39*** | 0.32** | 0.11 |
| F Exposure to IPV by mother | 0.21 | 0.06 | -0.11 | -0.19 | -0.09 | 0.04 | 0.05 | -0.01 | -0.05 | 0.07 |

M = males; F = females; CDA = Cyber Dating Abuse; IPV = Intimate Partner Violence. Standardized coefficients are reported. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the father strongly and directly predicted their perpetration of pressure-aggression.

ACEs → Emotional Deprivation → Suffered Pressure-Aggression

When individual and partner effects were constrained to be equal, the APIMeM in which ACEs were assumed to predict suffered pressure-aggression through emotional deprivation did not yield an adequate fit [$S-B \chi^2(37) = 90.441$, $p = 0.000$; $R-CFI = 0.924$; $R-RMSEA = 0.105$; $R-AIC = 16.941$]. The model fit significantly improved when the path from emotional deprivation to individually suffered pressure-aggression was freely estimated across gender [$S-B \Delta \chi^2(1) = 18.588$, $p = 0.000$], and when a direct path from females' exposure to IPV acted by the father to partner suffered pressure-aggression was added to the model [$S-B \Delta \chi^2(1) = 14.522$, $p = 0.000$]. The final model had a good fit [$S-B \chi^2(35) = 49.986$, $p = 0.048$; $R-CFI = 0.979$; $R-RMSEA = 0.057$] and explained a greater amount of variance in males ($R^2 = 0.37$) than in females ($R^2 = 0.07$) suffering pressure-aggression (see Figure 3). According to the model, emotional deprivation was related to pressure-aggression suffered by the partner for both males and females as well as to pressure-aggression suffered by respondents for males only. Also, for both males and females, emotional deprivation significantly mediated the association of emotional abuse and physical neglect with pressure-aggression suffered by the partner (see Table 3). Finally, females' exposure to IPV acted by the father strongly and directly predicted pressure-aggression suffered by their partner.

ACEs → Emotional Deprivation → Perpetrated Control-Monitoring

When individual and partner effects were constrained to be equal, the APIMeM positing that ACEs predict perpetrated control-monitoring through emotional deprivation did not yield an adequate fit [$S-B \chi^2(37) = 95.751$, $p = 0.000$; $R-CFI = 0.917$; $R-RMSEA = 0.109$; $R-AIC = 21.751$]. Equality constraints on individual and partner parameters were correctly imposed, indicating that dyad members did not differ in this regard. However, the LM test suggested that the model fit could be significantly improved by adding a direct path from females' exposure to IPV by the father to individual perpetrated control-monitoring [$S-B \Delta \chi^2(1) = 14.181$, $p = 0.000$] as well a direct path from males' exposure to IPV by the mother to individual perpetrated control-monitoring [$S-B \Delta \chi^2(1) = 10.172$, $p = 0.001$]. The final model had an adequate fit [$S-B \chi^2(35) = 61.838$, $p = 0.003$; $R-CFI = 0.962$; $R-RMSEA = 0.076$] and explained a greater amount of variance in females' ($R^2 = 0.39$) than in males' ($R^2 = 0.19$) perpetrated control-monitoring (see Figure 4). According to the model, emotional deprivation predicted perpetrated control-monitoring both within and across partners. Emotional abuse and physical neglect indirectly predicted control-monitoring perpetrated by both the individual and his/her partner, whereas emotional neglect indirectly predicted control-monitoring perpetrated by the individual only. Exposure to IPV enacted by opposite-sex parents directly predicted control-monitoring perpetrated by the respondent for both males and females.

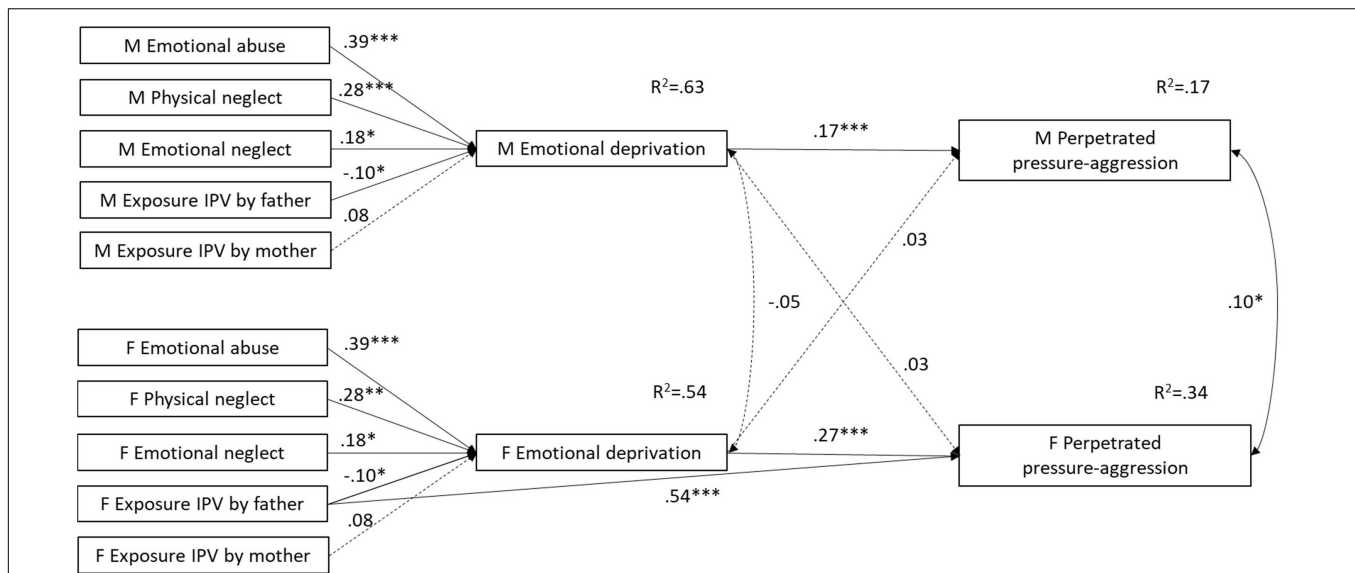


FIGURE 2 | APIMeM with emotional deprivation as mediator and perpetrated pressure-aggression as outcome. M = males; F = females; IPV = Intimate Partner Violence. Standardized coefficients are reported. Correlations among ACEs are omitted from the figure for clarity. Model fit statistics: S-B $\chi^2(35) = 33.388$, $p = 0.497$; R-CFI = 1.000; R-RMSEA = 0.000. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 3 | Indirect effects in the APIMeMs assuming emotional deprivation as mediator.

| Outcomes Predictors | M perpetrated pressure-aggression | F perpetrated pressure-aggression | M suffered pressure-aggression | F suffered pressure-aggression | M perpetrated monitoring-control | F perpetrated monitoring-control | M suffered monitoring-control | F suffered monitoring-control |
|-----------------------------|-----------------------------------|-----------------------------------|--------------------------------|--------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|
| M Emotional abuse | 0.07** | 0.01 | 0.07 | 0.08* | 0.08** | 0.06* | 0.08* | 0.06* |
| M Physical neglect | 0.05** | 0.01 | 0.05 | 0.05* | 0.06** | 0.05* | 0.06* | 0.04* |
| M Emotional neglect | 0.03* | 0.01 | 0.03 | 0.04 | 0.04* | 0.03 | 0.04* | 0.03* |
| M Exposure to IPV by father | -0.02 | 0.00 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.01 |
| M Exposure to IPV by mother | 0.01 | 0.00 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 |
| F Emotional abuse | 0.01 | 0.11* | 0.08* | -0.02 | 0.06* | 0.08** | 0.06* | 0.08* |
| F Physical neglect | 0.01 | 0.08* | 0.05* | -0.01 | 0.05* | 0.06** | 0.04* | 0.06* |
| F Emotional neglect | 0.01 | 0.05 | 0.04 | -0.01 | 0.03 | 0.04* | 0.03* | 0.04* |
| F Exposure to IPV by father | 0.00 | -0.03 | -0.02 | 0.00 | -0.02 | -0.02 | -0.01 | -0.02 |
| F Exposure to IPV by mother | 0.00 | 0.02 | 0.02 | 0.00 | 0.01 | 0.02 | 0.01 | 0.02 |

M = males; F = females; IPV = Intimate Partner Violence. Standardized coefficients are reported. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

ACEs → Emotional Deprivation → Suffered Control-Monitoring

When individual and partner effects were constrained to be equal, the APIMeM in which ACEs predicted suffered control-monitoring through emotional deprivation did not result in an adequate fit [$S-\chi^2(37) = 76.419$, $p = 0.000$; S-B CFI = 0.944; RMSEA = 0.090; R-AIC = 2.419]. Equality constraints on individual and partner parameters were correctly imposed, indicating that dyad members did not differ in this regard. However, the LM test suggested that the model fit could be significantly improved by adding direct paths from females' exposure to IPV by the father to both individual and partner suffered control-monitoring [$S-B \Delta\chi^2(1) = 19.822$, $p = 0.000$ for the individual path; $S-B \Delta\chi^2(1) = 11.666$, $p = 0.001$ for the partner path]. The final model had an adequate fit [$S-B\chi^2(35) = 56.182$, $p = 0.013$; S-B CFI = 0.970; RMSEA = 0.067]

and explained a similar amount of variance in males ($R^2 = 0.36$) and females ($R^2 = 0.29$) suffering control-monitoring (see Figure 5). According to the model, emotional deprivation predicted suffered control-monitoring both within and across partners. The indirect effects of emotional abuse, emotional neglect, and physical neglect on control-monitoring suffered by the respondent and by his/her partner were all significant. Females' exposure to IPV by the father directly predicted control monitoring suffered by both themselves and their partner.

ACEs → Abandonment → Perpetrated Pressure-Aggression

The APIMeM testing abandonment as a mediator of the association between ACEs and perpetrated pressure-aggression yielded a very poor fit [$S-B\chi^2(37) = 118.633$, $p = 0.000$; R-CFI = 0.869; R-RMSEA = 0.129; R-AIC = 44.633], due to

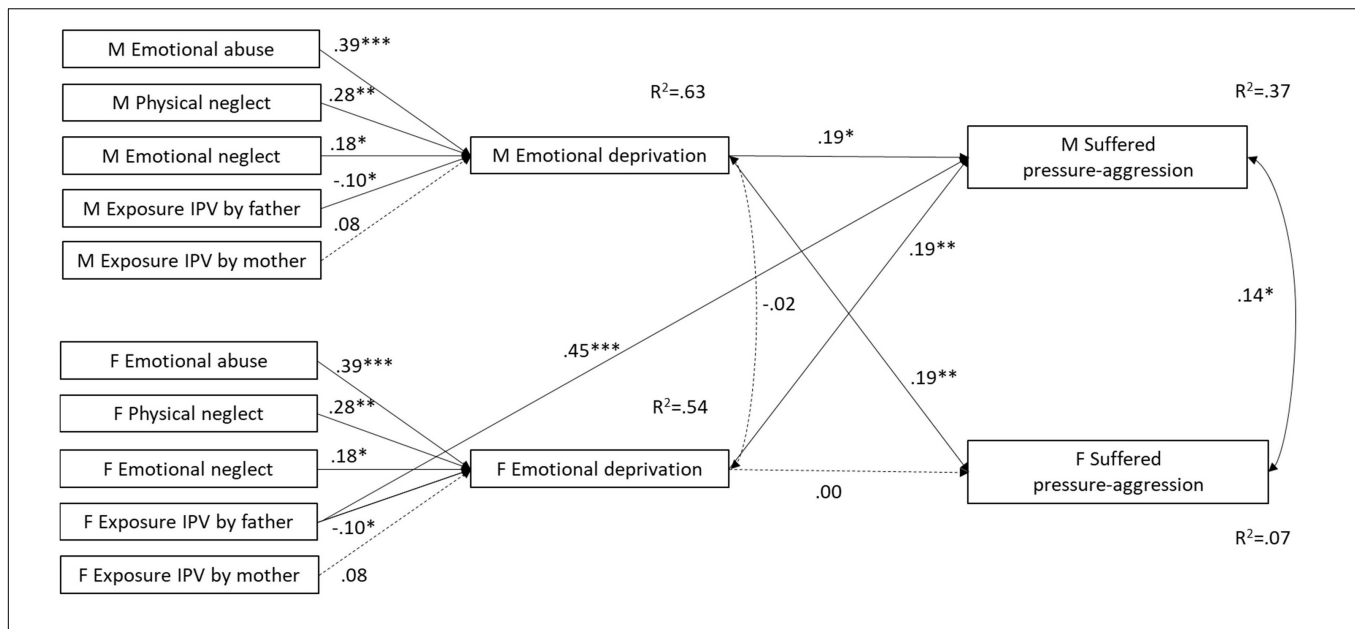


FIGURE 3 | Abime with emotional deprivation as mediator and suffered pressure-aggression as outcome. M = males; F = females; IPV = Intimate Partner Violence. Standardized coefficients are reported. Correlations among ACEs are omitted from the figure for clarity. Model fit statistics: $S-B\chi^2(35) = 49.986$, $p = 0.048$; $R-CFI = 0.979$; $R-RMSEA = 0.057$. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

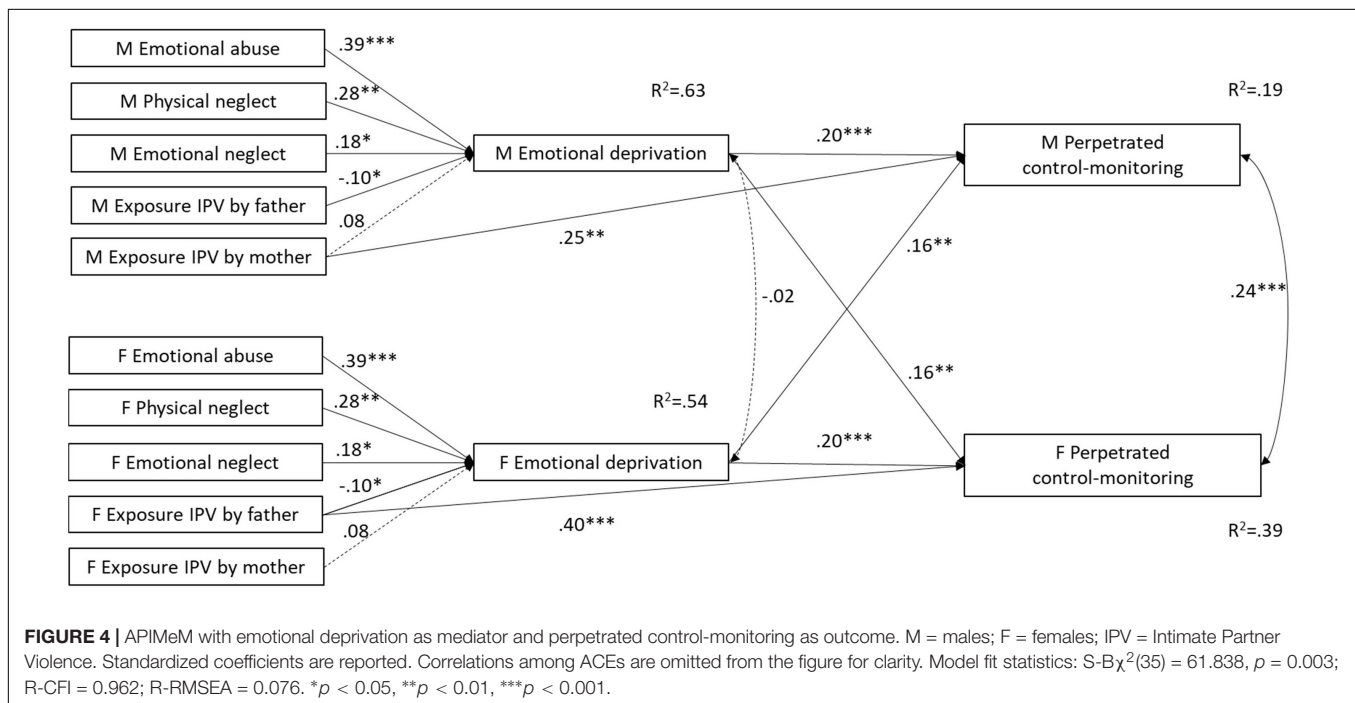


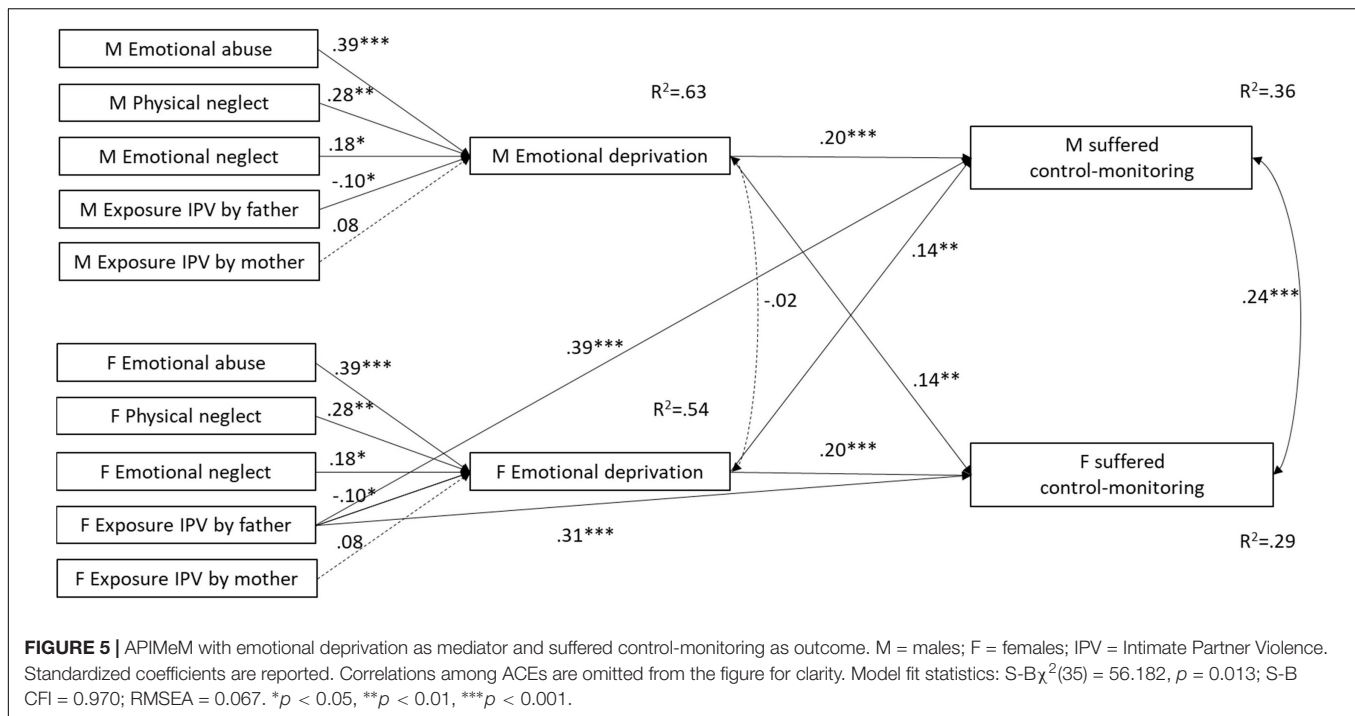
FIGURE 4 | APIMeM with emotional deprivation as mediator and perpetrated control-monitoring as outcome. M = males; F = females; IPV = Intimate Partner Violence. Standardized coefficients are reported. Correlations among ACEs are omitted from the figure for clarity. Model fit statistics: $S-B\chi^2(35) = 61.838$, $p = 0.003$; $R-CFI = 0.962$; $R-RMSEA = 0.076$. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the lack of significant relationships between abandonment and pressure-aggression perpetrated by the respondent or by his/her partner for both males and females.

ACEs → Abandonment → Suffered Pressure-Aggression

The APIMeM in which abandonment mediates the association between ACEs and suffered pressure-aggression also yielded a

very poor fit [$S-B\chi^2(37) = 127.976$, $p = 0.000$; $R-CFI = 0.856$; $R-RMSEA = 0.136$; $R-AIC = 53.976$], because abandonment was unrelated to individual suffered pressure-aggression for females and to partner suffered pressure-aggression for both males and females. The model did not achieve a satisfactory fit even when, consistent with the assumption of a partial mediation model, direct paths from ACEs to individual and partner suffered pressure-aggression were added.



ACEs → Abandonment → Perpetrated Control-Monitoring

The APIMeM positing that ACEs predict perpetrated control-monitoring through abandonment yielded a very poor fit [S-B $\chi^2(37) = 152.567$, $p = 0.000$; R-CFI = 0.820; RMSEA = 0.153; R-AIC = 78.566], probably due to the fact ACEs were related to perpetrated control-monitoring directly rather than indirectly. However, the model fit remained unsatisfactory even when, consistent with a partial mediation model, direct paths from ACEs to individual and partner perpetrated control-monitoring were added.

ACES → Abandonment → Suffered Control-Monitoring

The APIMeM in which ACEs predict suffered control-monitoring through abandonment also resulted in a poor fit [S-B $\chi^2(37) = 132.515$, $p = 0.000$; R-CFI = 0.851; R-RMSEA = 0.139; R-AIC = 58.515]. The fit was not significantly improved by the introduction of direct paths from ACEs to control-monitoring suffered by the respondent or by his/her partner for both males and females.

Alternative Models

Finally, since the cross-sectional nature of our data cannot rule out the possibility of reverse effects between maladaptive schemas and CDA dimensions, alternative APIMeMs in which outcomes and mediators were reversed were also tested. The alternative APIMeMs positing CDA dimensions as mediators of the association between ACEs and emotional deprivation yielded much poorer fits than our hypothesized APIMeMs, due to the fact ACEs were related to emotional deprivation directly

rather than indirectly (CFIs ≤ 0.790 ; R-RMSEA ≥ 0.187 ; Δ R-AICs ≥ 113.893 ; see **Supplementary Materials** for details).

On the contrary, alternative APIMeMs testing CDA dimensions as mediators of the association between ACEs and abandonment yielded equal or better fits than our hypothesized APIMeMs (Δ R-AICs ≤ 0.186). However, the fits for these alternative models, like those for our hypothesized models, were far from acceptable (CFIs ≤ 0.886 ; R-RMSEA ≥ 0.121 ; see **Supplementary Materials**). The poor fits for APIMeMs assuming pressure-aggression as a mediator was due to the lack of significant relationships between pressure-aggression and abandonment, which had been already observed in our hypothesized models. Surprisingly, the poor fits for APIMeMs testing control-monitoring as a mediator seemed mainly due to a lack of direct paths from ACEs to CDA, yet the introduction of these paths did not improve model fits enough to become acceptable.

DISCUSSION

This study investigated CDA among young adults using the romantic couple as the unit of analysis and taking into account the interdependence of its members. Specifically, informed by Schema Therapy and IPV research, the study posited that ACEs predicted perpetrated and suffered CDA both within and across partners through the mediation of emotional deprivation and abandonment schemas.

CDA Frequency and Reciprocity

Our preliminary analyses showed that, even though not particularly frequent, CDA occurs in most young adult romantic

couples, at least in the form of persistent control and monitoring behaviors. Indeed, both partners agree that control-monitoring was a more frequent form of CDA than pressure aggression, although this prevalence was more strongly perceived by abuse perpetrators than by their victims. Also, cyber dating control-monitoring was characterized by more reciprocity than cyber dating pressure-aggression both within and across partners. These data are consistent with prior CDA findings and can be explained by the fact that adolescents and young adults judge controlling behaviors as less serious and abusive than aggressive or sexting behaviors (e.g., Zweig et al., 2013, 2014; Borrajo et al., 2015a,b,c; Reed et al., 2017), which could lead them to enacting and reporting these behaviors more easily. Also, according to some sociologists (Acquisti and Gross, 2006; Hallam and Zanella, 2017; Koohikamali et al., 2017), today's society, full of stimuli and invitations to exhibit the self, creates a sort of short circuit between the need or pleasure of having an attractive partner and the fear of being betrayed by him or her. To cope with this fear, adolescents and young adults tend therefore to control their partner more assiduously. Finally, an explanation for the higher levels of acted, than suffered, control-monitoring could be found in the fact that control is a form of violence that the victim may not be aware of.

Within and Across Partners Associations of ACEs With Cyber Dating Pressure-Aggression Through Emotional Deprivation

Our APIMeM analyses showed that having experienced family emotional abuse and physical neglect during childhood and adolescence indirectly increased in both males and females the likelihood of perpetrating cyber dating pressure and aggression by increasing the internalization of the emotional deprivation schema. These findings were supported by both self-reported and partner-reported data and are in line with research showing that similar experiences lead people to be more aggressive in romantic relationships (Garrido and Taussig, 2013; Karakurt et al., 2013; Iverson et al., 2014; Eriksson and Mazerolle, 2015; Atmaca and Gencoz, 2016; Machisa et al., 2016; Smith-Darden et al., 2016; Madruga et al., 2017; Ramos et al., 2017; Kimber et al., 2018). Furthermore, an indirect effect on perpetrated cyber dating pressure and aggression was found for physical neglect experienced by males. No direct or indirect effects were found for physical abuse and witnessed intimate partner violence enacted by the same-sex parent of the respondent. It is possible that physical abuse shows greater impacts on traditional physical violence rather than on digital aggression and that seeing the same sex-parent perpetrating intimate partner violence does not lead the person to identify himself/herself with an emotionally deprived and dissatisfied figure, thereby not causing the internalization of this schema.

The APIMeM analyses also showed that, independently of their childhood experiences, the more couple members had internalized the belief that people will never be able to fully satisfy their needs for care, affection, and relational stability, the more they perpetrated online psychological or sexual

pressure and aggression against their partner and the more their partner acknowledged having suffered these forms of abuse. Significant gender differences emerged: the internalization of the emotional deprivation schema was more strongly related to perpetrated pressure-aggression for females and to suffered pressure-aggression for males. Despite these differences in strength, self-reported and partner-reported data were consistent in indicating that young adults were more likely to enact cyber dating pressure and aggression if they felt emotionally deprived by others. The findings can be explained using the theory of early maladaptive patterns (Young et al., 2007), according to which the coping style based on overcompensation, which for subjects with emotional deprivation is associated with the tendency to be excessively demanding on the partner to satisfy their emotional needs, explain the propensity to commit aggressive acts (Young and Flanagan, 1998). The findings are also consistent with the idea that emotional deprivation makes people more sensitive to identifying behaviors that confirm their belief that they are not satisfied with the relationship. However, the fact that this greater sensitivity was found mostly in males could be ascribed to the fact that psychological or sexual pressure and aggression are more socially accepted when performed by men. Therefore, being male and feeling a victim of this form of violence could be experienced as even more serious and harmful (West and Fenstermaker, 1995; Anderson, 1997).

Finally, a strong and direct association was found between females' exposure to violence by the father against the mother and females' tendency to pressure and be aggressive online toward their male partner, an association which was confirmed when considering pressure-aggression reported by the male partner. Thus, it seems that having suffered this adverse early experience led females to replicate online the abusing behaviors they observed offline in their father, perhaps as a way to protect themselves from the possibility of reliving what their mother suffered.

Within and Across Partners Associations of ACEs With Cyber Dating Control-Monitoring Through Emotional Deprivation

APIMeM results showed that the likelihood of perpetrating and suffering cyber dating control and monitoring was indirectly predicted in both males and females having experienced family emotional abuse, physical neglect, and emotional neglect during childhood and adolescence, through the internalization of the emotional deprivation schema. The only case in which emotional neglect was not predictive of control-monitoring was when partner effects for perpetrated control-monitoring were considered. Similar to what emerged for pressure-aggression, no direct or indirect effects were found for physical abuse and witnessed violence by the same-sex parent of the respondent. All these findings were supported by both self-reported and partner-reported data and are consistent with the Schema Therapy and IPV literature previously reviewed.

Our APIMeM also showed that, independently of their adverse child experiences, the more couple members had internalized

the emotional deprivation schema, the more they perpetrated and suffered cyber dating control and monitoring. Moreover, the more one partner perpetrated control against the other, the more the latter acknowledged having suffered this form of violence and reacted to this behavior in kind. No gender differences emerged, probably both because control behaviors are perceived as more acceptable for females and because, compared to aggressive behaviors, control behaviors are characterized by greater interdependence between partners (Zweig et al., 2013). Therefore, people believing that they cannot be fully satisfied in their emotional and relational need by anyone are not only prone to verifying the trust granted to the other, but also probably enact behaviors that induce the partner to perform the same type of controlling behaviors. People affected by Borderline Personality Disorder, for example, tend to manifest behaviors that make the partner jealous and lead the partner to control them, and this personality disorder is etiologically attributable to experiences such as those underlying the internalization of the emotional deprivation scheme (DSM-V; Selvini, 2017).

Finally, a strong and direct association was found between males and females' exposure to intimate partner violence perpetrated by the opposite-sex parent and their tendency to control and monitor the partner online. These results parallel the previous ones related to pressure-aggression and could be interpreted as a strategy not to assume in the current romantic relationship the victim role the same-sex parent had in their family of origin.

Within and Across Partners Associations of ACEs With Cyber Dating Pressure-Aggression and Control-Monitoring Through Abandonment

The abandonment schema was unrelated to cyber dating pressure-aggression, nor did it mediate the relationship between any of the adverse childhood experiences investigated and CDA. This finding was quite unexpected, since people who believe they are always dealing with unpredictable and lying partners, ready to invest in other relationships, could be assumed to control them (Young et al., 2007). However, the theory of maladaptive schemas offers a possible interpretation of this result: the adoption of a coping style based on surrender could induce individuals who have internalized this schema not to invest in deep relationships in order to counter the onset of a morbid attachment toward the partner (Young et al., 2007). Also, it is possible that the absence of significant results relating to this scheme was partly due to the small sample size.

Limitations and Conclusions

Several limitations of the study should be considered when interpreting these results.

First, because it used a cross-sectional design, inferences regarding direction of effects cannot be drawn with confidence. Even though alternative models tested provided additional evidence supporting the proposed role of emotional deprivation as mediator between ACEs and CDA, even this evidence is too

inconclusive to uncover causal relations because of its cross-sectional nature.

Second, the size of the sample and the choice to recruit non-cohabiting couples through posts on Facebook pages dedicated to university groups, which led mostly self-selected highly educated students to participate in the study, threaten the generalizability of our results to other types of subjects and couples. Since multi-problem families with high levels of ACEs and violence often have low levels of education (Asen et al., 2001; Asen and Scholz, 2010), we cannot rule out the possibility that our results might differ in less educated samples. However, given the fact that most international research on cyber dating abuse is based on samples consisting solely or predominantly of psychology students, this study has the merit of investigating students enrolled in a wide range of faculties, both humanistic and scientific. In addition, workers and unemployed people, even if numerically lower than students (8.7% of females and 29.7% of males), were not entirely absent from the sample.

Third, only two of the five schemas belonging to the disconnection and rejection domain (that is emotional deprivation and abandonment schemas) were analyzed, because the Italian validation of the Young Schema Questionnaire Short Form (Celsi, 2019, unpublished) yielded only these two factors.

Lastly, this study did not investigate whether partnership variables, such as the levels of satisfaction, investment, commitment, trust, and quality of alternatives, would influence or possibly buffer the relationships found.

Future studies could try to overcome some of these limits by investigating CDA predictors through longitudinal designs, expanding the sample to adolescent couples and to adult romantic couples (both cohabiting and non-cohabiting and highly and poorly educated), using the Young Schema Questionnaire Long Form, which has been validated for use in Italian samples (Saggino et al., 2014), and taking into account the possible predictive or moderating role of partnership variables.

Notwithstanding the limitations noted above, this study made significant contributions to the emerging literature on CDA. First, it has the merit of documenting whether some predictors of IPV, specifically ACEs and early maladaptive schemas, also predict CDA. In this regard, the study provides initial evidence that emotional abuse, physical neglect, emotional neglect, and the schema of emotional deprivation play a similar predictive role in relation to CDA. This supports the idea of close similarities between the two forms of couple violence. At the same time, the lack of a significant link between CDA and physical abuse, which has been found to be a distal predictor of IPV (McKinney et al., 2009; Iverson et al., 2014; Widom et al., 2014; Machisa et al., 2016; Voith et al., 2017), suggests that CDA may also function differently from IPV in some ways. A similar conclusion is suggested by the lack of a significant association between CDA and the schema of abandonment when controlling for adverse early childhood experiences. Despite the paucity of research on this specific schema, several studies have provided evidence to show that schemas belonging to the Disconnection and rejection domain predict IPV (e.g., Gay et al., 2013; Falahatdoost et al., 2014; Taşkale and Soygüt, 2017). Therefore, it seems necessary to investigate further the unique role that the abandonment

schema has in predicting IPV and CDA. Additional study of the relationship between CDA and witnessed intimate partner violence perpetrated by the opposite-sex parent also deserves attention. In the present study, witnessing violence by the opposite-sex parent was particularly predictive of perpetrated CDA for females.

Second, the study has the merit of investigating CDA from a dyadic perspective, evaluating the effects of both partners' early adverse experiences and maladaptive schemas, and doing so when partners were considered in their dual roles as perpetrators and victims. This perspective yielded new, interesting results, such as those showing that each partner's individual early experiences and schemas are likely to predict not only their own tendency to overcontrol their romantic partner but also their partner's tendency to overcontrol them. The use of both self-report and partner report was also important, as it revealed a convergence of results between the perspective of the victim and that of the offender.

Finally, gaining a better understanding of the predictive role that specific ACEs and early maladaptive schemas exert on the likelihood of perpetrating and suffering cyber dating abuse appears useful for both preventive and clinical programs. More specifically, regarding prevention, recent years have seen the spread of bystander programs aimed at combating dating violence (Storer et al., 2016). These programs aim to help young people to develop the skills to recognize violent acts and intervene when they witness behavior that can lead to violence. Designed to prevent sexual violence, these programs were then extended to other forms of violence (e.g., psychological violence and control) and proved to be effective because they counteract the tacit reinforcement that violence receives from the fact that peers ignore, and therefore substantially endorse, violent behavior (Katz et al., 2011). For example, being aware that a friend checks his/her romantic partner's geolocation without the partner's knowledge, and not expressing dissent toward this behavior, creates implicit reinforcement. On the contrary, expressing disappointment and trying to make the friend reflect on the negative aspects of the act can increase awareness and generate doubts about the acceptability of the behavior. However, these types of intervention, undoubtedly important on a social level, may be insufficient to trigger a profound change in those most prone to commit violence. Therefore, we believe that second-level interventions, addressed precisely to the subjects most at risk, can be best constructed only by having a more specific and in-depth knowledge of the background and personality characteristics of these same subjects. Similarly, from a clinical point of view, knowing

which adverse experiences and which early maladaptive schemas are most connected to violence could facilitate the patient's cognitive restructuring work. According to the Schema Therapy framework (Young et al., 2007), this work involves cognitive strategies aimed at helping the patient to identify situations that disconfirm the internalized maladaptive schemas, as well as experiential techniques based on imagination or role-playing exercises which lead patients to focus on and counter the anger and sadness connected to childhood adverse experiences. These cognitive and experiential strategies could be better designed and implemented in clinical interventions for CDA couples, if the specific early adverse experiences and maladaptive schemas which foster CDA are known. Moreover, deepening knowledge of similarities and differences between IPV and CDA predictors could be particularly useful for understanding whether prevention activities carried out to reduce offline couple violence are also suitable to counter online couple violence or whether specific programs are needed for IPV and CDA.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, upon justified request.

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 participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LC and FGP designed the study, LC collected the data, and LC and FGP analyzed them. All co-authors participated in the discussion of the results, drafted the manuscript and approved it for publication.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.623646/full#supplementary-material>

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The Role of Relational Entitlement, Self-Disclosure and Perceived Partner Responsiveness in Predicting Couple Satisfaction: A Daily-Diary Study

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Recent research has investigated how the sense of relational entitlement (SRE, the extent to which a person expects that his/her needs and wishes will be fulfilled by the romantic partner) diminishes couple satisfaction, but little is known about how SRE affects the daily quality of close, romantic relationships. Moreover, the evidence on how SRE interacts with other features of a satisfying relationship (such as the variables of the interpersonal process model of relationships—self-disclosure, perceived partner disclosure, and perceived partner responsiveness) is scarce. Using an electronic daily diary, we examined 99 couples (198 participants) for 7 days, with two daily measurements for each partner. We used a dyadic double intercept multilevel model, which simultaneously computes effects for men and women. We tested a model where one partner's daily couple satisfaction was predicted by their overall levels of SRE (excessive, restricted, and assertive) and by their daily and overall levels of self-disclosure, perceived partner self-disclosure, and perceived partner responsiveness. The model also included person-level interactions and cross-level interactions between the SRE types and variables of the interpersonal process model of relationships for each gender. The analysis indicated that person-level excessive SRE lowers couple satisfaction. Also, day and person-level perceived partner responsiveness and person-level self-disclosure are related to couple satisfaction, but the latter association is significant only for men. Finally, we found some significant person-level interactions that account for changes in couple satisfaction. For men, the links between couple satisfaction, excessive and restricted SRE were moderated by self-disclosure and perceived partner responsiveness, respectively, perceived partner self-disclosure and perceived partner responsiveness. For women, the associations between couple satisfaction, restricted and assertive SRE were moderated by self-disclosure, respectively, perceived partner self-disclosure. This study advances our understanding of the general implications of SRE in the dynamics of couple relationships. More specifically, it shows how SRE interacts with other couple-specific variables in shaping day-to-day couple satisfaction. The theoretical and clinical implications for couple therapy are discussed.

Keywords: entitlement, couple satisfaction, self-disclosure, perceived partner responsiveness, daily diary

INTRODUCTION

Inside their romantic relationships, people express and fulfill some of the most intimate needs. Hence, intimate relationships become a crucial context where entitlement-related behaviors take shape (George-Levi et al., 2014). Although generally considered a negative personality trait (Campbell et al., 2004; Grubbs and Exline, 2016) or a facet of narcissism (Miller et al., 2012), some scholars indicate that entitlement also has some adaptive characteristics (Levin, 1970; Moses and Moses-Hrushovski, 1990). Entitlement refers to an outcome that individuals believe they deserve to receive from their relationships (Attridge and Berscheid, 1994). This outcome is important because it allows the distribution of resources within romantic relationships (Lerner and Mikula, 1994). Moreover, other scholars refer to the entitlement as a crystallization of early attachment bonds (Tolmacz, 2011). Thus, just as attachment can be secure or insecure, entitlement may be adaptive or maladaptive.

Previous research showed that the maladaptive forms of entitlement are detrimental to couple satisfaction (Tolmacz and Mikulincer, 2011; George-Levi et al., 2014), but the more adaptive forms were not related to couple satisfaction (George-Levi et al., 2014). However, no study, to our knowledge, explored whether these relationships are influenced by other variables. For example, previous studies have shown that the expression of needs and the partner's responsiveness to those needs shape couple satisfaction (Bar-Kalifa et al., 2015; Unger et al., 2015). For this reason, the main goal of this study was to explore the moderating role of self-disclosure, perceived partner disclosure, and perceived partner responsiveness (PPR) in the relationship between sense of relational entitlement (SRE) and couple satisfaction. To do so, we used a dyadic daily-diary design that allowed us to examine whether and how the daily fluctuations in self-disclosure, perceived partner disclosure, and PPR, and the person level of these variables moderated the association between SRE and couple satisfaction.

THE SENSE OF RELATIONAL ENTITLEMENT

The first conceptualization of entitlement most likely belongs to Freud (George-Levi et al., 2014). If Freud (1916) talked about the patients who claimed more compensation for their congenital deficiencies, Jacobson (1959) suggested that some people may think they deserve more because of the exceptional qualities they believe they have. Later, the concept has been included among the five factors of narcissism, indicating the tendency to expect favored treatment from others (Exline et al., 2004). It is well-documented that narcissism has a negative impact on couple relationships by increasing vengefulness (Brown, 2004), interpersonal aggression (Reidy et al., 2010), and vindictive behavior (Ogrodniczuk et al., 2009). Also, some studies indicate that narcissism may predict higher marital satisfaction and commitment, but only in cases of narcissistic individuals with high self-esteem (Sedikides et al., 2004) and with

communal feelings for the partner (Finkel et al., 2009). However, narcissism and entitlement are distinct constructs (Brown et al., 2009). First, more recent research showed a clear distinction between two forms of excessive entitlement, grandiose and vulnerable, both of them being unrelated to narcissism (Crowe et al., 2016). Second, entitlement and narcissism show different relationships with other psychological constructs. For example, while grandiose narcissism is negatively associated with short-term psychological distress, anxiety and depression, entitlement shows no relationships with them (Brown et al., 2009). Third, narcissism is a purely intrapersonal construct, while entitlement is a more interpersonal one (Williams et al., 2018). Finally, narcissism can be conceptualized as a *personality trait* and a *personality disorder* (Lamkin et al., 2017), while entitlement is a trait-like characteristic that can take both adaptive (assertive) and pathological (restricted or inflated) forms.

Although the concept of entitlement was initially described as a negative individual characteristic, researchers understood that people can have a healthy assertion of their need and wishes (Levin, 1970; Kriegman, 1983; Moses and Moses-Hrushovski, 1990). The concept of *sense of entitlement* assumed and promoted this positive dimension. Thus, this concept integrated three basic entitlement-related attitudes: excessive, restricted, and assertive entitlement (Levin, 1970; Kriegman, 1983; Moses and Moses-Hrushovski, 1990). The authors suggest that an *excessive sense of entitlement* characterizes people who believe that their need must be fulfilled regardless of the needs or emotional states of those around. A *restricted sense of entitlement* is present in people characterized by unassertiveness, timidity, which are less independent and less self-assured. Finally, people who are characterized by *assertive sense of entitlement* can realistically estimate what they can expect from others, are assertive and confident that they can achieve their needs and rights. It is an adaptive form of entitlement, essential for the well-being of individuals (George-Levi et al., 2014). As we can see, unlike narcissistic entitlement, the sense of entitlement has both negative and positive dimensions and implications. Moreover, several clinical reports that underlined the important role of the sense of entitlement is couple relationships (e.g., Blechner, 1987; Billow, 1999).

In this context, Tolmacz and Mikulincer (2011) proposed another development of the concept, the *sense of relational entitlement* (SRE), in order to explain individual differences in expression of need and rights inside dyadic relationships. The authors defined the concept as the extent to which a person expects that his/her needs and wishes will be fulfilled by the romantic partner, and as a person's affective and cognitive responses to a romantic partner's failure to fulfill these needs and hopes (Tolmacz and Mikulincer, 2011). In recent years, the concept of SRE was applied in various studies concerning interpersonal relationships, being linked to caregiving style (George-Levi et al., 2016), attachment orientations (Shadach et al., 2017; Brenner et al., 2019), pathological concern (Shavit and Tolmacz, 2014), dating abuse (Warrener and Tasso, 2017), relationship with parents (Tolmacz et al., 2016), and the quality of one's intimate relationship (Bar-Kalifa et al., 2016; Tolmacz et al., 2017; Williams et al., 2018; Candel and Turliuc, 2019; Turliuc

and Candel, 2019). The conceptual innovation of Tolmacz and Mikulincer (2011) was completed with the development of a specific scale for measuring the sense of entitlement in couple relationships: The Sense of Relational Entitlement Scale (SRES). The scale includes subscales for the dimensions of entitlement (assertive, restricted, and excessive), this time in the context of the couple relationship. In other words, the authors indicated that people may be characterized by an assertive (confidence in the relationship and the ability to ask for their rights), restricted (a lack of assertiveness and deservingness), and excessive sense of relational entitlement (negative evaluations of the partner and exaggerated expectations). It seems that people with excessive SRE are more sensitive to negative aspects of the partner and relationship and have higher expectations for their partner attention and understanding (Tolmacz and Mikulincer, 2011). Also, an inflated sense of entitlement has been associated with inadequate early parental care, maladaptive attachment styles, and early trauma, such as sexual abuse (Shadach et al., 2017; Brenner et al., 2019). Thus, it was presumed that this type of relational entitlement will have the highest impact on couple satisfaction because excessively entitled people have stronger reaction to the degree of fulfillment of their needs and wishes (Bar-Kalifa et al., 2016). According to Tolmacz and Mikulincer (2011), two or more types of entitlement (for example, assertive and exaggerated) can coexist in the same individual. Given that this concept measures a type of dispositional entitlement and the fact that a relationship consists of hundreds of daily interactions, Tolmacz and Mikulincer (2011) suggest that a person can have high scores on more than one dimension of entitlement. This reflects the various interactions between partners, some of which are more assertive and adaptive, and others more exaggerated or maladaptive.

THE SENSE OF RELATIONAL ENTITLEMENT AND COUPLE SATISFACTION

Couple satisfaction represents the “people’s global subjective evaluation of the quality of their marriage” (Li and Fung, 2011, p. 246). It can vary as a function of different interpersonal and intrapersonal characteristics of the couple, such as the partner’s background and traits (Bradbury et al., 2000). Studies assessing the sense of relational entitlement and its link with couple satisfaction are scarce. As the Sense of Relational Entitlement Scale is being developed and validated only recently, the situation is to be expected. In their study in which they present the construction of the SRE scale, Tolmacz and Mikulincer (2011) presented the associations of SRE with couple satisfaction among young adults (Tolmacz and Mikulincer, 2011). These findings also received support when examining middle-aged long-term dyadic relationships (George-Levi et al., 2014). People with an inflated sense of relational entitlement are more sensitive to the partner’s transgressions. This leads them to use more negative tactics in conflict resolution, such as more verbal aggression, more dominance, and less compromise (Williams et al., 2018). Moreover, excessive relational entitlement was strongly related to

abusive behaviors in couple relationships (Wood, 2004; Warrenner and Tasso, 2017). Other research showed that it was related to divorce rates (Sanchez and Gager, 2000), selfishness in romantic relationships (Exline et al., 2004) and chronic relationship conflict over a period of 10 weeks (Moeller et al., 2009). On the contrary, individuals with a restricted sense of entitlement are more avoidant when resolving conflicts and suffer from more pathological concern (Shavit and Tolmacz, 2014; Williams et al., 2018). Previous studies showed that both excessive and restricted SRE were strong predictors of lower relational satisfaction (Tolmacz and Mikulincer, 2011; George-Levi et al., 2014; Candel and Turliuc, 2019). Having an assertive sense of relational entitlement was suggested to be linked with positive outcomes, such as higher life satisfaction, more self-esteem and self-efficacy (Tolmacz et al., 2016). However, previous studies that tested it in the context of romantic relationships found no link between assertive SRE and satisfaction (Tolmacz and Mikulincer, 2011; Candel and Turliuc, 2019). Thus, previous research points out that SRE is a trait-like psychological characteristic that has a negative impact on satisfaction. In this study, we were interested in exploring whether the between-person differences in SRE (excessive, restricted, and assertive) will lead to different levels of daily couple satisfaction. We hypothesized that:

- (H1) Excessive and restricted relational entitlement will be negatively associated with couple satisfaction. Given that assertive entitlement was not related to relational satisfaction, as previous studies have concluded (e.g., Tolmacz and Mikulincer, 2011), we did not make any hypothesis for its associations with couple satisfaction, but it was included in all the analyses.

PERCEIVED PARTNER RESPONSIVENESS, SELF-DISCLOSURE, AND COUPLE SATISFACTION

Romantic intimacy is one of the strongest positive predictors of physical health (e.g., lower illness rates, better recovery rates etc.; Hook et al., 2003), psychological well-being (e.g., lower risk for depression, higher levels of life satisfaction; Hook et al., 2003), and couple satisfaction (Dandurand and Lafontaine, 2013; Bar-Kalifa et al., 2015). The Interpersonal Process Model of Intimacy (Reis and Shaver, 1988) indicates that intimacy is built through two fundamental processes: self-disclosure and empathic response from the partner. The model suggests that the ability of both partners to communicate essential information about their wishes, needs, or expectancies, and the perception that a partner is responsive to one’s needs is a central construct when it comes to determining the quality of a relationship (Reis et al., 2004). According to this model, when the expression of needs and the response toward those needs are higher, people perceive their romantic relationships as being more intimate (Reis and Shaver, 1988).

Self-disclosure (namely, the verbal communication of information about the self, including personal thoughts, states, dispositions, needs, events in the past, and plans for the future) is a central concept in the study of romantic

relationships (Finkenauer et al., 2004). It can be used to maintain proximity to the partner (Lee and Pistole, 2012), it leads to greater intimacy (Laurenceau et al., 1998), and it is generally associated with positive couple outcomes over extended periods of time (Sprecher and Hendrick, 2004). Also, due to the capitalization of these positive outcomes, people who self-disclose more feel an improvement in other aspects of their romantic relationships (Langston, 1994). Previous studies offer evidence that greater self-disclosure is associated with greater couple satisfaction (Hendrick, 1981; Sprecher and Hendrick, 2004; Unger et al., 2015). This may be, in part, due to the role that self-disclosure has in relationship maintenance (Sprecher and Hendrick, 2004), and to its contribution to greater intimacy, which is an important indicator for relational success (Reis and Shaver, 1988). In addition to one's own self-disclosure, perceived partner disclosure might also play a role in the level of satisfaction a person feels. First, one's higher self-disclosure may lead to higher levels of partner disclosure (Laurenceau et al., 2005). Second, Rosenfeld and Bowen (1991) found that the partner's level of disclosure is important for one's couple satisfaction, but people usually overestimate the partner's disclosure. Thus, the perception overcomes the reality of the degree of partner's self-disclosure. Finally, giving and receiving self-disclosure are associated with love, commitment, and couple satisfaction, meaning that these processes sustain the desire to continue the relationship (Sprecher and Hendrick, 2004).

Perceived partner responsiveness (PPR), described as the perception that a partner understands, values, and responds supportively to one's needs, is a cardinal process in the study of relational quality (Reis et al., 2004). When people feel that their partners are more responsive, they believe their relationship is more intimate and that it offers more satisfaction (Laurenceau et al., 1998; Canevello and Crocker, 2010). It has been shown that PPR can mediate or moderate the relationship between various behaviors or traits (e.g., sexual behavior, attachment, or social anxiety) and couple satisfaction (Kane et al., 2007; Bar-Kalifa et al., 2015; Gadassi et al., 2016), and that it can influence variables such as investment, alternatives, or commitment for the relationship (Segal and Fraley, 2016). Moreover, the temporal link between PPR and couple satisfaction was previously validated in multiple studies that employed longitudinal or dyadic diary analysis (Bar-Kalifa et al., 2015; Gadassi et al., 2016; Segal and Fraley, 2016).

Expressing their needs (self-disclosure) and perceiving the partner's response to those needs (PPR) represent organizing constructs that change the way one feels in their relationship. Previous reports showed that perception of enthusiastic, engaged responses from one's partner was associated with more couple satisfaction (see Reis, 2014 for a review). Also, self-disclosure can promote couple satisfaction and endurance (see Finkenauer et al., 2018 for a review). Moreover, past daily diary studies showed that disclosing and receiving disclosure and responsiveness from the partner on a day-to-day basis represent central components of a well-functioning intimate relationship (Laurenceau et al., 2005). Based on these prior findings, we may consider that both the general levels of self-disclosure, perceived partner self-disclosure,

and PPR, and the day-to-day expressions of these functional behaviors would positively impact couple satisfaction. Thus, we hypothesized that:

- (2) Self-disclosure will be positively associated with couple satisfaction on person-level and day-level. (3) The perceived self-disclosure of the partner will be positively associated with couple satisfaction on person-level and day-level. (4) PPR will be positively associated with couple satisfaction on person-level and day-level.

THE MODERATION ROLE OF SELF-DISCLOSURE AND PERCEIVED PARTNER RESPONSIVENESS

While SRE refers to the extent a person expects his/her needs and wishes will be fulfilled inside a romantic relationship, self-disclosure includes the verbal communication of the person's needs, and perceived partner's responsiveness represents the perception that a partner understands and responds supportively to the person's needs. It is important to note that all these aspects gravitate around need fulfillment in the romantic relationship, being relevant for the person's perception of couple satisfaction (Patrick et al., 2007). Following the previously mentioned works, we consider that PPR and self-disclosure would change the nature (would be a moderator) of the associations between SRE and couple satisfaction by diminishing the strength of the previously found negative associations.

First, both PPR and self-disclosure foster positive outcomes that may influence the levels of couple satisfaction. For example, daily PPR encourages individuals to express more joy, excitement, contentment, and gratitude (Ruan et al., 2020). Also, PPR was positively related to forgiveness after a real live hurtful event (Pansera and la Guardia, 2011). In regard to self-disclosure, the partners who are more involved in such behaviors experience greater emotional involvement, greater satisfaction, and positive affect after being taking part in couple conflicts (Prager et al., 2015).

Second, we found evidence that SRE is associated with relationship quality variables (Tolmacz and Mikulincer, 2011; George-Levi et al., 2014; Candel and Turliuc, 2019). While the expression of needs is crucial in one's relationships, the inter-individual differences can make the most important difference in how people present their needs in their romantic relationships (Clark et al., 2001). Coming from a person's earlier experiences with fulfillment needs (Tolmacz, 2011), SRE plays a relevant role in an individual's general expectation toward a relationship and in the outcome of the said relationship. However, previous studies have shown that positive intimate experiences can counter a person's maladaptive expectation from a relationship (Stanton et al., 2017). For the individuals with an avoidant attachment style, engaging in intimacy-promoting behaviors led to a higher relational quality immediately after engaging in the said behaviors (Stanton et al., 2017). Experiences with people who are understanding, trustworthy, and responsive to one's needs will lead to positive views of others, whereas relationships with

people who are unresponsive and rejecting will lead to negative views of others (Bretherton, 1990; Grabill and Kerns, 2000).

Third, there is evidence for the moderating role of the intimacy-related variables on the association between various personal or couple constructs and relationship quality. For example, self-disclosure can soften the harmful effects of negative interactions on need fulfillment and can alleviate the negative effects of trauma on satisfaction (Prager and Buhrmester, 1998; Monk and Nelson Goff, 2014). A study assessing the moderation role of PPR showed that at higher levels of PPR, more self-focused talk was associated with higher sexual satisfaction, and at lower levels of PPR, more self-focused talk was associated with lower sexual satisfaction (Merwin and Rosen, 2020). Also, emotional intimacy was found to moderate the relationship between the use of Sexually Explicit Media (SEM) and relationship satisfaction in men's case, with a higher SEM significantly associated with lower relationship satisfaction among men reporting lower levels of emotional intimacy (Veit et al., 2017).

Based on this evidence, it is reasonable to expect that the impact of adaptive or maladaptive types of SRE on couple satisfaction may vary as a function of self-disclosure and PPR.

Moreover, with evidence coming from both cross-sectional (Kane et al., 2007; Unger et al., 2015) and daily diary studies (Bar-Kalifa et al., 2015; Gadassi et al., 2016; Segal and Fraley, 2016), we consider that both the person-level and day-level effects should be taken into account. We consider that having a relationship characterized by positive and intimacy-promoting behaviors such as PPR, self-disclosure, and perceived partner self-disclosure (in general and on a day-to-day basis) would buffer the negative effects of SRE on relational satisfaction. Individuals with excessive or restricted SRE feel more negativity and, in the case of the former, are more conflictual in nature. This can be counteracted by positive partner behaviors (PPR and perceived partner self-disclosure) and by more intimacy-promoting behavior on their part (self-disclosure). Thus, we hypothesized that:

- (5) The association between SRE (exaggerated, restricted, or assertive), on the one hand, and couple satisfaction, on the other hand, will be weaker for those characterized by high levels of self-disclosure, perceived partner self-disclosure or PPR.

Finally, although we did not propose any hypothesis for it, we explored the role of gender in shaping these relationships.

METHOD

Participants

Ninety-nine couples (198 participants) responded to a 7-day, two measurements each day dyadic diary. For men, the mean age was 25.74 years ($SD = 5.63$, Min. = 18, Max. = 42). For women, the mean age was 23.13 years ($SD = 4.92$, Min. = 18, Max. = 39). The mean length of the relationship was 42.78 months ($SD = 44.02$, Min. = 6, Max. = 204). From the entire sample, 15 couples were married. At least one partner from each couple was enrolled in a Psychology course at a Romanian University. Both their and their

partner's participation was voluntary. For their participation, the participants received credits for their course.

Procedure

Each participant received an online form containing the informed consent, the Sense of Relational Entitlement scale, and some demographic questions. In addition, they were asked to offer their email address and phone number. After sending back this information, each participant received another unique online form (containing an open-ended question regarding the most important topic of conversation for that day and the items measuring PPR, self-disclosure, perceived partner self-disclosure, and couple satisfaction), especially designed for him/her. They were asked to complete it twice a day (once at noon and once in the evening) for 7 days, from Monday to Sunday. Each day, one of the researchers sent personalized emails and phone messages to the participants in order to emphasize the importance of their adherence to the research. The protocol for this study was approved by the ethical committee of the university.

Measures

The Sense of Relational Entitlement

We used the Romanian version of the Sense of Relational Entitlement scale (Candel, 2018). This scale contains 18 items that assess each person's relational entitlement type. The scale offers different scores for excessive (eight items), restricted (three items), and assertive entitlement (seven items; it includes both assertive and expectation items, as recommended by George-Levi et al., 2014). The items are rated on a Likert scale ranging from 1 (not at all) to 7 (very much). Each measurement offered good internal consistency, for both male and female participants (for restricted entitlement: Cronbach's $\alpha = 0.69$ for males and 0.71 for females; for excessive entitlement: Cronbach's $\alpha = 0.86$ for males and 0.87 for females; for assertive entitlement: Cronbach's $\alpha = 0.70$ for males and 0.73 for females).

Couple Satisfaction

The participant's couple satisfaction was assessed using a single item ("Today I am satisfied with my relationship") rated on a Likert scale ranging from 1 (total disagreement) to 6 (total agreement).

The other variables were measured using a single item: self-disclosure ("How much did you self-disclose since the last answers?"), perceived partner self-disclosure ("How much did your partner self-disclose since the last answers?"), and PPR ("How responsive was your partner since the last answers?"). All three items were measured on a Likert scale from 1 (not at all) to 6 (very much).

Data Analytic Approach

The analysis used a total of 2,772 units of observations (99 couples \times 2 members \times 14 assessments). We analyzed these data using a multilevel model for dyadic diary data that treats the three levels of distinguishable dyadic diary data (days, nested within persons, nested within couples) as two levels of random variation. This method estimated separate intercepts and slopes for the male and female partner. The lower level represents

variability due to day-level repeated measures for male partners and female partners, and the upper level represents person-level variability across male partners and across female partners (Bolger and Laurenceau, 2013). For each type of SRE, which were separately considered as upper-level predictors, we were interested in the person-level effects (e.g., the degree to which a person was characterized by greater excessive SRE at the beginning of the diary). For the moderators, we were interested in both person-level effects (e.g., the degree to which a person was characterized by greater self-disclosure over the course of the diary) and day-level effects (e.g., the degree to which a certain day was characterized by greater self-disclosure than the person's average). For this reason, we tested a model in which couple satisfaction was predicted by each type of SRE, the participants' averages of self-disclosure, perceived partner, and PPR, alongside daily deviations from these averages. In addition, we tested the interaction of each type of SRE with both the day-level moderators (cross-level interactions) and person-level averages of the moderators (level-2/person-level interaction).

Satisfaction_{ijk} = (male)_i[γ_{10} Self-disclosure_{ijk} + γ_{20} Partner self-disclosure_{ijk} + γ_{30} PPR_{ijk} + γ_{01} Self-disclosure_{ij} + γ_{02} Partner self-disclosure_{ij} + γ_{03} PPR_{ij} + γ_{04} Excessive SRE_{ij} + γ_{05} Restricted SRE_{ij} + γ_{06} Assertive SRE_{ij} + u_{m0i} + u_{m1i} Self-disclosure_{ijk} + u_{m2i} Partner self-disclosure_{ijk} + u_{m3i} PPR_{ijk} + γ_{07} (Self-disclosure_{ij} Excessive SRE_{ij}) + γ_{08} (Self-disclosure_{ij} Restricted SRE_{ij}) + γ_{09} (Self-disclosure_{ij} Assertive SRE_{ij}) + γ_{010} (Partner self-disclosure_{ij} Excessive SRE_{ij}) + γ_{011} (Partner self-disclosure_{ij} Restricted SRE_{ij}) + γ_{012} (Partner self-disclosure_{ij} Assertive SRE_{ij}) + γ_{013} (PPR_{ij} Excessive SRE_{ij}) + γ_{014} (PPR_{ij} Restricted SRE_{ij}) + γ_{015} (PPR_{ij} Assertive SRE_{ij}) + γ_{11} (Self-disclosure_{ijk} Excessive SRE_{ij}) + γ_{12} (Self-disclosure_{ijk} Restricted SRE_{ij}) + γ_{13} (Self-disclosure_{ijk} Assertive SRE_{ij}) + γ_{21} (Partner self-disclosure_{ijk} Excessive SRE_{ij}) + γ_{22} (Partner self-disclosure_{ijk} Restricted SRE_{ij}) + γ_{23} (Partner self-disclosure_{ijk} Assertive SRE_{ij}) + γ_{31} (PPR_{ijk} Excessive SRE_{ij}) + γ_{32} (PPR_{ijk} Restricted SRE_{ij}) + γ_{33} (PPR_{ijk} Assertive SRE_{ij})] + (female)_i[γ_{40} Self-disclosure_{ijk} + γ_{50} Partner self-disclosure_{ijk} + γ_{60} PPR_{ijk} + γ_{016} Self-disclosure_{ij} + γ_{017} Partner self-disclosure_{ij} + γ_{018} PPR_{ij} + γ_{019} Excessive SRE_{ij} + γ_{020} Restricted SRE_{ij} + γ_{021} Assertive SRE_{ij} + u_{f0i} + u_{f1i} Self-disclosure_{ijk} + u_{f2i} Partner self-disclosure_{ijk} + u_{f3i} PPR_{ijk} + γ_{022} (Self-disclosure_{ij} Excessive SRE_{ij}) + γ_{023} (Self-disclosure_{ij} Restricted SRE_{ij}) + γ_{024} (Self-disclosure_{ij} Assertive SRE_{ij}) + γ_{025} (Partner self-disclosure_{ij} Excessive SRE_{ij}) + γ_{026} (Partner self-disclosure_{ij} Restricted SRE_{ij}) + γ_{027} (Partner self-disclosure_{ij} Assertive SRE_{ij}) + γ_{028} (PPR_{ij} Excessive SRE_{ij}) + γ_{029} (PPR_{ij} Restricted SRE_{ij}) + γ_{030} (PPR_{ij} Assertive SRE_{ij}) + γ_{41} (Self-disclosure_{ijk} Excessive SRE_{ij}) + γ_{42} (Self-disclosure_{ijk} Restricted SRE_{ij}) + γ_{43} (Self-disclosure_{ijk} Assertive SRE_{ij}) + γ_{51} (Partner self-disclosure_{ijk} Excessive SRE_{ij}) + γ_{52} (Partner self-disclosure_{ijk} Restricted SRE_{ij}) + γ_{53} (Partner self-disclosure_{ijk} Assertive SRE_{ij}) + γ_{61} (PPR_{ijk} Excessive SRE_{ij}) + γ_{62} (PPR_{ijk} Restricted SRE_{ij}) + γ_{63} (PPR_{ijk} Assertive SRE_{ij})] + e_{ijk}

In this double intercept model, Satisfaction_{ijk} is the predicted couple satisfaction for participant *i* in couple *j* on day *k*; male_i and female_i represent each gender's intercepts. On the day level, we introduced as predictors the daily levels of self-disclosure, perceived partner self-disclosure, and PPR for participant *i*

TABLE 1 | Descriptive statistics and gender differences for the variables.

| | Men | | Women | | Gender differences t |
|---|------|------|-------|------|-------------------------|
| | M | SD | M | SD | |
| Self-disclosure | 5.05 | 1.24 | 5.18 | 1.20 | −2.88** |
| Perceived partner Self-disclosure | 4.95 | 1.27 | 5.00 | 1.25 | −1.32 |
| Perceived partner responsiveness (PPR) | 4.88 | 1.25 | 4.83 | 1.35 | 1.21 |
| Couple satisfaction | 5.46 | 0.92 | 5.35 | 1.01 | 3.49*** |
| Excessive sense or relational entitlement (SRE) | 2.22 | 1.13 | 2.39 | 1.14 | −1.16 |
| Restricted SRE | 3.12 | 1.54 | 2.81 | 1.51 | 1.38 |
| Assertive SRE | 4.53 | 0.99 | 4.79 | 0.94 | −2.06* |

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; the results are based on the day-level measurements for all level 1 variables and on the person-level measurement for SRE.

in couple *j* on day *k*. At this level, γ_{10} and γ_{40} represent self-disclosure, γ_{20} and γ_{50} represent perceived partner self-disclosure, and γ_{30} and γ_{60} represent PPR. On the person level, we introduced as predictors the overall levels of excessive SRE, restricted SRE, assertive SRE, self-disclosure, perceived partner self-disclosure, and PPR for participant *i* in couple *j*. At this level, γ_{01} and γ_{016} represent self-disclosure, γ_{02} and γ_{017} represent perceived partner self-disclosure, γ_{03} and γ_{018} represent PPR, γ_{04} and γ_{019} represent excessive SRE, γ_{05} and γ_{020} represent restricted SRE, and γ_{06} and γ_{21} represent assertive SRE. u_{m0i} and u_{f0i} represent random intercepts, u_{m1i} and u_{f1i} represent random slopes for self-disclosure, u_{m2i} and u_{f2i} represent random slopes for perceived partner self-disclosure, and u_{m3i} and u_{f3i} represent random slopes for PPR. e_{ijk} is a residual component for this subject on the particular day. Additionally, this model also included person-level interactions and cross-level interactions between the SRE types and self-disclosure, perceived partner self-disclosure, and PPR for men and women, respectively.

All level-1 predictors were group-mean centered. All day-level effects were considered random and thus were allowed to vary from person to person. Each level-2 predictor was grand mean centered. All the analyses were computed using the IBM SPSS 20 software. To explore the interaction slopes, we estimated simple slopes for low (−1 SD), average, and high (+1 SD) levels of the moderators using the Preacher et al. (2006) computational tool for testing interaction effects in multilevel analysis.

RESULTS

Preliminary Analysis

Means, standard deviations, and the paired-sample *t*-tests for the gender differences of each of the studied variables are presented in **Table 1**. Women report higher daily self-disclosure and assertive SRE. Men report higher levels of daily couple satisfaction. **Table 2** presents the correlations between

TABLE 2 | Correlations between the variables.

| | Couple satisfaction | Self-disclosure | Perceived partner self-disclosure | PPR | Excessive SRE | Restricted SRE | Assertive SRE |
|-----------------------------------|---------------------|-----------------|-----------------------------------|-----------------|---------------|----------------|---------------|
| Couple satisfaction | 0.28*** | 0.41*** | 0.48*** | 0.48*** | −0.51*** | −0.07 | −0.13 |
| Self-disclosure | 0.13*** | 0.18*** | 0.87*** | 0.62*** | −0.14* | 0.05 | 0.124 |
| Perceived partner self-disclosure | 0.18*** | 0.42*** | 0.21*** | 0.73*** | −0.19*** | 0.08 | 0.11 |
| PPR | 0.21*** | 0.33*** | 0.54*** | 0.210*** | −0.21** | 0.11 | 0.02 |
| Excessive SRE | | | | | 0.23* | 0.26*** | 0.46*** |
| Restricted SRE | | | | | | −0.01 | 0.125 |
| Assertive SRE | | | | | | | 0.16 |

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Person-level correlations are presented above the diagonal and were calculated by averaging the daily responses over the entire diary period for each participant ($N = 198$). Day-level correlations are presented below the diagonal and were calculated using person-mean centered variables measured twice a day. On the diagonal, we included the correlations between men's and women's values (presented in bold and italic). For this, we used the day-level scores for couple satisfaction, self-disclosure, perceived partner self-disclosure and PPR, and the person-level scores for excessive, restricted, and assertive SRE.

the variables. Couple satisfaction is positively related to self-disclosure, perceived partner self-disclosure, and PPR at both levels of the analysis. SRE is unrelated to the person-level self-disclosure, perceived partner self-disclosure, and PPR and negatively related to couple satisfaction.

The Person-Level Effects on Couple Satisfaction

The results of the hierarchical linear models regarding couple satisfaction are presented in **Table 3**. At person-level, excessive entitlement is significantly associated with couple satisfaction, meaning that the participants with greater excessive entitlement also report lower couple satisfaction. These associations are significant for both men and women (men: $b = -0.25$, $SE = 0.05$, $p < 0.001$; women: $b = -0.28$, $SE = 0.06$, $p < 0.001$). Restricted and assertive SRE were not related to couple satisfaction. The PPR was associated with greater couple satisfaction for men ($b = 0.28$, $SE = 0.09$, $p < 0.001$) and women ($b = 0.28$, $SE = 0.09$, $p = 0.003$). This indicates that when the participants perceived greater partner responsiveness over the course of the diary, they also reported higher couple satisfaction. Self-disclosure was associated with satisfaction for men ($b = 0.24$, $SE = 0.10$, $p = 0.03$), meaning that men that self-disclose more have, in general, higher levels of couple satisfaction.

The Day-Level Effects on Couple Satisfaction

The day-level analysis yielded fewer significant results. Only PPR significantly predicted couple satisfaction, for both men and women (for men: $b = 0.13$, $SE = 0.03$, $p < 0.001$; for women: $b = 0.15$, $SE = 0.03$, $p < 0.001$). In the days when men and women perceived greater partner responsiveness, they reported higher satisfaction with their relationship. No other result was significant.

The Moderation Effect of Self-Disclosure, Perceived Partner Disclosure, and Perceived Partner Responsiveness

No cross-level interactions were found. However, several person-level interactions were significant. The plots for all the significant

interactions are included as **Supplementary Material**. The relationship between excessive SRE and couple satisfaction is moderated by self-disclosure and PPR. These effects were significant only for men. Estimation of simple slopes indicate that men's higher excessive SRE is not associated with couple satisfaction at low levels of self-disclosure ($b = -0.03$, $SE = 0.13$, $p = 0.80$), but is significantly associated with lower couple satisfaction at medium ($b = -0.25$, $SE = 0.09$, $p < 0.01$) and high levels of self-disclosure ($b = -0.48$, $SE = 0.13$, $p < 0.001$). Also, men's higher excessive SRE is associated with lower couple satisfaction at low ($b = -0.69$, $SE = 0.14$, $p < 0.001$) and medium levels of PPR ($b = -0.25$, $SE = 0.09$, $p < 0.01$). However, it is not associated with couple satisfaction at high levels of PPR ($b = 0.18$, $SE = 0.13$, $p = 0.19$).

The link between restricted SRE and couple satisfaction was moderated by perceived partner disclosure and PPR (for men only) and by self-disclosure (for women only). For men, the relationship between restricted SRE and couple satisfaction is not significant at low ($b = -0.15$, $SE = 0.10$, $p = 0.13$) and medium levels of perceived partner disclosure ($b = 0.003$, $SE = 0.07$, $p = 0.96$), but becomes barely significant and positive at high levels of perceived partner disclosure ($b = 0.16$, $SE = 0.09$, $p = 0.07$). In addition, the relationship between restricted SRE and couple satisfaction is not significant at low ($b = 0.17$, $SE = 0.10$, $p = 0.11$) and medium levels of PPR ($b = 0.003$, $SE = 0.06$, $p = 0.96$), but becomes barely significant and negative at high levels of PPR ($b = -0.16$, $SE = 0.09$, $p = 0.08$). Finally, at low ($b = 0.14$, $SE = 0.13$, $p = 0.28$) and medium levels of self-disclosure ($b = 0-0.03$, $SE = 0.07$, $p = 0.63$), women's level of restricted SRE is not related to couple satisfaction. However, the relationship becomes significant and negative at high levels of self-disclosure ($b = -0.21$, $SE = 0.10$, $p = 0.04$).

Self-disclosure and perceived partner disclosure moderate the relationship between assertive SRE and couple satisfaction (for women only). Assertive SRE has a barely significant negative association with couple satisfaction at low levels of self-disclosure ($b = -0.30$, $SE = 0.18$, $p = 0.07$). This relationship becomes non-significant at medium levels of self-disclosure ($b = 0.05$, $SE = 0.11$, $p = 0.62$). At high levels of self-disclosure, the association is significant and positive ($b = 0.44$, $SE = 0.14$, $p < 0.01$). At low

TABLE 3 | Self-disclosure, perceived partner self-disclosure, perceived partner responsiveness (PPR), and sense of relational entitlement (SRE), as predictors of couple satisfaction.

| | Men | | | | Women | | | |
|---|----------|------|--------|-------|----------|------|--------|-------|
| | Estimate | SE | 95% CI | | Estimate | SE | 95% CI | |
| Intercept | 5.42*** | 0.05 | 5.32 | 5.52 | 5.35*** | 0.06 | 5.24 | 5.47 |
| <i>Day Level</i> | | | | | | | | |
| Self-disclosure | 0.04 | 0.03 | −0.03 | 0.10 | 0.05 | 0.03 | −0.02 | 0.10 |
| Partner self-disclosure | 0.04 | 0.03 | −0.02 | 0.10 | 0.06 | 0.03 | −0.01 | 0.13 |
| PPR | 0.13*** | 0.03 | 0.06 | 0.19 | 0.15*** | 0.03 | 0.07 | 0.22 |
| <i>Person Level</i> | | | | | | | | |
| Excessive SRE | −0.25*** | 0.05 | −0.36 | −0.15 | −0.28*** | 0.06 | −0.39 | −0.16 |
| Restricted SRE | 0.003 | 0.03 | −0.06 | 0.06 | −0.03 | 0.03 | −0.10 | 0.03 |
| Assertive SRE | −0.06 | 0.06 | −0.17 | 0.05 | 0.06 | 0.06 | −0.07 | 0.18 |
| Self-disclosure | 0.24* | 0.10 | 0.02 | 0.46 | 0.20 | 0.13 | −0.06 | 0.48 |
| Partner Self-disclosure | −0.02 | 0.12 | −0.28 | 0.23 | −0.05 | 0.16 | −0.37 | 0.26 |
| PPR | 0.28*** | 0.08 | 0.11 | 0.45 | 0.28** | 0.09 | 0.08 | 0.48 |
| Self-disclosure × Excessive SRE | −0.27* | 0.11 | −0.51 | −0.04 | −0.13 | 0.13 | −0.41 | 0.14 |
| Self-disclosure × Restrictive SRE | −0.02 | 0.2 | −0.07 | 0.01 | −0.22* | 0.10 | −0.43 | −0.01 |
| Self-disclosure × Assertive SRE | 0.05 | 0.04 | −0.03 | 0.14 | 0.46** | 0.16 | 0.13 | 0.79 |
| Partner Self-disclosure × Restrictive SRE | 0.19* | 0.08 | 0.01 | 0.36 | −0.07 | 0.11 | −0.15 | 0.30 |
| Partner Self-disclosure × Assertive SRE | 0.06 | 0.16 | −0.27 | 0.21 | −0.54** | 0.18 | −0.90 | −0.18 |
| PPR × Excessive SRE | 0.51*** | 0.09 | 0.33 | 0.70 | 0.13 | 0.06 | −0.01 | 0.25 |
| PPR × Restrictive SRE | −0.19** | 0.06 | −0.33 | −0.06 | 0.13 | 0.06 | 0.01 | 0.26 |

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

levels of perceived partner disclosure, there is a significant and positive association between assertive SRE and couple satisfaction ($b = 0.51$, $SE = 0.17$, $p \leq 0.01$). This association becomes non-significant at medium levels of perceived partner disclosure ($b = -0.05$, $SE = 0.11$, $p = 0.62$), and significant and negative at high levels of partner disclosure ($b = -0.40$, $SE = 0.14$, $p \leq 0.01$).

DISCUSSIONS

Past research has shown that people that are either excessively or restrictedly entitled use maladaptive ways of need expression and that they may report lower levels of couple satisfaction (Tolmacz and Mikulincer, 2011; George-Levi et al., 2014). Besides, disclosing information about the self and about the current needs toward the romantic partner and the way the partner responds to this can affect couple satisfaction (Sprecher and Hendrick, 2004; Canevello and Crocker, 2010; Unger et al., 2015). Using dyadic diary data from romantic couples, the current study explored the possibility that self-disclosure, perceived partner self-disclosure, and PPR would moderate the relationships between excessive, restrictive, and assertive SRE and couple satisfaction.

The first hypothesis, regarding the relationship between SRE and couple satisfaction, was only partially supported. People with higher levels of excessive SRE reported lower levels of couple satisfaction. However, contrary to previous results (Tolmacz and Mikulincer, 2011), restricted SRE was not related to couple satisfaction. In another study on the same model of the SRE,

George-Levi et al. (2014) suggested that excessive and restricted entitlement should be grouped in one new factor called conflicted entitlement. As such, these two types of entitlement may share some variance when it comes to explaining the variation in couple satisfaction. Given that excessive entitlement was previously shown to have a stronger relationship with couple satisfaction (George-Levi et al., 2014), this may account for the non-significant association between restricted SRE and couple satisfaction. Finally, assertive SRE was not related to couple satisfaction, a finding that confirms previous studies (Tolmacz and Mikulincer, 2011).

We proposed that self-disclosure is related to couple satisfaction. This hypothesis was only partially supported. Men's self-disclosure is related to their couple satisfaction, but only at the personal level. Day-to-day self-disclosure does not seem to be related to daily levels of couple satisfaction, a finding that contradicts some previous results (e.g., Rosenfeld and Bowen, 1991). These findings may be explained by the fact that self-disclosure, although it has some aspects of personality construct, is also greatly influenced by relational or environmental conditions (Sprecher and Hendrick, 2004). As such, the relationship between daily self-disclosure and daily couple satisfaction might be affected by other variables. Also, emotional self-disclosure seems to be more important than factual self-disclosure (Laurenceau et al., 2005), but in this study, we did not differentiate between the two. As for the gender differences, previous studies (Dindia and Allen, 1992) have shown that women disclose more than men, and the present results confirm these findings. However, only men's higher

general levels of self-disclosure are associated with higher levels of couple satisfaction. Laurenceau et al. (2005) found that self-disclosure is more important for a male than it is for women in predicting intimacy. Although not identical, the process regarding couple satisfaction can be similar. Male partners can be more reliant on engaging in self-revealing disclosure, while female partners may derive their couple satisfaction from other components of the process (such as PPR).

The third hypothesis stated that perceived-partner self-disclosure is associated with couple satisfaction. We found no significant association at any level and for either gender. Although surprising, this may be explained by people's overestimation of their partner's disclosure. Rosenfeld and Bowen (1991) state that people have a tendency to consider their partner's self-disclosure similar to their own. These present results show a very strong correlation between self-disclosure and perceived partner self-disclosure, a fact that supports this assumption. As such, partner disclosure might act in a very similar way to self-disclosure.

The fourth hypothesis was confirmed. Perceived Partner Responsiveness was significantly related to higher couple satisfaction for all the participants, at both day and person levels. These findings support the previous results (Bar-Kalifa et al., 2015; Segal and Fraley, 2016) and show that feelings of understanding, validation, and acceptance from the partner are extremely important in shaping one's couple satisfaction toward the relationship.

The hypothesis concerning the moderating role of self-disclosure, perceived partner self-disclosure, and PPR was only partially supported. First, a significant association between higher excessive SRE and lower couple satisfaction was observed only for the men that used more self-disclosure. Although contrasting with the proposed hypothesis, this result finds its support in the studies showing the negative effects of too much self-disclosure (Cozby, 1972; Collins and Miller, 1994). High levels of self-disclosure can leave the recipient unsure of how to respond, leading to their constant retreat from the relationship. This might be particularly damaging for an excessively entitled person who might not easily forgive such a transgression, feeling that their personal needs are not fulfilled by the partner. Moreover, entitled individuals use various self-promotion behaviors, self-disclosure being one of them, but are also unethical in their decision-making style (Tamborski et al., 2012; Abell and Brewer, 2014). They can promote their needs in the relationship with their partner by self-disclosing, but might not reciprocate when the partners also express their needs. Thus, the partners can distance themselves from the entitled individuals, with the latter becoming less satisfied. Finally, people can also self-disclose their negative feelings, which might lead to negative reciprocity from the partner and further dissatisfaction (Finkenauer et al., 2018). Excessively entitled individuals might be more prone to self-disclose their disappointments following their partner's transgressions. When the level of their negative self-disclosure gets stronger, their satisfaction might become weaker. On the contrary, perceiving one's partner as being more responsive is beneficial for the more entitled individuals. In agreement with our hypothesis, perceived partner responsiveness buffers the

negative effect of excessive SRE on couple satisfaction. Having a partner that is more sensible and responsive toward one's needs was found to be related to higher couple satisfaction (Gadassi et al., 2016). This seems to play an important role in determining someone with strong unmet emotional needs to feel more satisfied. Feeling that the partner is caring and understanding is beneficial for men with higher levels of excessive entitlement. Finally, perceived partner responsiveness might also appear due to the individual's own projection of responsiveness (Lemay et al., 2007). Due to an underlying narcissism, those with an excessive entitlement can consider themselves as being more responsive to their partners' needs. Thus, they might maintain the perception of a responsive partner and their relational satisfaction due to their personality traits.

The moderator analysis for the relationship between restricted entitlement and couple satisfaction provided some contradictory findings. First, the link is negative only at high levels of either PPR or self-disclosure (the former moderator was significant for men, while the latter was significant for women). Restricted entitlement consists of the belief that one does not deserve to get anything from the partner. However, both high PPR and high self-disclosure foster intimacy, a process where the partners listen to each other and are attentive to one another (Prager, 1995). This might contradict the core beliefs of inadequacy that a restrictively entitled person possesses, leading to confusion, guilt, shame, and low couple satisfaction. Paradoxically, higher levels of restricted SRE and higher levels of perceived partner self-disclosure interact and predict higher levels of couple satisfaction for men. Tolmacz (2011) proposes that a restricted sense of entitlement can emerge from maternal messages that communicate dissatisfaction with the child. Therefore, the individual starts believing in their usefulness. Later, the adult would act in such a way to satisfy the partner to compensate for their perceived ineptness. Our results suggest that partner disclosure offers the ideal opportunity for individuals with a restricted entitlement to feel useful. Specifically, by allowing their partners to disclose, they consider that they atone for their past unfitness, which makes them feel more satisfied. Nevertheless, the positive impact of perceived partner self-disclosure might also be explained by the capitalization theory (Langston, 1994). Self-disclosing about positive events can lead to more trust toward the target person (Reis et al., 2010). Although we measured just the perception of partner self-disclosure and not the actual disclosure, it is possible for them to be positively correlated. This means that the partners after they self-disclose, offer more trust to the restrictive entitlement individuals, which might determine the latter to capitalize on these positive experiences. In the end, it is possible for the individuals with a restricted sense of entitlement to capitalize more from their partners' positive experiences than from their own.

Assertive entitlement is significantly and positively related to couple satisfaction only when the person discloses more. This result was found only among women. For assertively entitled individuals it is important to obtain what they feel they deserve. This attitude, combined with a higher ability to self-disclose and communicate in a non-aggressive way about their needs, can determine the partner to pay more attention

to the person's needs. They might also capitalize on their positive self-disclosure and increase their satisfaction by talking about their positive experiences. Moreover, when low levels of self-disclosure are achieved, the assertive persons lack one important mechanism used to express their needs. Therefore, they seem to be less satisfied. On the contrary, the level of perceived partner disclosure intensifies dissatisfaction among assertively entitled women. This shows that while assertive women need to disclose more to be more satisfied, they do not want to reciprocate and allow the partners to disclose. Previous studies showed that assertive entitlement was positively related to some facets of narcissism, such as superiority and vanity (Tolmacz and Mikulincer, 2011). Despite being the more adaptive type of entitlement, assertive entitlement still overlaps with some narcissistic traits. Also, taking into account the results of Crowe et al. (2016) and Hart et al. (2019), assertive entitlement can be described as a more emotionally stable and less vulnerable form of entitlement, but not completely devoided of the antagonistic behavior that can be found in maladaptive entitlement. As such, when faced with greater partner disclosure and greater expression of needs from their partner, the individuals with greater assertive entitlement might not feel prepared to respond and thus might report less couple satisfaction.

Significant gender differences emerged during the analysis. Self-disclosure, perceived partner disclosure, and PPR mostly played different roles among men and women and interacted differently with the facets of SRE. One potential explanation for this is that there are gender differences in the process of intimacy. Women generally self-disclose more than men (Dindia and Allen, 1992; Horne and Johnson, 2018), and this result was supported by our findings. Moreover, other studies suggest that women feel more satisfied with the process of intimacy when the partner self-discloses more, while for men, both partners must disclose (Manne et al., 2004). Moreover, women tend to respond with better accuracy to their partner's expression of needs, being responsive when the partners experience greater stress. On the contrary, men offer both responsiveness and negative behaviors when the partner needs support (Neff and Karney, 2005).

As a summary, this study shows that the components of the interpersonal process of intimacy can both buffer and aggravate the effects of SRE on couple satisfaction. For excessively entitled individuals, offering more self-disclosure seems to be counterproductive. However, having a more responsive partner allows for greater couple satisfaction. Still, this positive effect of PPR can be only temporary, depending on the ability and willingness of the partner to be responsive toward partners who greatly exaggerate their needs and concentrate mostly on themselves. It is worth noting that these results were found only in males. As previously mentioned, women are generally better at responding to their partner's moments of greater stress. Thus, excessively entitled men might risk taking this ability for granted. For restricted individuals, higher intimacy promoting behaviors (higher self-disclosure and PPR) may contrast with their low or non-existent expectations, bringing a decline in their satisfaction. On the contrary, greater perceived partner disclosure may come with the opportunity to feel useful and increase their couple

satisfaction. In the end, assertive entitled individuals profit from greater self-disclosure and report more couple satisfaction, but seem to be affected by greater partner self-disclosure. Although the least damaging form on entitlement, assertiveness can also bring negative consequences when the partners insist too much on their needs. Alternatively, given that this result was found only on women, assertive women can achieve lower couple satisfaction when their partner discloses more because self-disclosure is not a behavior that fits with the gender role expected from men. Our results support the view of Finkel et al. (2017) on the role of responsiveness in romantic relationships. While being responsive promotes couple satisfaction, this is highly dependent on the individual's predispositions. In conjunction with self-disclosure and PPR, the different types of entitlement lead to different levels of couple satisfaction.

In addition to theoretical advances, this study also proposes some methodological strengths. To our knowledge, this is one of the first studies that used the concept of SRE and all three of its forms in a diary design. This kind of research is very useful because it allows the study of the participants in a more ecologically valid way, partially suppressing the shortcomings of a cross-sectional design. Also, while previous studies that investigated this concept concentrated in more experienced couples, our results point to some similar findings in a sample of young couples.

However, this study is not without its limits. While the diary design allows for a long investigation, it remains correlational, and thus, it does not allow for inferring a causal association between the variables. Also, all the concepts were measured with self-reporting questionnaires and the sample was mostly composed of couples with a relatively high socioeconomic status that presents higher than average couple satisfaction. In the future, other methods (such as direct observation) and other samples can be used to extend these results. Finally, although entitlement is distinct from narcissism, the two concepts are related. Future studies should control the role of narcissism to explore how SRE affects couple satisfaction above and beyond it.

CONCLUSION

This present study examined the moderation effect of self-disclosure and PPR on the associations between SRE and couple satisfaction. Our main findings indicate a negative association of daily couple satisfaction with excessive SRE, but not with restricted SRE. Self-disclosure was related to couple satisfaction, but only for men and only at person-level. Perceived-partner self-disclosure was related with couple satisfaction for men and women at both day-level and person-level. All three types of SRE (assertive, restricted, and excessive) interact with self-disclosure, perceived partner disclosure, and perceived partner responsiveness and account for changes in couple satisfaction. To our knowledge, this is the first study to use the variables included in the interpersonal process model of intimacy (Reis and Shaver, 1988) as an organizing construct for the interactions between SRE and couple satisfaction. The research on relational entitlement is recent, and only a few studies have examined its importance

in shaping the levels of couple satisfaction. Still, our results are important, because other than their empirical strengths, they can point to some clinical and therapeutic implications too. For example, they suggest that careful expression of needs thought self-disclosure and a responsive answer from the partner can overcome the effects of some of the more damaging types of entitlement. Based on these results, the therapists would be able to create programs that take into account the level of excessive, restricted, and assertive relational entitlement when advising greater use of self-disclosure and PPR. Finally, these programs should use different techniques depending on gender.

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 Ethical Committee of the Alexandru Ioan Cuza University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

OSC and MNT wrote the manuscript, conceived and designed the study. OSC collected and analyzed the data.

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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It Takes a Team to Make It Through: The Role of Social Support for Survival and Self-Care After Allogeneic Hematopoietic Stem Cell Transplant

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Background: Social support plays an important role for health outcomes. Support for those living with chronic conditions may be particularly important for their health, and even for their survival. The role of support for the survival of cancer patients after receiving an allogeneic hematopoietic cell transplant (alloHCT) is understudied. To better understand the link between survival and support, as well as different sources and functions of support, we conducted two studies in alloHCT patients. First, we examined whether social support is related to survival (Study 1). Second, we examined who provides which support and which specific support-related functions and tasks are fulfilled by lay caregivers and healthcare professionals (Study 2).

Methods: In Study 1, we conducted a retrospective chart review of alloHCT patients ($N = 173$, 42.8% female, age: $M = 49.88$) and registered availability of a dedicated lay caregiver and survival. In Study 2, we prospectively followed patients after alloHCT ($N = 28$, 46.4% female, age: $M = 53.97$, 46.4% ethnic minority) from the same hospital, partly overlapping from Study 1, who shared their experiences of support from lay caregivers and healthcare providers in semi-structured in-depth interviews 3 to 6 months after their first hospital discharge.

Results: Patients with a dedicated caregiver had a higher probability of surviving to 100 days (86.7%) than patients without a caregiver (69.6%), $OR = 2.84$, $p = 0.042$. Study 2 demonstrated the importance of post-transplant support due to patients' emotional needs and complex self-care regimen. The role of lay caregivers extended to many areas of patients' daily lives, including support for attending doctor's appointments, managing medications and financial tasks, physical distancing, and maintaining strict dietary requirements. Healthcare providers mainly fulfilled medical

needs and provided informational support, while lay caregivers were the main source of emotional and practical support.

Conclusion: The findings highlight the importance of studying support from lay caregivers as well as healthcare providers, to better understand how they work together to support patients' adherence to recommended self-care and survival.

Keywords: allogeneic hematopoietic cell transplant, cancer, caregiver support, healthcare providers, multiple medication adherence, social support, survival, self-care

INTRODUCTION

Social support has long been recognized as a key contributor to health (Berkman et al., 2000; Uchino, 2006; Holt-Lunstad et al., 2010). It is associated with higher quality of life and even survival in cancer (Chou et al., 2012; Aizer et al., 2013; Luszczynska et al., 2013). For recipients of an allogeneic hematopoietic cell transplant (alloHCT, commonly used to treat blood and lymphoid cancers), social support is especially critical. Many hematopoietic cell transplant programs require a caregiver to become eligible for transplant (National Marrow Donor Program, 2017; Preussler et al., 2019). However, so far, there is conflicting evidence regarding the impact of social support on survival after alloHCT.

A systematic review by Beattie et al. (2013) contained six studies published before 2011 in this population, while we identified six additional recent studies in our literature update. Four studies found that patients with social support after transplant had higher rates of survival than those without support (Colón et al., 1991: $N = 100$ patients after alloHCT, 55 vs. 20% at 24 months; Frick et al., 2005: $N = 99$ patients after autologous transplant, 78 vs. 40% at 47 months; Foster et al., 2005: $N = 131$ patients after alloHCT, 54 vs. 15%; Foster et al., 2013, also reported in McLellan et al., 2011: $N = 164$ alloHCT patients, 42 vs. 26%). Foster et al., 2013 highlighted the importance of longer and more frequent visits from a dedicated lay caregiver for survival, contrasted with merely having a support system. Another study ($N = 92$, 46% after alloHCT and 54% after autologous transplant) did not report enough information to calculate survival rates but found higher survival with better support (Rodrigue et al., 1999). AlloHCT patients with at least one close and dependable relationship partner survived for longer after transplant than those with poorer support pre-transplant ($N = 400$, $HR = 0.57$ over 2 years; Ehrlich et al., 2016). Patients after alloHCT who were single showed shorter survival times than those married or in committed relationships ($N = 130$ over a median follow-up of 713 days, $HR = 1.91$; Pillay et al., 2014). Another recent study found a non-significant tendency that support stability and support availability were related to survival in a smaller sample of 119 patients after alloHCT ($HR = 1.29$ and 1.23 over a median follow-up of 721 days; Harashima et al., 2019).

While considerable evidence indicates that support matters, some studies found no link between support or marital status and survival. An unpublished dissertation with a large sample did not find an association between support and survival ($N = 272$ patients, 83% after alloHCT, 17% after autologous transplant;

Artherholt, 2007). Three additional studies that used marital status as a support indicator failed to find a link with survival in large samples of patients after alloHCT ($N = 10,226$, Tay et al., 2020; $N = 715$, Gerull et al., 2017; $N = 309$; Sato et al., 2018). However, two of these studies still found some evidence that social support could matter for survival: Tay et al. (2020) found an association for graft-versus-host disease (GvHD), while Gerull et al. (2017) found that patients with missing information on marital status had worse survival than those with available information.

The available evidence leaves considerable gaps. Larger studies relied on marital status as a support indicator, while smaller studies used more elaborate and nuanced measures. Overall, social support was not consistently measured, with marital status likely being too coarse a measure for support, as it ignores other sources than the spouse (such as parents, siblings, or children, Foster et al., 2013; Sato et al., 2018; Preussler et al., 2019). Taken together, the mixed outcomes of the available studies and varying indicators of social support suggest the need for a deeper understanding of the characteristics of caregivers and functions of social support in patients after alloHCT (Beattie et al., 2013; Tay et al., 2019).

Patients after transplant experience high mortality due to potentially life-threatening complications, infections, GvHD, and cancer recurrence (Pasquini and Wang, 2011; Holtan et al., 2015). Patients are prescribed a complex self-care regimen to improve survival rates, including procuring and taking 18 or more different medications, frequent hospital visits, and following strict dietary, hydration, and hygiene requirements including social distancing (Tomblyn et al., 2009; Morrison et al., 2017). However, adherence to this complex regimen has not been ideal. A study following 376 alloHCT recipients found that almost two-thirds were non-adherent in taking immunosuppressant medication (Kirsch et al., 2014), while 54.6% of alloHCT patients were poorly adherent to their medication regimens in a recent pilot study (Lehrer et al., 2018).

Reviews of the existing literature, examining both structural and functional support, found that social support, especially practical support provided by close others, was linked to better adherence (DiMatteo, 2004; Scheurer et al., 2012). A recent review of 52 studies in hematological cancer patients found that social support was associated with medication adherence (Hall et al., 2016). A study of 21 alloHCT patients and their partners found varying rates (19 to 100%) of adherence to various post-transplant self-care tasks, with adherence levels dependent on which dyad member was responsible for the task

(Posluszny et al., 2018). There are few studies examining support from healthcare providers (Hall et al., 2016), with available studies suggesting that patient-physician communication and relationship quality are linked to patient adherence to treatment and medications (Haskard Zolnieriek and DiMatteo, 2009; Hillen et al., 2010; Espinosa and Kadić-Magljajić, 2019).

We conducted two studies in alloHCT patients to address gaps in the literature. In Study 1, we conducted a retrospective chart review to examine whether social support is related to survival. In Study 2, we conducted a prospective study at the same hospital to examine characteristics of lay caregivers and healthcare providers and the types of support they provide to alleviate distress and facilitate patients' adherence to prescribed self-care.

STUDY 1: SUPPORT AND SURVIVAL IN ALLOHCT PATIENTS

In Study 1, we conducted a retrospective chart review of alloHCT patients.

Methods

Setting and Participants

The study took place at a large urban teaching hospital which serves a diverse population and has a well-established transplant program delivering alloHCT. The program requires the patient to name a caregiver to become eligible for alloHCT. The research team conducted a retrospective chart review study. Patients were eligible for inclusion in the chart review if they were at least 18 years old and had received their first alloHCT between February 26, 2009 and August 28, 2013. The research team then coded survival data for up to 6 months until February 28, 2014. Patients with identical dates for birth, treatment receipt, or death were individually examined and duplicates due to data entry errors removed, resulting in data from 173 participants eligible for inclusion in these analyses. The local Institutional Review Board of the hospital from which the data were collected reviewed and approved the study (HS# 13-00761).

Measures

Members of the hospital team abstracted information from patient charts, including patient background information on age, gender, minority background, cancer type, and transplant donor type. *Support* was assessed with data from the hospital database (Epic). A member of the research team consulted the "next of kin" information on the first page of each patient chart ("snapshot view") that the study team used in Study 2 to contact caregivers to schedule appointments; it is also used in clinical care, for example, to inform others should the patient pass away or in case of financial matters. This field is filled out by the admission team when a patient is admitted for transplant. We coded support available if there was someone listed in this field (0 = no, 1 = yes). Additionally, if there was no one listed or if the person listed didn't match up with the clinicians' recollection of the caregiver, the staff member read through the Social Work notes, and coded "1" if there was mention of a caregiver consistently involved or 0 if there was no one listed. Due to the placement on the first

page of each patient chart, its use for clinical work as well as hospital finances, and our own observation of its validity in Study 2, we assume that the coded information reflects the availability of support to patients after alloHCT.

Survival was calculated based on the number of days between first transplant and the date when the chart review was completed (February 28, 2014), if the patient was still alive, or date of death, if the patient had died before that point in time. Survival to 100 days and to 180 days was coded as a binary variable (0 = no, 1 = yes). Because patients receive continuing care at the transplant clinic over an extended period of time and the clinic reported patient outcomes to a national database, the abstracting team was able to resolve nearly all issues with missing data or data entry errors.

Data Analysis

We ran logistic regressions predicting survival to 100 days and to 180 days, with the main predictor availability of a caregiver (caregiver available: 1 = yes, 0 = no). In additional analyses, we adjusted for covariates which are relevant for survival, such as age (centered at the grand mean), gender (also centered at the grand mean), minority background (1 = yes, 0 = no), cancer type (leukemia 1 = yes, 0 = no), and transplant donor (with HLA-identical sibling transplant, coded 1 = yes, 0 = no). All analyses were conducted with IBM SPSS version 26.0 with a significance level of $p < 0.05$.

Results

Characteristics of Patients

In total, 173 patients (42.8% female, age: $M = 49.88$) received an alloHCT for the first time in the chart review period. The sample was ethnically diverse, with half of the participants coming from a minority background ($n = 90$, 52.0%; Non-Hispanic White: 48.0%, African American: 10.4%, Asian: 15.6%, Hispanic: 26.0%). A majority of patients had leukemia as cancer type (85.0%). The allogeneic cells for the transplant came in one of three patients from an HLA-identical sibling (36.4%).

Support and Survival

Patients' hospital files mentioned a dedicated caregiver in the patient chart for 150 patients (88.2%), while 23 patients (11.2%) did not have a dedicated caregiver listed. Of the 173 patients analyzed, 146 (84.4%) survived to 100 days after their first transplant, and 123 (71.1%) to 180 days.

Patients with a dedicated caregiver had a higher probability of surviving to 100 days (86.7%) than patients without a caregiver (69.6%), as logistic regression analysis showed, $OR = 2.84$, $p = 0.042$. Multiple logistic regression indicated that this effect was robust, $OR = 3.03$, $p = 0.044$, adjusting for covariates that explain variation in survival, such as age, gender, minority ethnic background, cancer type, and HLA-identical sibling transplant (see **Tables 1** and **2** Part a). In line with prior studies, younger patients and those who were able to obtain an HLA-identical sibling transplant showed a higher probability of surviving to 100 days.

At 180 days, more patients had passed away, and the effect sizes were somewhat smaller and non-significant,

TABLE 1 | Availability of caregiver and frequencies and probabilities of surviving to 100 and 180 days after transplant.

| | | Survival | | Total | Survival probability (%) |
|----------------------------------|-------|----------|-----|-------|--------------------------|
| | | No | Yes | | |
| (a) Surviving to 100 days | | | | | |
| Caregiver | No | 7 | 16 | 23 | 69.6 |
| | Yes | 20 | 130 | 150 | 86.7 |
| | Total | | 146 | 173 | |
| (b) Surviving to 180 days | | | | | |
| Caregiver | No | 10 | 13 | 23 | 56.5 |
| | Yes | 40 | 110 | 150 | 73.3 |
| | Total | | 123 | 173 | |

yet showed the same pattern of results: Patients with a dedicated caregiver had higher chances of surviving to 180 days (73.3%) than patients without a caregiver (56.5%), OR = 2.12, $p = 0.103$, with nearly identical effect size after adjusting for covariates, OR = 2.15, $p = 0.103$ (see Tables 1, 2, Part b).

Discussion

Study 1 found that the availability of a dedicated caregiver was related to a 17.1% higher rate of surviving to 100 days after

transplant, compared to transplant recipients who did not have a dedicated caregiver. Support from a dedicated caregiver in the first months after leaving the hospital seems particularly important, as patients are learning to adapt to the complex self-care regimen. The effect size for survival at 180 days was similar although not significant. The findings are in line with the previous literature, demonstrating that the presence of a lay caregiver was an important factor for survival after transplant (Foster et al., 2005, 2013; McLellan et al., 2011; Beattie et al., 2013) and related to longer survival after transplant (Hoodin et al., 2006; Pillay et al., 2014). We assume that the patients who had a dedicated caregiver recovered better and survived at higher rates after transplant because they were more able to follow the complex life-saving self-care regimen with the help from their caregivers (Ehrlich et al., 2016; Posluszny et al., 2018). In order to better understand the role of support in self-care, Study 2 examined the sources and functions of social support in depth.

STUDY 2: A CLOSER LOOK AT SUPPORT FOR ALLOHCT PATIENTS' SELF-CARE

Study 2 zooms in on the characteristics, support functions and tasks of lay caregivers and healthcare providers.

TABLE 2 | Availability of caregiver and surviving to 100 and 180 days after transplant, logistic regression without and with adjusting for covariates ($N = 173$).

| | | <i>b</i> | SE | Wald | df | <i>p</i> | OR | 95% CI | |
|----------------------------------|----------------------------------|----------|------|------|----|----------|------|--------|-------|
| | | | | | | | | Lower | Upper |
| (a) Surviving to 100 days | | | | | | | | | |
| Univariate logistic regression | | | | | | | | | |
| | Intercept | 0.83 | 0.45 | 3.33 | 1 | 0.068 | 2.29 | | |
| | Caregiver | 1.05* | 0.51 | 4.15 | 1 | 0.042 | 2.84 | 1.04 | 7.77 |
| Multiple logistic regression | | | | | | | | | |
| | Intercept | 1.56 | 0.93 | 2.80 | 1 | 0.094 | 4.76 | | |
| | Caregiver | 1.11* | 0.55 | 4.05 | 1 | 0.044 | 3.03 | 1.03 | 8.90 |
| | Age | -0.43 | 0.19 | 4.88 | 1 | 0.027 | 0.65 | 0.45 | 0.95 |
| | Gender | -0.41 | 0.46 | 0.79 | 1 | 0.375 | 0.67 | 0.27 | 1.63 |
| | Ethnic minority | -0.53 | 0.50 | 1.13 | 1 | 0.289 | 0.59 | 0.22 | 1.56 |
| | Cancer type | -0.71 | 0.82 | 0.74 | 1 | 0.388 | 0.49 | 0.10 | 2.46 |
| | HLA-identical sibling transplant | 1.49 | 0.59 | 6.46 | 1 | 0.011 | 4.44 | 1.41 | 14.01 |
| (b) Surviving to 180 days | | | | | | | | | |
| Univariate logistic regression | | | | | | | | | |
| | Intercept | 0.26 | 0.42 | 0.39 | 1 | 0.533 | 1.30 | | |
| | Caregiver | 0.75 | 0.46 | 2.66 | 1 | 0.103 | 2.12 | 0.86 | 5.21 |
| Multiple logistic regression | | | | | | | | | |
| | Intercept | 0.44 | 0.67 | 0.43 | 1 | 0.513 | 1.55 | | |
| | Caregiver | 0.77 | 0.47 | 2.66 | 1 | 0.103 | 2.15 | 0.86 | 5.42 |
| | Age | -0.16 | 0.14 | 1.26 | 1 | 0.261 | 0.85 | 0.65 | 1.13 |
| | Gender | -0.01 | 0.36 | 0.00 | 1 | 0.968 | 0.99 | 0.49 | 2.00 |
| | Ethnic minority | 0.21 | 0.38 | 0.31 | 1 | 0.580 | 1.24 | 0.58 | 2.62 |
| | Cancer type | -0.54 | 0.55 | 0.99 | 1 | 0.320 | 0.58 | 0.20 | 1.70 |
| | HLA-identical sibling transplant | 0.56 | 0.38 | 2.25 | 1 | 0.134 | 1.76 | 0.84 | 3.66 |

b, regression weight; SE, standard error; Df, degrees of freedom; *p*, significance level; OR, odds ratio; CI, confidence interval with lower and upper limit.

Methods

Setting and Participants

Study 2 is a prospective qualitative study in the same patient population at the same hospital as in Study 1 with partly overlapping participants. During the study period, 84 adult patients received an alloHCT at the study site and they were all invited to participate in the study by the doctors. 7 patients (8.3%) were ineligible for participation because of language barriers (all materials were available in English, Spanish, and Mandarin). The recruitment rate was high, as about half ($n = 38$, 49.4%) of the eligible patients ($n = 77$, 91.7%) agreed to participate and signed consent. However, of the consented patients ($n = 38$), five patients did not participate in the data collection: One patient passed away prior to discharge; one patient had a complicated recovery with many hospitalizations; and three patients withdrew from the study before discharge. Data collection began with 33 patients (42.9%), but five patients were not interviewed for the following reasons: three patients deceased before interview, one was not available for interview and another one was too ill to conduct interview. Thus, we included 28 patients (84.8% of those from whom we started collecting data) in our qualitative analyses.

We interviewed patients ($N = 28$) three to 6 months after their first discharge from the hospital after receiving an alloHCT. Eligible patients were invited by healthcare providers to participate in the study during pre-transplant visits or during their hospitalization after transplant. Individuals were eligible for the study if they were blood or lymphoid cancer patients, scheduled to receive an alloHCT, at least 18 years old and spoke English, Spanish or Mandarin. As already mentioned in Study 1, the hospital requires naming a caregiver for eligibility for alloHCT. Two of the interviews were conducted in Spanish (7.1%), the rest in English ($n = 26$, 92.9%) and none in Mandarin. Participation was voluntary. All patients were prescribed a multiple medication regimen (typically consisting of 18 or more different medications with 24 or more pills per day to prevent or treat GvHD, fungal and bacterial infection, and irritation of the digestive system) as a part of the self-care regimen after discharge which also included frequent hospital visits, and abiding by strict dietary and hydration requirements and hygiene regimens including social distancing (Tombly et al., 2009; Morrison et al., 2017). The local Institutional Review Board of the hospital from which the data were collected reviewed and approved the study (HS# 12-00453). All participants provided written informed consent prior to participation. The study team complied with the relevant standards in reporting results (Tong et al., 2007, 2012; Creswell et al., 2011; O'Brien et al., 2014) and followed the COREQ guideline (Tong et al., 2007) closely (see Appendix A).

Measures

Semi-structured in-depth interviews were conducted. Interviewers followed a structured interview guide (see Appendix B) and probed individuals for detailed answers about their self-care regimen and social support. The interview guide was developed by the principal investigator, who is an expert in health psychology. Interview questions covered various domains related to individuals' self-care regimen, including questions on social support from lay caregivers and healthcare providers. The

interview guide contained the following main questions (see Appendix B for a complete list including additional probes).

- Can you share with me a little bit about how life has changed for you since your transplant?
- Who in your life knows that you are taking medication? Are there people in your life who support you taking your medications? Are there people in your life who help to make sure that you take your medication on time?
- How have your eating and drinking habits changed since the transplant?
- Does anyone help you with the pillbox? Who, specifically, helps you? How do they help you?
- Does a lack of money ever make it difficult for you to take your medication? Can you tell me about this? What do you do about it?
- Tell me about your healthcare provider(s). Who is the person who primarily treats you? What is your relationship like with your care provider? Do you think your relationship with your care provider makes it easier or harder to take your medication? How so? Do you feel like your care provider understands your needs?

To ensure the quality of the interviews, interviewers were trained by the principal investigator; the interview questions were pilot tested during role-play interviews prior to conducting actual interviews with patients. All research assistants at the time had a bachelor's or master's degree in social sciences, public health, or health sciences.

Procedures

Participants who agreed to participate in the study and signed written informed consent forms were contacted in advance to schedule each interview. Individual semi-structured interviews were conducted between three to 6 months after patients' first discharge from hospital. Interviews were conducted either in person before hospital appointments and/or via telephone when participants could not manage hospital visits or preferred telephone interviews. In some cases, the caregiver also joined the interview when accompanying the participant to appointments. Interviews lasted from 40 to 60 min and participants could take a break if desired. All interviews were conducted by two interviewers, with one interviewer asking questions and the other taking notes and recording the interview. All the interviews were audio recorded and transcribed. The audio recordings were deleted after transcription. Data were kept in a secure password protected drive. Participant were made aware of and agreed to being recorded at the beginning of the interview. All confidential information in the interview transcripts was removed and replaced with generic titles (e.g., nurse Jane Doe with Nurse 1).

Data Analysis

Data on support from healthcare providers was missing for two of the 28 participants because the participants felt too sick or could not finish the interview for other reasons. Thus, percentages are calculated based on 26 interviews for information regarding support from healthcare providers. All interview transcripts were read carefully and coded in NVivo version 11. One of the authors

(YS) selected seven interviews from the 28 patients (25%) to represent the sample as best as possible and two coders (YS and SC) coded individually if an interview contained information about support from lay caregivers and healthcare providers. The coders met several times with the project lead (GS) to go over the coding and discuss the discrepancies until the two were in agreement. We calculated kappa coefficient based on a binary coding if support from a lay caregiver and a healthcare provider was mentioned by the patient (mentioned: 1 = yes, 0 = no). Kappa coefficients for support from lay caregivers and support from healthcare providers were calculated separately. The kappa for sources of support (lay caregivers' support mentioned, yes/no; healthcare provider support mentioned, yes/no) was in agreement ($\kappa = 1.00$). The finer coding of the subcategories of social support used thematic analysis (Braun and Clarke, 2006). The coding scheme initially followed classical social support theory, including instrumental, emotional and informational support (Weiss, 1974; Cohen and McKay, 1984; House et al., 1985; Thoits, 2011). Two coders (YS and SC) coded relevant quotes on social support, to identify the meanings in the interviews and analyze the data. While reading through the interviews for coding the coders identified additional themes, so added codes for the following themes: meaning in life, financial support from lay caregivers, and support with medical needs from healthcare providers. An initial category with the working title "Lack of support" was modified and renamed to ambivalence about support. A codebook was developed listing different themes, definitions, and examples (see Appendix C). All interview transcripts and relevant quotes were carefully read again by one of the researchers (YS) to calculate the number of patients and percentage of total participants that had mentioned a specific theme at least once.

Results

In total, 28 individuals (46.4% female, age: $M = 53.97$) participated in the interviews. The sample was ethnically diverse, with almost half of the participants coming from a minority background ($n = 13$, 46.4%): Non-Hispanic White: 53.6%, African American: 7.1%, Asian: 17.9%, Hispanic: 17.9%, other: 3.6%.

Characteristics of Lay Caregivers

Lay caregivers, such as family members and friends, were the primary source of social support for transplant recipients. All participants reported receiving support from family members, friends, or acquaintances ($n = 28/28$, 100.0%). Moreover, about half of the participants reported to have at least one primary source of support, usually a spouse or partner, who was their main caregiver over the course of the transplant ($n = 15/28$, 53.6%, see **Figure 1**). For example, a participant mentioned that his wife supported him in taking his medications (P13, male). Another participant mentioned, "My husband does everything! He's actually on top of everything more than I am." (P07, female)

A considerable number of transplant recipients ($n = 11/28$, 39.3%) reported relying on several lay caregivers, such as the partner and other family members ($n = 6/28$, 21.4%), family members other than the partner ($n = 4/28$, 14.3%), or family

members and friends ($n = 1/28$, 3.6%). One of the participants mentioned that his whole family ensures that he takes his medications regularly on time (P14, male). Another participant mentioned,

Well, yes my mother, I talk to her every day, three times a day, again my son, my boyfriend, (...) so yes, I have a lot of people supporting me, asking me this, did I do this. (P31, female)

Additionally, in two cases, acquaintances or non-family members supported individuals after transplant as lay caregivers ($n = 2/28$, 7.1%). One of them mentioned,

The helpers are mainly people from my [place of worship]. I have a woman who accompanies me to all my visits. Since my first transplant she has gone to every appointment with me. She brings lunch and meals and snacks. And uh, there's a team of persons who provide me what I need in terms of food and stuff like that. So they've been very helpful. Um... I have a staff. A secretary, a bookkeeper, a staff in the kitchen. They do parts just to make sure. To get my car moved, get my mail, someone to go to the bank. So they take care [of] all those things. (P19, male)

Regardless of the type of their connection to the patient, patients described lay caregivers as essential for post-transplant recovery. For some patients after transplant ($n = 4/28$, 14.3%) this extended into experiencing new meaning in life, with life after transplant perceived as an opportunity to love and be with loved ones. A participant mentioned,

I have grown to love everything (...) I have taken advantage of time spent with my children, putting more attention to everything in life and being appreciative of God each and every day. (P23, female)

Types of Support From Lay Caregivers

Lay caregivers supported individuals after transplant in three main ways, instrumental, emotional, and informational support, with some patients noting some ambivalence about receiving support (see **Table 3** for an overview). We will present each type of support with examples. Regarding *instrumental support*, lay caregivers had a wide range of tasks to help the patients with from daily living, financial matters to medication intake, to reduce the risk of infection in the immunosuppressed patients.

[My] husband does all the homework. He cooks, I don't. Doctor doesn't want me to have outside food. He reminds me to take the medication, he reminds me almost every time. (P11, female)

Instrumental support for daily living is vital as individuals after transplant must reduce their exposure to all possible sources of infection. This includes eating cooked foods only, watching what they drink and touch, and maintaining physical distance from people while managing side effects and other physical complications (Beattie and Lebel, 2011). Instrumental support for daily living from lay caregivers is crucial, including driving, cooking, getting groceries, and fulfilling daily practical needs ($n = 16/28$, 57.1%).

One participant mentioned,

Fortunately, my father helps me out with the transportation most of the time, so I don't have to rely on public transportation. So, I

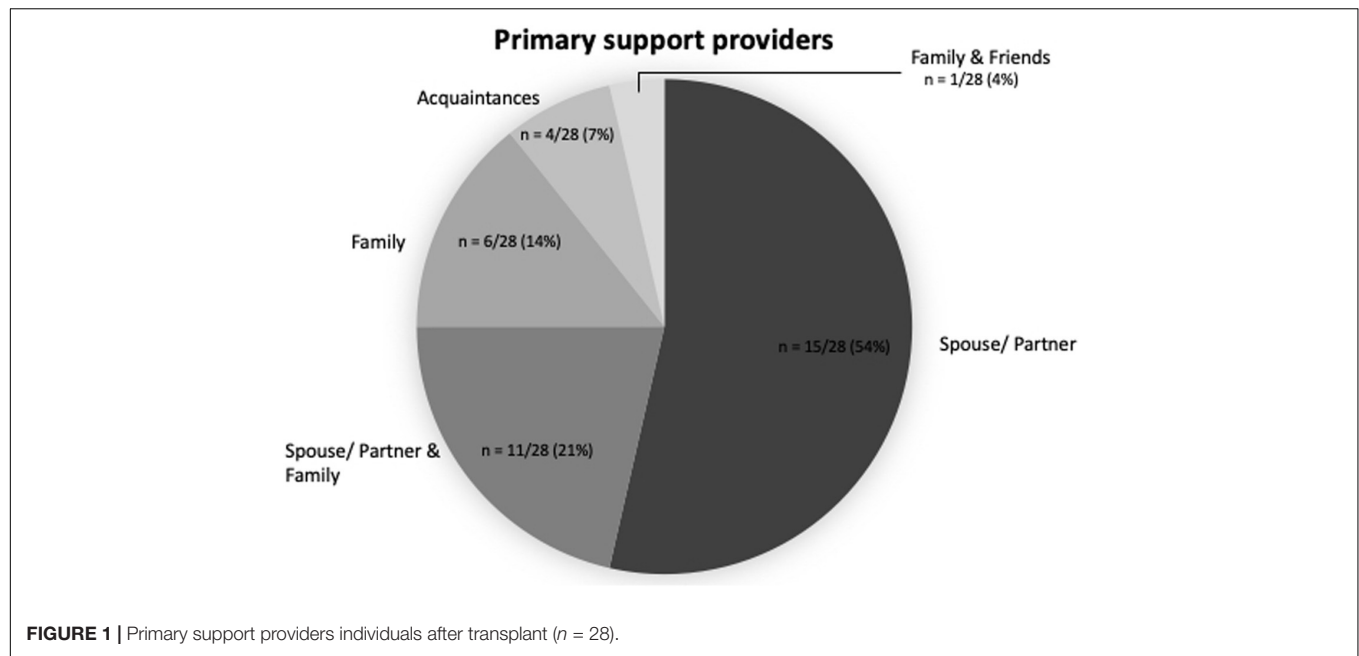


TABLE 3 | An overview of the type of support, definition and number of patients reporting it (N = 28).

| Types of support | Definition | N = 28 n, % |
|-------------------------------------|---|-------------|
| Lay caregivers | | |
| Instrumental support: | Tangibly helping patients through taking relevant actions: | |
| For daily living | Providing support relevant to maintain daily lives of patients, including driving, cooking, getting groceries, and fulfilling daily practical needs | 16, 57.1% |
| For financial matters | Supporting patients with expenses related to alloHCT treatment | 4, 14.3% |
| For medication intake | Supporting patients with medication-related tasks, including taking medications, reminding of doses, refilling, and picking up the medications | 26, 92.9% |
| Emotional support | Supporting patients by expressing words of encouragement, empathy and caring | 11, 39.3% |
| Informational support | Lay caregivers were not the primary sources of informational support, but they helped as memory facilitators and conveyers of information from the healthcare providers | 1, 3.6% |
| Ambivalence about receiving support | Support attempts that were not perceived as helpful or relevant to patients | 7, 25% |
| Healthcare Providers | | |
| Informational support: | Providing relevant information about survival and self-care after discharge | |
| Medications | Any relevant information about prescribed medications, including their functions, dosing information, side effects, and how to take them | 23, 88.5% |
| Self-care | Information relevant for self-care (other than medication intake) included guidelines for nutrition and hydration | 6, 23.1% |
| Support for medical needs | Helping patients practically to fulfill their medical needs through relevant actions (e.g., refill medications on time), which often made patients feel emotionally supported and cared for | 18, 69.2% |
| Emotional support | Providing words of encouragement, making patients feel cared, which contributed to a trusting relationship between healthcare providers and patients | 9, 34.6% |

would be infection free or decrease the chances of infection. (P20, male)

Another participant said that his wife makes sure to provide food and drinks that are nutritious and hydrating, yet very enjoyable and creative.

My wife was coming up with creative things, too. I started running out of ideas. She found things at Whole Foods like chicken potpie and roasted vegetable pot pie. I had a lot of stuff like that. It was very flavorful. (P10, male)

His wife also provided him with different drinks to make sure he stayed hydrated. "I'm very aware of having to hydrate because of these drugs. It's also part because of my wife. She buys creative food things for recipes and different drinks." (P10, male)

One participant suffered from stomach issues that made her nauseous, and her husband cooked food that was easy to swallow and digest. She said,

Husband does all the homework. He cooks, I don't. Doctor doesn't want me to have outside food. We eat together, every 2 to 3 hours

I have to eat, unless I have a stomach problem. It's the time when I am going to eat. Some snack: rice cake, I am [Asian]. (. . .) Every 2 hours I ate rice cooked with lots of water. Don't have to chew; I was able to eat just a little bit, every 2 hours. (P11, female)

Instrumental support with financial matters is critical for patients as hematopoietic cell transplant is expensive and requires an extensive treatment process over a long period of time, often creating financial hardship for individuals and their families after transplant (Khera et al., 2014; Kim et al., 2015). Instrumental support with financial matters helped individuals to ameliorate their financial burdens, as well as their emotional stress and anxiety, as explicitly mentioned by some ($n = 4/28$, 14.3%). One mentioned, "I don't even know where the bills are. I think he doesn't want me to know because he doesn't want me to worry." (P07, female). Moreover, lay caregivers needed to balance the need for financial support with caring for individuals after transplant.

She has her own business, but she works from home. Financially we weren't fantastic but no, she didn't work a lot. She was kind of holding it all together. While I was at the hospital, she was not focusing on work at all. (P10, male)

Instrumental support for medication intake is another critical area in which patients need help, as individuals after transplant must take numerous medications even after a successful transplant and discharge from the hospital. Medication-related tasks are critical yet difficult for individuals after alloHCT due to the number and complexity of medications. Nearly all individuals in the sample ($n = 26/28$, 92.9%) mentioned that their lay caregivers helped with medication-related tasks, such as taking medications, reminding of doses, refilling, and picking up the medications.

Every 2 and 3 hours I have to take the medication. I have to be aware of the time and take and my husband reminds me. In 6 months, I have only missed one tablet. (P11, female)

She also mentioned that she was able to refill medications on time because of her partner's support: "[My] husband calls the pharmacy, they send us FedEx." (P11, female)

Emotional support, such as expressing encouragement, empathy and caring, plays a significant role in helping individuals after transplant as patients after alloHCT become physically and emotionally vulnerable (Rini et al., 2011). More than half of the participants reported receiving emotional support ($n = 11/28$, 39.3%). "As soon as I went into the hospital, my husband put up a website for me because everyone called. So many people wrote in, it was wonderful" (P07, female). Internet and technology development have also facilitated emotional support. "I stay home, but I'm not alone a lot. I do have friends who drop in a lot. We have a lot of support. And I Skype a lot, everybody has that all over the world." (P07, female)

For emotional support, individuals after transplant rely on a broader range of support sources than for instrumental support, including members of their extended family, friends, and acquaintances. In one case, an individual relied more on friends for emotional support than family members and distinguished the different types of support she received.

They really support me in every way, my friends and my family. But for the medication, it's my family, my husband and my little ones, they remind me all the time, but emotionally, my friends, they help me, like when I'm not feeling too up to it, or if I don't have, like, enough energy they help me a lot. (P22, female)

Individuals after transplant also perceive the importance of receiving emotional support. An individual after transplant suggested to other patients,

To be able to talk about your problems, talk with friends and family. I would [be] trying to get them involved in a support group. I am lucky to have a very supportive family and friends, so I didn't have to go out of my shell. You want people to ask how you are doing. You need someone who is patient enough to listen. (P07, female)

Informational support was not reported from **lay caregivers ($n = 0.0\%$)** as healthcare providers were the primary source of informational support, but lay caregivers helped as memory facilitators and conveyers of information from the healthcare providers. In one interview the caregiver interrupted to provide the correct response when the patient was asked what medications he had to take on an empty stomach. The wife interrupted that "the only one that he takes on an empty stomach is Prilosec" (P25, male). This response indicates that she helped the patient to remember the information. One patient ($n = 1/28$, 3.6%) mentioned her "husband keeps asking doctors about [side effects of medications]" (P07, female). In this case, the patient's husband helped the patient by clarifying and reiterating the information received from the doctors and also asked further questions that the patient might have missed or forgotten to ask. All other participants sought information either by using online resources or directly asking their healthcare providers. One person mentioned, "most of the teaching [is through] the doctors, and the nurses. And I also go online sometimes and do my little own research." (P22, female)

Support attempts were not helpful to all individuals and some patients expressed *ambivalence about support* from others ($n = 7/28$, 25%). One participant chose not to share his situation with the people around him at all, believing that it would only cause more trouble.

I'm a public figure, I kept it secret for a long time, (. . .) Keeping it secret: if I told them they were going to worry. They would want me to take medication they know about. Take this, take that. I [had] not wanted to deal with all that advice. Listen, I have my doctors. You guys, just pray, don't try to be my doctors. (P19, male)

Four patients expressed that they did not like the feeling of being monitored by their lay caregivers. They sought independence and control over their situation, though to no avail. In these cases, less support may be better. They perceived actions of support not as helpful, but somewhat unpleasant and even troublesome. An individual mentioned,

My wife asks me all the time whether I'm taking medications, whether I took the medications, but basically I just think she's asking too much because I'm just taking it. (P13, male)

One mentioned that he does not take medications when he is bothered by other people (P17, male). The degree of support received, and the quality of relationships varied among individuals.

In another case, the support from lay caregivers was ambiguously helpful. A participant mentioned the clothes she is accustomed to wearing:

My sister doesn't want me to use that, she buys new clothes. I want the old clothes. She said I cannot use it anymore. Where is it what I like. Even [the clothes] is old [in] our thinking, I will go to the dry cleaning, wash and dry clean. I don't know where the clothes are. She is hiding clothes away. I don't know where they are (P29, female).

Characteristics of Healthcare Providers

We found that all participants asked about healthcare providers identified them as a source of support (100% of 26 interviews). Participants referred specifically to doctors and nurses when speaking about healthcare providers. At the hospital, clinical interdisciplinary teams worked closely together. Therefore, most individuals after transplant perceived them as a team ($n = 22/26$, 84.6%).

Nearly all individuals reported having a good relationship with their healthcare providers and evaluated the relationship as positive ($n = 24/26$, 92.3%). The quality of the patient-healthcare provider relationship influenced individuals' health behaviors, especially with regards to making medical decisions. When patients built trusting relationships with their healthcare providers, they felt confident following their healthcare providers' guidelines. One individual mentioned, "I'm a believer, I believe in him. First thing we do in any situation that you want to get help you have to believe. I believe in him. So what he says is right." (P17, male) Another individual also mentioned,

Very simply, they have my best intentions in mind, and they override what do you call it. they know what the right thing to do is, whether I like it or not. So they're not sticking me with bad tasting medications on purpose to make me feel bad. This is the right thing to take. They're the experts, they know the conditions, they know what's coming. (P13, male)

At the same time, one participant ($n = 1/26$, 3.8%), while mentioning he did receive some support from his healthcare providers, also expressed that he had received too little information at the discharge meeting and was therefore dissatisfied with the healthcare providers. He said,

I ended up back in here [admitted to the hospital]. They didn't talk about hydration. (...) Hydration is likely a bigger deal than they tell you about. I was back in for 12 days. I was berserk about that. (P01, male)

Another patient was ambiguous in her response regarding the relationship with healthcare providers and did not quite perceive a relationship: "Well, I have not had problems with them. I don't care." (P12, female)

Types of Support From Healthcare Providers

Individuals after transplant perceived that their healthcare providers mostly provided informational support in line with

their expertise. However, many individuals mentioned that they also received other types of support from the healthcare providers, including emotional support. We will present specific examples detailing the kinds of support provided and how they helped patients after transplant (see **Table 3** for an overview).

Individuals after transplant mostly received *informational support* from healthcare providers ($n = 23/26$, 88.5%). A wide spectrum of healthcare providers, including pharmacists, dietitians, hematologists and specialist nurses, provided informational support verbally and in writing. Patients received information on medications ($n = 23/26$, 88.5%) and nutrition, including hydration ($n = 6/26$, 23.1%).

One participant reported that the relationship with healthcare providers made it easier to take medications.

Because they tell me exactly that I need to take them, why I need to take them, yeah always teaching. Always teaching, yup. Every single day, every single appointment. The nurse coming first goes over all of the medication and the doctor will do the same thing. (P22, female)

Many patients reported that their health providers met their *medical needs* ($n = 18/26$, 69.2%). One individual mentioned, "They make sure that all my medical needs are met so I can recover and go back to a regular life." (P14, male). Another patient recalled the help she received when she forgot to refill her medications on time and needed an immediate supply. "I have run out of the Prograf and that is very important, but the doctors called in a 4-day refill script to [name of pharmacy 6] and I picked it up." (P31, female). Often, support for medical needs was combined with emotional support, as a female participant reported in dealing with her difficult stage four GvHD. She said,

One of the reasons, I have to tell you, are the [name of hospital 1] nurses. They are angels. They packed me in ice at night. They looked at me, my skin was peeling, you couldn't touch me any place without me screaming because it hurt so much. It's very good to have nurses that are so kind. They actually stayed with me. They didn't have to do more than just come when I rang the bell. It's harder at night because everything is so quiet, and nothing can distract you from the pain. (P07, female)

Healthcare providers, usually nurses, were also the sources of *emotional support*, encouraging individuals after transplant and showing care for their personal lives ($n = 9/26$, 34.6%). The attitude of healthcare providers and the way individuals after transplant perceived them influenced them in their recovery process. As one participant noted,

In the sense that they know things are important, they make me feel like my recovery is important, they make sure that all my medical needs are met so I can recover and go back to a regular life. (P14, male)

Another participant said,

I think the best thing was speaking with all the nurses. Becoming friendly with them. (...) Yeah, and the day I left the hospital was my birthday and they brought me a birthday cake. I can't believe they did that! So that was nice, that brightened up my day. (P43, female)

Emotional support contributed to a good and trusting relationship with healthcare providers, encouraging and helping individuals after transplant to recover. None of the patients expressed *ambivalence about support* from healthcare providers ($n = 0/28, 0\%$).

Discussion

Study 2 explored the sources and functions of social support for adherence to recommended self-care in individuals after alloHCT. In line with a previous study, the role of lay caregivers is critical for patients after alloHCT as they closely support patients with managing home care and other daily tasks after transplant (Posluszny et al., 2018). Moreover, healthcare providers played an important role in providing information regarding medications and self-care after discharge. They supported patients with medical needs and also cared and comforted them. Our findings suggest that these support sources serve complementary functions. While emotional and instrumental support is largely within the domain of lay caregivers, medical needs and informational support are mostly provided by healthcare providers. Thus, patients must coordinate support-seeking from both lay caregivers and healthcare providers to facilitate multiple medication intake and self-care after alloHCT.

General Discussion

The current study examined the importance of social support in patients after alloHCT. Both quantitative and qualitative data suggest the importance of social support to enable patients to maintain a complex self-care regimen related to infection prophylaxis and survival. Study 1 found that the presence of a dedicated lay caregiver is related to improved chances of survival after alloHCT, supporting previous findings (Beattie et al., 2013; Foster et al., 2013; Ehrlich et al., 2016; Harashima et al., 2019) and Study 2 examined the different types of support provided by lay caregivers and healthcare professionals. Our findings suggest that lay caregivers and healthcare providers each serve the patients in different ways. Moreover, the different sources and networks of social support in Study 2 (see **Figure 1**) suggest that information on marital status misses the contribution of other lay caregivers, which may explain why these studies found no link between marital status and survival (Gerull et al., 2017; Sato et al., 2018; Tay et al., 2020). More nuanced measures of support than marital status should be considered for future research.

The difficulties of recovery after transplant, often characterized by severe complications, patients feeling unwell, fatigued, and socially limited due to their immunosuppressed state, make caregiver support essential for day-to-day living (So et al., 2003; Soubani, 2006; Rini et al., 2011; Wulff-Burchfield et al., 2013; Posluszny et al., 2018). Financial support seems essential for patients after alloHCT (Preussler et al., 2019). Our culturally diverse sample showed a uniformly high reliance on social support, although ethnicity and cultural background played a role in providing appropriate concrete supportive acts (e.g., support for adequate nutrition and hydration with buying bread and soft drinks vs. cooking rice with lots of

water). Furthermore, caregivers' presence motivated patients and gave them reasons to live despite their difficult health condition, supporting prior research (Krause, 2007). We assume that this mechanism is also true for lay caregivers who were shouldering a high caregiver burden in meeting the considerable physical, financial, and emotional needs of individuals after transplant. The presence of their loved ones, despite their worsened health condition, may give meaning to caregivers' own lives. Efforts made by healthcare providers to support patients were deeply appreciated by participants. In line with prior research, caring and trusting patient-provider relationships foster patients' adherence to recommended self-care (Haskard Zolnierok and DiMatteo, 2009; Hillen et al., 2010; Espinosa and Kadić-Maglajlić, 2019).

There are several limitations to these studies. First, both studies were conducted in a single treatment center in a large urban area over a limited period of time. The findings may not be generalizable beyond this setting and time period. However, the diversity of the sample regarding ethnic background and age range makes it likely that the findings will be more widely applicable. Second, Study 2 may show some sampling biases, as participants who volunteered to enroll and be interviewed could differ from those not enrolled or interviewed (e.g., in health or adherence). We tried to limit bias by inviting everyone who was eligible and scheduled to receive an alloHCT. Another potential bias is that individuals may have provided socially desirable responses during the interviews. However, participants were highly motivated and passionate about contributing to the study to improve care for future transplant recipients and often contributed more than we asked (e.g., by sending pictures of their numerous pill containers). Therefore, we assume that many participants responded with earnestness and sincerity. In future research, interviewing the caregiver could give an additional validation of patients' reports and a complementary perspective (Posluszny et al., 2018). Third, the treatment center we collaborated with required nominating a dedicated support provider in order to receive an alloHCT, as is common practice (National Marrow Donor Program, 2017; Preussler et al., 2019). Thus, the majority of patients in Study 1 and 2 had a dedicated caregiver, and only a small group of patients had limited or no support. Future studies in treatment centers which do not require a caregiver may observe stronger effect sizes than those observed in this study. However, we observed variability in support in Study 1 and 2; despite the efforts of the hospital, some caregivers do not fulfill their role. Anecdotally, during data collection for Study 2, we received consent from two individuals whose lay caregiver support was minimal, and both patients passed away before we could interview them. These two cases, in addition to our observations of the high support needs of our participants, illustrate the difficulty of adhering to the self-care recommendations and the multiple medication regimen without a rigorous support system, with severe consequences for survival. Fourth, in the chart review in Study 1 the research team was able to merely establish the presence of a caregiver but was not able to determine more information about the quality of support (e.g., if there were other caregivers involved and with what frequency and duration caregivers were available,

as others have done; Foster et al., 2013). In Study 2, we were able to describe the sources and functions of support in detail, but the sample was too small to examine the link with survival. Therefore, the conceptual linkages between types of support and impact on survival are merely suggestive and require further research.

Despite these limitations, this article has several strengths. First, this article contributes to previous literature that support truly matters for survival (Beattie et al., 2013; Foster et al., 2013), using both quantitative and qualitative data. Study 1 underscored the essential role of support, while Study 2 provided a nuanced description of the characteristics of support providers and types of support. The availability of support may influence survival in two ways. Support may impact adherence to a complex self-care regimen with quality of life. Support may also help patients find meaning in life and carry on despite facing a high risk of mortality and challenges with quality of life. Second, this article contributes to the evidence base of a less frequently studied cancer population (i.e., blood and lymphoid cancer patients after alloHCT), where there is to our knowledge just one other study of patient-caregiver responsibilities (Posluszny et al., 2018). Finally, to facilitate adherence to this complex self-care regimen, all three parties—the transplant recipient, lay caregivers, and the healthcare providers—must work together as a team. A prior systematic literature review showed that social support from family members increases medication adherence (DiMatteo, 2004), but does not focus on healthcare providers. Our findings suggest the importance of support from healthcare providers who should be considered part of the patient support team.

Based on our findings, we propose a process model of social support for patients who need to perform a complex self-care regimen, which needs to be tested in future studies

and could inform intervention development (see Figure 2). The figure represents the interactions among the support triad of healthcare providers, lay caregivers, and patients, and the functions of social support from each source. Based on a strong foundation of trust, healthcare providers are mainly responsible for providing professional informational support regarding prescribed medications and medical needs, and effectively communicating this information to patients and lay caregivers. Lay caregivers provide more intimate, daily instrumental support, such as refilling and organizing medications, managing financial matters, cooking, and helping with physical distancing. They are also the major sources of emotional support, encouraging and comforting patients, which helped patients to maintain a positive and optimistic attitude toward their recovery. We propose that the different types of support are partly co-occurring and intertwined (e.g., with actions of practical support expressing a lay caregiver's love for the patient) and that there may be an interactive effect between different types of support that deserves further research.

Our findings—although they are based on a limited sample size from a single transplant center—highlight the importance of measures that many transplant centers already implement in their clinical care to ensure adequate support for individuals after transplant. To ensure that patients and caregivers can follow the complex self-care regimen, healthcare providers need to devote time and attention to conveying the details about the relevant self-care tasks. Although transplant clinics already provide relevant education sessions to patients and caregivers, consistent implementation is critical, and it might be also helpful to repeatedly check on the availability of caregiver support throughout treatment even after discharge (Preussler et al., 2019). A scheduled dedicated prescription meeting delivered by a nurse

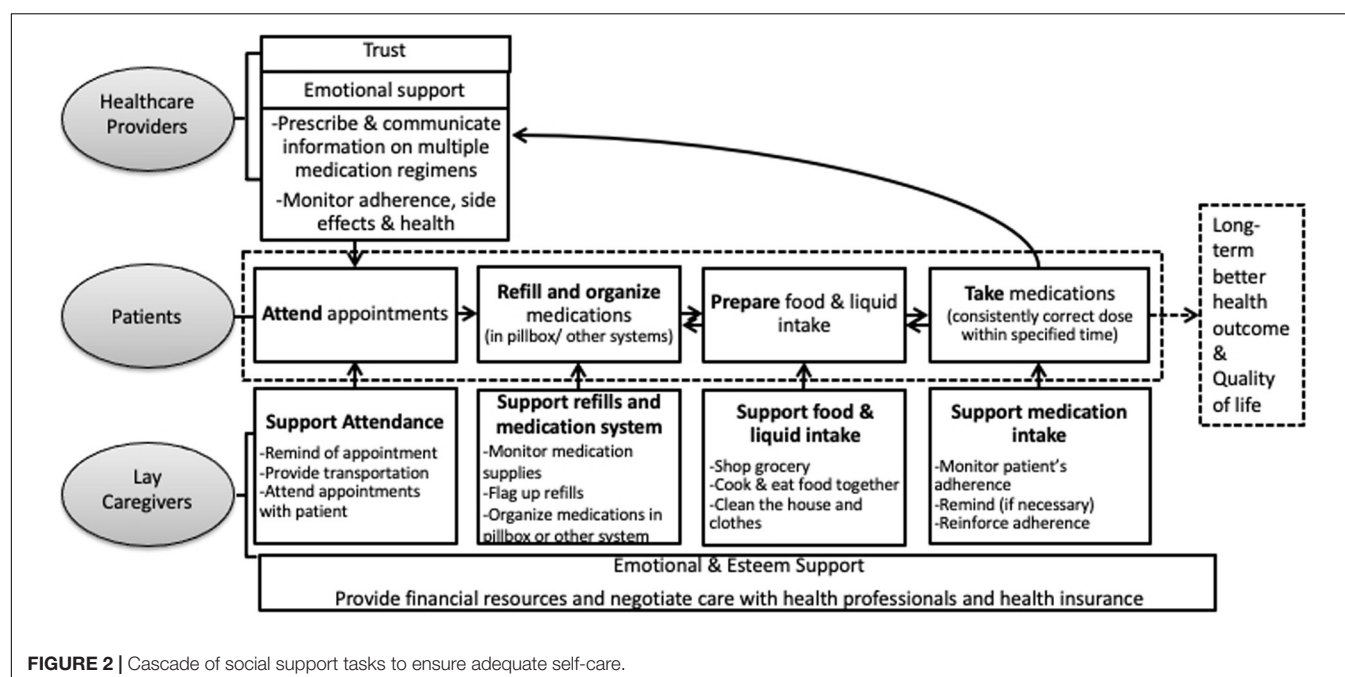


FIGURE 2 | Cascade of social support tasks to ensure adequate self-care.

or a pharmacist in the presence of both patient and caregiver was helpful to the participants in this study who received it. Second, the requirement to nominate a dedicated lay caregiver after transplant seems to be warranted. Third, social support is essential for following a self-care regimen. If providers of social support cannot attend the prescription meetings, they should be informed about the patient's support needs via a phone call or at least by a written letter. Lastly, we suggest the need for more clinical interventions and possibly policy implementations as some question whether poor social support should keep patients from receiving a transplant (Sharma and Johnson, 2019).

CONCLUSION

In conclusion, this study contributes to a more detailed theoretical and practical understanding of social support for a complex self-care regimen. To the best of our knowledge, this is amongst the first in-depth investigation of support, survival and self-care in patients after alloHCT. The teamwork of patients, lay caregivers, and healthcare providers is the basis for successful survival after transplant. Based on our findings, healthcare providers and lay caregivers must work in tandem to promote adherence to self-care regimens. The results of this study also suggest that there is a need to develop interventions for patients and their caregivers to facilitate treatment adherence for survival.

DATA AVAILABILITY STATEMENT

The datasets for these studies are available from the authors on request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the local Institutional Review Board at Mount Sinai School of Medicine reviewed and approved both studies (Study 1: HS# 13-00761 and Study 2: HS# 12-00453).

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The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GS designed the research project. ES and WHR advised with designing the study and also helped conduct the study. GS and YS developed the research questions. GS analyzed the data for Study 1. YS and SC helped with data collection and analyzed the data for Study 2. GS wrote Study 1 and YS wrote Study 2. YS, SC, JR, and GS contributed to writing and revising the manuscript. YS, JR, and GS revised the manuscript for the final submission. All authors contributed and provided revisions of the 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.2021.624906/full#supplementary-material>

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Joint Goals in Older Couples: Associations With Goal Progress, Allostatic Load, and Relationship Satisfaction

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Older adults often have long-term relationships, and many of their goals are intertwined with their respective partners. Joint goals can help or hinder goal progress. Little is known about how accurately older adults assess if a goal is joint, the role of over-reporting in these perceptions, and how joint goals and over-reporting may relate to older partners' relationship satisfaction and physical health (operationally defined as allostatic load). Two-hundred-thirty-six older adults from 118 couples (50% female; $M_{\text{age}} = 71$ years) listed their three most important goals and whether they thought of them as goals they had in common with and wanted to achieve together with their partner (self-reported joint goals). Two independent raters classified goals as "joint" if both partners independently listed open-ended goals of the same content. Goal progress and relationship satisfaction were assessed 1 week later. Allostatic load was calculated using nine different biomarkers. Results show that 85% self-reported at least one goal as joint. Over-reporting— the perception that a goal was joint when in fact it was not mentioned among the three most salient goals of the spouse – occurred in one-third of all goals. Multilevel models indicate that the number of externally-rated joint goals was related to greater goal progress and lower allostatic load, but only for adults with little over-reporting. More joint goals and higher over-reporting were each linked with more relationship satisfaction. In conclusion, joint goals are associated with goal progress, relationship satisfaction, and health, but the association is dependent on the domain of functioning.

Keywords: close relationships, joint goals, older adults, relationship satisfaction, allostatic load, goal progress, couple, health

INTRODUCTION

Many marriages in old age are long-term relationships (Meegan and Berg, 2002). Older spouses tend to become more central to each other due to an increased focus on close, emotionally meaningful relationships (Baltes and Carstensen, 1999). Partners shape each other's behavior, physiology, and health (e.g., review by Kiecolt-Glaser and Wilson, 2017). One underlying mechanism may be shared goals (Lauer et al., 1990; Berg and Upchurch, 2007). Goals serve as a personal compass into old age (Hooker, 2002). Goals are mostly examined in samples of

unrelated individuals, and yet, they often need to be coordinated with close others such as spouses (Baltes and Carstensen, 1999; Mann et al., 2013; Fitzsimons and Finkel, 2018). Little is known about the proportion and type of goals that older spouses have in common and the correlates for everyone involved. Using a sample of 118 older couples, this brief report seeks to fill this gap by investigating the joint nature of everyday goals, taking into account the perspective of both partners as well as potential implications for goal progress, health, and relationship satisfaction.

Joint Goals and Goal Progress

We operationally define goals as joint when spouses report goals they have in common and want to achieve together with their partner. Extending research with younger couples and a focus on relationship goals (Avivi et al., 2009) we assume that a higher number of joint goals allows older spouses to pool their resources and make better goal progress.

Importantly, partner ratings of a goal as joint might not always be accurate; instead, they may be positively biased (Martz et al., 1998; Gagné and Lydon, 2004). Known as the “positivity effect,” older adults prioritize positive over negative information (Baltes and Carstensen, 1999; Carstensen et al., 2003). Older adults also view their spouse’s behavior as more positive during conflict than middle-aged couples in the eye of independent observers (Story et al., 2007). We, therefore, assume that perceptions of goals as joint may not always be accurate but positively biased in the present sample. In other words, older spouses may over-report joint goals relative to external raters. Over-reporting occurs if older adults—thinking of joint goals as joint when in fact it is not mentioned among the three most salient goals of the spouse. In line with the Transactive-Goal-Dynamics Theory (Fitzsimons and Finkel, 2018) and previous research indicating that older couples with more joint goals use more collaborative problem-solving (Hoppmann and Gerstorf, 2013) and engage in more spousal goal involvement (Meegan and Goedereis, 2006), we argue that to translate joint goals into action, goal coordination between partners is key. To collaboratively engage in goal coordination, the Transactive-Goal-Dynamics Theory states that it is necessary that partners adjust their behavior to each other’s goal-relevant states (e.g., expectations). A discrepancy between assumed and actual joint goals makes that difficult and may thus hinder goal coordination and ultimately goal progress. We thus assume that joint goals can be better pursued if both partners have correct insights into each other’s salient goals, which facilitates goal coordination. Therefore, we expect that more joint goals are associated with greater goal progress, particularly when older adults accurately perceive their salient goals as jointly held, i.e., they engage in little over-reporting.

Joint Goals and Allostatic Load

Joint goals may not only impact everyday behaviors but also shape health outcomes, possibly through stress-related pathways and lifestyle factors (Hoppmann and Klumb, 2006; Hoppmann and Gerstorf, 2014; Feeney and Collins, 2015). This may be particularly true among older adults due to age-related wear and tear (Seeman and Gruenewald, 2006). A well-established

index of stress-related wear-and-tear is allostatic load (Seeman et al., 2004). Allostatic load taps into different biological systems, including neuroendocrine and cardiovascular risk markers (Seeman and Gruenewald, 2006). Previous research indicates that social factors such as positive and close relationships, spousal presence and social support are linked to reduced allostatic load (Seeman et al., 2002; Juster et al., 2010; Brooks et al., 2014; Priest et al., 2015). In contrast, higher spouse and family negativity are related to higher allostatic load (Brooks et al., 2014). We expected that a high number of joint goals would be associated with low allostatic load, possibly because older spouses with many joint goals are better able to coordinate complex health goals, engage in dyadic planning, and accordingly have healthier lifestyles and experience less stress (Keller et al., 2017; Wiley et al., 2017; Berli et al., 2018; Fitzsimons and Finkel, 2018). Thus, we expect that when older adults’ perceptions of joint goals converge with what independent raters are able to detect, they can better coordinate goal-directed activity. Therefore, parallel to our hypothesis regarding goal progress, we expect the association between joint goals and low allostatic load to be more pronounced if older adults accurately perceive their goals as jointly held, i.e., they engage in little over-reporting.

Joint Goals and Relationship Satisfaction

With increasing age and a limited future time perspective, there is a shift in goals toward emotionally meaningful social relationships (English and Carstensen, 2014). Therefore, we aimed to investigate - as a third relevant correlate - how joint goals might be related to relationship satisfaction. The Eudaimonic Theory of Marital Quality proposes that shared goals are central ingredients of marital satisfaction (Fowers and Owenz, 2010). Shared goals address inherent needs for security and belonging and foster dyadic processes such as the inclusion of the partner in the self, couple identity, and commitment. We assume that rosy-colored views of goals as shared with a partner would be positively associated with relationship satisfaction and that this association would not be tempered by positively biased over-reporting of joint goals as relationship satisfaction may be based on subjective perceptions and is less behavioral than the other two indicators. Accordingly, we expected that more joint goals would be associated with higher relationship satisfaction.

The Current Study

Incorporating the perspective of both spouses, this brief report elucidates how joint goals are linked with goal progress, health, and relationship satisfaction taking into account meaningful differences between subjective and external ratings of joint goals. Specifically, we hypothesized that more joint goals would be related to greater goal progress (hypothesis 1, Hp1), lower allostatic load (Hp2), and higher relationship satisfaction (Hp3). In line with motivational theories, we assumed that goal coordination is necessary to translate joint goals into goal progress and allostatic load. Thus, we expected the associations between joint goals and goal progress and allostatic load to be stronger if older adults accurately perceived their salient goals as jointly held (moderation effect).

METHODS

Participants

Participants were 118 community-dwelling couples ($N = 236$ individuals). From the original 258 participants who entered the study, nine couples dropped out after the baseline session and two further couples had to be excluded due to missing values on the main outcome variables. The sample included ethnically diverse heterosexual couples aged 60–87 years ($M = 71.01$, $SD = 5.97$) as described in Table 1. 82.4% of couples were married and 7.6% lived in a domestic partnership; relationship duration was 41.01 years on average ($SD = 13.30$).

Procedure

The study was part of a larger project on spousal health dynamics (described in **Supplementary Material 1** and Pauly et al., 2019). Couples were recruited in the greater Vancouver area using various strategies (e.g., media, community organizations). Informed consent was obtained (University of British Columbia ethics board), and each partner received \$100 compensation. The study consisted of a baseline-session, a 1-week time-sampling phase, and an exit-session 1 week later.

Measures

Personal Goals and Self-Reported Joint Goals

Participants reported three open-ended, particularly salient goals (A,B,C) whose realization was highly important to them within the upcoming week (based on Hoppmann and Klumb, 2006; see **Supplementary Material 2**). Afterward, participants self-rated their goals along 12 domains (e.g., “work,” “family,” multiple answers possible). For each goal, participants were asked, “Is this a goal that you and your partner have in common and want to achieve together?” This measure was used to calculate the self-reported number of joint goals (range 0–3) with a mean of $M = 1.77$, $SD = 1.05$.

Externally-Rated Joint Goals

Participants’ three salient goals were also rated by two independent raters (NU and SB). They classified the goals as joint (=both partners mentioning the same goal) or individual (=goal was only mentioned by one partner) using a prior developed coding scheme (see **Supplementary Material 3**). For example, a goal was rated as joint if both partners mentioned the same activity, the same place, or the same third person. A goal was additionally rated as joint if one goal represented a subcategory of the other (e.g., “cleaning the house” and “cleaning the kitchen”). It was rated as individual if goals involved distinct activities (e.g., “swimming” vs. “tennis”).

Agreement between the independent raters was high (645 of 708 goals; 91.10%). In case of disagreement, a consensus was achieved during a discussion. Interrater-reliability was substantial (Cohen’s Kappa = 0.794). The calculation of Cohen’s Kappa is conservative in our case because it does not account for the order of potential goal combinations.

Over-Reporting of Joint Goals

To calculate over-reporting, externally-rated joint goals were compared to self-reported joint goals. If participants reported that they wanted to achieve a goal together with their partner, but the partner did not mention this goal, it was classified as “over-reported.” All other combinations counted as “not over-reported”¹. For each participant, over-reporting was added up across all three goals. Thus, “over-reporting” ranged from 0 to 3 with a mean of $M = 1.04$, $SD = 0.92$.

Goal Progress Questionnaire

At the exit session, participants rated their goal progress since the baseline session, i.e., over the last week. For each goal separately, participants rated (1) their goal progress and (2) the extent to which they had reached that goal (1 = *none* to 5 = *a lot*; $M = 3.11$, $SD = 0.93$).

Allostatic Load

Allostatic Load was calculated as a sum score taking four different physiological systems into account (Seeman and Gruenewald, 2006; Chen et al., 2012): cardiovascular functioning (systolic and diastolic blood pressure), inflammation (C-reactive protein), lipid and general metabolic activity (body mass index, waist and hip circumference, lipid profile, HbA1C), and hypothalamic pituitary adrenal (HPA) axis activity² (cortisol, calculated as area under the curve, Pruessner et al., 2003). An individual received a “1” per indicator if their value fell into the highest-risk quartile within the present sample (in the case of multiple indicators per system, the mean was used). Scores ranged from 0 to 1 (0 = no biomarker within the system in risk quartile; 1 = all biomarkers within the system within risk quartile). The allostatic load index was computed as the sum of the four systems with possible scores ranging from 0 to 4 ($M = 1.07$, $SD = 0.87$).

Relationship Satisfaction

Relationship satisfaction was assessed by the relationship assessment scale (Hendrick, 1988; Hendrick et al., 1998). Participants rated seven items (e.g., “How well does your partner meet your needs?”) from not at all (1) to very much (5); Cronbach’s $\alpha = 0.89$ and $M = 4.17$, $SD = 0.70$.

Statistical Analyses

Hierarchical linear 2-level random intercept models for the outcomes (1) goal progress, (2) relationship satisfaction, and (3) allostatic load were conducted using the R package lme4 (Bates et al., 2014). Predictor variables were (1) the number of joint goals (externally-rated) at the couple-level, (2) over-reporting at the individual-level, and (3) the interaction between the two. The interaction was decomposed by calculating simple slopes (Preacher et al., 2006). Gender, age, language of study participation (English vs. Mandarin), and self-rated health (“poor = 1” to “excellent = 5”) served as

¹“No over-reporting” mostly means there was consensus between self-report and external rating. Only in a minority of goals (5.9–11.1% for each of the three goals), the external rating but not the self-rating was joint.

²Thirty couples were not asked to provide saliva samples because of thyroid dysfunction.

TABLE 1 | Descriptive statistics and correlations of sample characteristics ($N = 236$) and study variables.

| Variables | Women | | Men | | Correlations | | | | | | |
|--|----------|-------------------|----------|-------------------|-----------------|----------------|-------------|-------------|---------------|----------------|----------------|
| | <i>M</i> | <i>(SD)</i> | <i>M</i> | <i>(SD)</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 Age | 69.77 | 5.44 ^d | 72.26 | 6.22 ^d | 0.66 *** | −1.70 | −0.01 | 0.05 | −0.01 | 0.10 | 0.02 |
| 2 Self-rated health | 3.27 | 0.96 | 3.25 | 0.95 | −1.60 | 0.39*** | 0.06 | −0.12 | 0.41*** | −0.05 | 0.03 |
| 3 Goal progress ^a | 3.15 | 0.87 | 3.06 | 0.99 | −0.60 | 0.15 | 0.07 | 0.17 | −0.10 | 0.05 | 0.05 |
| 4 Allostatic load ^b | 1.00 | 0.80 | 1.15 | 0.93 | 0.04 | −0.10 | −0.12 | 0.09 | −0.08 | −1.50 | −1.40 |
| 5 Relationship satisfaction ^c | 4.06 | 0.80 ^d | 4.29 | 0.57 ^d | −0.18 | 0.40*** | 0.07 | −0.03 | 0.48** | 0.10 | 0.03 |
| 6 Number of joint goals (self-report) | 1.58 | 1.09 ^d | 1.97 | 0.98 ^d | −0.05 | 0.01 | 0.22* | 0.07 | 0.40*** | 0.30*** | 0.58*** |
| 7 Over-reporting of joint goals | 0.88 | 0.88 ^d | 1.19 | 0.95 ^d | −0.11 | 0.20 | 0.06 | −0.01 | 0.25** | 0.60*** | 0.31*** |
| | <i>N</i> | % | <i>N</i> | % | | | | | | | |
| Ethnicity | | | | | | | | | | | |
| Caucasian/White | 71 | 60.2 | 70 | 59.8 | | | | | | | |
| Asian | 39 | 33.1 | 42 | 35.9 | | | | | | | |
| Aboriginal | 2 | 1.7 | 0 | 0 | | | | | | | |
| Hispanic | 1 | 0.8 | 1 | 0.9 | | | | | | | |
| Other | 5 | 4.2 | 4 | 3.4 | | | | | | | |
| English language ^e | 69 | 58.5 | 69 | 58.5 | | | | | | | |
| University education or equivalent | 82 | 70.1 | 79 | 66.9 | | | | | | | |
| Retired | 106 | 90.6 | 100 | 85.5 | | | | | | | |

^arange from 1 (none) to 5 (a lot) ^brange from 0 (very low risk for chronic disease) to 4 (very high risk for chronic diseases) ^crange from 1 (very low relationship satisfaction) to 5 (very high relationship satisfaction); ^dmean differences between men and women are significant; ^elanguage of study participation (English vs. Mandarin); correlations of women are presented above the main diagonal, correlations of men are presented below the main diagonal, and correlations between men and women are displayed in bold in the main diagonal. * $p < 0.05$. ** $p < 0.01$, *** $p < 0.001$.

TABLE 2 | Domains of goals and the proportion of joint goals.

| Domain | % of goals falling into this domain | Example goals | % of joint goals | | χ^2 | <i>p</i> |
|-------------------|-------------------------------------|--|--------------------|----------------------------------|----------|----------|
| | | | Within this domain | Outside this domain ^a | | |
| Health | 54.4 | "do a full health check", "walk at least 15 minutes a day" | 39.5 | 20.7 | 28.915 | <0.001 |
| Social | 53.2 | "invite family and friends for dinner" | 31.8 | 29.9 | 0.300 | n.s. |
| Work and finances | 42.0 | "paperwork for taxes" | 22.7 | 38.8 | 15.772 | <0.001 |
| Leisure | 39.8 | "taking photos" | 31.8 | 30.4 | 0.162 | n.s. |
| Home management | 25.3 | "clean out closet and pictures" | 30.3 | 31.1 | 0.038 | n.s. |
| Other | 40.8 | | 27.3 | 33.3 | 2.247 | n.s. |

$N = 708$ goals. Domains are based on participant's self-reports, and multiple answers were possible (i.e., one goal can belong to multiple domains). Percent joint is based on external rating. Domains were summarized as follows: "health": health, physical activity; "social": partnership, family, friends; "work and finances": work and productive activities, finances; "other": cognition and memory, volunteer, other; n.s., non significant.

^aAll goals, which do NOT belong to this domain.

control variables. All continuous variables were grand-mean centered and R^2 is reported (see **Supplementary Material 1** for analytic details).

RESULTS

Descriptive Statistics for Joint Goals

External ratings identified one-third of goals (30.9%) as joint, with 65.3% of participants having at least one goal in common with the partner. Self-reports identified two-thirds of goals as joint (60.1%), twice as many as the external ratings suggest. Most participants (85.2%) self-reported at least one joint goal. Almost one-third (31.4%) reported wanting to achieve all three goals together with their partner. The difference between self-reports

and external ratings was positively biased, and common: 65.6% of participants over-reported at least one joint goal. Men were older, more satisfied with their relationship, and reported more joint goals than women. No gender differences were found for goal progress and allostatic load (see **Table 1**).

Most goals were in the health domain (54.4%), followed by social (53.2%), work and finances (42.0%), and leisure (39.8%). Health-related goals had the highest proportion of joint goals (39.5% based on external ratings), whereas work and finance goals had the lowest proportion of joint goals (22.7%; see **Table 2**).

Self-reported and externally-rated joint goals were positively correlated ($r = 0.29$, $p < 0.001$). The number of joint goals (self-reported and externally-rated) was not significantly

TABLE 3 | Multilevel analysis with goal progress, relationship-satisfaction, and allostatic load as outcome variables ($N = 118$ couples).

| | Goal progress | | | Allostatic load | | | Relationship satisfaction | | |
|--|--------------------------|-------|-----------------|--------------------------|-------|-----------------|---------------------------|-------|-----------------|
| | Coefficient (<i>b</i>) | SE | <i>p</i> -value | Coefficient (<i>b</i>) | SE | <i>p</i> -value | Coefficient (<i>b</i>) | SE | <i>p</i> -value |
| Intercept | 3.185*** | 0.215 | <0.001 | 1.056*** | 0.161 | <0.001 | 4.03*** | 0.085 | <0.001 |
| Level 1 (person) | | | | | | | | | |
| Over-reporting of joint goals | 0.016 | 0.080 | 0.841 | −0.042 | 0.074 | 0.568 | 0.132* | 0.050 | 0.009 |
| Age (in years) | −0.011 | 0.011 | 0.328 | 0.011 | 0.010 | 0.259 | 0.002 | 0.008 | 0.200 |
| Gender | 0.097 | 0.118 | 0.414 | −0.156 | 0.109 | 0.154 | −0.181** | 0.065 | 0.007 |
| Self-rated health | 0.160* | 0.068 | 0.020 | −0.131* | 0.063 | 0.040 | 0.168*** | 0.044 | <0.001 |
| English language ^a | −0.327* | 0.139 | 0.019 | 0.271* | 0.129 | 0.040 | 0.370*** | 0.960 | <0.001 |
| Level 2 (couple) | | | | | | | | | |
| Number of joint goals ^b | −0.049 | 0.093 | 0.595 | 0.000 | 0.021 | 0.999 | 0.160* | 0.085 | 0.016 |
| Interaction | | | | | | | | | |
| Over-reporting x number of joint goals | −0.196* | 0.092 | 0.035 | 0.184* | 0.086 | 0.033 | −0.048 | 0.061 | 0.431 |
| Additional information | | | | | | | | | |
| ICC | 0.071 | | | 0.087 | | | 0.480 | | |

SE, standard error, goal progress ranged from 1 (none) to 5 (a lot), relationship satisfaction ranged from 1 (not at all) to 5 (very much), allostatic load scored from 0 (very low) to 4 (very high), gender was coded 0 = men, 1 = women. ^alanguage of study participation was coded 1 = English and 0 = Mandarin. All continuous variables were grand mean-centered. Due to parsimony, education was excluded as a control variable because it was not significantly related to any of the outcome variables ^bBased on external rating * $p < 0.05$. ** $p < 0.01$, *** $p < 0.001$.

correlated with goal progress or allostatic load. Relationship satisfaction was positively associated with self-reported joint goals ($r = 0.24$, $p < 0.001$) and over-reporting ($r = 0.15$, $p = 0.02$). Intraclass correlations (ICC) ranged from 0.071 (goal progress) over 0.087 for allostatic load to 0.480 (relationship satisfaction), indicating that most of the variance was at the individual level.

Goal Progress (Hp1)

Results regarding Hp1 concerned a moderation of over-reporting and joint goals on goal progress (Table 3). Control variables showed significant main effects for self-rated health ($b = 0.16$, $SE = 0.07$, $p = 0.020$) and English as language of study participation ($b = -0.33$, $SE = 0.14$, $p = 0.019$). No main effects emerged for over-reporting or number of joint goals. As hypothesized, the interaction between over-reporting and the number of externally-rated joint goals was significant ($b = -0.20$, $SE = 0.09$, $p = 0.035$; see Figure 1). More joint goals were related to more goal progress, but only when over-reporting was low; the simple slope for low over-reporting (1 *SD* below the mean) was 0.19 (0.08), $t = 2.21$, $p = 0.028$; the simple slope for average over-reporting (mean) was 0.001 (0.07), $t = 0.01$, $p = 0.993$ and the simple slope for high over-reporting (1 *SD* above the mean) was -0.19 (0.12), $t = 1.49$, $p = 0.138$. The model explained 13.99% of the variance.

Allostatic Load (Hp2)

Hp2 was examined using a similar multilevel model (Table 3). There were positive main effects for self-rated health ($b = -0.13$, $SE = 0.06$, $p = 0.040$) and English as language of study participation ($b = 0.27$, $SE = 0.13$, $p = 0.040$). No main effects for joint goals and over-reporting were found. However, the hypothesized interaction between the number of joint goals and over-reporting was significant ($b = 0.18$, $SE = 0.09$, $p = 0.033$; Figure 1). Simple slope analysis indicated that a high

number of joint goals in combination with low over-reporting was associated with lower allostatic load; the simple slope for low over-reporting (1 *SD* below the mean) was -0.20 (0.07), $t = -3.05$, $p = 0.003$; the simple slope for average over-reporting (at mean value) was -0.02 (0.07), $t = -0.35$, $p = 0.723$ and the simple slope for high over-reporting (1 *SD* above the mean) was 0.15 (0.12), $t = 1.28$, $p = 0.201$. The model explained 15.89% of the variance.

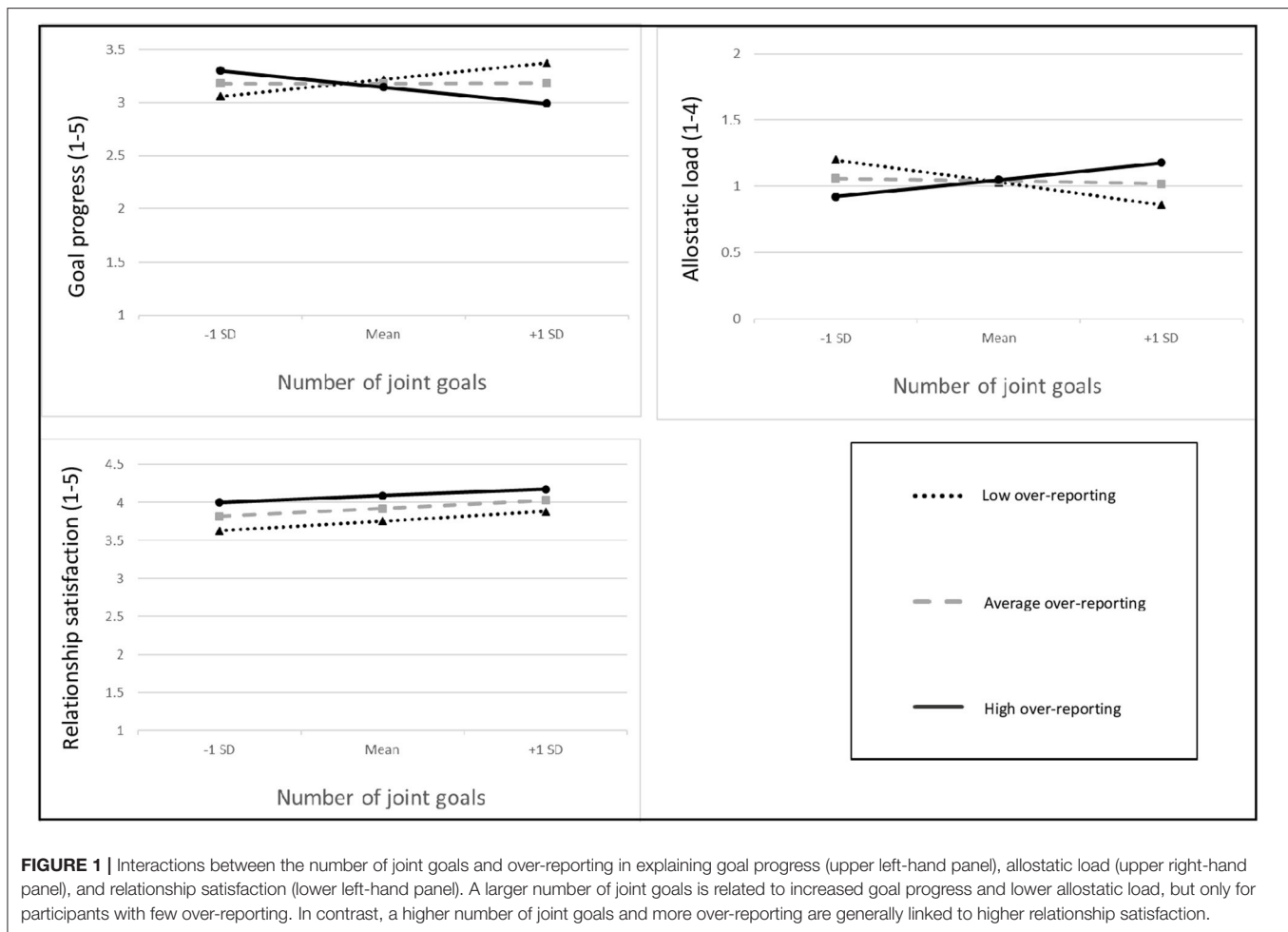
Relationship Satisfaction (Hp3)

Better self-rated health ($b = 0.17$, $SE = 0.04$, $p < 0.001$), being a man ($b = -0.18$, $SE = 0.07$, $p = 0.007$), and English as language of study participation ($b = 0.37$, $SE = 0.96$, $p < 0.001$) were associated with higher relationship satisfaction. There was a significant main effect for the number of externally-rated joint goals ($b = 0.16$, $SE = 0.09$, $p = 0.016$), and for over-reporting ($b = 0.13$, $SE = 0.05$, $p = 0.009$), indicating that participants were more satisfied with their relationship if they over-reported and had more externally judged joint goals³. The overall model explained 51.91% of the variance.

DISCUSSION

This brief report investigated how joint goals are related to goal progress, allostatic load, and relationship satisfaction. Findings indicate that a high proportion of participants' three most salient goals were joint (external rating 30.9%, self-report 60.1%). Comparing participants' self-reports with external ratings of joint goals points to systematic and potentially meaningful differences. About two-thirds of participants over-reported at least one joint goal (thinking their goal was joint without the partner

³Calculating all main-analyses without the control variables yielded the same result patterns, see **Supplementary Material 4**.



mentioning it among their three most salient goals). Results show that the number of externally-rated joint goals in combination with little over-reporting was associated with more goal progress and lower allostatic load. Having many joint goals and over-reporting were each related to higher relationship satisfaction.

Joint Goals and Goal Progress (Hp1)

In line with Hp1, we showed that a high number of joint goals was related to more goal progress 1 week later, but only for participants with low over-reporting. By comparing both partners' goals, we were able to disentangle the effects of joint goal perceptions and over-reporting and uncovered unique associations with goal progress. This finding is consistent with the idea that it is important to know a partner's goals to engage in goal coordination. According to the Transactive-Goal-Dynamics Theory (Fitzsimons and Finkel, 2018), goal coordination is a key factor for translating joint goals into goal progress. Inaccurate perceptions of joint goals could waste energy when trying to get a partner involved in progress on a goal they do not care about. Ultimately, this could lead to frustration and undermine goal-relevant efforts. Possible mechanisms behind the observed moderation of joint goals and over-reporting might be more effective collaborative problem-solving (Hoppmann

and Gerstorf, 2013) or higher frequency and enjoyment of collaboration (Schindler et al., 2010).

Allostatic Load (Hp2)

In line with Hp2, joint goals were related to better individual health if perceived accurately. We also found that the highest proportion of joint goals appeared in the health and physical activity domains. This is consistent with propositions that health behaviors may be important variables linking psychosocial resources with allostatic load (Wiley et al., 2017). Goal coordination (Fitzsimons and Finkel, 2018), joint implementation of goal-directed activity (Berli et al., 2018), and dyadic planning (Keller et al., 2017) all require knowledge of a partner's goals and have been linked to health behavior engagement. Interpreting the moderation effect, we assume that an accurate perception of the partners' salient goals (little over-reporting) facilitates jointly coordinating goal-directed activity. Importantly, no causal conclusions can be drawn from our findings. For example, Wiley et al. (2017) argue that the reverse is possible: high allostatic load could undermine psychosocial resources, for example, by acting as a stressor.

Relationship Satisfaction (Hp3)

In line with Hp3, a larger number of joint goals was associated with higher relationship satisfaction. One possible linking variable could be trait similarity: joint goals are more common in couples with similar traits (Gray and Coons, 2017), and trait similarity among partners, in turn, has been linked with high relationship satisfaction (e.g., Malouff et al., 2010). Notably, the reverse (relationship satisfaction predicting joint goals) could be true as well and needs to be tested using more mechanism-oriented longitudinal study designs.

An unexpected result relates to the fact that more over-reporting was associated with higher relationship satisfaction. There has been a debate about whether it is necessary to view the world accurately or if it might sometimes be adaptive to have positively biased views. In this sense, over-reporting could be interpreted as an indicator of positive illusions. Seminal work by Taylor and Brown (1994) argues that positive illusions have positive effects on well-being. Our results linking over-reporting with relationship satisfaction are consistent with this idea. Importantly, the divergent findings regarding goal progress and allostatic load (in interaction with the number of joint goals) are in line with Taylor's and Brown's (1994) proposition that positive illusions do not have to be unanimously positive and that, in fact, they can backfire. It might be that joint goals and positively biased perceptions capture processes that are essential for satisfying relationships; however, not having an accurate reading of a partner's goals may undermine collaborative efforts to work toward goals and play a role in allostatic load, e.g., through poorer health behaviors (Kaul and Lakey, 2003).

Implications of Findings

So what shall we tell older adult couples? It depends on what is most important for a given couple in a specific situation: that they make progress on their goals, that they optimize their health, or that they happily live together. This is in line with previous research showing that consensus between couples differs in its effect on distress depending on the area of consensus (Reyes et al., 2020). If being satisfied with their relationship is the priority, biased perceptions might not be so bad (Story et al., 2007).

There is initial evidence that addressing health behavior change in both partners of a couple has favorable outcomes (Jackson et al., 2015; Richards et al., 2018). Our results further underpin the notion that health interventions should capitalize on significant others.

If the importance of joint goals is corroborated in future studies, it will be essential to inform older adults about the meaning of joint goals. It would be interesting for future studies to develop interventions showing partners how they can turn "me goals" into "we goals" and to facilitate translating them into action, for example, through dyadic behavior change techniques (Knoll et al., 2017).

To give a broader outlook, integrating goal setting and progress discussions into patient care plans is an increasing need in medicine (Schulman-Green et al., 2006). The findings of this study suggest that including the patient's partner in the goal-setting process poses a crucial step to be considered in all efforts of improving patient-centered care.

Limitations

Our goal assessment has some degree of ambiguity. We focused on three spontaneously generated particularly salient goals. It is possible that when one partner reported their goal as joint, but the other partner did not list it, that it could have shown up further down the list. Also, a focus on only three goals restricts variability. However, as goals represent a very complex system and people often pursue multiple personal goals across various life domains which might compete with each other (Kruglanski et al., 2002; Riediger and Freund, 2004; Presseau et al., 2013), a "complete list of their individual and joint goals" can probably never be reached. Nevertheless, focusing on particularly salient goals should be seen as a starting point that warrants further extension. In addition, we do not distinguish between partners sharing a goal and wanting to achieve it together. However, with this qualitative assessment of goals, we were able to assess and rate individually generated personal goals without imposing restrictions on their content.

Of note, the effects of joint goals and over-reporting could be different in younger adults, recently married older adults and adults living with health problems. For example, as goal pursuit might be particularly difficult for adults living with significant health problems, this population might especially benefit from joint goals and collaborative problem solving (Schindler et al., 2010).

Furthermore, data analytic choices were made conceptually and had to consider power limitations related to the sample size (118 couples). We hope that future work with larger samples builds on our findings and extends them by estimating actor and partner effects using SEM approaches.

Lastly, we cannot draw conclusions about the underlying mechanisms. Recent research on dyadic self-regulatory processes such as dyadic planning (Knoll et al., 2017), couple self-efficacy, and communal coping (Lewis et al., 2006) might be starting points. Finally, no causal conclusions can be drawn based on our correlational findings. To address these limitations, a follow-up study assessing goals more comprehensively and experimentally manipulating potential underlying factors by teaching different dyadic goal setting and behavior change strategies would be valuable.

In conclusion, when studying older adults' goals, it is essential to include the partner because our results show that older adults want to achieve a high proportion of their goals together as a team. A high number of joint goals appears to have positive ramifications for diverse outcomes such as goal progress, allostatic load, and relationship satisfaction.

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 Clinical Research Ethics Board of the

University of British Columbia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CH, MA, DG, and KM designed and directed the project and supervised the work. NU performed the data analysis and the goal rating and wrote the manuscript. VM managed the project, recruited participants, performed the study, and did the data management. SB performed the goal rating and assisted with drafting the manuscript. TP contributed to the data analysis and discussing the results. All authors commented on the manuscript and contributed to the final version of the manuscript.

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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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Cancer and Relationship Dissolution: Perspective of Partners of Cancer Patients

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Purpose: Cancer can be a burden on the relationship and even lead to relationship dissolution. Previous studies about the impact of cancer on close relationships almost exclusively involve cancer patients. So far, little is known about the views of spouses. Therefore, this study focuses on partners or ex-partners of cancer patients.

Methods: In this cross-sectional study, $N = 265$ partners or ex-partners of cancer patients are examined regarding a possible separation, the reasons for separation and the influence of the cancer on the relationship. In addition, predictors of separation and the positive or negative perception of the impact of cancer on the relationship were investigated.

Results: The separation rate (23.4%) was marginally lower than in the general population in Germany (35.79%). The most frequent reason for separation was the death of the cancer patient (59.6%), followed by relationship problems (26.9%), and the cancer disease itself (9.6%). Among those who were separated, 57.4% reported that cancer contributed to the separation. On average, the influence of cancer on relationship dissolution is indicated with 82.9%. Also, for those who stayed together, 83.7% reported an impact of the cancer on the relationship, of which 55.9% reported a negative impact. Logistic regressions indicated that higher levels of depression were associated with greater odds of a more negative perception of the influence of cancer on the relationship, whereas a more satisfied relationship tended to be associated with a more positive perception. Those who had no psychological treatment in the past, lower anxiety levels and lower relationship satisfaction had an increased risk of separation. Overall, relationship satisfaction was significantly lower than in the general population in Germany.

Conclusion: In particular, psychological factors such as depression and anxiety as well as relationship satisfaction appear to be factors influencing separation and the perception of the influence of cancer on the relationship as positive or negative. Therefore, it seems to be reasonable to consider these aspects in the psychosocial support and also to include the partners in order to achieve a stable and satisfied relationship which has a positive effect on health and psychological well-being.

Keywords: cancer, survivorship, relationship satisfaction, depression, anxiety, relationship dissolution, partners

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INTRODUCTION

Cancer and its therapy can present challenges and burdens that can last over time, not only for patients but also for their intimate partners and the relationship (Kayser and Scott, 2008; Aizer et al., 2013). Around 50% of cancer patients show high levels of distress (Mehnert et al., 2018), including clinically significant emotional distress and/or unrecognized or untreated psychosocial conditions as a result of cancer (Grassi, 2020). For the majority of patients, partners are the primary source of support (Manne and Badr, 2008; Forsythe et al., 2014). However, partners experience comparable levels of psychological distress, depression, and anxiety, as well as reduced quality of life (Sjovall et al., 2009; Sklenarova et al., 2015; Zimmermann, 2015; Brandao et al., 2017), and high distress and low relationship satisfaction (Li and Loke, 2013). Therefore, the support of the partner can also be influenced by their own stress and this can have a stressful effect on the relationship.

Marital adjustment is important for the health and psychological well-being of both partners. Higher marital quality is associated with better health (Robles et al., 2014). In the specific context of cancer, the relationship has a positive impact on timing of diagnosis, treatment outcome, and cancer mortality. Having a partner is beneficial after cancer (Dasgupta et al., 2016). For example, Buja et al. (2018) found in their systematic review that unmarried patients have a higher risk of advanced cancer or melanoma at the time of diagnosis. In addition, unmarried patients have a higher risk of metastatic cancer, undertreatment, as well as death due to cancer than married patients (Aizer et al., 2013). Cancer survivors who receive more social support from their partners are more likely to successfully cope with the challenges of a cancer diagnosis, including managing depression and anxiety, maintaining a healthy lifestyle and positive attitude, and coping with occupational and financial problems (Kvikstad et al., 1995). In general, most individuals in close relationships find ways to cope and adapt to the challenging stressors of cancer. However, when dyadic adjustment to cancer-related distress fails, the relationship breaks down (Foster et al., 2009; Kirchhoff et al., 2012). A subset of patients and their partners are at higher risk for separation and divorce (Carlsen et al., 2007; Karraker and Latham, 2015; Sbarra et al., 2015) compared with the general population.

Some studies show that marital stress associated with cancer may lead to an increased risk of separation and divorce compared with the general population (Karraker and Latham, 2015); others found that the risk of divorce is no greater in cancer survivors than in the general population (Carlsen et al., 2007). Studies have also found gender differences, with female patients being significantly more likely to divorce than male patients (Syse, 2008; Glantz et al., 2009; Karraker and Latham, 2015). Nevertheless, the results are inconsistent. A meta-analysis showed that couple-based interventions had a small to medium impact on cancer patients' physical health. Partners were able to derive moderate effects from couple-based interventions on improving sexual relations (Li et al., 2020). Another systematic review for psychological interventions targeting partners of cancer patients showed positive effects related to social support,

distress, and communication for partners and patients (Kleine et al., 2019). A study examining the processes of intimacy and psychological distress in couples with different cancers shows an improvement in relationship intimacy through disclosure of cancer-related concerns. This could make it easier for both partners to adjust to the disease (Manne et al., 2010). In the context of these findings, the involvement of partners of cancer patients is a crucial criterion for a stable relationship and good coping with the disease.

Most studies addressing cancer and relationship dissolution examine patients. To the best of our knowledge, there have been few studies that bring in the perspective of the partners on the impact of cancer on relationship quality and continuation (Sjovall et al., 2009; Drabe et al., 2013). Demands for future studies to also survey partners or ex-partners should be addressed here (Stephens et al., 2016). Stephens et al. (2016) stated that including ex-spouses may help "to understand relationships among cancer-related problems and relationship dissolution" (p. 872). Specifically, the inclusion of ex-partners may help to more accurately capture reasons for separation. Ex-partners were defined as individuals who had been in a relationship with a cancer patient but had ended it. In addition to the patient's perspective, it seems useful to capture the partners' perspective as well. Because most previous studies have focused on cancer patients and separation, examining partners could provide further insight into the impact of cancer on relationships and, in particular, on separation. The research questions of the present study focus on the influence of partners' sociodemographic factors such as age, gender, separation of own parents, children, or medical factors (own disease, psychological treatment) and psychological factors such as depression, anxiety, distress, quality of life, and relationship satisfaction on marital stability, as well as the influence of cancer on their relationship and influencing factors from the partners' perspective. Therefore, the present study focuses on relationship dissolution among partners of cancer patients and examines (1) the frequency of relationship dissolution and the reasons for relationship dissolution. In addition, (2) the impact of cancer on the relationship, and (3) the predictors of relationship dissolution are analyzed.

MATERIALS AND METHODS

Participants

Partners or ex-partners ($N = 265$) of cancer patients participated in the study. Demographic and psychological factors as well as differences between partners and ex-partners are shown in **Table 1**. The mean duration of those currently in a relationship with the cancer patient ($n = 203$) was 20.46 (SD = 13.59) years. The mean relationship duration until cancer diagnosis was 17.98 (SD = 12.86) years. For those who separated from the cancer patient ($n = 62$), the mean relationship duration to separation was 19.10 (SD = 14.65) years. The most frequent types of cancer among patients were colon cancer (18.5%), lung cancer (12.8%), and breast cancer (10.6%). In 55.8% of patients, the cancer was a primary disease, in 3.4% a secondary disease and in 17% a recurrence. A total of 21.1% reported

TABLE 1 | Demographics, relationship-related and health-related variables of the total sample ($N = 265$) as well as for partners who are in a relationship with the cancer patient at the time of the study ($n = 203$) and those who have separated ($n = 62$).

| Variable | $N = 265$ total sample | $N = 203$ in relationship with the cancer patient | $N = 62$ separated from the cancer patient | Differences |
|--|------------------------|---|--|---|
| <i>Demographics</i> | | | | |
| Sex, n (%) | | | | n.s. |
| Female | 197 (74.3) | 152 (77.2) | 45 (22.8) | |
| Male | 68 (25.7) | 51 (25.0) | 17 (25.0) | |
| Mean age (SD) | 50.32 (12.58) | 50.43 (12.36) | 49.97 (13.36) | n.s. |
| Education, n (%) ¹ | | | | n.s. |
| Less than 10 years | 42 (15.9) | 31 (73.8) | 11 (26.2) | |
| 10 years | 80 (30.2) | 66 (82.5) | 14 (17.5) | |
| More than 10 years | 140 (52.8) | 105 (75.0) | 35 (25.0) | |
| Job status, n (%) | | | | n.s. |
| Full-time employed | 114 (43.0) | 89 (78.1) | 25 (21.9) | |
| Half-time employed | 63 (23.8) | 51 (81.0) | 12 (19.0) | |
| Retired | 51 (19.2) | 39 (76.5) | 12 (23.5) | |
| In sick leave | 15 (5.7) | 9 (60.0) | 6 (40.0) | |
| Homework | 11 (4.2) | 10 (90.9) | 1 (9.1) | |
| Study/training | 6 (2.3) | 2 (33.3) | 4 (66.7) | |
| Unemployed | 5 (1.9) | 3 (60.0) | 2 (40.0) | |
| Children | | | | n.s. |
| No | 80 (30.2) | 60 (75.0) | 20 (25.0) | |
| Yes | 185 (69.8) | 143 (77.3) | 42 (22.7) | |
| Separation of own parents, n (%) | | | | n.s. |
| No | 62 (23.4) | 44 (71.0) | 18 (29.0) | |
| Yes | 203 (76.6) | 159 (78.3) | 44 (21.7) | |
| <i>Medical variables</i> | | | | |
| Own somatic illness, n (%) | | | | n.s. |
| Yes | 107 (40.4) | 80 (74.8) | 27 (25.2) | |
| No | 158 (59.6) | 123 (77.8) | 35 (22.2) | |
| Psychological/psychiatric treatment in the past, n (%) | | | | $X^2 = 12.80$, $df = 1$, $p < 0.001$ |
| Yes | 91 (34.3) | 58 (63.7) | 33 (36.3) | |
| No | 174 (65.7) | 145 (83.3) | 29 (16.7) | |
| Current psychological/psychiatric treatment, n (%) | | | | n.s. |
| Yes | 42 (15.8) | 30 (71.4) | 12 (28.6) | |
| No | 223 (84.2) | 173 (77.6) | 50 (22.4) | |
| Cancer diagnosis of the cancer patient, n (%) ² | | | | n.s. |
| Colon cancer | 49 (18.5) | 37 (75.5) | 12 (24.5) | |
| Lung cancer | 34 (12.8) | 28 (82.4) | 6 (17.6) | |
| Breast cancer | 28 (10.6) | 21 (75.0) | 7 (25.0) | |
| Urological cancer | 27 (10.2) | 18 (66.7) | 9 (33.3) | |
| Stomach cancer | 22 (8.3) | 13 (59.1) | 9 (40.9) | |
| Hematological cancer | 22 (8.3) | 20 (90.9) | 2 (9.1) | |
| Prostate cancer | 18 (6.8) | 15 (83.3) | 3 (16.7) | |
| Mean time since diagnosis in months (SD, range) | 44.2 (55.9, 0–310) | 37.7 (52.2) | 65.3 (62.5) | $t(261) = 3.47$, $p = 0.001$ |
| Current disease status of the cancer patient, n (%) | | | | $X^2 = 24.51$, $df = 4$, $p < 0.001$ |
| Primary disease | 148 (55.8) | 118 (79.7) | 30 (20.3) | |
| Cancer in remission | 56 (21.1) | 43 (76.8) | 13 (23.2) | |
| Cancer recurrence | 45 (17.0) | 36 (80.0) | 9 (20.0) | |
| Secondary disease | 9 (3.4) | 6 (66.7) | 3 (33.3) | |
| Not known | 7 (2.6) | 0 (0) | 7 (100) | |

(Continued)

TABLE 1 | Continued

| Variable | N = 265 total sample | N = 203 in relationship with the cancer patient | N = 62 separated from the cancer patient | Differences |
|---|----------------------|---|--|---------------------------------------|
| Current treatment status of the cancer patient, n (%) | | | | $\chi^2 = 40.1$, df = 2, $p < 0.001$ |
| Treatment ongoing | 152 (57.4) | 137 (90.1) | 15 (9.9) | |
| Treatment completed | 106 (40.0) | 64 (60.4) | 42 (39.6) | |
| Not known | 7 (2.6) | 2 (28.6) | 5 (71.4) | |
| Psychological variables M (SD) | | | | |
| Distress (DT) | 6.4 (2.5) | 6.4 (2.4) | 6.3 (2.7) | n.s. |
| Depression (PHQ-9) | 9.5 (5.9) | 8.9 (5.8) | 11.1 (6.2) | $t(263) = 2.60$, $p = 0.01$ |
| Anxiety (GAD-7) | 8.1 (5.4) | 8.0 (5.3) | 8.4 (5.7) | n.s. |
| Health-related quality of life (EQ-5D) | 83.5 (14.8) | 84.0 (14.9) | 81.8 (14.4) | n.s. |
| State of health (EQ VAS) | 69.2 (24.4) | 70.0 (24.5) | 66.7 (24.3) | n.s. |
| Relationship satisfaction (QMI) | 35.2 (9.0) | 35.5 (9.1) | 34.4 (8.6) | n.s. |

n.s. = not significant.

¹ $n = 3$ (1.1%) others.

²cancers below 5% (gynecological cancer 3.8%, head and neck cancers 4.5%, melanoma 4.5%, brain tumor 2.3%, and others 6.8%).

QMI-D, Quality of Marriage Index; DT, NCCN Distress Thermometer; PHQ-9, Patient Health Questionnaire; GAD-7, Generalized Anxiety Disorder Seven Item Scale; EQ-5D, EuroQol Five Dimensions Questionnaire; and EQ VAS, EQ-5D Visual Analog Scale (0–100). The percentages refer to the respective rows.

that the cancer was currently cured. 57.4% of patients were currently receiving medical treatment. Of the medical treatments, 19.1% received surgery, 48.7% received chemotherapy, 19.1% received radiation.

The mean distress score was 6.4 (SD = 2.5). In addition, 78.5% ($n = 208$) of participants reported an elevated distress level. The mean severity of depressive symptoms was mild to moderate with $M = 9.5$ (SD = 5.9). Minimal depression scores were found in 23.4% ($n = 62$), mild in 34.7% ($n = 92$), moderate in 22.3% ($n = 59$), moderately severe in 12.5% ($n = 33$), and severe in 7.2% ($n = 19$) of the partners. The mean score of anxiety ($M = 8.1$, SD = 5.4) was mild. 29.8% of participants showed minimal anxiety scores, 35.5% mild, 20.4% moderate and 14.3% severe. The health-related quality of life-visual analog scale ($M = 69.2$, SD = 24.4) was below the population mean [$M = 77.1$, SD = 17.8; $t(2285) = 6.47$, and $p < 0.001$] as well as the EQ-5D sum score ($M = 83.5$, SD = 14.8) compared to the German general population [$M = 91.7$, SD = 13.1; $t(2285) = 9.43$, and $p < 0.001$] (Hinz et al., 2006). Relationship satisfaction ($M = 35.2$, SD = 9.0) was lower than in the general population in Germany [$M = 38.65$, SD = 6.91; $t(1694) = 7.09$, and $p < 0.001$]. In addition, 32.1% ($n = 85$) of the sample was below the cut-off of 34, which indicates an unsatisfied relationship (Zimmermann et al., 2019). Associations between time since cancer diagnosis were shown only for distress ($r = -0.21$, $p = 0.001$), not for depression, anxiety, quality of life, or relationship satisfaction. No differences were found for depression [$\chi^2(16) = 25.6$, $p = 0.06$] or distress [$\chi^2(4) = 7.7$, $p = 0.10$] and current disease status, but differences emerged for anxiety and disease status [$\chi^2(12) = 30.5$, $p = 0.002$] with higher anxiety when cancer recurred or it was a first disease. No differences were found in current treatment status (treatment ongoing vs. treatment completed) related to depression [$\chi^2(8) = 4.9$, $p = 0.77$] or anxiety [$\chi^2(6) = 9.2$, $p = 0.16$], but there were differences in distress [$\chi^2(2) = 6.9$,

$p = 0.03$]. When the patient was under current medical treatment, no 128 (48.3%) of the partners experienced distress above the cut-off, whereas 28.3% ($n = 75$) were above the cut-off when treatment was completed. In sum, the present sample appeared to have increased psychological distress, mild to moderate depression, mild anxiety, and lower health-related quality of life. Satisfaction with the relationship was also lower than in a German comparison sample.

Procedure

For the analysis of separation and divorce, the study population was restricted to those partners who were either living with the cancer patient or married at the time of the cancer diagnosis. An online questionnaire (created with Questback EFS Survey), accessible via an URL, was used to collect data. The survey period ran from November 1st, 2017 to September 1st, 2020. The participants were asked about their mental and physical health, the quality of their relationship, and the separation events during and after their partners' cancer. Participation in this nationwide online survey was voluntary, anonymous, and free of charge. Inclusion criteria were: age 18 years and older, presence of a partner's cancer diagnosis currently or in the past, and the absence of severe mental impairments. Several cancer-related or oncological organizations (Cancer Society of Lower Saxony, Cancer Society of North Rhine-Westphalia, Network of Comprehensive Cancer Centers/German Cancer Aid) supported recruitment. Participants were informed about the study via mail, flyers or postal cards by oncological centers of hospitals, advice centers, or support groups. In addition, the study was advertised on the websites of Hannover Medical School and the University Hospital Düsseldorf Germany.

Ethical approval for this study was obtained from the ethics committees of the Hannover Medical School (number 3653-2017) and the University Hospital Düsseldorf (number 2017114500).

Measures

Depression

The German version of the depression scale of the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was used to measure the severity of depression symptoms. It consists of nine items answered on a 4-point scale (0 = not at all to 3 = almost every day), e.g., “Over the last 2 weeks, how often have you been bothered by any of the following problems? Little interest or pleasure in doing things.” The sum of item scores includes a range from 0 to 27. From a value of 10, the diagnosis of depression is proposed (10–14 = mild, 15–19 = moderate, and 20–27 = severe). In the original sample the PHQ-9 was a reliable ($\alpha = 0.89$) and valid measure of depression severity (Kroenke et al., 2001). Cronbach's alpha in the present study was $\alpha = 0.88$.

Anxiety

The German version of the self-report questionnaire of the Generalized Anxiety Disorder Seven Item Scale (GAD-7; Spitzer et al., 2006) was used to measure the severity of anxiety symptoms. The questionnaire includes seven items ranged from 0 = not at all, 1 = several days, 2 = more than half of the days, to 3 = nearly every day, e.g., “Over the last 2 weeks, how often have you been bothered by the following problems? Feeling nervous, anxious or on edge.” The items were added (range from 0 to 21). Higher values indicating higher severity of generalized anxiety symptoms. Scores of 5, 10, and 15 represent cut-off points for mild, moderate, and severe anxiety, respectively. Cronbach's alpha in the present study was $\alpha = 0.91$.

Health-Related Quality of Life

The German version of the EuroQol Five Dimensions Questionnaire (EQ-5D; Hinz et al., 2006) was used to measure the health-related quality of life with five items (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression; e.g., Mobility: I have no problems in walking about; I have some problems in walking about; and I am confined to bed) answered on a three-point scale (1 = no problems, 2 = moderate problems, and 3 = extreme problems). The score was calculated as the sum of item scores minus 5, multiplied with 10, and subtracted from 100 (Hinz et al., 2006). This calculation resulted in a range from 0 to 100. Higher values indicating higher quality of life. Cronbach's alpha in the present study was $\alpha = 0.61$. Furthermore, the EQ-5D Visual Analogue Scale (EQ-VAS) measures the state of health on a horizontal slider bar ranging from 0 = the worst imaginable state of health to 100 = the best imaginable state of health. Higher values indicating better state of health.

Psychosocial Distress

The German version of the NCCN Distress Thermometer (DT; Mehnert et al., 2006) was used to measure psychosocial distress. The DT is a screening tool that has been used in psycho-oncologic research worldwide in order to detect clinically significant levels of distress in patients with cancer (Donovan et al., 2014). The DT consists of a single item which assesses the global level of distress that has been experienced in the past week, including the present day [“Please circle the number (0–10) that best describes how much distress you have been experiencing in the

past week including today”]. The scale ranges from 0 (no distress) to 10 (extreme distress) with a cut-off score of 5 indicating a clinically significant level of distress. The DT has been validated in cancer patients with different diagnoses and disease stages (Donovan et al., 2014).

Relationship quality was measured with the German version of the Quality of Marriage Index (QMI-D; Zimmermann et al., 2015, 2019). Five of the six items are answered on a seven-point Likert scale (1 = very strong rejection to 7 = very strong agreement; e.g., “Our marriage is strong”). A global item is rated on a 10-point scale (1 = very unhappy to 10 = perfectly happy). The total value ranges between 6 and 45, lower values stand for a lower relationship quality. A cut-off value of 34 is given. Values above the cut-off indicate a satisfied relationship. Reliability in the original sample was high with $\alpha = 0.94$ (Zimmermann et al., 2019). Cronbach's alpha in the present study was $\alpha = 0.95$.

In addition, we asked partners whether cancer had affected their relationship (yes vs. no) and, if so, how (positively or negatively). For those who separated, the survey asked “Do you think cancer was a contributing factor to the separation?” and asked to provide a percentage if the answer was yes.

Statistical Analyses

For descriptive statistics, percentages, frequencies, mean values and standard deviations were calculated. In order to determine differences between groups, *t*-tests for independent samples and χ^2 -tests were computed. Categorical dependent variables (relationship dissolution, positive vs. negative perception of the influence of cancer on relationship) were predicted using logistic regression. In logistic regression model, age, gender, children, parental separation, physical disease, psychological treatment in the past, quality of life (EQ-5D), depression (PHQ-9), anxiety (GAD-7), psychological distress (DT), and relationship satisfaction (QMI) were used as independent variables. For all predictors, tolerance was above 0.25 indicating that no severe multicollinearity was present. For every regression model, graphical residual analysis indicated that no severe heteroscedasticity was present either. Results of the logistic regression models were reported as odds ratios (ORs) with 95% confidence intervals (CIs). *P*-values less than 0.05 were considered statistically significant. All statistical analyses were executed with SPSS 26.0.

RESULTS

Relationship Dissolution: Frequency and Reasons

The separation rate of the participants (23.4%, $n = 62$) was lower than in the general population in Germany (35.79%; $\chi^2 = 3.59$, and $p = 0.058$; Statistisches Bundesamt, 2020). Of those who had separated from the cancer patient ($n = 62$), $n = 27$ were in a new relationship with a non-cancer partner at the time of the survey. $N = 35$ participants were not currently in a relationship (see **Figure 1**). The most frequent reason for separation was the death of the cancer patient (59.6%, $n = 31$), followed by relationship problems (26.9%, $n = 14$), and the cancer itself

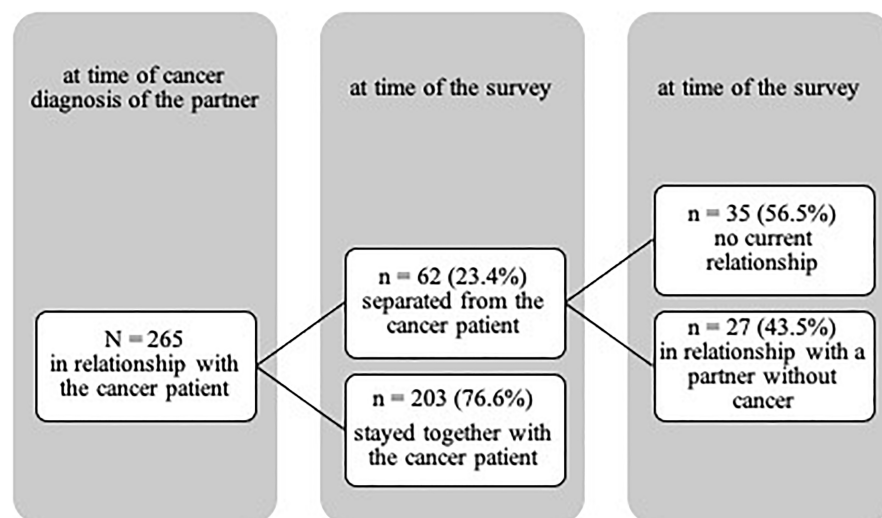


FIGURE 1 | Changes in relationship status of the sample between the time of the cancer diagnosis of the partner and the time of the survey.

(9.6%, $n = 5$). However, if those participants are excluded for whom the reason for separation was “death of the patient” ($n = 31$), the separation rate was 13.2%, significantly lower than the separation rate in Germany.

Influence of Cancer on Relationship

Of those who were separated from the cancer patient ($n = 62$), 57.4% ($n = 35$) indicated that cancer contributed to the separation. On average, the impact of cancer on relationship dissolution was reported as $M = 82.9\%$ ($SD = 25.03$). Of those who were currently in a new relationship ($n = 27$), 59.3% ($n = 16$) reported that their former partner’s cancer also had an impact on their current relationship, with the majority (69.2%) reporting a positive impact. Of those who remained with the cancer patient, 83.7% ($n = 170$) reported that cancer had influenced their relationship; 44.1% ($n = 75$) considered this influence to be positive, 55.9% ($n = 95$) considered it to be negative.

A logistic regression analysis was performed for those $n = 170$ who remained with the cancer patient and perceived an influence of cancer on the relationship, with the type of influence (positive or negative) of cancer on the relationship as the dependent variable and age, gender, children, parental separation, physical disease, psychological treatment in the past, EQ-5D, PHQ-9, GAD-7, DT, and QMI as predictor variables (see **Table 2**). A total of 170 cases were analyzed and the full model predicted type of influence (omnibus chi-square = 35.39, $df = 12$, and $p < 0.001$). The model accounted for between 18.8 and 25.2% of the variance in type of influence, with overall 70% of accurate predictions. **Table 2** gives coefficients and the Wald statistic and associated degrees of freedom and probability values for each of the predictor variables. This shows that only depression and relationship satisfaction reliably predicted the type of influence of cancer on the relationship. The values of the coefficients showed that higher depression and lower relationship satisfaction were associated with negative influence of cancer on the relationship

TABLE 2 | Coefficients from binary logistic regression of negative or positive influence of cancer on relationship ($N = 170$).

| Predictor | β | SE_{β} | OR | Wald χ^2 | p |
|--|---------|--------------|------|---------------|-------------|
| Age | −0.02 | 0.02 | 1.00 | 0.02 | 0.90 |
| Gender | −0.01 | 0.46 | 1.00 | 0.00 | 0.99 |
| Number of children | −0.54 | 0.38 | 0.58 | 1.98 | 0.16 |
| Parental separation | −0.63 | 0.44 | 0.53 | 2.06 | 0.15 |
| Own physical disease | −0.30 | 0.41 | 0.74 | 0.55 | 0.46 |
| Psychological treatment in the past | −0.07 | 0.39 | 0.93 | 0.03 | 0.86 |
| Health-related quality of life (EQ-5D) | −0.02 | 0.02 | 0.99 | 0.77 | 0.38 |
| State of health (EQ VAS) | −0.00 | 0.01 | 1.00 | 0.22 | 0.64 |
| Depression (PHQ-9) | 0.11 | 0.05 | 1.12 | 4.33 | 0.04 |
| Anxiety (GAD-7) | −0.02 | 0.06 | 0.98 | 0.14 | 0.71 |
| Distress (DT) | 0.01 | 0.10 | 1.01 | 0.01 | 0.92 |
| Relationship satisfaction (QMI) ^a | −0.10 | 0.02 | 0.91 | 16.46 | 0.00 |

Influence of cancer on relationship was coded as 1 = positive and 2 = negative. DT, NCCN Distress Thermometer; PHQ-9, Patient Health Questionnaire; GAD-7, Generalized Anxiety Disorder Seven Item Scale; EQ-5D, EuroQol Five Dimensions Questionnaire; EQ VAS, EQ-5D Visual Analog Scale; and OR, odds ratio. Significant coefficients in bold.

^aRelationship satisfaction with the cancer patient.

by a factor of 1.12 and 0.91, respectively (depression: 95% CI 1.01–1.24, relationship satisfaction: 95% CI 0.87–0.95).

Predictors of Relationship Dissolution

Differences between those who separated and those who stayed with the cancer patient were found for psychological treatment in the past and depression, with those who separated showing higher scores ($p = 0.01$; see **Table 3**).

To analyze factors influencing relationship dissolution, those who stayed with the cancer patient and those who separated were compared. However, those for whom the death of the patient was the reason for separation ($n = 31$) were excluded. In this case it can be assumed that the relationship would continue

TABLE 3 | Coefficients from binary logistic regression of relationship dissolution ($N = 233$)¹.

| Predictor | β | SE_{β} | OR | Wald χ^2 | p |
|--|---------|--------------|------|---------------|--------------|
| Age | 0.02 | 0.02 | 1.02 | 0.84 | 0.34 |
| Gender | 0.71 | 0.49 | 2.03 | 2.06 | 0.15 |
| Number of Children | -0.21 | 0.47 | 0.81 | 0.20 | 0.66 |
| Parental separation | 0.20 | 0.52 | 1.23 | 0.15 | 0.70 |
| Own physical disease | -0.45 | 0.51 | 0.64 | 0.80 | 0.37 |
| Psychological treatment in the past | -1.24 | 0.44 | 0.29 | 8.09 | 0.004 |
| Health-related quality of life (EQ-5D) | -0.01 | 0.02 | 0.99 | 0.54 | 0.46 |
| State of health (EQ VAS) | 0.001 | 0.01 | 1.00 | 0.002 | 0.96 |
| Depression (PHQ-9) | -0.12 | 0.07 | 0.89 | 3.03 | 0.08 |
| Anxiety (GAD-7) | 0.20 | 0.08 | 1.22 | 5.88 | 0.02 |
| Distress (DT) | 0.01 | 0.11 | 1.01 | 0.01 | 0.95 |
| Relationship satisfaction (QMI) ^a | 0.04 | 0.02 | 1.04 | 3.93 | 0.05 |

¹ $n = 31$ were excluded due to death of the patient as separation reason. Relationship dissolution was coded as 1 = yes (partnership with the cancer patient did not exist at the time of the survey) and 2 = no (partnership still exist).

DT, NCCN Distress Thermometer; PHQ-9, Patient Health Questionnaire; GAD-7, Generalized Anxiety Disorder Seven Item Scale; EQ-5D, EuroQol Five Dimensions Questionnaire; EQ VAS, EQ-5D Visual Analog Scale; and OR, odds ratio. Significant coefficients in bold.

^aRelationship satisfaction with the cancer patient.

without the death of the patient. A logistic regression analysis was performed with relationship dissolution as the dependent variable, and age, gender, children, parental separation, physical disease, psychological treatment in the past, EQ-5D, PHQ-9, GAD-7, DT, and QMI as predictor variables. A total of 233 cases were analyzed and the full model significantly predicted relationship dissolution (omnibus chi-square = 26.74, $df = 12$, and $p = 0.008$). The model accounted for between 10.8 and 20.2% of the variance in relationship dissolution status, with overall 87.6% of accurate predictions. **Table 3** gives coefficients and the Wald statistic and associated degrees of freedom and probability values for each of the predictor variables. This shows that only psychological treatment in the past, anxiety and relationship satisfaction reliably predicted relationship dissolution. The values of the coefficients revealed that no psychological treatment in the past, lower anxiety scores and lower relationship satisfaction are associated with an increase in the odds of relationship dissolution by a factor of 0.29, 1.22, and 1.04, respectively (psychological treatment in the past: 95% CI.12 – 0.68, anxiety: 95% CI 1.04 – 1.43, and relationship satisfaction: 95% CI 1.00 – 1.09).

DISCUSSION

The aim of the present study was to investigate partnership dissolution in the context of cancer among partners or ex-partners of cancer patients. For this purpose, the frequency of dissolution and its reasons as well as the influence of cancer on the relationship and predictors of dissolution from the partners' perspective were to be examined. Additionally, the subjective psychological and physical status of partners of cancer patients was included in the evaluation.

The dissolution rate among partners was lower than the separation rate in the general German population. This is consistent with other studies showing that cancer survivors were not at higher risk of divorce than the general population (Carlsen et al., 2007; Laitala et al., 2015; Stephens et al., 2016). Death of the cancer patient was the most frequent reason for relationship dissolution. However, half of the separated partners also gave other reasons (e.g., relationship problems) for separation. Relationship problems appear to be a key contributor to separation.

More than half of those who were separated stated that cancer contributed to relationship dissolution. On average, the influence of cancer on relationship dissolution was as high as 82.9%. Even among those who had separated from the cancer patient and were in a new relationship, the cancer also had an impact on the new relationship – but for the majority, a positive one. It is possible that experiencing the cancer in the partner has also changed their own attitudes. Research on post-traumatic growth after cancer shows comparable positive effects in patients and their partners (Zwahlen et al., 2010). Thus, it is possible that these positive effects (such as a sense of togetherness, shared strength, and being able to rely on each other) can also be transferred to a new relationship.

In addition, the majority of those who stayed with the cancer patient reported that the cancer influenced the relationship. However, a negative influence was described more frequently. Depression and relationship satisfaction were found to be significant factors in the type of impact cancer had on the relationship (positive or negative). Higher levels of depression were associated with more negative perceptions, whereas a more satisfied relationship tended to be associated with more positive perceptions. Demographic variables such as age or gender did not appear to predict perceptions of cancer. It is possible that this perception may be due to a caregiving burden associated with partner strain. Although not all cancer patients are in need of caregivers, spousal caregivers are at higher risk for mental, physical and social morbidity due to their caregiving experience (Li and Loke, 2013). In particular, the burden of caregiving appears to have an impact on the psychological distress of the partner (Geng et al., 2018). Unfortunately, data on caregiving burden are not available in this study.

Those who separated showed higher depression scores compared with those who stayed together and were more likely to have had psychological treatment in the past. Those who had no history of psychological treatment, had lower anxiety levels, and lower partnership satisfaction were at increased risk for relationship dissolution. The odds ratio for anxiety and relationship satisfaction was above 1, at 1.22 for anxiety and 1.04 for relationship satisfaction. Specifically, psychological variables appeared to predict separation, but also perceptions of the impact of cancer on the relationship as positive and negative. In contrast, medical and/or sociodemographic factors do not seem to be relevant. This is consistent with other studies showing that anxiety rather than depression was most of a problem in long-term cancer survivors and spouses compared to healthy controls (Mitchell et al., 2013).

It is important to acknowledge that this study has some limitations. First, this study included partners of patients with different types of cancers, resulting in heterogeneity. This may be considered both an advantage and a disadvantage. Second, the assessment of the impact of cancer on the relationship may be subject to subjective bias because the assessment was retrospective. Participants may either overestimate or underestimate the impact of cancer on the relationship. Third, it was not possible to determine when the relationship ended after the cancer diagnosis. Thus, the direction of causality between relationship dissolution and cancer diagnose could not be determined. Although cancer diagnosis is not a direct causal factor, the study suggests that non-causal associations may exist and that these associations are important with regard to the vulnerability of divorced partners of cancer patients. Forth, no information was available on who initiated the separation. Fifth, a higher response rate might have captured more cases of relationship dissolution because participants who refused to complete the survey may have faced more serious problems than those who accepted it. Finally, cancer-related mortality may further contribute to the underestimation of relationship dissolution and the effects of cancer on relationship. Despite the limitations, strengths of the study include its focus on partners of cancer patients, who have not previously been the focus of studies of cancer and separation, and its extensive data, which also allow for more sophisticated analyses, such as predictors of separation and the impact of cancer on a relationship.

The results show that the partners of cancer patients also suffer long-term from the consequences of cancer. Assuming that a good relationship is a protective factor for the patients (Buja et al., 2018) and that a cancer diagnosis can be a burden for both – the patient and the partner (“we-disease”; Kayser et al., 2007), partners should therefore also be considered in care and the focus should be on the relationship as well as the psychological stability of the partners. Interventions aimed at improving psychological functioning and quality of life of cancer patients and their partners are necessary to reduce negative effects on the individuals and also the couple.

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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 Hannover Medical School (number 3653-2017) and the University Hospital Düsseldorf (number 2017114500). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TZ and AK conceptualized and designed the study. BN collected the data of the study. TZ, AK, and BN analyzed and interpreted the data. TZ and BN wrote the original draft of the manuscript. TZ, AK, and BN reviewed and edited 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/fpsyg.2021.624902/full#supplementary-material>

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Adjustment of Couples to the Transition to Retirement: The Interplay of Intra- and Interpersonal Emotion Regulation in Daily Life

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Background: Retirement is a central transition in late adulthood and requires adjustment. These processes not only affect the retired individuals but also their romantic partners. The aim of this study is to investigate the interplay of intrapersonal emotion regulation (rumination) with interpersonal regulation processes (disclosure quality). Furthermore, the associations of daily retirement-related disclosure with adjustment symptoms in disclosing and the listening partner will be investigated. It is expected that the effects of disclosure alter after providing the couples with a self-applied solitary written disclosure task in order to support their intrapersonal emotion regulation.

Methods: In this dyadic online-diary study, 45 couples ($N = 45$) with one partner perceiving the adjustment to a recent retirement as challenging reported rumination, perceived disclosure quality (repetitive, focused on negative content, hard to follow, disclosing partner open for common/authentic), retirement-related disclosure, and ICD-11 adjustment symptoms preoccupation and failure to adapt were assessed at the end of the day over 14 days. In the middle of this assessment period, couples performed a modified online-expressive writing about their thoughts and feelings regarding the transition to retirement.

Results: The double-intercept multilevel Actor-Partner Interdependence Models (APIM) reveal that on days with more daily rumination, the spouse perceived that disclosure of the retiree is more difficult to follow, more negative, and repetitive. In contrast, the retiree perceived less authenticity and openness to comments during disclosure on days when the spouse reports more rumination. Retirement-related disclosure showed no within-couple association with failure to adapt but actor effects on preoccupation. Moreover, a partner effect of disclosure of the retirees on the preoccupation of spouses could be observed. This contagious effect of the retiree disclosure, however, disappeared during the week after writing.

Conclusion: Our results support the notion that disclosure processes are altered during maladaptive intrapersonal emotion regulation processes. This in turn seems to lead to less effective interpersonal regulation and contagious spilling over of symptoms.

Supporting intrapersonal emotion regulation seems to have the potential to allow more favorable interpersonal regulation processes and to free interpersonal resources for an individual adjustment. This has implications for further planning of support for couples facing life transitions and aging-related changes.

Keywords: interpersonal emotion regulation, disclosure, transition to retirement, adjustment disorder symptoms, expressive writing, daily diary, interplay intra- and interpersonal emotion regulation

INTRODUCTION

Relationships are an important resource in life (Coan and Sbarra, 2015; Kiecolt-Glaser and Wilson, 2017). Coping with a challenge together expands the resources of the individual on the partner, and it not only activates individual resources like self-regulation and self-efficacy but also adds genuine relational processes to the regulation equation (Bodenmann, 1997; Rohrbaugh et al., 2004; Helgeson et al., 2018; Rentscher, 2019). Accordingly, romantic relationships have been identified as highly relevant when it comes to adjusting to difficult health situations (Manne et al., 2004) and life transitions like a central one in late adulthood—the transition to retirement (Havighurst et al., 1969; van Solinge and Henkens, 2005).

From a life-span perspective, it has been emphasized that retirement—which represents a change in the work sphere—is influenced and influences other life spheres—most prominently the sphere of romantic relationships (van Solinge and Henkens, 2005). Retirement adjustment has been defined as “a longitudinal process during which the levels of retirees of adjustment may fluctuate as a function of individual resources and changes in these resources.” (Wang et al., 2011; p. 207). If these processes are not successful, symptoms linked to an adjustment disorder may arise. An adjustment disorder has been defined as “emotional disturbance arising as a consequence of a significant life event” (Maercker et al., 2013; p. 381). Again, the *socio-interpersonal context* has been assumed to play a defining role in the context of stress response (Radloff, 1977; Maercker et al., 2013; Krutolewitsch et al., 2016; Lorenz et al., 2018). More specifically, *intra- and interpersonal emotion regulations* represent basic processes that are highly predictive for adjustment problems to stressful life events (DeSteno et al., 2013; Zaki and Williams, 2013; Horn and Maercker, 2015, 2016).

As it is expected, individual trajectories of the adjustment to retirement are diverse, and in most cases, they are successful (Wang, 2007; Barbosa et al., 2016). However, research in this field has identified that high-risk groups seem to be more challenged by the transition and are characterized by high-retirement anxiety rates (Wang, 2007) and mental health problems (Butterworth et al., 2006). In these studies, the predictors of successful adjustment to retirement were physical health, finances, psychological health, personality-related attributes, leisure, voluntary retirement, and social integration in general (Barbosa et al., 2016). Again, the marital relationship was discussed as one of the most important resources for a successful adjustment (Bishop and Shoemaker, 1987; van Solinge and Henkens, 2005). Even though the central role of relationships

is not in question, to our knowledge, no study so far zoomed into the daily processes of couples as a resource for adjustment after the transition to retirement. Furthermore, it is no secret and well-studied that relationship processes can go array and do not help in all circumstances—they often provoke interpersonal distress particularly in late adulthood (Rook, 2003). But what are the predictors of successful co-regulation? This study aims at contributing to a better understanding of the interplay between intra- and interpersonal emotion regulation in the daily life of couples, who consider the transition to retirement as a challenge. First, we studied the interplay of daily intrapersonal emotion regulation (rumination) with the quality of attempts of interpersonal emotion regulation (perceived disclosure quality). Is maladaptive intrapersonal emotion regulation a risk factor for less successful relational regulation? Second, we investigated the association of daily disclosure with adjustment symptoms in the daily life of couples and whether this association is altered after applying an expressive writing task supporting intrapersonal emotion regulation. Does supporting intrapersonal emotion regulation result in more favorable relational adjustment processes?

The conceptual background of this study is introduced by bridging core relationship-related processes with those of intra- and interpersonal emotion regulation. Furthermore, a short introduction to the solitary written disclosure, also referred to as *expressive writing* (Pennebaker, 1997) as a way of supporting intrapersonal emotion regulation, is provided.

For a better understanding of whether relational processes are helpful or harmful when coping with a common stressor, it is recommended to consult the concepts illustrating the establishment of *relationship quality*. The establishment of intimacy has been introduced as an interactive process involving disclosure of personal relevant content that is followed by a responsive reaction by the interaction partner (Reis and Shaver, 1988). Hereby, it is crucial that this responsive reaction is perceived as such (Debrot et al., 2012). Accordingly, it has been suggested that establishing perceived responsiveness and psychological intimacy is an indirect *socio-affective pathway of emotion regulation* (Debrot et al., 2013; Horn et al., 2018). Calling against the “lone man against the element” view on emotion regulation, relationships have been interpreted as resources for the co-regulation of emotions not only in early childhood but also throughout the life span (Coan and Sbarra, 2015; Kiecolt-Glaser and Wilson, 2017). A central *interpersonal emotion regulation* strategy is *disclosure* (Manne et al., 2004) or *social sharing*, which is fulfilling socio-affective needs after emotional upheavals (Rimé, 2007). Note the overlapping key role of disclosure in

both areas, namely establishment of intimacy and interpersonal emotion regulation.

From an intrapersonal perspective, *emotion regulation* has been defined as processes that involve increasing, decreasing, or maintaining emotional states in terms of their quality and intensity. These processes can be automatic or controlled (Gross, 2013). There is solid evidence that adaptive intrapersonal emotion regulation is at the core of healthy functioning (DeSteno et al., 2013). Likewise, maladaptive emotion regulation represents a major transdiagnostic risk factor for mental and physical health problems (Aldao et al., 2010). Among maladaptive strategies, *rumination* has been identified as one of the most maladaptive emotion regulation strategies (Nolen-Hoeksema and Davis, 1999). The ruminative processing style is characterized by a self-focus leading to repetitive, negative thoughts (Ehring and Watkins, 2008) and an abstract, rigid processing style (Watkins and Moulds, 2005), which, ironically, is the result of trying to avoid the negative emotional content (Wenzlaff and Luxton, 2003). It is only plausible that when these ruminative negative thought circles are shared, there will be social consequences. Accordingly, earlier studies showed that ruminators benefit less from the social support (Nolen-Hoeksema and Davis, 1999), and this form of self-focus is associated with less empathic perspective-taking (Joireman and Hammersla, 2002). In general, it has been shown that avoidant emotion regulation strategies like rumination are associated with perception of reduced authenticity and likability (Butler et al., 2003) and thus spillover to the relationship.

To sum up, considering the characteristics of rumination—rigid, repetitive, and avoidant processing style—and the findings in the literature, it is expected that when ruminative thoughts are shared, the quality of self-disclosure is altered. Disclosure might be perceived as less authentic (Butler et al., 2003), more repetitive, negative, and difficult to follow (see the characteristics of ruminative thinking style; Ehring and Watkins, 2008). In line with this expectation of interpersonal effects of intrapersonal rumination, a recent line of research focuses on the interpersonal manifestation of rumination. This had been originally studied on friendship dyads in childhood and adolescence (Rose, 2002) and can be defined as rumination in dialog—disclosing the negative content in a repetitive way to close others. *Co-rumination* or *co-brooding* (Horn and Maercker, 2016) could be established as an interpersonal risk factor above and beyond intrapersonal rumination and as an important mechanism explaining the contagion of internalizing symptoms (Stone et al., 2011).

But what can be done to avoid this spilling over of the intrapersonal process into the relationship? One established minimal intervention to support intrapersonal emotion regulation and consequently improve interpersonal emotion regulation is solitary written disclosure, also referred to as *expressive writing* (Pennebaker, 1997). This is a self-applied minimal intervention that instructs individuals to write down their deepest thoughts and feelings about a stressful experience. As in interpersonal disclosure, this requires finding words for personal relevant content, own emotional responses, and thoughts. But, in contrast to social sharing situations, it neither requires a listener nor aspires for a responsive reaction.

Numerous studies with different populations reveal a small, but stable effect of this minimal intervention (Frattaroli, 2006). In the literature, improving intrapersonal emotion regulation is seen as a main therapeutic mechanism (Horn and Mehl, 2004; Horn et al., 2011). Accordingly, the buffering effect of writing against maladaptive rumination has been proven in earlier studies (Sloan et al., 2008). Instead, more adaptive ways of cognitive-affective processing are supposed to be triggered which fosters the integration of the emotional event (Horn and Mehl, 2004) and helps forming a story about the emotionally arousing event (Graybeal et al., 2002). A more coherent narrative, in turn, should be easier to share. Accordingly, the social effects of expressive writing have been reported testing the assumption that expressive writing provides a “preprocessing” that improves communication and social exchange in romantic couples after challenging experiences (Lepore and Greenberg, 2002; Slatcher and Pennebaker, 2006; Baddeley and Pennebaker, 2011; Finkel et al., 2013). To conclude, solitary written disclosure is supposed to reduce rumination. Furthermore, it is supposed to improve interpersonal regulation processes mainly by helping the individual to find a coherent narrative that can be shared more easily—particularly in times of pronounced stress experiences. For the listener, in turn, it might enhance the chances to respond in a validating and understanding way to this shared story.

So far, these processes have not been investigated in the daily life of couples older than 65 years who are facing the transition to retirement. The aim of this study is twofold. First, we investigated whether that disclosure quality represents a path by which maladaptive intraindividual emotion regulation spills over to interpersonal regulation. Is daily intraindividual *rumination* associated with different perceived *disclosure quality* in the daily life of couples facing the transition to retirement? More specifically, we investigated whether on days with more rumination, disclosure of the partner is perceived as less authentic, less open for comments, more difficult to follow, more redundant, and more repeating negative topics.

Second, we investigated whether daily adjustment is associated with interpersonal emotion regulation. On days with more *retirement-related disclosure*, are there more or less adjustment symptoms in the retiree and the partner? Furthermore, we compared the week before and after the writing task—is the association between disclosure and adjustment symptoms altered after writing about the deepest thoughts and feelings regarding the transition to retirement?

MATERIALS AND METHODS

Procedure

The GUHR study (acronym for German “dealing together with the challenges of retirement”) included different-sex couples in which at least one partner had faced retirement recently (last 24 months) and experienced the situation still as a transition. In addition, couples were required to experience the transition to retirement as an ongoing challenge. Daily Internet access and an own email address (at least one per couple) were further inclusion criteria as this was needed for the daily online questionnaires. Couples were recruited as a convenience

sample from September 2015 to December 2017 via different channels: mailing lists, senior universities, Facebook, retirement associations, magazines, and direct contact in public spaces.

The daily diaries were performed with personalized online surveys programmed and carried out with the survey software “Unipark.” The participants received a link by email to each daily diary questionnaire. Furthermore, couples were asked not to discuss or communicate any questions and answers with their partner throughout the study duration. Following the first questionnaire, the 14-day diary survey took place at the desired time. The start of the diary survey was always on Mondays, and the following two weeks were supposed to be as representative as possible of the everyday life of the couple. For example, there were no surveys during vacation. During these two weeks, the participants answered a short daily diary questionnaire every morning after getting up and every evening before going to bed (i.e., morning and evening questionnaires). The morning survey contained questions about momentary affect and relational variables as well as sleep quality and is not part of this study. All study variables were assessed at an end of the day diary with self-reports on affect and relationship issues. Three months after the 14-days diary survey, a follow-up survey took place. During the entire study period, the participants could send an email to those conducting the study and ask questions or raise concerns. The participants received 50 CHF as compensation per couple. This study has been approved by the Ethics committee of the Faculty of Arts at the University of Zurich (No. 08042015).

Solitary Written Disclosure: The Modified Expressive Writing Task

On the first Saturday of the diary survey, in the middle of the daily diary assessment period, the participants additionally received a link to a writing task (i.e., expressive writing), which was embedded in an online questionnaire framework. Both partners received initiations and completed the task separately and solitarily. The instruction was based on the established expressive writing paradigm and modified for the current study as follows:

“Today, I want you to write for the next 15 min about the deepest thoughts and feelings regarding the transition to retirement/the transition to retirement of your partner. (...) You might tie what you write to parts of your life that might have changed due to the new situation: How is the current situation linked to your past, your relationships with others, or who you would like to become, or to who you have been, who you would like to be, or who you are now. What has the transition to retirement meant to your relationship? What has been difficult for you as a couple? What has been positive? What would you recommend other couples facing the situation?”

Participants

Forty-five couples ($N = 45$) were included in the analysis. Eight couples ($N = 8$) were incomplete (totally <10 entries during the diary period), and two couples ($N = 2$) were simultaneously retired after both working full hours and could thus not be included in the current analyses. This is because the distinguishable feature of the dyad (which is required for

actor partner interdependence analyses, see below) was “recently retired” vs. “partner of recently retired.” In couples with two retirees ($N = 15$), the most recently retired one, the partner who was working full time as opposed to part-time before retirement, was defined as a retiree.

The average relationship duration of the couples was $M = 31.12$ years ($SD = 13.41$), most of them were married ($N = 35$), lived together ($N = 40$), and had children ($N = 32$). For the retirees, the average months since retirement was $M = 17.49$ months ($SD = 17.1$), and the median of working hours before retirement was 42 h/weeks. Further characteristics of the retired partners (e.g., education level and reasons for retirement; Floyd et al., 1992) are depicted in **Table 1**. From the table, it can be noted that most of the retirees had no financial concerns about their retirement, did not retire involuntarily, and reported elevated worries about their retirement, but they do not have clinically significant depression scores and were happy with their relationship.

Measures

All measures used in the online—“end of the day”—diary included in this study are presented in the following sections. All items could be answered on a scale ranging from 0 to 4. If necessary, there were parallel versions for the retirees and their partners (separated by slashes below).

Daily Adjustment Disorder Symptom

The items were chosen from the standard screening questionnaire of adjustment disorder, the adjustment disorder new module (Lorenz et al., 2016) based on its item qualities explaining the symptom group and its eligibility for daily assessment. Two major symptom groups are assumed in the adjustment disorder concept of ICD-11 (International Classification of Diseases, 11. revision): first, *preoccupation*, which manifests by excessive thinking and worrying about the stressor, and second, *failure to adapt*, which is characterized by impaired daily functional status, e.g., sleep problems or role functioning. “Failure to adapt” was assessed with the following item: “Today, it was easy for me to complete the things, that had to be done (reversed).” “Preoccupation” was assessed as follows: “Today, I could not stop to think about my/my partner’s transition to retirement.”

Retirement-related Disclosure

Here, a modified version of other studies assessing daily disclosure in couples was used (Horn et al., 2017, 2019). The item was worded as follows: “Today I talked with my partner about my thoughts and feelings regarding my/his/her retirement.”

Perceived Disclosure Quality

Following are the items that assessed the different facets of perceived disclosure quality: “When my partner talked today with me about positive and negative experiences ...: (1) ... I found it difficult to follow. (2) ... He/she was very redundant. (3) ... He/she repetitively came back to the same negative topics. (4) ... I perceived him/her as open for comments. (5) ... I perceived him/her as authentic and open.

TABLE 1 | Characteristics of the recently retired partners.

| | | <i>N</i> | <i>M/SD</i> |
|--|---------------------------------------|----------|---|
| Total | | 45 | |
| Females/males | | 29/16 | |
| Education no college degree | | 17 | |
| <51 000 CHF annual income | | 10 | |
| Reasons for retirement (multiple answers possible) | | | |
| | Too much stress at work | 4 | |
| | Physical strain at work | 4 | |
| | Disliked work | 2 | |
| | Employer suggested retirement | 3 | |
| | Employer offered incentives | 3 | |
| | Involuntary retirement | 0 | |
| | Problems with co-workers | 0 | |
| | Wanted more time with family | 10 | |
| | Wanted more leisure time | 15 | |
| | My partner wanted that I retire | 1 | |
| | I reached the official retirement age | 17 | |
| | Own health reasons | 6 | |
| | Partner health reasons | 1 | |
| | I could afford retirement financially | 16 | |
| Worries about retirement (Mean/SD) | | | 3.61/0.89 (range 1–5) |
| PHQ-9 depression score (Mean/SD) | | | 3.14/2.79 (cut-off for mild depression = 9) |
| DAS-4 dyadic adjustment (Mean/SD) | | | 10.18/1.59 (range 0–16) |

Items assessing reasons for retirement and worries are taken from Floyd et al. (1992); PHQ-9: Patient Health Questionnaire (Kroenke et al., 2001), DAS-4: Dyadic Adjustment Scale short version (Sabourin et al., 2005).

Rumination

The item assessing daily rumination was taken from earlier studies (Debrot et al., 2013) and is worded as follows: “Today, I had to think again and again about the reasons for my mood and was not able to control it.”

Analytical Strategy

To address actor and partner effects over time, an Actor–Partner Interdependence Model (APIM; Kenny et al., 2006) was conducted within a double-intercept multilevel modeling framework for the dyadic intensive longitudinal data (Bolger and Laurenceau, 2013). APIM is a widely used analytical framework for adequately modeling the dyadic data, which allows to distinguish the effects within one partner of those crossing over to the other partner while controlling for interdependencies in the couple (Kenny et al., 2006). The APIM model of this study is depicted in **Figure 1**. APIMs require distinguishable dyads; in this study, the distinguishable feature was “recently retired” vs. “partner” (see also the sample description). Gender was used as a control variable in all models. In order to rely on the most parsimonious models, time centered at the middle of the assessment period and time since retirement were dropped as controls in the analyses as they did not display significant associations. All predictors were person-mean centered.

All analyses were conducted with the Mlwin software (Rabash et al., 2009). First, actor and partner effects of daily rumination on different disclosure quality measures (e.g., authentic, repeating negative content, open for comments, and redundant) were

estimated in separate multilevel models controlling for gender. Second, actor and partner effects of retirement-related disclosure on adjustment symptoms (i.e., preoccupation and failure to adapt) were modeled separately. In these two models, the week before and after writing was accounted for by adding a dummy-coded predictor as well as the interaction of this variable with partner effects of retirement-related disclosure.

RESULTS

Actor and Partner Effects of Daily Rumination on Perceived Disclosure Quality

An overview of the results is depicted in **Figure 2**, and all estimates of the APIM multilevel analyses are given in **Table 2**. First, actor effects of own rumination on the perception of the disclosure quality of the partner could be detected, which were slightly different depending on the role; for the spouses of the retired partners, days of more rumination were associated with the perception of the partner as less authentic. In contrast, the retirees reported higher levels of all five disclosure quality facets on days with more pronounced levels of own rumination.

When looking at the effect of the level of rumination of partners crossing over to the romantic counterpart above and beyond own levels of rumination that day, again different patterns for retirees and their spouses were observed; these effects

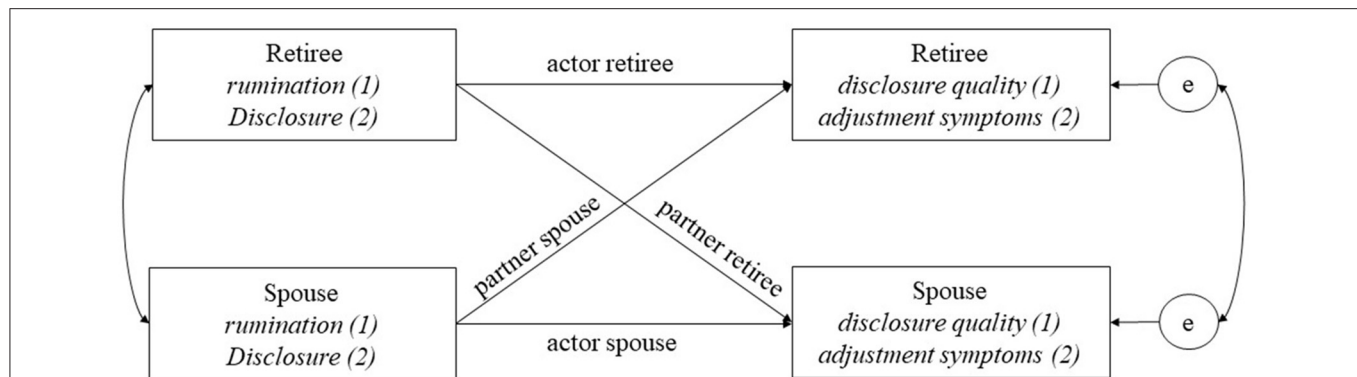


FIGURE 1 | Conceptual model of this study: APIM depicting actor and partner effects that will be analyzed over time within couple. First research question: actor and partner effects of rumination on perceived disclosure quality and second research questions: actor and partner effects of retirement-related disclosure on daily adjustment disorder symptoms.

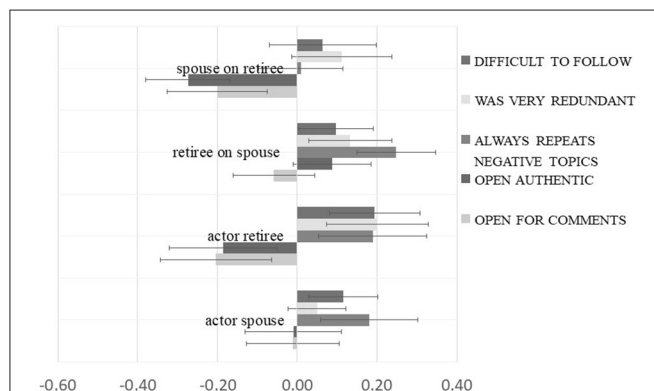


FIGURE 2 | Daily rumination on perceived disclosure quality. Estimates are unstandardized betas of double intercept (retiree/partner) APIM multilevel models controlled for gender. T-lines represent 95% CIs.

of the partner revealed that on days with more rumination reported by the spouse, the retiree reports the perception of the spouse as being less authentic and open to comments. In contrast, spouses perceived more redundancy and repetitive negative content in the disclosure of their retired partners.

Actor-Partner Interdependence Model Analyses on Adjustment Disorder Symptoms and Sleep Problems

All estimates of the APIM analyses investigating actor and partner effects of retirement-related disclosure on adjustment symptoms are depicted in **Table 3**. Within couples, failure to adapt symptoms did not show associations with retirement-related disclosure. In contrast, both partners did report more preoccupation on days when they shared retirement-related disclosure. Furthermore, there was a partner effect of retiree, but not spouse disclosure on preoccupation. In other words, on days when retirees talked more about their thoughts and feelings regarding retirement, the spouse reported more preoccupation.

There was no main effect on adjustment disorder symptoms when the week after expressive writing was compared with the prior week. However, the interaction of the partner effect of retirement-related disclosure with this dummy coded variable was significant. **Figure 3** illustrates that in the week after expressive writing, the partner effect of retiree disclosure on spouse adjustment disappeared. In other words, after the writing task, days with more disclosure by their retiree were no longer days with more preoccupation with the spouse. This might suggest less spillover or possible contagion of sharing of the negative content after writing about it.

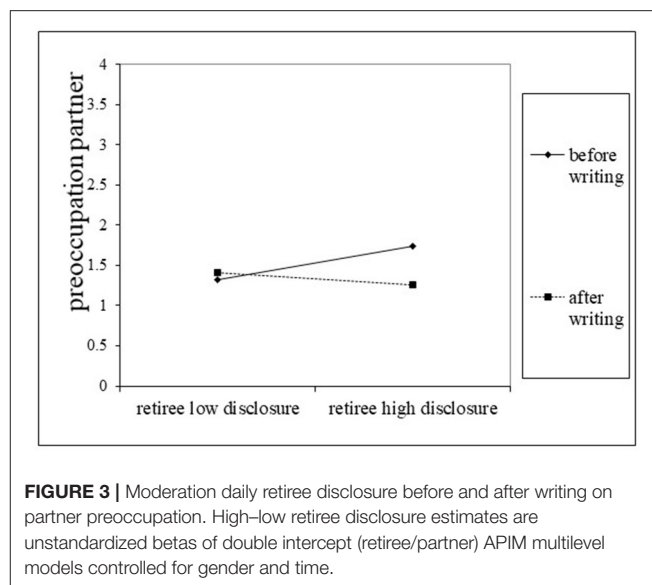
DISCUSSION

Summing up the main results, this study suggests the following: first, on days with more rumination, the perceived quality of disclosure in the couple was different. More specifically, disclosure was perceived as less authentic, more negative, redundant, and difficult to follow, and the disclosing partner was perceived as less open for comments. There were differential effects for retirees and their spouses; while ruminating retirees were perceived as repetitive and less open to comments, ruminating spouses were perceived as less authentic. Second, days of more failure to adapt, i.e., problems with daily functioning, did not differ in terms of couple disclosure in this study. However, partners disclosed their thoughts and feelings about retirement more on days with more preoccupation about the transition to retirement. Furthermore, we observed spilling-over effects on the partner; on days with more retirement-related disclosure by the retiree, the partner reported more preoccupation. Third, this association, however, was dampened in the week after both partners wrote about their deepest thoughts and feelings regarding the transition to retirement. More in-depth findings followed by a broader outlook, limitations, and a conclusion are discussed in the following sections.

TABLE 2 | Multilevel models estimates: actor and partner effects of daily rumination on disclosure quality.

| | Always repeats negative topics | | | Open for comments | | | Was very redundant | | | Was authentic | | | Was difficult to follow | | |
|------------------------------|--------------------------------|------|---------------|-------------------|------|----------------|--------------------|------|---------------|---------------|------|----------------|-------------------------|------|---------------|
| | Estimate | S.E. | CI 95% | Estimate | S.E. | CI 95% | Estimate | S.E. | CI 95% | Estimate | S.E. | CI 95% | Estimate | S.E. | CI 95% |
| Fixed part | | | | | | | | | | | | | | | |
| Intercept retiree | 1.23 | 0.16 | [0.91, 1.55] | 3.41 | 0.16 | [3.10, 3.72] | 1.30 | 0.07 | [1.17, 1.43] | 3.47 | 0.16 | [3.15, 3.79] | 1.46 | 0.08 | [1.30, 1.63] |
| Intercept spouse | 1.22 | 0.20 | [0.83, 1.60] | 3.49 | 0.18 | [3.13, 3.84] | 1.19 | 0.08 | [1.04, 1.34] | 3.75 | 0.20 | [3.37, 4.14] | 1.32 | 0.09 | [1.15, 1.48] |
| Actor spouse rumination | 0.18 | 0.06 | [0.06, 0.30] | -0.01 | 0.06 | [-0.13, 0.10] | 0.05 | 0.04 | [-0.02, 0.12] | -0.01 | 0.06 | [-0.13, 0.11] | 0.12 | 0.04 | [0.03, 0.20] |
| Actor retiree rumination | 0.19 | 0.07 | [0.05, 0.32] | -0.20 | 0.07 | [-0.34, -0.06] | 0.20 | 0.07 | [0.07, 0.33] | -0.19 | 0.07 | [-0.32, -0.05] | 0.19 | 0.06 | [0.08, 0.31] |
| Retiree rumination on spouse | 0.25 | 0.05 | [0.15, 0.35] | -0.06 | 0.05 | [-0.16, 0.04] | 0.13 | 0.05 | [0.03, 0.24] | 0.09 | 0.05 | [-0.01, 0.19] | 0.10 | 0.05 | [0.00, 0.19] |
| Spouse rumination on retiree | 0.01 | 0.05 | [-0.10, 0.11] | -0.20 | 0.06 | [-0.33, -0.08] | 0.11 | 0.06 | [-0.01, 0.24] | -0.27 | 0.05 | [-0.38, -0.17] | 0.06 | 0.07 | [-0.07, 0.20] |
| Female (male) | -0.10 | 0.16 | [-0.41, 0.21] | -0.20 | 0.14 | [-0.48, 0.08] | 0.05 | 0.07 | [-0.08, 0.18] | -0.22 | 0.16 | [-0.53, 0.09] | 0.00 | 0.09 | [-0.18, 0.18] |
| Random part | | | | | | | | | | | | | | | |
| Level: between couple | | | | | | | | | | | | | | | |
| Retiree | 0.09 | 0.22 | | 0.94 | 0.21 | | 0.14 | 0.04 | | 0.98 | 0.22 | | 0.22 | 0.06 | |
| Covariance retiree- spouse | 0.02 | 0.19 | | 0.61 | 0.18 | | 0.07 | 0.03 | | 0.63 | 0.19 | | 0.03 | 0.03 | |
| Spouse | 0.06 | 0.25 | | 0.96 | 0.22 | | 0.13 | 0.03 | | 1.12 | 0.25 | | 0.09 | 0.03 | |
| Level: within couple | | | | | | | | | | | | | | | |
| Variance retiree | 0.21 | 0.06 | | 0.64 | 0.05 | | 0.24 | 0.02 | | 0.75 | 0.06 | | 0.39 | 0.03 | |
| Variance spouse | 0.28 | 0.06 | | 0.63 | 0.05 | | 0.23 | 0.02 | | 0.76 | 0.06 | | 0.46 | 0.03 | |

N = 44 couples, 7 days, 1,128 observations in use. *SE* = standard error, estimates; fixed effects = non-standardized betas (range variables 0–4; all variables person-mean centered), *CI* 95%: confidence intervals 95%, if not including zero bold.



Perceived Disclosure Quality on Days With Intrapersonal Rumination: Actor and Partner Effects

First, we investigated whether on days with more intrapersonal rumination, perceived disclosure quality is altered. In this sample, retirees perceived disclosure of their spouses as less authentic and less open on days when the spouses reported more rumination. In contrast, the spouse perceived the ruminating recently retired partner as sharing more redundant, negative, and difficult to follow material. The differential effects of the role of partner might be explained by being more affected by the retirement transition and thus more in need of downregulating emotional responses. The qualities of disclosure of the retiree as perceived by the spouse mirror the quality of ruminative processing. So, possibly, the ruminative mode of processing the salient stressor explains the perception of the spouse. Retirees were possibly more distressed and felt an urge to share their emotionally pressing, more incoherent stories that possibly lead to co-brooding.

In contrast, the perceptions of the retiree hint at a different pattern. Here, an avoidant quality of social sharing was perceived. This might be explained by the attempt of the spouse to be supportive and understanding when talking about the retirement, which is primarily an experience of the partner and secondarily affecting the spouse. This is in line with the findings of another asymmetric situation in couples coping with the disease of one of the partners. In this context, the term protective buffering has been introduced, referring to a less authentic and less confrontative way of offering support to the ill partner with best intentions, however, mostly adverse outcomes (Coyne and Smith, 1994). Further research is needed for a better understanding of how to overcome asymmetric couple situations and maintain a sense of efficacy and autonomy in both partners which should foster positive adjustment.

TABLE 3 | Multilevel model estimates: actor and partner effects of retirement-related disclosure on adjustment symptoms preoccupation and failure to adapt.

| | Preoccupation | | | Failure to adapt | | |
|--|---------------|-------|-----------------------|------------------|-------|---------------------|
| | Estimate | S.E. | CI 95% | Estimate | S.E. | CI 95% lower bound |
| Fixed part | | | | | | |
| Intercept retiree | 1.45 | 0.08 | [1.37, 1.60] | 3.56 | 0.11 | [3.45, 3.77] |
| Intercept spouse | 1.41 | 0.12 | [1.17, 1.64] | 3.77 | 0.11 | [3.56, 3.98] |
| Actor spouse disclosure | 0.19 | 0.03 | [0.13, 0.25] | 0.00 | 0.06 | [-0.11, 0.11] |
| Partner spouse disclosure | 0.03 | 0.05 | [-0.06, 0.12] | -0.05 | 0.07 | [-0.18, 0.08] |
| Actor retiree disclosure | 0.22 | 0.05 | [0.12, 0.31] | 0.07 | 0.07 | [-0.07, 0.20] |
| Partner retiree disclosure | 0.26 | 0.06 | [0.14, 0.38] | -0.18 | 0.10 | [-0.38, 0.02] |
| Female (male) | -0.10 | 0.11 | [-0.32, 0.12] | -0.05 | 0.10 | [-0.24, 0.15] |
| Week after writing (retiree) | -0.07 | 0.07 | [-0.20, 0.07] | 0.20 | 0.10 | [-0.01, 0.40] |
| Week after writing (spouse) | -0.01 | 0.07 | [-0.14, 0.12] | -0.02 | 0.11 | [-0.23, 0.19] |
| Interaction week after writing*retiree partner effect disclosure | -0.07 | 0.07 | [-0.21, 0.07] | 0.16 | 0.11 | [-0.05, 0.36] |
| Interaction week after writing*spouse partner effect disclosure | -0.35 | 0.10 | [-0.55, -0.16] | 0.30 | 0.17 | [-0.03, 0.62] |
| Random part | | | | | | |
| Level: between couple | | | | | | |
| Intercept retiree | 0.154 | 0.039 | | 0.31 | 0.079 | |
| Covariance retiree-spouse | 0.017 | 0.039 | | 0.073 | 0.042 | |
| Intercept spouse | 0.307 | 0.073 | | 0.119 | 0.039 | |
| Level: within couple | | | | | | |
| Variance retiree | 0.262 | 0.017 | | 0.572 | 0.037 | |
| Variance spouse | 0.227 | 0.015 | | 0.681 | 0.045 | |

N = 44 couples, 7 days, 1,014 observations in use. SE = standard error, estimates; fixed effects = non-standardized betas (range variables 0–4; all variables person-mean centered), CI 95%: confidence intervals 95%, if not including zero bold.

The actor effects of rumination might be explained by the biased perception of disclosure of the partners associated with a ruminative self-focus. Another explanation might be that on days with more ruminative self-focus, social behavior and processing are altered and thus provoke altered disclosure quality in the partner. This way of interpreting the actor effects would be supported by findings showing less perspective-taking (Joireman and Hammersla, 2002) and less likability (Butler et al., 2003) during intrapersonal emotion regulation involving an avoidant self-focus.

Retirement-related Disclosure and Daily Adjustment: Actor and Partner Effects

Retirement-related disclosure occurred on days with more and not fewer adjustment symptoms. Besides the lack of substantial associations with failure to adapt, preoccupation showed significant actor effects for both partners. It is important to note that these are within-person effects and reveal coupled temporal unfolding. The study results suggest that the disclosure we assessed might have been shared thoughts associated with reported preoccupation. Again, this underlines the well-documented need to share emotionally arousing experiences (Rimé, 2007). Furthermore, it supports the assumption that the quality of intrapersonal processing of emotional experiences is mirrored in the way they are shared to others. In other words, disclosure in this study might have had rather a co-ruminative nature and thus was not immediately successful

in co-regulating symptoms. The partner effect of disclosure of the retirees on their spouse could be interpreted as resulting from a higher need for adjustment and emotion regulation due to the individual transition, which might lead to more incoherence and more urgency. As mentioned earlier, co-rumination is associated with more emotional contagion and maladaptive outcome (Schwartz-Mette and Rose, 2012). Further research is needed to disentangle adaptive and less adaptive ways of sharing stress-related contents and their predictors. The significant interaction results are in line with earlier findings, indicating that expressive writing has the potential to lead not only to improved intrapersonal emotion regulation but also to better interpersonal functioning. In this study, there was no placebo condition and the specific effects of writing about the retirement transition cannot be tested. Even though the interaction effect is subtle and preliminary, the spillover effect of disclosure of the retirees was dampened after expressive writing in this sample—a finding that needs to be replicated in further research and suggests an asymmetrical effect of the writing task.

Disclosure Valence

According to the literature, there are some aspects that might be worthwhile to consider in further research, the emotional tone or the affective valence of disclosure processes being one among them. In this study, the affective valence was not assessed as we asked for thoughts and feelings regarding retirement—so it

is not clear whether this rather included concerns and worries about the retirement or more enthusiastic sharing about the great new leisure time opportunities (though the latter is less probable, given the sample inclusion criterion of feeling challenged). In other lines of research investigating different forms of disclosure, the power of positive disclosure or positive sharing has been illustrated; it is supposed to allow *capitalization* upon positive experiences by sharing them and thus serving positive processes in the individual and also fostering relationship quality in couples (Gable and Reis, 2010). It has been shown that the established negative association between depressive symptom and marital quality is partly explained by reduced positive disclosure (Horn et al., 2017), hinting at the important function of daily positive disclosure for relationship quality. Furthermore, recent contributions from affective science highlight the importance of positivity resonance in relationships in general, i.e., shared moments of positive affective experiences as a driving factor for growth in personal and social resources (Frederickson, 2016). Other studies showed that mundane but not particularly emotionally loaded disclosure is highly valuable for adjustment to health problems (Robbins et al., 2018; Horn et al., 2019). The later findings are in line with the “Relational Regulation Theory”, stating the importance of interactions—including mundane but not particularly emotional ones—in everyday social interactions for successful interpersonal adjustment (Lakey and Orehek, 2011). To sum up, disclosure comes in different forms and shapes which might have differential implications for psychosocial adjustment and couple functioning. Further research considering the affective quality and intensity of the disclosed content would be of high interest.

Aging Together

Pathways to retirement are pathways to aging, as this life transition of leaving the workforce has pronounced implications on how individuals are viewed by the society, by their romantic partner, and by themselves, and which roles they feel and are assigned to (van Solinge and Henkens, 2007; Wang et al., 2011). It is known that the value of the professional role for the self and high identification with work predicts a more demanding transition to retirement (Barbosa et al., 2016) and that there are gender effects to expect (Kim and Moen, 2002). In this study, gender could be controlled statistically, but the fact remains that most of the retirees were male and spouses being female. However, earlier studies have shown the gender differences in marital quality after retirement depending on the previous working conditions (Moen et al., 2001). This warrants further investigation with more heterogeneous samples and might lead to implications not only for including the partner in intervention supporting the individual transition to retirement (Ahlers, 2004) but also for targeting interventions to different types of couples. For example, it has been reported that dual-earner couples often plan to retire together and cohort effects on the transition to retirement reflecting different realities regarding gender equality in the workforce (Moen et al., 2006; Ho and Raymo, 2009). Other studies have found that younger dual-earner couples do not generally prefer to retire jointly, only if they report high levels of relationship and low levels of work attachment (Eismann et al.,

2017) and that perceived influence on retirement decisions by the partner yields ambivalent results calling for validating the need of the retirees for autonomy while including the partner in the retirement process (Smith and Moen, 2004). Furthermore, this opens the door for further investigation into the cohort effects of the life transition and poses questions regarding possible societal changes and their effect on the transition of couples to retirement. For example, it has been proposed that as the postretirement life tends to be healthier and longer as compared with earlier generations, the individuals tend to build up a “bucket list” for the time after retirement and postpone the pursue of leisure goals into this period (Freund, 2020). This should also have an impact on the marital relationship and warrants further research. Generally, the opportunity for establishment and cultivation of leisure time activities after retirement has been discussed (Pinquart and Schindler, 2009; Zawadzki et al., 2015) which bears the potential for an increase in daily well-being (Zawadzki et al., 2015). From the perspective of a couple, this might also be worthwhile to take into account. For example, for the planning of targeted interventions, taking the advantage of establishing novel shared leisure time activity might help to open up spaces for disclosure and responsiveness and to overcome “relationship boredom” in long-term couples (Aron et al., 2000). In general, there is increasing evidence and high-conceptual plausibility that a dyadic perspective on the transition to retirement and healthy aging is indicated (Hoppmann and Gerstorf, 2009; Haase and Shiota, 2019; Horn and Röcke, 2020) and should inform future approaches investigating and supporting this transition.

Implications and Outlook

The results of this study suggest a shifting scope in interventions. Individuals facing a life transition like retirement benefit from social resources and adaptive co-regulation in the relationship. To be successful in this endeavor, positive conditions for social sharing, in other words, good communication helps. The more possibly innovative viewpoint provoked by our findings might be that supporting individual emotion regulation also has the potential to lead to more adaptive couple processes. This is in line with earlier findings in the context of depression; in a seminal study, individual interpersonal psychotherapy showed similar effects on couple processes and depressive symptoms like an intervention focusing on enhancing dyadic coping in the relationship (Bodenmann et al., 2008). The interplay between intrapersonal repetitive thoughts and perceived disclosure quality might represent a way to analyze how intrapersonal emotion regulation deficits spillover into the relationship—possibly by verbalizing ruminative circles in dialogue. Studies conducted with adolescents in a developmental psychopathology framework support this notion: co-rumination has been shown to mediate links between depressive symptoms and interpersonal stressors over time (Hankin et al., 2010; Schwartz-Mette and Rose, 2012). It has also been reported in adult couples facing health problems—again maladaptive ways of sharing catastrophic thoughts and negative feelings about the stressor could be detected as a mediating mechanism in daily life between intrapersonal catastrophizing and fatigue symptoms after cancer (Müller et al., 2019).

Given the fact that disclosing thoughts and feelings are the starting point of the constant updating process for psychological intimacy, it does not come as a surprise that social resources might deteriorate social resources by worsening relationship quality. This is in line with earlier findings in the context of social support (Maisel and Gable, 2009), stress response (Canevello et al., 2016), enacted responsiveness (Debrot et al., 2012), and physical health (Selcuk and Ong, 2013), highlighting the importance of perceived responsiveness for positive effects on the outcome of couple-related processes. In other words, if the input of the partner comes in a context, where the romantic counterpart does not feel understood, validated, and cared for, it will not help. Sharing the overwhelming, fragmented content that has not been “preprocessed” to a coherent narrative might just be difficult to understand, and thus it is hard to transmit the feeling of being understood to the partner. Interestingly, it has been shown that the perception of being understood—not the actual level of correct understanding by the partner—is the driving force for better dyadic adjustment (Hinneken et al., 2020). Given our findings, there might also be a risk of projecting own insecurities to the partner, a phenomenon well-studied in terms of projection of own responsiveness (Lemay et al., 2007). The non-experiential, abstract, avoidant processing mode related to rumination is opposed to functional self-reflection and self-understanding (Treynor et al., 2003), which is associated with insight into the self and all facets of positive well-being (Harrington and Loffredo, 2011). In other words, it may result in difficulty for the partner to transmit a sense of being understood to partners who do not understand themselves. It is interesting to note that this adaptive way of reflective self-focus fosters empathic perspective-taking and concern (Joireman and Hammersla, 2002) and should allow a stress expression that is easier to be answered with a responsive reaction—a script that is trained in established programs fostering dyadic coping (Leuchtmann et al., 2018). To sum up, providing alternatives for ruminative self-focus and fostering reflective self-focus not only improves adaptive intrapersonal processes but should also spillover to the relationship quality by allowing disclosure in a way that makes it possible for the partner to react in a responsive way.

Limitations

This study has many limitations that need to be considered to prevent premature conclusions.

First, the sample size is very small. The statistical power is borderline, particularly on the couple level (level 2). With 14 points of measurement, power might be slightly more satisfying at level 1. However, replications with bigger sample sizes are warranted before relying on the findings, which furthermore reflect only small effects. This would also be important in order to strengthen the confidence in the psychometric quality of the items that have been developed for this study.

Second, given the long-recruitment period that resulted from the difficulties to find eligible couples, it is plausible to assume that the sample might be selected and does not represent all couples facing retirement or other stressors. This sample was furthermore characterized by lacking financial concerns and

involuntary retirement, two factors that have been identified as risk factors for difficulties when adjusting to retirement. Furthermore, even though couples defined themselves as challenged by the transition, adjustment problems did not reach clinical significance, though they were fluctuating significantly during the assessment period. Possibly, the investigated associations do not generalize to situations when adjustment fails in a more pronounced way and leads to more severe mental health problems. To reduce the study burden and being able to recruit more burdened populations, less obstructive methods than daily diaries like mobile sensing of couple conversations in audio recordings might be possible alternatives for the future; this might allow fewer selected samples when investigating the processes. Given the very basic nature of the processes and the innovative assessment, our results are heuristically interesting and possibly inspiring future research. Furthermore, the inclusion criterion “perceiving oneself as challenged by the transition to retirement” might be vague and interpreted differently by the participating couples who had been facing the transition for different periods of time already. Further studies with a prescreening of postretirement expectancies and anxieties, current adjustment, and mental health status would allow a more specific selection of a high-risk group. Furthermore, the subjective definition “of being challenged by the transition” leads to a broad range of time passed after retirement. Therefore, it cannot be excluded that we studied couples at different stages of adjustment. Lastly, in the present study, we included only dyads who had one partner facing the transition disengaging from work life and the other partner not. However, many couples actively attempt to coordinate a joint transition to retirement which might lead to a more symmetric situation, possibly fostering less threat to self-esteem and autonomy (Zee and Bolger, 2019).

Third, this study is relying on self-reports with all their limitations. However, self-reports are the gold standard to assess perceptions (as perceived disclosure quality) and subjective experiences (e.g., rumination and adjustment symptoms). We do not know how actually disclosure sequences unfolded, what and how couples talked with each other, and what behaviors they showed. This information would add immensely to the preliminary contribution of this study and could be assessed by either inviting couples to the lab and instigating analog disclosure situations or audio-sensing daily conversation of couples (Mehl et al., 2012) and investigating their language use (Horn and Meier, 2021).

Furthermore, the reported associations are correlational in nature and do not allow causal inferences. The results reflect temporal coincidences of the study variables within couples during their daily life.

CONCLUSION

The preliminary conclusion of this study is that intrapersonal risk and protective factors possibly cross over to the partner *via* interpersonal emotion regulation processes. This might play an important role when adjusting to stressors and life transitions like retirement. This study showed that disclosure in couples can

also lead to maladaptive crossover effects to the partner. This is particularly the case on days when maladaptive intrapersonal emotion regulation takes place in the form of rumination. In other words, intrapersonal emotion regulation provokes changes in social life. These changes reflect mechanisms that play an important role when adjusting to stressors and have a potential impact on both partners. Improving intrapersonal regulation of emotional reactions to stressors might attenuate negative social contagion and foster adaptive sharing processes. Our findings support a socio-interpersonal perspective on adjustment to life transitions and stressful health situations and open the door for further research and interventions to support the transition to retirement and other relevant life events. A bidirectional view seems warranted—the relationship as a resource for coping better with stress but also as vulnerable to external stress influences (Lavner and Bradbury, 2017)—a vulnerability that might be prone to be overcome when considering the support of interpersonal emotion regulation.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics committee of the Faculty of Arts

at the University of Zurich. The patients/participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AH and SH conceived and designed the study. Recruitment and data collection were performed by SH and VR. Data selection and entry were supervised by AH. Statistical analyses were performed by AH. AH drafted the manuscript. All authors contributed to the writing of the manuscript and gave final approval of the version submitted.

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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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