Affiliative Responses to External Stress in Couples

by

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ABSTRACT

Can stress ever be good for romantic relationships? Although it is well-established that stress can harm relationships (Karney & Bradbury, 1995; Randall & Bodenmann, 2009), stress may also bring people closer together (Taylor, 2011b). Specifically, recent research and theory suggest that when people experience acute and chronic stress that originates outside of the couple (i.e., external stress) and is moderate in intensity, they may show affiliative responses toward their partner (Clavel et al., 2017; Donato et al., 2018). Moreover, stressed women may be more likely to show affiliative responses toward their partner than stressed men (Taylor et al., 2000. Importantly, how much a person displays affiliative responses may not only depend on their own stress but also their partner's stress. However, there is currently little research examining both partners' stress and affiliative responses. Thus, the current dissertation examines affiliative responses in couples experiencing acute and chronic external stress. This research aims to understand (1) when external stress may be associated with more affiliative responses and (2) who may show more affiliative responses to external stress. In three studies, I examined stress and affiliation during the COVID-19 pandemic, during a laboratory stressor, and during a dyadic caregiving interaction with an infant simulator. I found that moderate acute stress may be associated with greater affiliation in women and lower affiliation in men, shared acute and chronic stressors may be associated with greater affiliation, and people may respond to their partner's stress by affiliating with their simulated infant. This work contributes important new information about how external stress may affect men and women in romantic relationships.

CHAPTER 1

Introduction

Stress can negatively impact romantic relationships (Karney & Bradbury, 1995; Randall & Bodenmann, 2009; Story & Bradbury, 2004). When people encounter stressors such as those related to work demands, financial hardships, or daily hassles, they often feel less close to and provide less support to their romantic partners (e.g., Totenhagen et al., 2013). However, in some cases, people may also feel closer to and provide greater support to their partner following stress (Berger et al., 2016; Clavel et al., 2017). The current dissertation examines people's affiliative responses to stressors that are external to the relationship. I examine (1) when people in romantic relationships may show greater affiliative responses towards their partner and (2) who may be especially likely to show affiliative responses towards their partner following a stressful experience.

What is stress?

Stress can be defined as a process involving three components: the stressor, appraisal, and response (Lazarus, 1993). Stressors are environmental stimuli that people perceive, such as real or imagined events. People then interpret the stressor and their available resources to deal with the stressor, which refers to appraisal. If people interpret the stressor as positive or have sufficient resources to deal with it, they will likely not experience stress. However, if people interpret the stressor as negative and have insufficient resources to deal with it, they will likely show psychological and physiological changes such as increases in perceived stress and stress-

related hormones (Cohen et al., 1997; Lazarus, 1993). Following these psychological and physiological changes, people typically engage in responses that are aimed at overcoming the situation, such as affiliation (Lazarus, 1993; Taylor & Master, 2011). Affiliative responses have been observed in response to external stressors (e.g., experimental manipulation; von Dawans et al., 2012). Psychological changes (e.g., recalling an event they thought was stressful; Donato et al., 2018) and physiological changes (e.g., changes in hormones; Berger et al., 2016) in response to experimental stress manipulations were also associated with affiliation. Therefore, the proposed dissertation will examine stressors, psychological and physiological changes, and whether they are associated with affiliative stress responses in romantic relationships.

To understand affiliative stress responses in romantic relationships, it is important to consider different dimensions of stress and how they may affect romantic relationships. These are (a) the *locus* of stress, (b) the *duration* of stress, and (c) the *intensity* of stress. First, the locus of stress may lie outside or inside the relationship (Randall & Bodenmann, 2009). Stressors originating from outside of the couple (e.g., work stress, children) are considered external, whereas stressors originating from inside the couple (e.g., relationship conflict) are considered internal stressors. External stressors may be especially important for affiliative responses in romantic relationships. Compared to external stressors, partners experiencing internal stressors such as conflict may be less likely to show positive responses (e.g., affiliation). In fact, internal stressors may involve negative partner behaviors such as dismissiveness or hostility. Although external stressors can sometimes lead to internal stressors (e.g., Ascigil et al., 2020; Randall & Bodenmann, 2009), there is a growing body of research suggesting links between external stressors and positive changes in romantic relationships (e.g., Neff & Broady, 2011; Williamson et al., 2021). However, positive effects of internal stressors were rarely found in the literature

(for an exception, Gordon & Chen, 2016). Therefore, the current dissertation focuses on external stressors.

Second, stressors may also vary in their duration. Stressors that are short in duration (e.g., minutes to days) and are limited in the number of instances are considered to be acute, whereas stressors that last longer (e.g., months to years) and tend to be more stable aspects of the environment are considered to be chronic (Randall & Bodenmann, 2009, 2017). Both acute and chronic stress may contribute to negative changes in romantic relationships; however, these changes tend to be more negative when people report chronic stress (Karney et al., 2005). The current dissertation examines both acute stressors induced in the lab environment and chronic stressors associated with the COVID-19 pandemic.

Third, not all experiences of stress will have the same impact on couples. A final important distinction we must make is the intensity of stress. The intensity of stress may be determined by the person's subjective evaluation of stress (Donato et al., 2018) or the researchers' objective evaluation of the stressor (i.e., critical life events; Randall & Bodenmann, 2009). Stressors that are of lower intensity are considered minor (e.g., being late for an appointment), whereas stressors that are higher in intensity are considered major (e.g., job loss; Randall & Bodenmann, 2017). Minor stress can be especially harmful to romantic relationships as it can impact the romantic relationship without the partners realizing it (Bodenmann et al., 2007). Major stress, on the other hand, is less consistently associated with romantic relationship functioning (Bodenmann et al., 2007; Randall & Bodenmann, 2009). Some suggest that moderate levels of stress may have a positive impact on the relationship, whereas low and high levels of stress have a negative impact. Specifically, moderate levels of stress can provide couples with the opportunity to practice their coping responses in a manageable situation,

whereas low levels of stress may not call for such coping responses and high levels of stress may overwhelm their coping capabilities (Neff & Broady, 2011). The current dissertation also examines the role of stress intensity in affiliative responses within couples.

All three dimensions of stress (i.e., locus, duration, and intensity) are thought to be critical for understanding the impact of stress on close relationships (Randall & Bodenmann, 2009). Previous researchers called for the conceptualization of stress in romantic relationships using these three dimensions in order to examine stress in a more reliable and valid way (Randall & Bodenmann, 2009, 2017). Thus, the current dissertation focused on responses to external stressors varying in intensity and duration.

Affiliative stress responses

Human stress responses have historically been conceptualized as "fight-or-flight". The flight-or-flight response describes two key ways in which people respond to stress: either aggressively (by "fighting" the stressor) or fleeing (by taking "flight" from the stressor) physically or with psychological avoidance (Cannon, 1932). However, early empirical work on the psychology of affiliation by Stanley Schachter showed that people may also respond to stress by turning to others. For example, comparing individuals who were made to believe that they were waiting to take part in a high-stress (i.e., receiving a series of painful electric shocks) versus a low-stress task (i.e., receiving a series of tingling electric shocks), those in the high-stress condition were more likely to choose to wait with others than wait alone (Schachter, 1959). Recent theorists also argued that the fight-or-flight conceptualization ignores one of the most basic ways humans respond to a broad array of stressful situations: namely, coming together in social groups to provide and receive protection (Taylor, 2006, 2011a). Such responses to stress in which people seek or provide closeness, care, or support are broadly termed affiliative stress

responses (Taylor et al., 2000). Affiliative stress responses may help people deal with stress by providing resources for joint protection and managing emotions by comparing themselves to others (Schachter, 1959; Taylor et al., 1992, 2000).

To characterize affiliative stress responses, Taylor and colleagues describe "tend-and-befriend" as an additional human stress response (2000). This conceptualization proposes that people may also respond to stress with affiliative behaviors, such as caring for others ("tending") and creating or maintaining social relationships that provide resources and protection in stressful contexts ("befriending"; Taylor, 2011b). Although tending is primarily conceptualized as a response in infant-parent relationships, such affiliative responses have been expanded to other relationships as well (Feldman, 2012; Taylor et al., 2000).

Other theoretical frameworks also suggest that people may display affiliative responses to stress. For example, Bowlby posited that the attachment behavioral system becomes activated when people feel threatened or distressed due to personal (e.g., pain, illness), relational (e.g., separation, conflict), or external events (e.g., stressful events; Bowlby, 1969). The Attachment Diathesis-Stress Process Model, an extension of attachment theory, suggests that virtually all humans desire to be closer to their attachment figures when experiencing acute or chronic stressors (Simpson & Rholes, 2012, 2017). As a result of this desire, most people are likely to display attachment behaviors such as seeking closeness and comfort.

Taylor and colleagues posit that affiliative stress responses are at least as common as fight-or-flight responses during stressful situations (Taylor, 2006). But why do people display affiliative responses in stressful situations? Tend-and-befriend theory suggests that this is a highly adaptive response for survival (Taylor et al., 2000). Although fight-or-flight responses can protect the individual from threatening situations, they may not always be feasible. For example,

if the person cannot fight the threat themselves, affiliative responses may be more feasible as the social group may provide support or protection (Taylor, 2011b). Similarly, if the person cannot flee the threat, they may tend to others around them (e.g., offspring) in order to quiet them and blend into the environment together (Taylor et al., 2000). Similar to the tend-and-befriend theory, attachment theory suggests that attachment behaviors are highly adaptive for survival because proximity to caregiving figures can ensure the survival of vulnerable infants (Bowlby, 1969). Both theories suggest that people may engage in affiliative behaviors such as proximity seeking in order to alleviate their stress (Simpson & Rholes, 2017).

Although the tend-and-befriend theory is not specific to romantic relationships, it has been used to describe romantic relationship dynamics. When people in romantic relationships face stressors, they may tend to their partner by providing care and support and seek closeness or social support from their partner (Taylor, 2002). For example, after recalling a moderately stressful experience, people reported a greater desire for proximity to their partner (e.g., "I wish my partner embraces me"; Donato et al., 2018). However, a large body of work on theoretical frameworks, such as the family stress model and the vulnerability stress adaptation model, suggest that romantic partners often report conflict or social withdrawal when they face stressors (e.g., Conger & Elder, 1994; Karney & Bradbury, 1995).

Sex differences

Why do some people turn to others during stress while other people engage in aggression or social withdrawal? Tend-and-befriend theory suggests that there are sex differences in how people typically respond to stress due to the evolutionary challenges faced by men versus women[1]. Specifically, historically, women bore the responsibility of caring for offspring

[1] Similar to van Anders (2013), the current dissertation uses both gender and sex because affiliation may be a mix of gender (e.g., socialization to nurturance) and sex (e.g., hormonal correlates of nurturance).

throughout pregnancy and early life, and were more invested in their offspring (Taylor, 2011a). This greater investment created the adaptive challenge of protecting not only the self, but also the offspring. In this way, there were greater selection pressures for affiliative stress responses in women, instead of fight-or-flight responses that may compromise offspring safety (Taylor, 2006). Taylor and colleagues argued that fight-or-flight responses may compromise offspring safety because fighting the threat may leave the offspring exposed to the threat, whereas fleeing may be compromised when carrying an infant and during pregnancy. Also, they argued that tending responses reduce the neuroendocrine responses to stress that may compromise the health of the offspring. Therefore, fight-or-flight stress responses may protect the individual, whereas tend-and-befriend stress responses may ensure joint protection of self and dependents (Taylor, 2011a). Due to the lack of similar selection pressures in men, fight-or-flight may be more characteristic of men's than women's stress responses (Taylor et al., 2000).

Other researchers have argued that male paternal behavior and coalition formation are forms of tending and befriending responses in men (Geary & Flinn, 2002). Also, recent studies have found no differences between men and women's caregiving motivation or support provision when they were not stressed (Neff & Karney, 2005; Probst et al., 2017). However, Taylor and colleagues argue that male hormone responses to stress (e.g., increases in testosterone) do not support caregiving (Taylor et al., 2002). They further argue that coalition formation in men has the purpose of gaining or maintaining a position in hierarchies rather than befriending. Therefore, the tend-and-befriend theory maintains that women may be more likely than men to turn to others in stressful situations.

In support of this view, experimental research suggests that, when stressed, women display more affiliative responses than men. For example, in Schachter's experiments, the effect

of anticipating a stressful situation on affiliation was found primarily in female participants (Schachter, 1959). More recent experimental studies also found greater affiliation in women compared to men following stress manipulations. For example, stressed women were more prosocial and cooperative in social decision-making experiments, whereas stressed men were more selfish and competitive (Nickels et al., 2017). Further, stressed women viewing videos of infants were also found to be more willing to take care of them compared to stressed men (Probst et al., 2017). Affiliative stress responses were also found in studies examining stressful events outside of the laboratory. For example, women were more likely to provide support during crises in their social networks, and they also sought more social support during stressful times compared to men (Tamres et al., 2002; Taylor, 2011b).

Sex differences in stress responses may be modest, however. Researchers have expanded on the tend-and-befriend theory to include men's tending and befriending as well (Geary & Flinn, 2002). This expansion posits that men may also be invested in their offspring and benefit from affiliating with social groups, and may therefore engage in affiliative stress responses. In support of this view, experimental research has shown that men who were stressed reported greater closeness, trustworthiness, and sharing with others compared to men who were not stressed (Berger et al., 2016; von Dawans et al., 2012). Furthermore, differences between men and women in tend-and-befriend stress responses are not always found. For instance, in a survey, both men and women reported tend-and-befriend responses as their most common responses to stress (Levy et al., 2019). In fact, Taylor also concluded that both men and women may show affiliative responses to stress and that sex differences are robust but modest in magnitude (2011a). Therefore, although initially theorized to have evolved as an adaptive response to stress

particularly for women, affiliative stress responses may be observed in both men and women, with women showing slightly more affiliative responses than men.

Locus, duration, and intensity of stress

Although it is unclear whether there are significant sex differences in tending and befriending, there is agreement that people sometimes respond to stressors in affiliative ways. Some researchers highlight the importance of the types of stressors in determining whether stressful experiences will bring partners closer or not. For example, Clavel and colleagues argue that stressors that are external to the relationship and affect large numbers of people may prompt people to unite with close others, and protect or support them in the face of a perceived common threat (2017). Consistent with this perspective, Clavel and colleagues found in African American couples that those who experienced more frequent racial discrimination events (e.g., exclusion, harassment) were more supportive towards their partner two years later. Importantly, they found the opposite effect when they examined another stressor in the same couples: Those who experienced greater financial strain (e.g., postponing medical or dental care, difficulty paying bills) were less supportive towards their partner two years later. The authors argued that discrimination had a clear external locus, whereas financial strain did not (e.g., people may attribute the locus of financial strain to their partner). Furthermore, discrimination affects large numbers of people and is an uncontrollable stressor, which may enhance external attributions. Therefore, the locus of the stressor appears to be an important factor in determining whether partners will engage in affiliative responses.

Furthermore, the duration of the stressors that Clavel and colleagues examined should also be noted. Both racial discrimination and financial strain were chronic stressors. Taylor suggests that, although acute stressors can prompt people to be affiliative, chronic stressors can

have the opposite effect and take a toll on relationships (Taylor, 2002). In fact, recent research suggests that chronic stress (indexed by chronic worrying, work-related and social stress) can increase disengagement from others (Schweda et al., 2019). However, Clavel and colleagues' findings suggest that external chronic stressors like racial discrimination may increase affiliation in couples. Therefore, stressors that are long in duration may be associated with greater affiliation in couples if they have a clear external locus.

The intensity of stress may also be important for affiliative stress responses as there is a growing body of research suggesting that moderate stress may be good for romantic couples (e.g., Neff & Broady, 2011). This research is consistent with the classical studies on motivation, whereby people show greater positive emotion at moderate levels of arousal (Hebb, 1955), as well as those on the inverted U-shaped relationship between stress and performance (Yerkes & Dodson, 1908). One recent study found that the effects of stress on passion towards the partner (e.g., "I wish my partner embraces me") depend on the intensity of the stressor (Donato et al., 2018). Participants in the experimental conditions were instructed to recall issues that caused them low, moderate, or high levels of stress and describe the issue in detail, whereas participants in the control group listed reasons for feeling stressed without elaborating on them. Those in the low and high-stress conditions reported lower passion towards their partner than those in the moderate stress condition. In fact, those who experienced moderate levels of stress reported a similar level of passion to those in the control condition. Another study found that moderate increases in cortisol, a stress hormone, following a stress manipulation were associated with higher caregiving motivation in men (i.e., "How big is your urge to pick the infant up, to cradle it in your arms and to try and comfort it?") compared to men who had low or high increases in cortisol (Probst et al., 2017).

Stress responses in couples

It is also important to note that stress responses are often a dyadic process for couples. That is, how much a person displays affiliative behaviors may not only depend on their own stress but also their partner's stress. For example, people may respond to their partner's stress by providing greater support. In heterosexual couples, when husbands experience greater stress, wives may provide more tangible support (i.e., taking on more household responsibilities; Bolger et al., 1989) as well as emotional support (i.e., caring and comforting; Neff & Karney, 2005). Therefore, individuals in romantic relationships may display affiliative behaviors in response to their *partner's* stress and it is critical to account for both partners for a better understanding of affiliative stress responses in couples.

A dyadic approach to examining stress responses in romantic relationships may not only account for the role of both partners' stress in predicting one's affiliative responses, but also help us understand the effects of *shared* stress. In romantic relationships, partners often feel stressed due to shared experiences at the dyad level (e.g., both partners experiencing stress due to a pandemic). Though Schachter's experiments were not conducted with couples, they suggested that when participants in the high-stress condition were given the choice of waiting with other participants waiting for the same task or another task, they were more likely to choose to wait with other participants waiting for the same high-stress task (Schachter, 1959). Schachter concluded that "misery does not love just any kind of company, it loves only miserable company," which highlighted the importance of the shared stress experience in predicting affiliation (p. 24).

Few studies accounted for both partners' stress in examining stress responses in couples. In one exception, Bodenmann and colleagues (2015) experimentally induced stress among

couples and examined support provision. Consistent with the sex differences proposed by the tend-and-befriend perspective, they found that stressed men provided lower-quality support to their partners compared to stressed women. More specifically, stressed men showed fewer positive behaviors (e.g., listening, showing interest and empathy) and more negative behaviors (e.g., being dismissive, hostile, ambivalent) than did comparably stressed women when their partner expressed feeling stressed or upset. Unstressed men and women, on the other hand, were similar in their support provision to their stressed partners. In their study of discrimination and financial strain, Clavel and colleagues (2017) found that both one's own experience of discrimination and their partner's experience of discrimination were associated with greater support provision. Therefore, a dyadic approach can also help us explore affiliative stress responses in situations where both partners experience stress.

Current dissertation

In the current dissertation, I examine affiliative stress responses in couples across three studies: Study 1 examines couples' affiliative responses to acute and chronic stress related to the COVID-19 pandemic; Studies 2 and 3 examine couples' affiliative responses to acute stress in the lab environment. Across three studies, the current dissertation examines the following questions:

(1a) Do people show more affiliative responses towards their romantic partner when experiencing acute and chronic external stress?

(1b) Do people show more affiliative responses towards their romantic partner when experiencing moderate levels of external stress, as opposed to low or high levels of stress?

I hypothesize that moderate stress levels will be associated with greater affiliation (H1b) as opposed to low or high levels of stress (H1a).

(2) Do women show more affiliative stress responses compared to men?

Given the mixed findings and modest sex differences in tend-and-befriend responses, I hypothesize that men and women will show similar levels of affiliative stress responses (H2).

Study 1 examines associations between pandemic-related stress and affiliative responses (i.e., pandemic-related support) both cross-sectionally and longitudinally in a sample including both individuals and couples. Importantly, the cross-sectional subsample of this study allows us to examine an acute stressor (pandemic-related stress at the beginning of the pandemic) and the longitudinal subsample of this study allows us to examine a chronic stressor (pandemic-related stress throughout the first year of the pandemic). Study 2 examines couples in which either one or both partners are stressed, to understand how much they affiliate with their partners in the lab. Study 3 examines couples in which either one, both, or neither one of the partners are stressed, to understand how much they affiliate with their partner during a caregiving interaction with an infant simulator that calls for affiliation. A summary of the different stress and affiliation measures we examine in different studies is provided below.

Table 1
Overview of studies

	Stressor Type	**Stress Measure**	**Affiliation Measure**
Study 1	● External Acute ● External Chronic	● Pandemic-related stress	● Pandemic-related support
Study 2	● External Acute	● Stress manipulation ● Cortisol ● Perceived stress	● Support ● Affiliative behaviors
Study 3	● External Acute	● Stress manipulation ● Cortisol ● Perceived stress	● Support ● Positive feelings towards infant simulator

CHAPTER 2

Study 1

In times of crises, such as a global pandemic, relationship partners' affiliative responses can be important for their well-being and relationship quality. In earlier attachment research, Bowlby observed that family members seek proximity to each other for days or even weeks after disasters, because affiliation is comforting during these major external stressors (Bowlby, 1973). More recently, researchers have found that couples grew closer immediately after a hurricane compared to before the hurricane (Williamson et al., 2021). The current study aimed to understand whether pandemic-related stress was also related to affiliation during the COVID-19 pandemic and who may have shown greater affiliation in response to pandemic-related stress.

The COVID-19 pandemic has been a stressful time for many individuals. Shortly after it was declared a global pandemic, nearly half of Americans were worried about contracting COVID-19 (American Psychiatric Association, 2020). Most felt that it was having a serious impact on their day-to-day lives and feared that it would have a long-lasting impact on the economy (American Psychiatric Association, 2020). Importantly, stressors related to the pandemic were acute at the beginning of the pandemic, but later became chronic as the pandemic continued for over two years.

Can external chronic stressors that are common to both partners bring couples closer together? Previous research suggests that they may. Clavel and colleagues (2017) argue that external stressors that affect large numbers of people may prompt people to protect or support

their close others who are seen as vulnerable to the same stressor. In fact, in a longitudinal study of African American couples, they found that those who reported experiencing more racial discrimination were rated by trained coders as more supportive towards their partner during a discussion task two years later. Moreover, participants were also more supportive to partners who experienced more racial discrimination. Partner ratings of supportiveness were consistent with observer ratings: In follow-up surveys, those who experienced more discrimination were rated as more supportive by their partners two years later. Overall, these findings suggest that chronic external stressors that affect large numbers of people may promote more affiliative responses in couples.

Clavel and colleagues (2017) highlighted the importance of the stressor having a clear external locus in order for it to bring close others together. In their research, large numbers of people being impacted by discrimination stress and the uncontrollability of this stressor may have enhanced external attributions of this stressor. They also highlighted the importance of the stressor being shared. Specifically, they posited that the desire to protect close others who are also vulnerable to the same stressors as them may drive the increased support behaviors in response to discrimination stress (Clavel et al., 2017).

The COVID-19 pandemic had some of the same characteristics that Clavel et al. highlighted. The pandemic was experienced by large numbers of people around the world and stressors related to it were shared by many couples. Given these shared stressors, romantic partners may have experienced similar levels of pandemic-related stress. Many people may have also perceived the pandemic-related stressors as uncontrollable, especially at the beginning of the pandemic. Therefore, we may expect pandemic-related stress to be associated with affiliation.

In the current research, we examined the short-term and long-term associations between pandemic-related stress and pandemic-related support within couples. This allowed us to examine pandemic-related stress as both an acute and a chronic stressor.

Specifically, we examined the following research questions cross-sectionally and longitudinally:

(RQ 1a) Is higher pandemic-related stress associated with more affiliative responses (i.e., pandemic-related support provision) in romantic couples during the COVID-19 pandemic?

(RQ 1b) Do people show more affiliative responses towards their romantic partner when experiencing moderate levels of pandemic-related stress, as opposed to low or high levels of pandemic-related stress? We hypothesize that moderate levels of pandemic-related stress (H1b), as opposed to low or high levels of pandemic-related stress (H1a), will be associated with greater pandemic-related support provision.

(RQ 2) Do women show more affiliative stress responses compared to men? We hypothesize that men and women will show similar levels of pandemic-related support provision when they are stressed about the COVID-19 pandemic (H2).

(Exploratory) Do people show more affiliative stress responses when their stress is shared by their partner? We will explore whether people show higher levels of pandemic-related support provision when both they and their partner are stressed about the COVID-19 pandemic.

As the current study includes dyadic and longitudinal subsets, we will test these research questions for (1) actors only, (2) actors and partners, and (3) over time.

Methods

Procedure

We collected data between April 2020 and May 2021 using multiple platforms. Although the same survey was shared on all platforms, the procedure and eligibility criteria varied across platforms. First, we shared a survey on social media (e.g., Facebook, Twitter, Reddit, Craigslist) and asked volunteers to participate in our study. We used paid ads to reach potential participants from the U.S. and Canada. Those who were interested in our study first completed an eligibility survey. Eligible participants were over the age of 18, in a cohabiting relationship, and currently living in the U.S. or Canada. Those who were eligible proceeded to complete the survey. At the end of the survey, participants were encouraged (but not required) to invite their partners to complete the survey as well. Those who were willing to invite their partner received a link and a dyad ID to share with their partner. Current social media data includes those who participated between April 2020 and May 2021 (90.34% of participants completed the survey within the first month of the study). All participants who were recruited through social media were volunteers and were not compensated for their participation. We did not collect any personal information to contact social media participants again.

Second, we shared an eligibility survey through Prolific.co and invited eligible participants to complete the same survey that social media participants completed. Interested participants first took an eligibility survey. Participants were eligible if they were living in the USA, over the age of 18, and sheltering-in-place with their romantic partner at the time of recruitment (i.e., not leaving home except for essential business and exercise and not regularly working outside the home). We identified 60 participants who reported not sheltering-in-place with their romantic partner in the baseline survey, even though they had reported doing so in the

eligibility survey. These 60 participants were moved to the Social Media dataset as they were no longer eligible to participate in the Prolific survey but fulfilled the eligibility criteria for the Social Media survey. Prolific participants were paid $3 for participating in this survey. Similar to social media participants, at the end of the survey, participants were encouraged to invite their partner to complete the survey as well. Although they were not required to invite their partner, their partner would also receive compensation if they were willing to participate ($3). Participants who were willing to share the survey with their partner provided their partner's Prolific ID (if available) so that we could directly invite them to complete the survey, or received a link to share the survey with their partner if they were not Prolific users. Prolific participants were also informed that they would be contacted again for follow-up surveys. Those who participated in follow-up surveys received $1.5 for each additional survey. Prolific participants were invited to participate in the study in April 2020 (Time 1), May 2020 (Time 2), August 2020 (Time 3), November 2020 (Time 4), February 2021 (Time 5), and May 2021 (Time 6). Participants who completed all of the first four surveys received a $1.5 bonus. The study was reviewed by the University of Michigan's Institutional Review Board and was found to be exempt from IRB approval.

Participants

For social media participants, we aimed for 1,000 participants and at least 100 couples. This target was set because it was a feasible number of participants to reach online given the current eligibility requirements. A total of 1,255 social media participants completed the study; 957 participated in the survey individually and 149 couples participated together (298 individuals) between April 2020 and May 2021. Because we aimed to collect longitudinal data from Prolific participants, we determined the sample size based on a priori power analyses

(Ackerman & Kenny, 2016): We aimed to reach 150 couples to capture small to moderate effects using the Actor-Partner Interdependence Model. At baseline (Time 1), a total of 618 participants completed the study; 316 participants completed the study individually and 151 completed it with a partner (i.e., 302 individuals). At the follow-ups, 558, 429, 365, 297, and 222 participants completed the study at Time 2, 3, 4, 5, and 6, respectively. Our total sample across different recruitment platforms was 1,273 individuals and 300 couples at baseline (N=1,873). Participants ranged between the ages of 18 and 79 (M = 34.76) and were mostly White (N = 1448). Participants mostly identified as women (N = 1174) and men (N = 516). They had been with their partner for 9.11 years on average. Their household income ranged from under $15,000 to over $300,000 (*Median* = $50,001-75,000).

Measures

Pandemic-related stress. Participants reported the degree to which they were worried about getting COVID-19 ("How worried are you about getting COVID-19?") and concerned about meeting their and their family's needs ("How much has the COVID-19 pandemic made you concerned about meeting you and your family's basic needs, e.g., food, shelter, exercise, medical care?") rated on a scale from 1 (*Not at all*) to 5 (*Extremely*). At baseline, these two items were positively correlated (r (1871) = .406). These items were analyzed separately as they assessed two different aspects of stress regarding the pandemic and did not have adequate reliability together (α = .57).

Pandemic-related support provision. Participants reported the degree to which they provided pandemic-related support to their partner using two items capturing negative ("How often do you disregard or dismiss your partner's anxiety or concerns about the pandemic?") and positive support provision ("How understanding are you about your partner's anxiety or concerns

about the pandemic?") on scales from 1 (*Never/Not at all*) to 5 (*Always/Extremely*). At baseline, these two items were negatively correlated (r (1871) = -.418). These items were analyzed separately as they assessed two different aspects of support and did not have adequate reliability together (α = .59).

Analytic plan

Because our sample included couples, the data were non-independent. For example, the amount of support provided by one person is likely correlated with the amount of support provided by his or her partner. We used multilevel modeling to nest individuals within couples and account for this non-independence in all analyses. Because RQ1 was concerned with the association between moderate levels of pandemic-related stress and pandemic-related support, we included the quadratic effect of pandemic-related stress as a predictor in our models. We also included sex as a moderator in all models and tested the simple slopes when there were significant interaction effects. This helped us examine whether the association between actor and partner pandemic-related stress and pandemic-related support was different for men and women. However, we excluded participants who reported a different gender due to their small number.

First, we used the full baseline dataset of female and male participants (N = 1690) to examine *actor effects* (i.e., the effects of one's own pandemic-related stress and stress responses on one's own support provision) and the baseline dyadic subset (N = 576) to examine both *actor effects* and *partner effects* (i.e., the effects of one's partner's pandemic-related stress on one's own support provision). In additional APIM analyses, we also tested the interaction between actor and partner effects in order to examine the effects of only one or both partners having higher pandemic-related stress. Next, we examined longitudinal associations between pandemic-related stress and pandemic-related support in the full Prolific sample of female and male

participants (N = 604) and the dyadic Prolific subset (N = 296)[2]. Couples were treated as distinguishable based on sex.

In all analyses, predictors that had interval scales were grand mean centered, sex was contrast coded (Female = -1; Male = 1), and a compound symmetry covariance structure was used for the residuals with homogenous variances. The analyses were run using the lme() function from the nlme package in R 4.0.2. We ran two versions of each analysis: First, we examined individuals in actor-only models using the full sample, then we examined actor and partner effects using APIMs in the dyadic subset. Lastly, we examined the interactions between actor and partner effects. Below, we report all associations that yielded a $p < .10$; however, our statistical significance criterion is set at $p < .05$.

Results

Baseline actor-only associations between pandemic-related stress and pandemic-related support

First, we examined baseline associations between pandemic-related stress and pandemic-related support provision in the full baseline data. We found that those who were more worried about getting COVID-19 were more understanding towards their partners' pandemic-related worries and concerns ($b = .112$, $SE = .024$, $p < .001$). There was also an interaction with sex ($b = .045$, $SE = .023$, $p = .056$), though this effect did not reach the threshold of statistical significance. This interaction suggested that both men and women were more understanding of their partners when they were more worried about getting COVID-19, but men showed a stronger association ($b = .157$, $SE = .038$, $p < .001$) than women ($b = .067$, $SE = .028$, $p = .018$).

[2] In order to examine whether the association between pandemic-related stress and pandemic-related support was different across time (i.e., when pandemic-related stress was more acute versus chronic), we also included time in our longitudinal models. We did not find any effects of time, therefore we dropped time and its interactions with other parameters from the longitudinal models for simplicity.

Being more worried about getting COVID-19 was not associated with being more dismissive of the partner's pandemic-related worries and concerns (b = -.026, SE = .021, p = .234); however, there was again an interaction with sex (b = -.041, SE = .021, p = .052), though this effect did not reach the threshold of statistical significance. Men were less dismissing of their partners when they were more worried about getting COVID-19 (b = -.067, SE = .034, p = .053), whereas women did not show an association between worry and dismissing of their partners (b = .016, SE = .025, p = .535). We did not find any quadratic associations between being worried about getting COVID-19 and pandemic-related support provision at baseline (Table 2).

Figure 1. Associations between worries about getting COVID-19 and pandemic-related support provision at baseline (full sample)

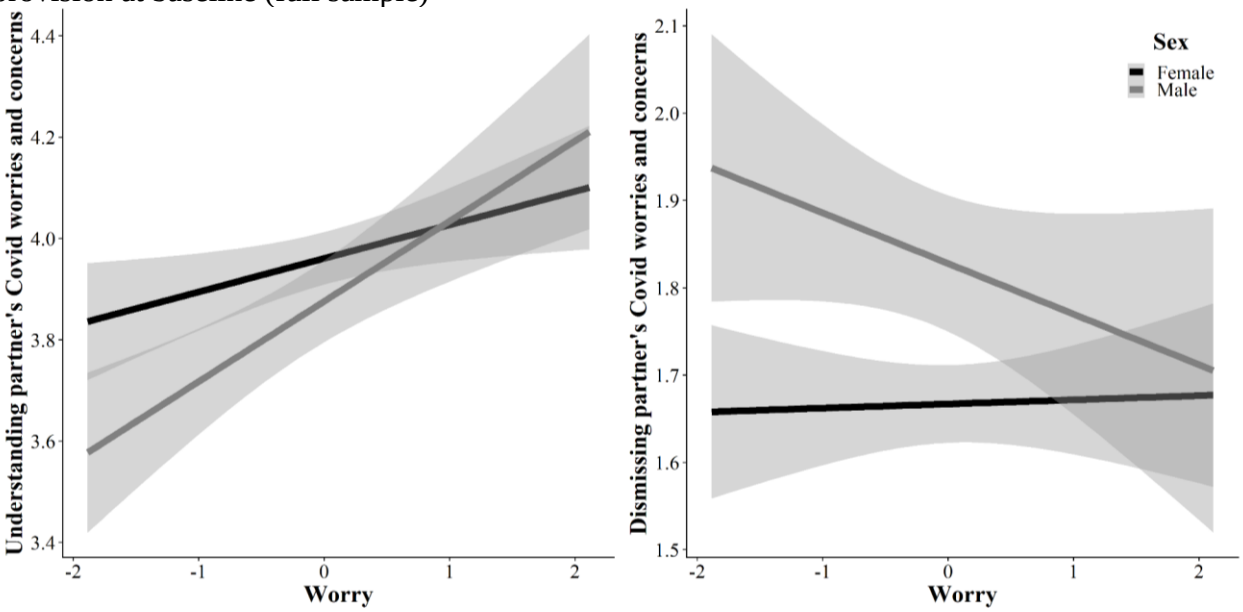


Table 2
Associations between worries about getting COVID-19 and pandemic-related support provision at baseline (full sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*

Intercept	3.91	3.85 – 3.97	**<.001**	1.77	1.71 – 1.82	**<.001**
Sex	-.05	-.11 – .01	.074	.07	.01 – .12	**.014**
W	.11	.06 – .16	**<.001**	-.03	-.07 – .02	.234
W*W	.01	-.03 – .04	.681	-.02	-.05 – .01	.181
Sex*W	.04	-.00 – .09	.055	-.04	-.08 – .00	.052
Sex*W*W	.01	-.03 – .04	.596	.02	-.02 – .05	.318

Note. W = Worries about getting COVID-19.

Consistent with the associations between worries about getting COVID-19 and pandemic-related support provision, we also found that being concerned about meeting one's family's needs due to the pandemic was related to being more understanding of the partner's pandemic-related worries and concerns (b = .049, SE = .022, p = .027). This was not moderated by sex (b = .026, SE = .021, p = .215). However, though not statistically significant, there was also an interaction between sex and the quadratic term of pandemic-related concerns (b = .032, SE = .017, p = .057). This interaction suggested that men were less understanding when they were moderately concerned about meeting their family's needs compared to when they had low or high levels of concerns (b = .050, SE = .027, p = .070), whereas women did not show a quadratic relationship between concerns and being understanding (b = -.014, SE = .019, p = .476).

Greater concern was not associated with being more dismissive of the partner's pandemic-related worries and concerns (b = .019, SE = .020, p = .335). There was an interaction with sex (b = -.035, SE = .019, p = .069), though this effect did not reach the threshold of statistical significance. This interaction suggested that women were more dismissive of their partner's pandemic-related worries and concerns when they were more concerned about meeting their family's needs due to the pandemic (b = .055, SE = .023, p = .017), whereas men did not

show a significant association between concern and dismissiveness (*b* = -.016, *SE* = .032, *p* = .616). We did not find any other significant associations between being worried about getting COVID-19 and pandemic-related support provision at baseline (Table 3).

Figure 2. Associations between concerns about meeting basic needs and pandemic-related support provision at baseline (full sample)

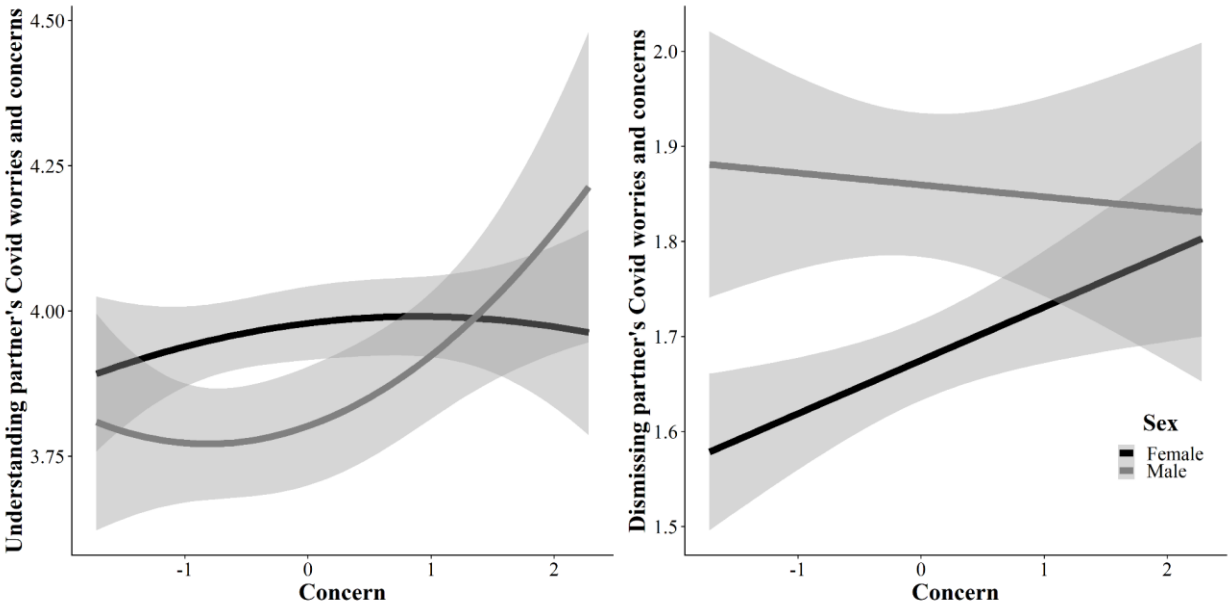


Table 3
Associations between concerns about meeting basic needs and pandemic-related support provision at baseline (full sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	3.89	3.83 – 3.95	**<.001**	1.77	1.71 – 1.82	**<.001**
Sex	-.09	-.15 – -.04	**.001**	.10	.05 – .15	**<.001**
C	.05	.01 – .09	**.027**	.02	-.02 – .06	.335
C*C	.02	-.02 – .05	.285	-.00	-.03 – .03	.992
Sex*C	.03	-.02 – .07	.215	-.04	-.07 – .00	.069

Sex*C*C	.03	-.00 – .06	.057	-.01	-.04 – .02	.651

Note. C = Concerns about meeting basic needs.

Baseline dyadic associations between pandemic-related stress and pandemic-related support

In the baseline dyadic subset, those who were more worried about getting COVID-19 were more understanding towards their partners (b = .159, SE = .041, p < .001). The partner's worries about getting COVID-19 were not associated with how understanding people were (b = .023, SE = .041, p = .572). Neither actor nor partner effects were moderated by sex. There was, however, a significant interaction between sex and the quadratic effect of worry (b = .082, SE = .030, p = .007). Men were less understanding towards their partners when they were moderately worried about getting COVID-19 (b = .089, SE = .041, p = .034), whereas women were more understanding towards their partners when they were moderately worried about getting COVID-19 (b = -.076, SE = .042, p = .073) but this effect did not reach the threshold of statistical significance.

There was a similar association between worries and dismissiveness although this effect did not reach the threshold of statistical significance. Those who were more worried about getting COVID-19 were less dismissive of their partners (b = -.074, SE = .039, p = .055). The partner's worries about getting COVID-19 were not associated with how dismissive people were (b = .036, SE = .038, p = .353). Neither actor nor partner effects were moderated by sex. There was also a quadratic effect of worries (b = -.050, SE = .028, p = .072), though this effect also did not reach the threshold of statistical significance. This quadratic effect suggested that people were more dismissive when they were moderately worried, compared to when they had lower or higher worries (Table 4).

Figure 3. Associations between worries about getting COVID-19 and pandemic-related support provision at baseline (dyadic sample)

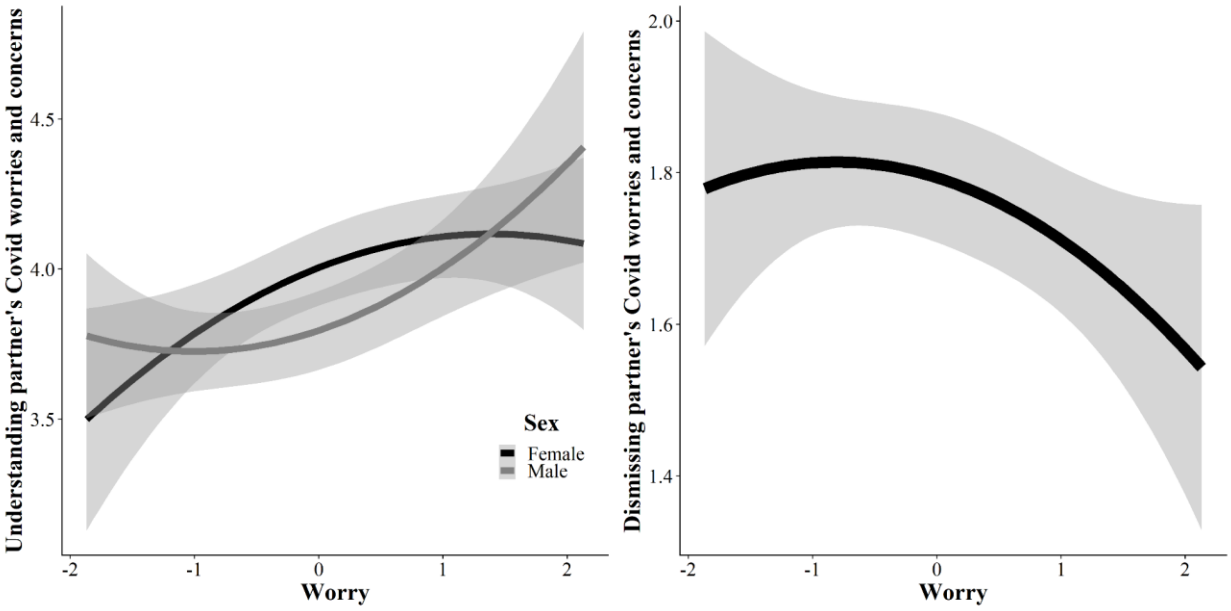


Table 4

Associations between worries about getting COVID-19 and pandemic-related support provision at baseline (dyadic sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	3.90	3.78 – 4.02	**<.001**	1.85	1.74 – 1.96	**<.001**
Sex	-.07	-.16 – .02	.144	.08	-.01 – .17	.073
W	.16	.08 – .24	**<.001**	-.07	-.15 – .00	.056
W*W	.01	-.05 – .06	.837	-.05	-.10 – .00	.072
PW	.02	-.06 – .10	.572	.04	-.04 – .11	.334
PW*PW	-.01	-.06 – .05	.832	-.02	-.08 – .03	.410
Sex*W	-.01	-.10 – .07	.785	-.01	-.09 – .07	.823
Sex*W*W	.08	.02 – .14	**.007**	-.04	-.10 – .01	.129
Sex*PW	.01	-.08 – .09	.872	-.06	-.13 – .02	.177
Sex*PW*PW	-.06	-.11 – .00	.062	.04	-.02 – .09	.168

Note. W = Worries about getting COVID-19; PW = Partner worries about getting COVID-19.

Neither being concerned about meeting family's basic needs due to the pandemic (*b* = .043, *SE* = .036, *p* = .236) nor having a partner who was more concerned were related to how understanding people were (*b* = .024, *SE* = .036, *p* = .513). These effects were not moderated by sex. However, consistent with the associations between worries about getting COVID-19 and pandemic-related support provision, there was a significant interaction between sex and the quadratic effect of concerns (*b* = .056, *SE* = .027, *p* = .036). Men were less understanding towards their partners when they were moderately concerned about meeting family's basic needs (*b* = .086, *SE* = .037, *p* = .022), whereas women did not show a significant association between the quadratic effect of concern and understanding their partners (*b* = -.026, *SE* = .037, *p* = .486).

Similarly, being concerned about meeting family's basic needs due to the pandemic (*b* = -.007, *SE* = .035, *p* = .835) or having a partner who was more concerned was not related to dismissiveness (*b* = .028, *SE* = .035, *p* = .433). These were not moderated by sex. However, there was a significant interaction between sex and the quadratic effect of being concerned about meeting family's basic needs (*b* = -.051, *SE* = .025, *p* = .046). Simple slopes for this interaction suggested that women did not show a significant association between the quadratic effect of concern and dismissing their partners (b = .034, SE = .035, p = .334), whereas men were more dismissive towards their partners when they were moderately concerned about meeting family's basic needs (*b* = -.068, *SE* = .036, *p* = .059) though this effect did not reach the threshold of statistical significance.

Figure 4. Associations between concerns about meeting basic needs and pandemic-related support provision at baseline (dyadic sample)

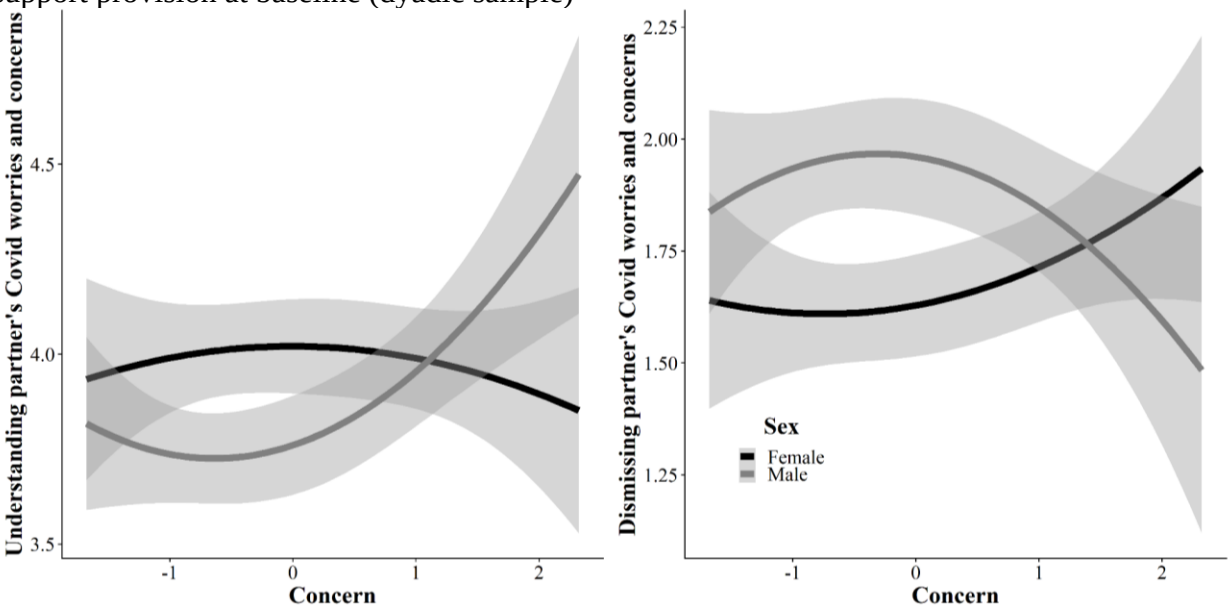


Table 5

Associations between concerns about meeting basic needs and pandemic-related support provision at baseline (dyadic sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.90	3.78 – 4.01	**<.001**	1.82	1.71 – 1.92	**<.001**
Sex	-.14	-.23 – -.05	**.003**	.14	.05 – .23	**.002**
C	.04	-.03 – .11	.235	-.01	-.08 – .06	.838
PC	.02	-.05 – .09	.513	.03	-.04 – .10	.427
C*C	.03	-.02 – .08	.248	-.02	-.07 – .03	.503
PC*PC	-.01	-.06 – .04	.632	-.01	-.06 – .03	.553
Sex*C	.05	-.03 – .12	.254	-.03	-.11 – .04	.379
Sex*PC	.02	-.06 – .09	.692	-.03	-.11 – .04	.418
Sex*C*C	.06	.00 – .11	**.036**	-.05	-.10 – -.00	**.046**
Sex*PC*PC	.00	-.05 – .06	.876	.02	-.03 – .07	.478

Note. C = Concerns about meeting basic needs; PC = Partner concerns about meeting basic needs.

Next, we examined whether there were actor by partner interactions when predicting pandemic-related support provision (Table 6). We found a significant interaction between actor and partner worries in the model predicting dismissing partner's pandemic-related worries and concerns (b = -.085, SE = .035, p = .015). When the partner had greater worries about getting COVID-19, greater actor worries were associated with less dismissing (b = -.152, SE = .049, p = .002). There was no significant association between actor worries and dismissing when the partner was less worried (b = .018, SE = .052, p = .729). There were no actor by partner effects in other models.

Figure 5. Associations between shared pandemic stress and pandemic-related support provision at baseline (dyadic sample)

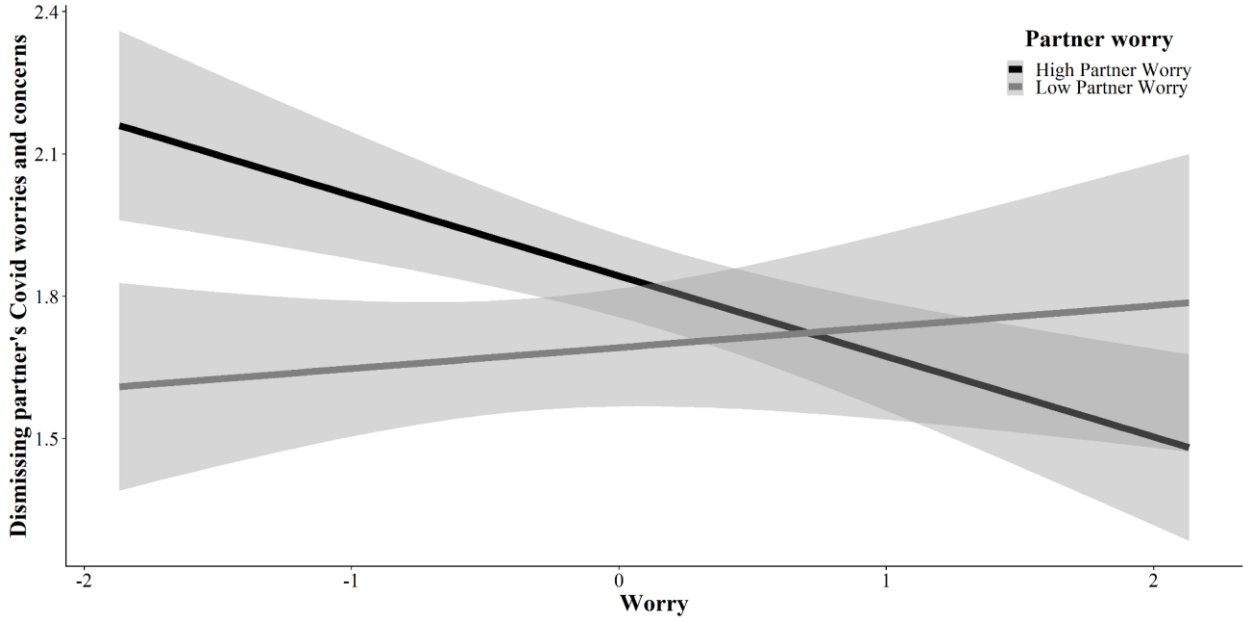


Table 6
Associations between shared pandemic stress and pandemic-related support provision at baseline (dyadic sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*

Intercept	3.91	3.82 – 4.00	**<.001**	1.80	1.72 – 1.88	**<.001**
Sex	-.05	-.12 – .02	.166	.08	.01 – .14	**.032**
W	.13	.06 – .21	**.001**	-.07	-.14 – .00	.069
PW	.00	-.08 – .08	.997	.05	-.02 – .12	.174
Sex*W	.01	-.07 – .09	.787	-.01	-.08 – .07	.888
Sex*PW	-.02	-.10 – .06	.669	-.05	-.13 – .03	.209
W*PW	.01	-.07 – .08	.877	-.09	-.15 – -.02	**.015**
Sex*W*PW	.02	-.04 – .08	.463	.00	-.05 – .06	.910
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.91	3.83 – 4.00	<.001	1.81	1.72 – 1.89	<.001
Sex	-.09	-.16 – -.02	.012	.09	.03 – .16	.007
C	.04	-.03 – .11	.306	-.00	-.07 – .06	.902
PC	.03	-.04 – .10	.465	.04	-.03 – .10	.289
Sex*C	.05	-.02 – .13	.180	-.04	-.12 – .03	.293
Sex*PC	.01	-.06 – .09	.710	-.04	-.12 – .03	.275
C*PC	.01	-.05 – .08	.702	-.05	-.12 – .01	.123
Sex*C*PC	.03	-.02 – .09	.227	.02	-.03 – .08	.350

Note. W = Worries about getting COVID-19; PW = Partner worries about getting COVID-19; C = Concerns about meeting basic needs; PC = Partner concerns about meeting basic needs.

Longitudinal associations between pandemic-related stress and pandemic-related support

Consistent with findings from the full baseline sample, we found that those who were more worried about getting COVID-19 were more understanding towards their partners' pandemic-related worries and concerns (b = .105, SE = .025, p < .001). We also found an interaction between sex and the quadratic effect of worries (b = .029, SE = .014, p = .043). Simple slopes analyses showed that men were less understanding when they were moderately

worried compared to when they had low or high worries (*b* = .048, *SE* = .022, *p* = .030), whereas the quadratic effect of worries was not significant for women (*b* = -.010, *SE* = .021, *p* = .624). We also did not find a significant association between being more worried about getting COVID-19 and being more dismissive of the partner's pandemic-related worries and concerns (*b* = -.018, *SE* = .023, *p* = .422) and this effect was not moderated by sex (*b* = -.000, *SE* = .020, *p* = .998). We also did not find a quadratic effect of worries on dismissiveness (*b* = .021, *SE* = .016, *p* = .186).

Figure 6. Associations between worries about getting COVID-19 and pandemic-related support provision (longitudinal sample)

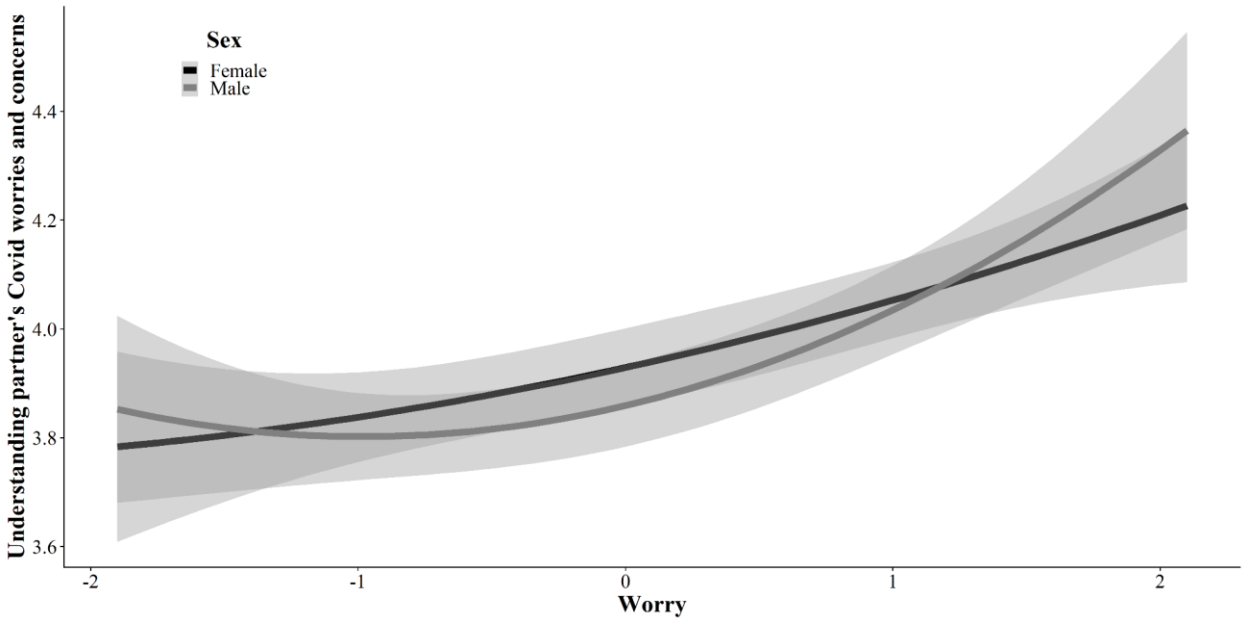


Table 7
Associations between worries about getting COVID-19 and pandemic-related support provision (longitudinal sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.89	3.82 - 3.96	**<.001**	1.705	1.64 - 1.77	**<.001**

Sex	-.06	-.11 - -.00	**.038**	.031	-.01 - .08	.226
W	.10	.06 - .15	**<.001**	-.018	-.06 - .03	.422
W*W	.02	-.01 - .05	.240	.021	-.00 - .05	.186
Sex*W	.00	-.04 - .04	.868	.000	-.03 - .04	.998
Sex*W*W	.03	.00 - .06	**.043**	.012	-.01 - .04	.402

Note. W = Worries about getting COVID-19.

Unlike findings from the full baseline sample, pandemic-related concerns were not significantly associated with understanding the partner's pandemic-related worries and concerns (b = -.003, SE = .021, p = .195). However, the quadratic effect of pandemic-related concerns suggested that moderate concern was associated with less understanding compared to low and high levels of concern (b = .037, SE = .012, p = .002). There was also an interaction between sex and the quadratic effect of concerns (b = .021, SE = .012, p = .076), though this interaction did not reach the threshold of statistical significance. Simple slopes analyses suggested that men were less understanding when they were moderately worried compared to when they had low or high worries (b = .059, SE = .017, p < .001), whereas women did not show a significant quadratic relationship between worries and understanding (b = .016, SE = .017, p = .343). Unlike the findings from the baseline sample, pandemic-related concerns were *positively* associated with dismissing the partner's pandemic-related worries and concerns (b = .060, SE = .023, p = .008).

Figure 7. Associations between concerns about meeting basic needs and pandemic-related support provision (longitudinal sample)

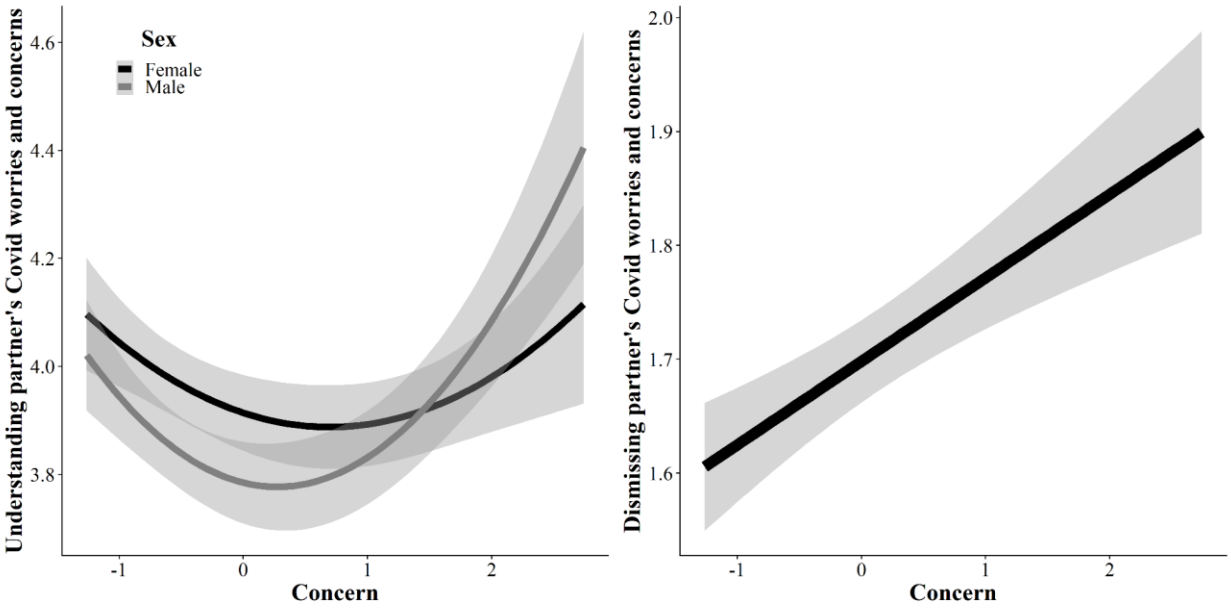


Table 8

Associations between concerns about meeting basic needs and pandemic-related support provision (longitudinal sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.87	3.801 - 3.943	**<.001**	1.73	1.666 - 1.786	**<.001**
Sex	-.07	-.12 - -.01	**.018**	.02	-.02 - .073	.332
C	-.03	-.06 - .013	.195	.06	.015 - .104	**.008**
C*C	.04	.013 - .061	**.002**	.00	-.03 - .021	.731
Sex*C	.02	-.02 - .056	.359	.00	-.03 - .040	.891
Sex*C*C	.02	-.00 - .044	.076	.01	-.00 - .038	.218

Note. C = Concerns about meeting basic needs.

Longitudinal dyadic associations between pandemic-related stress and pandemic-related support

Consistent with findings from the dyadic baseline sample, those who were more worried about getting COVID-19 were more understanding towards their partners (b = .169, SE = .032, p < .001) in the longitudinal dyadic subset (Table 9). The partner's worries about getting COVID-19 were not associated with how understanding people were (b = .011, SE = .029, p = .693). Neither actor nor partner effects were moderated by sex. There was also a quadratic effect of worry (b = .033, SE = .020, p = .099); however, this effect did not reach the threshold of statistical significance. This suggested that people were less understanding when they were moderately worried.

Unlike findings from the dyadic baseline sample, there was a quadratic relationship between worries and dismissing the partner's worries and concerns (b = -.048, SE = .020, p = .021). This suggested that people were more dismissive when they were moderately worried, compared to when they had low or high worries. There were no significant main effects of actor or partner worries about getting COVID-19 on dismissiveness; however, there was a significant interaction between sex and partner worries (b = -.069, SE = .032, p = .029). Women were more dismissive when their partners were more worried (b = .087, SE = .045, p = .043), whereas men did not show a significant association between partner worries and dismissiveness (b = -.052, SE = .041, p = .219).

Figure 8. Associations between worries about getting COVID-19 and pandemic-related support provision (dyadic longitudinal sample)

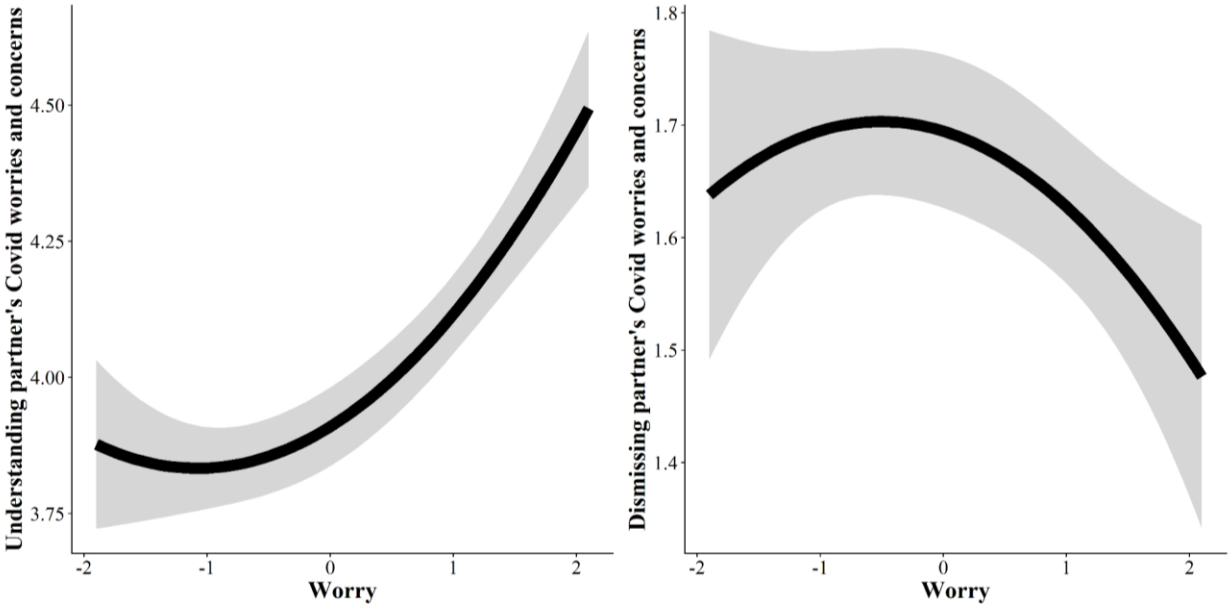


Table 9

Associations between worries about getting COVID-19 and pandemic-related support provision (dyadic longitudinal sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	3.89	3.77 - 4.00	**<.001**	1.76	1.65 - 1.87	**<.001**
Sex	-.10	-.18 - -.02	**.012**	.06	-.01 - .13	.100
W	.17	.11 - .23	**<.001**	-.04	-.10 - .02	.239
W*W	.03	-.00 - .07	.099	-.05	-.08 - -.00	**.021**
PW	.01	-.04 - .07	.693	.02	-.03 - .08	.544
PW*PW	.03	-.00 - .07	.144	.00	-.04 - .04	.874
Sex*W	-.03	-.09 - .04	.416	.04	-.01 - .11	.162
Sex*W*W	.02	-.02 - .06	.375	-.02	-.06 - .02	.283
Sex*PW	.01	-.05 - .07	.859	-.07	-.13 - -.00	**.029**
Sex*PW*PW	.03	-.00 - .07	.128	.01	-.03 - .05	.639

Note. W = Worries about getting COVID-19; PW = Partner worries about getting COVID-19.

Actor or partner concerns were not significantly associated with understanding (Table 10): There was a quadratic effect of partner concerns (b = .028, SE = .017, p = .095), though this effect did not reach the threshold of statistical significance. This suggested that people were less understanding when their partner was moderately concerned. There was also an interaction between sex and the quadratic effect of concerns (b = .033, SE = .017, p = .051) that again did not reach the threshold of statistical significance. Simple slopes suggested that men were less understanding when they were moderately concerned (b = .055, SE = .023, p = .020), whereas women did not show a quadratic relationship between concerns and understanding (b = -.011, SE = .024, p = .647). Unlike findings from the dyadic baseline sample, those who were more concerned were more dismissive (b = .062, SE = .030, p = .041), and this effect was not moderated by sex.

Figure 9. Associations between concerns about meeting basic needs and pandemic-related support provision (dyadic longitudinal sample)

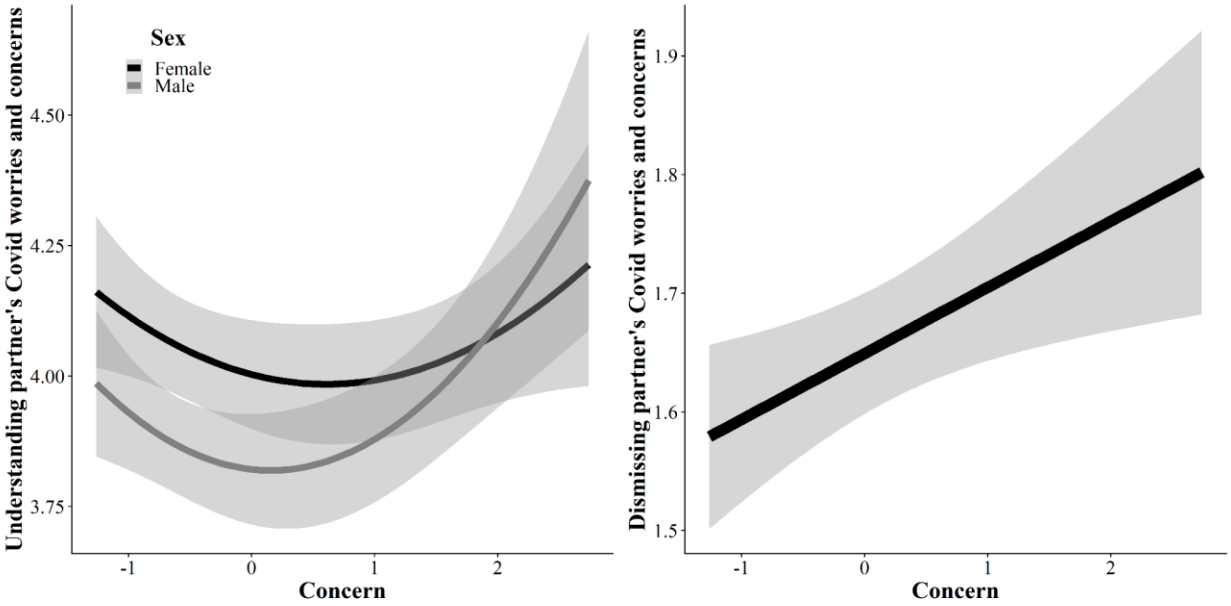


Table 10
Associations between concerns about meeting basic needs and pandemic-related support provision (dyadic longitudinal sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.91	3.803 - 4.024	**<.001**	1.66	1.558 - 1.753	**<.001**
Sex	-.10	-.17 - -.02	**.013**	.08	.012 - .149	**.022**
C	-.02	-.08 - .039	.514	.06	.002 - .120	**.041**
C*C	.02	-.01 - .054	.193	.00	-.03 - .027	.769
PC	.01	-.03 - .068	.597	.04	-.00 - .096	.105
PC*PC	.03	-.00 - .060	.095	.02	-.01 - .049	.281
Sex*C	-.01	-.07 - .051	.753	.00	-.05 - .060	.891
Sex*PC	.02	-.03 - .081	.404	.01	-.01 - .044	.444
Sex*C*C	.03	.000 - .066	.051	-.01	-.06 - .044	.712
Sex*PC*PC	.00	-.03 - .028	.792	-.03	-.05 - .005	.108

Note. C = Concerns about meeting basic needs; PC = Partner concerns about meeting basic needs.

Lastly, we examined the actor by partner interactions in the longitudinal subset (Table 11). There were significant interactions between actor and partner worries for both understanding (b = .051, SE = .022, p = .019) and dismissing (b = -.048, SE = .023, p = .034). Simple slopes analyses suggested that pandemic-related worries were more strongly associated with understanding when the partner is more worried (b = .223, SE = .035, p < .001), compared to when the partner is less worried (b = .122, SE = .041, p = .003). Similarly, being more worried was associated with less dismissing when the partner was also more worried (b = .090, SE = .038, p = .017), whereas there was no association between worries and dismissing when the

partner was less worried (*b* = .007, *SE* = .040, *p* = .867). There were no significant interaction effects for actor and partner concerns.

Figure 10. Associations between shared pandemic stress and pandemic-related support provision (dyadic longitudinal sample)

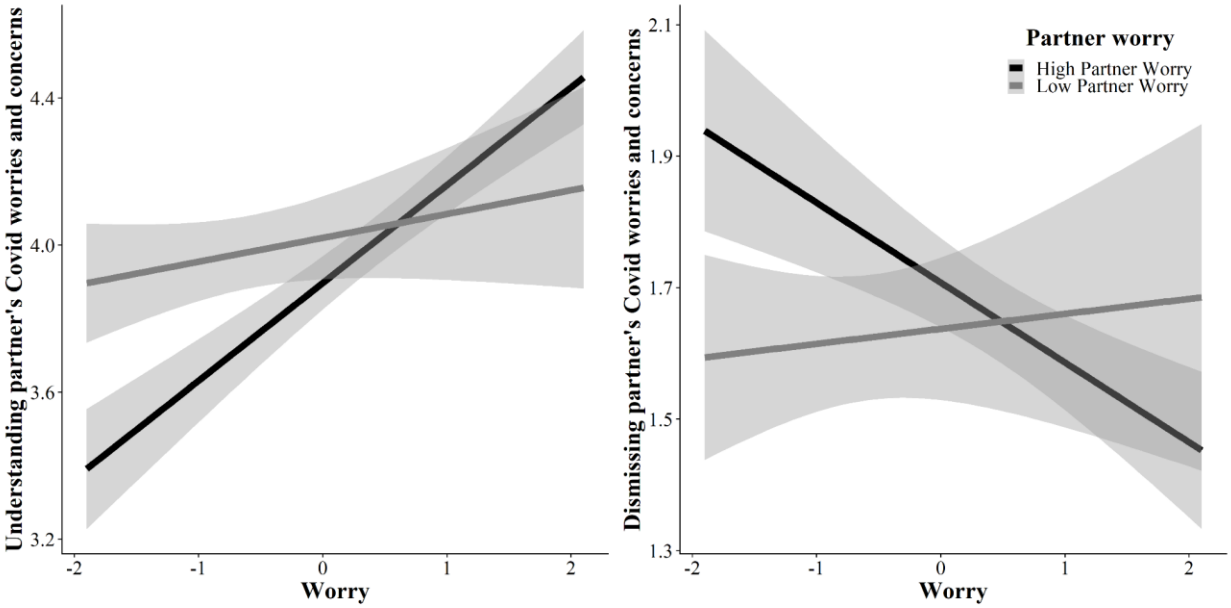


Table 11

Associations between shared pandemic stress and pandemic-related support provision (dyadic longitudinal sample)

	Understanding partner's worries and concerns about the pandemic			**Dismissing partner's worries and concerns about the pandemic**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.91	3.83 - 4.03	**<.001**	1.73	1.64 - 1.82	**<.001**
Sex	-.05	-.11 - .012	.116	.04	-.02 - .10	.153
W	.17	.11 - .23	**<.001**	-.04	-.10 - .02	.185
PW	.02	-.03 - .07	.522	.02	-.03 - .08	.446
Sex*W	-.04	-.09 - .03	.259	.05	-.00 - .12	.096
Sex*PW	.02	-.03 - .08	.476	-.06	-.12 - -.00	**.040**
W*PW	.05	.01 - .09	**.019**	-.05	-.09 - -.00	**.034**

Sex*W*PW	.01	-.02 - .05	.560	.01	-.02 - .05	.575
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*p*
Intercept	3.96	3.86 - 4.06	<.001	1.68	3.83 – 4.00	<.001
Sex	-.07	-.13 - -.00	**.048**	.06	.01 – .12	**.026**
C	-.01	-.06 - .04	.666	.06	.01 – .11	**.033**
PC	.03	-.02 - .08	.318	.06	.01 – .11	**.014**
Sex*C	.02	-.03 - .07	.577	.01	-.04 – .07	.572
Sex*PC	.02	-.02 - .08	.380	-.03	-.08 – .02	.210
C*PC	.02	-.01 - .06	.214	-.02	-.06 – .02	.265
Sex*C*PC	.00	-.02 - .03	.874	.00	-.03 – .03	.849

Note. W = Worries about getting COVID-19; PW = Partner worries about getting COVID-19; C = Concerns about meeting basic needs; PC = Partner concerns about meeting basic needs.

A summary of Study 1 results is presented below.

Table 12
Summary of Study 1 results

	Baseline Actor-only Model	
	Understanding	Dismissing
Worry	+ (Linear)	n.s.
Concern	+ (Linear)	n.s.
	Baseline Dyadic Model	
	Understanding	Dismissing
Worry	+ (Linear)	n.s.
Concern	- (Quadratic $_{Male}$)	+ (Quadratic $_{Male}$)
	Longitudinal Actor-only Model	
	Understanding	Dismissing
Worry	+ (Linear)	n.s.
Concern	- (Quadratic)	+ (Linear)
	Longitudinal Dyadic Model	
	Understanding	Dismissing
Worry	+ (Linear)	+ (Quadratic)
Concern	n.s.	+ (Linear)
	Baseline Shared Stress Model	
	Understanding	Dismissing

Worry	n.s.	- (Linear)
Concern	n.s.	n.s.
	Longitudinal Shared Stress Model	
	Understanding	Dismissing
Worry	+ (Linear)	- (Linear)
Concern	n.s.	n.s.

Note. n.s. = Non-significant.

Discussion

Study 1 examined short-term and long-term associations between pandemic-related stress and pandemic-related support in a sample including both individuals and couples. Specifically, we examined whether two types of pandemic-related stress, worrying about getting COVID-19 and being concerned about meeting one's own and their family's needs, were associated linearly or curvilinearly with pandemic-related support provision. We also examined whether these associations were moderated by sex.

Across the full baseline sample and the dyadic baseline subset, we consistently found that greater pandemic-related stress was associated with greater pandemic-related support. We also found in the longitudinal subset and the dyadic longitudinal subset that being more worried about getting COVID-19 was associated with being more understanding towards the partner's pandemic-related worries and concerns. However, greater pandemic-related stress was also consistently associated with *less* pandemic-related support provision in the long term, especially for pandemic-related concerns. Overall, acute pandemic stress promoted greater pandemic-related support provision, whereas the effects of chronic pandemic stress were more ambivalent.

Why might chronic concerns have a negative association with understanding, but chronic worries have a positive association with understanding? One possible explanation for this unexpected finding is that the question about pandemic-related concerns ("How much has the COVID-19 pandemic made you concerned about meeting you and your family's basic needs,

e.g., food, shelter, exercise, medical care?") covered a broad range of concerns. For example, imagine someone who is concerned about the gyms being closed due to the pandemic and thinks that they should be reopened. This person would score higher on the concern measure but may be less understanding and more dismissive of a partner who is worried about getting COVID-19 in such public places.

Differences between men and women often emerged in curvilinear effects. When they emerged, these quadratic effects consistently suggested that at moderate levels of pandemic-related stress, men affiliated less. Therefore, the effects of moderate pandemic-related stress on men's affiliation were in the opposite direction of the expected associations between moderate stress and affiliation. Women either had linear and positive associations between stress and support, or no significant associations. This pattern was consistent with the tend-and-befriend theory and highlighted the importance of moderate stress intensity in examining sex differences in affiliative stress responses. However, we must also note that these differences tended to be very small and sometimes did not reach the threshold of statistical significance.

We also found that both partners experiencing higher levels of worries was positively associated with affiliation. Specifically, those who were more worried about getting COVID-19 were less dismissive of their partner's pandemic-related worries and concerns and were more understanding of their partner's pandemic-related worries and concerns if their partner was also more worried about getting COVID-19. This finding was consistent across the baseline and longitudinal dyadic subsets. Therefore, the shared experience of stress may also be an important factor that promotes affiliative stress responses.

Overall, Study 1 suggested that greater pandemic-related stress may be associated with more affiliation in both short-term. However, in the long-term, greater pandemic-related stress

may have more ambivalent effects on affiliation. Findings from this study also suggest that stress intensity may be a key factor in differentiating men's and women's affiliative responses. Moreover, findings from our exploratory analyses suggested that stressed people may show greater affiliation in both short- and long-term if their partner is also stressed. In Study 2, we will expand on these findings in an experimental study. We will examine the effects of moderate stress on affiliation in couples where either one or both partners are experiencing stress.

CHAPTER 3

Study 2

Findings from Study 1 suggested that sex differences in affiliative stress responses may emerge especially at moderate levels of acute stress and that people may be more affiliative if their stress is shared by their partner. In Study 2, we aimed to understand the association between stress and affiliation when people experience a moderately stressful event in the lab and further explore the role of shared stress in affiliation. Therefore, we examined the association between acute stress and affiliation in couples following an experimental manipulation in which one or both partners completed a moderately stressful task in the lab.

Data for the current study came from a pilot study designed to develop a standardized lab procedure to induce stress in couples. To manipulate stress, we used a variation of the Trier Social Stress Task (TSST), one of the most widely used stress manipulation protocols (Kudielka et al., 2007). In this task, participants give a video-recorded speech under time pressure in front of interviewers who are trained to remain emotionally neutral (Kirschbaum et al., 1993). The TSST reliably induces moderate levels of psychological and physiological stress (Kirschbaum et al., 1993; Kudielka et al., 2007).

Recent research found that women who completed the TSST showed greater affiliative responses (e.g., greater cooperation) in a subsequent decision making game compared to women in control groups that sat idly in a room for five minutes or gave a speech about a book or a vacation in an empty room, whereas men who completed the TSST were either less affiliative or

no different than men in the control group (Nickels et al., 2017; Youssef et al., 2018). One recent study of romantic partners who independently completed the TSST also found that stressed men were poorer support providers and stressed women were better support providers to their stressed partners compared to unstressed men and women (Bodenmann et al., 2015). These findings were consistent with the tend-and-befriend theory.

Although men were less affiliative following stress manipulations in these studies, they may still show affiliative responses to stress. Specifically, research using the TSST as well as other stress manipulations found that increases in cortisol following stressors, rather than the stress manipulation per se, may be associated with more affiliative responses in men. For example, in a sample of men who completed the TSST or a control condition where they completed a reading task, men across the two experimental groups felt closer to their same-sex conversation partner in a subsequent dyadic interaction if they experienced greater increases in cortisol following the experimental manipulation (Berger et al., 2016). In research using a different stress manipulation where participants immersed their forearm into either iced or warm water, men who showed moderate increases in cortisol reported greater caregiving motivation across experimental groups (Probst et al., 2017). Importantly, being in the stressed experimental group was not related to feelings of closeness (Berger et al., 2016) and was related to lower caregiving motivation in these studies (Probst et al., 2017).

Why might physiological stress (e.g., cortisol increases) versus exposure to stressors be related to different outcomes in men? One possible explanation is the differential effects of stress exposure on physiological reactivity across men and women. Recent reviews suggest that salivary cortisol responses to the TSST were repeatedly found to be different across male and female participants: The average salivary cortisol increases were up to twice as high in men

compared to women (Kudielka et al., 2009; Kudielka & Kirschbaum, 2005; Liu et al., 2017). This means that men and women may experience the physiological intensity of stressors differently, with men often experiencing significantly greater physiological stress intensity than women for the same stressor. Therefore, examining the physiological markers of stress may be helpful in understanding sex differences in affiliative responses.

In the current study, we used data from a pilot study to examine the association between stress and affiliation in couples following the TSST. We examined the roles of stress manipulation, perceived stress reactivity, cortisol reactivity, and participant sex in predicting affiliation. Specifically, we examined the following research questions:

(RQ 1a) Is stress (i.e., perceived stress or cortisol reactivity) associated with more affiliative responses (i.e., supportive behaviors and self-reported support) in romantic couples?

(RQ 1b) Do people show more affiliative responses towards their romantic partner when experiencing moderate levels of stress (measured via perceived stress and cortisol reactivity; manipulated with a moderately stressful task), as opposed to low or high levels of stress? We hypothesized that moderate stress levels would be associated with greater affiliation (H1b), as opposed to low or high levels of stress. (H1a).

(RQ 2) Do women show more affiliative stress responses compared to men? We hypothesized that men and women would both show affiliative stress responses; however, women's affiliative responses would be better predicted by the moderate stressor whereas men's would be better predicted by moderate increases in cortisol (H2).

In addition to these main research questions, we also explored differences across experimental conditions to understand the role of shared stress:

(E) Does the association between stress and affiliation differ for couples in different experimental conditions (i.e., concurrent stress or non-concurrent stress task)? We did not have a directional hypothesis for the moderating role of the experimental manipulation.

Methods

Procedure

The study was reviewed by the University of Michigan's Institutional Review Board and received IRB approval. Interested participants were sent a survey to confirm their eligibility. Eligible couples participated in a 2-hour session in a lab designed to resemble a living room. Because of diurnal changes in hormones, sessions were held between the hours of noon and 7 PM (Schultheiss & Stanton, 2009). Participants were asked to avoid eating, drinking (except water), and brushing their teeth within an hour before their visit. Once couples arrived in the lab, they completed a consent form and got their physiological equipment set up (i.e., a blood pressure cuff and a heart rate monitor) with the guidance of the experimenter. Couples were assigned to either the non-concurrent stress or the concurrent stress condition where either one or both members of the couple completed the TSST, respectively. Twenty couples were assigned to the concurrent stress condition, 10 couples were assigned to the non-concurrent stress condition and had a male partner complete the TSST, and 10 couples were assigned to the non-concurrent stress condition and had a female partner complete the TSST.

The TSST is one of the most reliable manipulations to elicit physiological stress due to its difficulty, uncontrollability, and socially evaluative nature (Kudielka et al., 2007). We used a modified version of the TSST in the current study. Participants who underwent the TSST were given a job description and asked to give a five-minute speech about their personal capabilities as if they were applying for the job. Unlike the original TSST protocol, participants gave their

speech on Zoom and they did not complete a mental math task at the end of the interview. Recent work has validated the online version of the TSST (Meier et al., 2022). Participants were given 15 minutes to prepare for their speech. If they were in the concurrent stress condition, the two partners received different job descriptions for their TSST task. Partners who did not complete the TSST in the non-concurrent stress condition worked on other tasks during the 15-minute preparation period (see below). Partners were in the same room during the preparation period.

To increase the demands of the task, during the 15 minutes provided to prepare for the speech, couples also had to complete one collaborative task and three additional tasks. Throughout the study, we pilot tested two different collaborative tasks. For half of the participating couples, the collaborative task was the Wilderness Survival Task. These couples had to collaborate in deciding on the best answer for eight questions related to survival in a wilderness scenario (e.g., best action to avoid snakes, the best place to make camp). The other half of the couples completed a three-dimensional puzzle task (i.e., Magna-tiles). They had to assemble magnetic tiles together to replicate a boat pictured in the instruction sheet. For the three additional tasks, couples could choose to work individually or collaboratively. For example, in the non-concurrent condition, the partner who was not preparing for a speech could complete all the individual tasks; or partners could divide the individual tasks among each other. Couples also had to take a surprise break midway through their 15-minute period to complete short surveys and take blood pressure measures. These aspects of the study (i.e., interview anticipation, time pressure, additional tasks, surprise break, and interview) matched the elements of other reliable stress-inducing tasks, such as the original TSST task (Kudielka et al., 2007). Couples were informed that completing all tasks (i.e., interview preparation, collaborative task, and the three

additional tasks) in 15 minutes with reasonable accuracy would earn them a $5 bonus. All couples were awarded the $5 bonus.

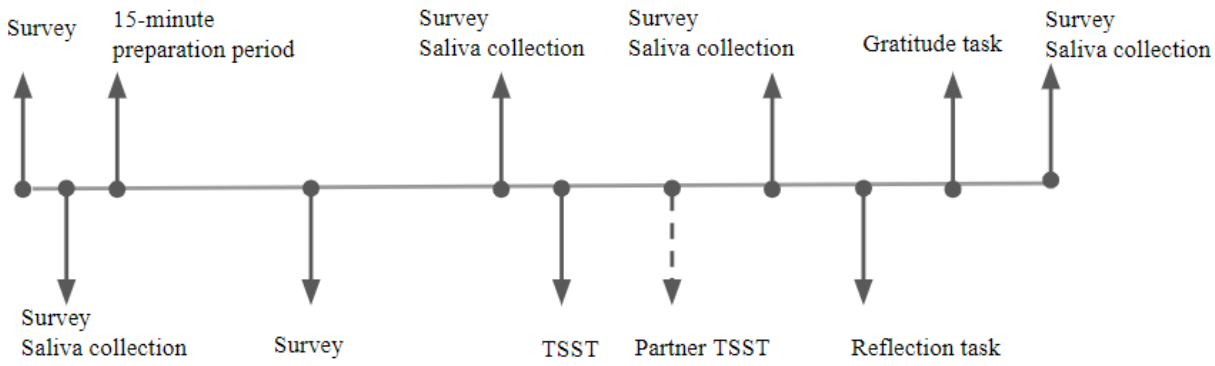
Based on their assigned experimental condition, either one or both partners independently completed the TSST. Following the 15-minute period, partners who were given a job description were invited to another room where they sat in front of a video recorder and gave their speech to two female interviewers via Zoom. In the concurrent stress condition, one partner completed the interview first and the other partner completed an additional task (i.e., a Sudoku task) while waiting for their interview. The order in which partner completed the interview first was balanced by sex across opposite-sex study participants and randomly assigned in the same-sex couples. In the non-concurrent stress condition, the partner who did not complete the TSST completed a Sudoku task while waiting for their partner to be back from the interview.

TSST interviews were not conducted in person due to the ongoing COVID-19 pandemic. However, one of the interviewers gave participants instructions in person from a distance before the 15-minute period. When it was time for the interview, participants were invited to a separate room where there was a laptop with a Zoom meeting set up for them. The interviewers followed a standardized script, and they were trained to be neutral and not give any positive feedback such as smiling or nodding. If participants finished their speech before the five minutes were up, they were asked up to two questions (i.e., “Please tell us why you deserve this job”; “Do you have anything else you can add?”). If participants stopped again before the five minutes were up, they were informed that the interviewers would sit in silence until the five minutes were up.

Following the TSST, couples reunited in the lab and completed two discussion tasks: a three-minute reflection task where they discussed their experiences in the lab (i.e., “Spend the next three minutes reflecting on your experience however you see fit”) followed by a three-

minute gratitude task where they discussed what they appreciated about each other (i.e., "Please take turns describing something about your partner that you feel grateful for"). The perceived stress and cortisol assessments following the discussion tasks marked the participants' recovery from the stress manipulation. An overview of the full procedure is shown in the figure below.

Figure 11. Overview of Study 2 protocol



Participants

Participants were 40 couples who had been living together for at least one year. They were aged between 20-39 (*M* = 26.31; to control for age-related hormonal changes; Leifke et al., 2000), fluent in English, cohabiting, and both partners were either working or in school full time. Most participants were White (76.25%) and were in opposite-sex relationships. We had one male and one female same-sex couple and both couples were randomly assigned to the non-concurrent condition. Participants had been with their partner for 5.27 years on average. Their household income ranged from under $15,000 to $200,001-$300,000 (*Median* = $50,001-75,000). Participants were recruited via online advertising (e.g., Craigslist, Facebook, U-M Health Research Studies) as well as flyers placed around campus. Each participating couple received $45 (including the $5 bonus) upon completing the study.

Measures

Supportive behaviors. Participants' video recordings were coded by three trained research assistants. After watching the entire 15-minute period, they coded the extent to which each participant was understanding (ICC = .58), validating (ICC = .80), and caring (ICC = .83) on a scale from 1 (Not at all) to 5 (Extremely). A composite supportive behavior score was computed by averaging these behaviors for each participant (α = .83). Videos were only coded if participants consented to their videos being used for research purposes. A total of 37 participants were coded for the 15-minute period.

Support. Following the 15-minute period (after the interview preparation) participants were asked how supportive they and their partner were during the 15-minute period. They rated the extent of emotional support (e.g., "Supportive", "Understanding", "Validating", "Caring")[3] they and their partner provided to each other (1 = *Not at all*, 7 = *Extremely*). We averaged participants' ratings of themselves in order to compute their self-reported support provision (α = .82). Participants who completed the Wilderness Survival Task during the 15-minute period (M = 4.54; N = 20 couples) reported higher supportiveness than those who completed the MagnaTiles (M = 4.16; N = 20 couples), though this difference was not statistically significant (p = .131).

Cortisol reactivity. We collected saliva samples consistent with procedures outlined in previous research (e.g., Schultheiss & Stanton, 2009). In the lab session, participants collected their saliva samples by placing a cotton swab under their tongue for one minute (Poll et al., 2007). Saliva samples were collected before the 15-minute preparation period (i.e., about 10-minutes after arrival in lab), after the 15-minute preparation period, after the TSST interview,

[3] Participants were also asked how "Unhelpful," "Selfish," "Thoughtful," and "Attentive" they and their partner were. These items were not included in the analysis for consistency across Studies 2 and 3.

and five to ten minutes after the gratitude task. Given that in previous research, cortisol levels peaked 10-minutes after the end of the stressor (Kirschbaum et al., 1993), these time points corresponded to cortisol levels at baseline, mid-preparation period, beginning or end of the TSST (depending on the order in which participants went in for their interview in the concurrent stress condition), and beginning of the gratitude conversation. The samples were stored in a freezer until they were assayed using enzyme immunoassay (EIA; Gozansky et al., 2005). After preparing the cortisol data for analysis (i.e., winsorizing for men and women), we examined changes in hormones as a function of stress manipulation. We winsorized cortisol measures from two male and two female participants who had cortisol values that were more than three standard deviations higher than the average male and female participant. Using cortisol measurements as the outcome and time as the predictor, we computed the slope of change in cortisol for each person by splitting the sample by person ID and fitting regressions for each person[4]. Given that the last cortisol measurement was taken after the participants entered the recovery period, we only used the first three cortisol measurements to compute the slope of change in cortisol. Larger slopes indicated more steep changes in cortisol, i.e., greater cortisol reactivity.

Perceived stress reactivity. Perceived stress was measured six times: before the 15-minute period, seven minutes into the 15-minute period, after the 15-minute period, after the TSST interview, after the reflection task, and after the gratitude task. Participants rated a single item ("Right now, I feel stressed/tense/overwhelmed") on a 7-point scale (1 = *Not at all*, 7 = *Extremely*). To obtain a measure of changes in stress as a function of the stress manipulation, we computed the slope of change in perceived stress. Using the stress measures as the outcome and

[4] The cortisol slopes were not normally distributed ($W = .90$, $p < .001$). Given that there were negative changes present in the current data (Min =-.35, Max = .36), we first added 1 to all scores to ensure that all values were positive. Then we log-transformed these scores; however, this did not improve normality (W = .89, $p < .001$), so we used slopes in our analyses without logging them.

time as the predictor, we computed the slope of change in perceived stress for each person. Given that the last two measures of perceived stress were taken after the participants entered their recovery period, we used only the first four measures to compute their stress reactivity. Larger slopes indicated more steep changes in perceived stress, i.e., greater perceived stress reactivity.

Analytic plan

First, in our preliminary analyses, we examined whether perceived stress and cortisol changed differently across experimental groups. Next, in our main analyses, we examined whether affiliation (affiliative behaviors and self-reported support) was different across experimental groups and as a function of cortisol and perceived stress reactivity. Similar to Study 1, we used multilevel modeling to account for the interdependence of partners within couples. Because we did not have a control condition where neither partner completed the TSST, we could not test the interaction between actor and partner stress condition. Instead, we treated the experimental conditions as a three-level predictor where the levels were (1) both partners stressed (N = 40 participants/20 couples), (2) stressed in the non-concurrent condition (N = 20 participants), and (3) not stressed in the non-concurrent condition (N = 20 participants). Lastly, similar to Study 1, we used APIMs to examine the associations between actor and partner stress (perceived stress reactivity, cortisol reactivity) and affiliation. In order to examine sex differences in these associations, we included sex as a moderator. Because we did not have enough same-sex couples to examine the effects of partner sex, we excluded same-sex couples from our analyses.[5] Couples were treated as distinguishable based on sex.

[5] The results remained virtually the same when we kept same-sex couples in our sample and ran APIMs for indistinguishable couples.

Similar to Study 1, predictors that had at least interval scales were grand mean centered, binary predictors were contrast coded (e.g., Female = -1; Male = 1), and a compound symmetry covariance structure was used for the residuals. The analyses were run using the lme() function from the nlme package in R 4.0.2. Below, we report all associations that yielded a $p < .10$; however, our statistical significance criterion is set at $p < .05$. Given the small sample size, all effects are interpreted along with the effect size estimates. Effect sizes (i.e., Cohen's d) are estimated using the lme.dscore function from the EMAtools package.

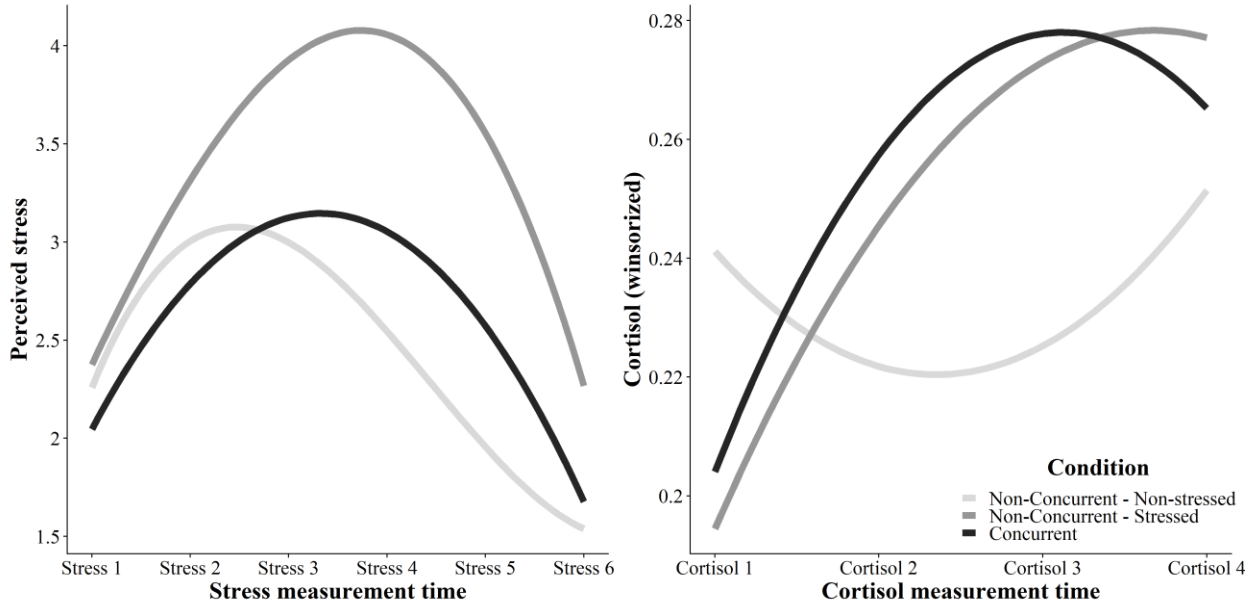
Results

Preliminary analyses

Prior to our main analyses, we used growth curve analyses to examine whether participants' perceived stress and cortisol levels changed differently across the three experimental conditions. We found a significant interaction between completing the TSST in the non-concurrent condition and the quadratic effect of time (b = -.164, SE = .048, $p < .001$, d = -.337) in predicting perceived stress over time. Those who completed the TSST in the non-concurrent condition (i.e., while their partner did not complete the TSST) showed a larger quadratic effect (b = -.312, SE = .035, $p < .001$, d = -.853) compared to others (b = -.184, SE = .021, $p < .001$, d = -.862); however, these two groups were similar in effect sizes. Next, we looked at cortisol levels over time. We found a significant interaction between completing the TSST in either of the conditions and the quadratic effect of time (b = .012, SE = .006, p = .030, d = -.280). Those who completed the TSST showed significant quadratic changes in cortisol (b = -.016, SE = .005, p = .003, d = -.389), whereas others did not (b = .008, SE = .010, p = .386, d = .112). Therefore, participants who completed the TSST while their partner did not complete the

TSST showed a significant stress reactivity and all participants who completed the TSST showed a significant cortisol reactivity compared to those who did not complete the TSST.

Figure 12. Changes in perceived stress and cortisol across experimental groups

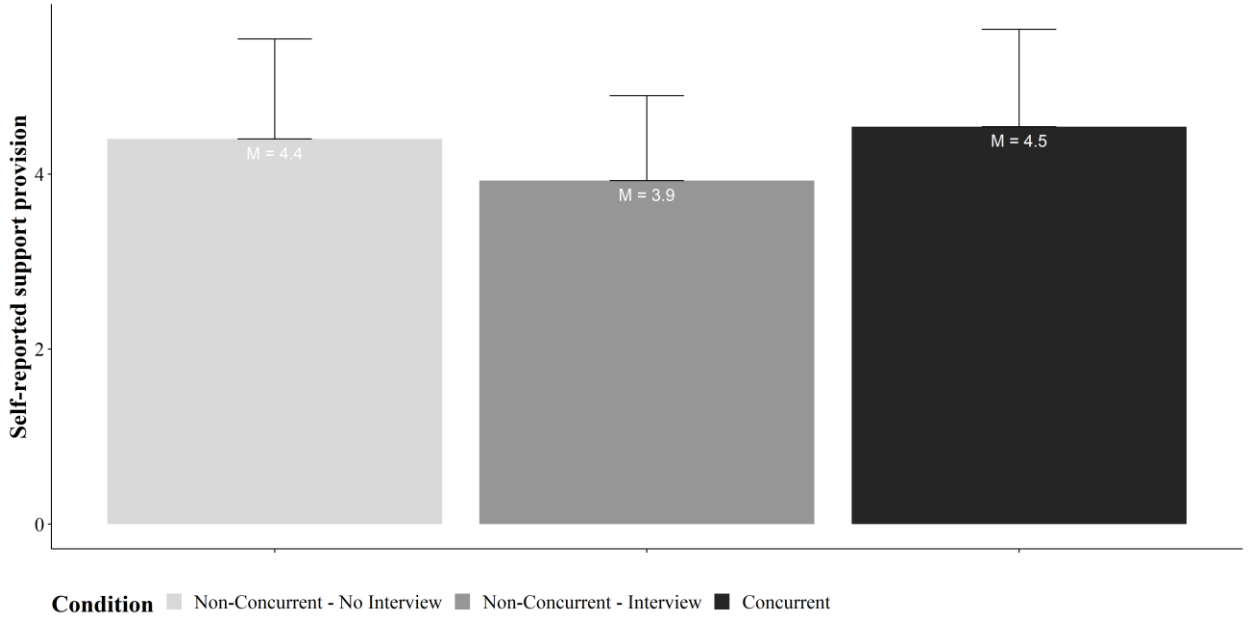


Differences in affiliation across experimental conditions

In our main analyses, we first examined whether people showed different levels of affiliation across experimental conditions. We found that those who did not complete the TSST in the non-concurrent stress condition (i.e., while their partner completed the TSST) did not significantly differ from those in the concurrent stress condition in the amount of support they reported providing to their partner (b = -.128, SE = .153, p = .408, d = -.292). However, those who completed the TSST in the non-concurrent stress condition (i.e., while their partner did not complete the TSST) reported providing less support compared to those in the concurrent stress condition (b = -.309, SE = .153, p = .051, d = -.705); though this difference did not reach the threshold of statistical significance, it had a medium to large effect size. There were no differences by participant sex and no significant interactions between experimental conditions

and sex. There were no significant effects of sex or experimental condition when we looked at observed support provision.

Figure 13. Differences in self-reported support provision across experimental groups



Note. Error bars represent standard deviations.

Table 13
Differences in self-reported support provision across experimental groups

	Self-reported support provision			**Observed support provision**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	4.10	3.76 – 4.45	**<.001**	2.10	1.70 – 2.50	**<.001**
Sex	-.01	-.36 – .34	.964	-.04	-.6 – .08	.484
NCS	-.31	-.61 – -.01	.051	-.04	-.44 – .37	.851
NCNS	-.30	-.43 – .7	.408	.06	-.34 – .47	.765
Sex* NCS	.02	-.28 – .32	.884	.03	-.5 – .21	.763
Sex* NCNS	-.03	-.33 – .26	.822	.00	-.09 – .28	.324

Note. NCS = Non-concurrent stressed; NCNS = Non-concurrent non-stressed.

Associations between stress and affiliation across experimental conditions

Next, we examined associations between stress and affiliation while controlling for experimental conditions[6]. When we examined the associations between perceived stress reactivity and affiliation, we did not find any significant effects of stress reactivity, partner stress reactivity, moderate levels of actor and partner stress reactivity, or interactions with sex on either elf-reported or observed support provision (Table 14).

Table 14
Associations between perceived stress reactivity and affiliation across experimental conditions

	Self-reported support provision			**Observed support provision**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	4.02	3.50 – 4.54	**<.001**	2.42	1.85 – 3.00	**<.001**
NCS	-.37	-.71 – -.04	**.045**	.07	-.35 – .50	.749
NCNS	-.14	-.48 – .20	.438	.16	-.27 – .60	.488
Sex	.11	-.32 – .55	.622	-.00	-.22 – .21	.974
Stress	-.01	-1.13 – 1.11	.984	.10	-1.01 – 1.20	.869
PStress	-.00	-1.18 – 1.18	.995	.02	-1.16 – 1.19	.978
Sex*Stress	.58	-.45 – 1.60	.297	.75	-.51 – 2.00	.279
Sex* PStress	-.34	-1.42 – .74	.558	-.24	-1.50 – 1.02	.719
Stress*Stress	1.08	-1.67 – 3.83	.466	-2.04	-5.14 – 1.06	.236
PStress* PStress	-.11	-2.93 – 2.72	.944	-1.39	-4.50 – 1.72	.406
Sex*Stress*Stress	-.51	-3.29 – 2.27	.732	-.62	-3.35 – 2.10	.663
Sex*PStress*PStress	-.70	-3.52 – 2.12	.642	-.53	-3.24 – 2.18	.710

Note. NCS = Non-concurrent stressed; NCNS = Non-concurrent non-stressed; Stress = Perceived stress reactivity; PStress = Partner perceived stress reactivity.

[6] The associations between stress and affiliation remained virtually the same when we did not control for the experimental conditions.

Similarly, when we examined the associations between cortisol reactivity and affiliation, we again did not find any significant effects of cortisol reactivity, partner cortisol reactivity, moderate levels of actor and partner cortisol reactivity, or interactions with sex on either self-reported or observed support provision (Table 15).

Table 15
Associations between cortisol reactivity and affiliation across experimental conditions

	Self-reported support provision			**Observed support provision**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	4.04	3.67 – 4.40	**<.001**	2.20	1.68 – 2.72	**<.001**
NCS	-.36	-.65 – -.06	**.030**	-.05	-.60 – .51	.864
NCNS	-.13	-.43 – .17	.412	.19	-.36 – .75	.505
Sex	.04	-.27 – .35	.819	-.15	-.22 – -.08	**.007**
Cort	1.05	-1.60 – 3.71	.461	-1.23	-5.42 – 2.97	.572
PCort	-.50	-3.48 – 2.47	.753	-.76	-4.95 – 3.43	.724
Sex*Cort	-1.41	-4.06 – 1.25	.327	2.67	-.91 – 6.25	.184
Sex* PCort	1.04	-1.93 – 4.02	.514	-.32	-3.98 – 3.34	.863
Cort*Cort	4.14	-13.39 – 21.67	.660	-26.19	-6.10 – 7.72	.171
PCort*PCort	-9.54	-31.78 – 12.71	.426	-19.46	-53.30 – 14.39	.288
Sex*Cort*Cort	1.34	-16.20 – 18.88	.887	3.49	-2.05 – 63.03	.110
Sex*PCort*PCort	-15.73	-37.85 – 6.39	.191	-17.86	-5.40 – 14.69	.308

Note. NCS = Non-concurrent stressed; NCNS = Non-concurrent non-stressed; Cort = Cortisol reactivity; PCort = Partner cortisol reactivity.

Discussion

In Study 2, we examined couples' self-reported and observed support following a non-concurrent or concurrent stress-inducing task. We found that when couples were in the concurrent stress condition (i.e., both partners completed the TSST), they reported providing more support to their partner compared to those who were the stressed partner in the non-concurrent stress condition (i.e., those who completed the TSST while their partner did not). Those who were the non-stressed partner in the non-concurrent stress condition (i.e., those who did not complete the TSST while their partner did) reported providing a similar amount of support to their partner as those who were in the concurrent stress condition. We did not find any significant differences across experimental groups for observed support provision.

Although findings on differences across experimental groups were not statistically significant, they were in line with Study 1 findings: Stressed participants were more affiliative if their partner was also stressed. Interestingly, participants in the concurrent stress condition also felt less stressed than those who completed the same stress-inducing task in the non-concurrent stress condition, even though they showed a similarly high cortisol response. It is likely that, although partners in the concurrent stress condition received different job descriptions to prepare for, they perceived this task as a shared stressor. Therefore, the current study suggests that the shared nature of the stressor may be an important factor contributing to affiliation.

We did not find an association between cortisol reactivity and affiliation in either men or women. It should be noted that we were not able to add experimental groups as a moderator when examining associations between stress reactivity and affiliation. Doing so would produce a model with too many parameters, therefore we only controlled for the experimental groups for simplicity. Given that participants in both the concurrent stress condition and stressed

participants in the non-concurrent stress condition both showed high levels of cortisol reactivity, it would be valuable to examine whether the association between cortisol reactivity and affiliation differed across experimental groups.

The current study had several important limitations. First, the data used in this study were collected as a pilot study for a larger study and thus the tasks during the 15-minute period were not standardized across participants. When we explored differences in means for the first (i.e., those who completed the Wilderness Survival task as their collaborative task) and second half of the samples (i.e., those who completed the Magna-Tiles task as their collaborative task), there were differences in how much support they reported providing. It is possible that participants who completed the Wilderness Survival task were more understanding and validating towards their partner because they were instructed to reach an agreement with their partner on the best answer. It is unclear whether these differences meaningfully affected the current findings; however, the differences between these two groups were not statistically significant. Because this was a pilot study, the current study also had a small sample. This meant that we had low statistical power for our analyses. Also, relatively few participants consented to have their videos coded for observed support provision, which reduced the power for analyses examining observed support provision even further. Lastly, the current study lacked a control group. Although there were non-stressed participants in the non-concurrent stress condition, there was no experimental condition where both partners were non-stressed.

Overall, Study 2 suggested that shared stress may be associated with more affiliation. Moreover, contrary to our expectations, there was no association between cortisol reactivity and affiliation for either men or women. However, this was a small pilot study that lacked a standardized protocol and a true control group. In Study 3, we attempt to build on Study 2 in an

experiment using a standardized caregiving task and a larger sample. We further explore the role of shared stress and compare stressed partners to a true control group where neither partner experiences a stressor.

CHAPTER 4

Study 3

Findings from the previous two studies suggested that people may be more affiliative if their stress is shared by their partner. Contrary to our expectations, Study 2 did not find an association between cortisol reactivity and affiliation for either men or women. In Study 3, we aimed to further examine the role of psychological and physiological stress in affiliation within a larger sample of couples during a standardized caregiving task.

Affiliative stress responses are theorized to stem from the attachment/caregiving system (Taylor et al., 2000). Moreover, tend-and-befriend theory argues that being the main caregiver of infants is one of the reasons why men and women differ in their affiliative stress responses. They argue that affiliative stress responses in women serve to maximize their survival as well as the survival of the offspring they are caring for. However, there is little research on the effects of acute stress on caregiving in men and women. Given that couples often have to care for their children when experiencing acute stress, it is important to understand how stress may impact people's affiliative behaviors towards their co-parenting partner as well as their infant during caregiving tasks.

Importantly, it is often difficult to examine infant-parent interactions in a standardized way, as infant age, temperament, and gender may vary in ways that could affect parental behavior (Rutherford, 2019). For example, greater infant crying may promote greater care from the caregiver (Zeifman, 2001). In order to examine responses to infants in a more standardized

way, researchers have measured participants' responses to watching videos of infants (Probst et al., 2017) or listening to audio recordings of crying babies (van Anders et al., 2014).

Probst and colleagues (2017) recently examined people's willingness to care for infants shown in videotapes following a stress manipulation. Participants were assigned to either a stress-inducing (i.e., submerging forearm in iced water) or control condition (i.e., submerging forearm in warm water) and then shown twenty ten-second videos of infants. After each video, they were asked to indicate their willingness to care for the infant (i.e., "How big is your urge to pick the infant up, to cradle it in your arms and to try and comfort it?"). Each participant rated ten videos of crying infants and ten videos of non-crying infants (successively blinking and squeezing eyelids or tongue thrusting). Across both crying and non-crying videos, men and women in the control condition were equally willing to take care of the infants. However, across both crying and non-crying videos, stressed men were less willing to care for the infant compared to stressed women, non-stressed women, and non-stressed men. The researchers also found a quadratic association between men's cortisol increases during the stress manipulation task (i.e., submerging forearm in iced or warm water) and caregiving motivation: Men reported *higher* caregiving motivation when they showed moderate increases in cortisol, but lower caregiving motivation when they showed low or high increases in cortisol. Women did not show associations between cortisol increases and caregiving motivation. Importantly, this study examined individuals and not couples, so these results cannot speak to the extent to which stressed individuals are willing to care for crying infants when they are with a stressed versus non-stressed partner.

It remains unclear how acute stress may affect people's caregiving and affiliative behaviors towards their partner in a *dyadic* setting. For example, when partners share the same

stressor, their affiliative responses to infants may be different compared to when only one partner is experiencing a stressor. For example, recent research examining couples expecting their second child found that greater shared parenting stress (e.g., “Need to keep a constant eye on what the child is doing”, “Child difficult to manage in public places”) was related to less cooperative coparenting among couples, whereas the individual variance in parenting stress was not related to coparenting (Volling et al., 2021). These findings suggest that a dyadic examination of couples experiencing external stress during a caregiving task can advance previous research on acute stress and caregiving. However, doing so in a standardized lab environment remains a challenge.

One recent standardized method for examining caregiving behaviors in the lab is the employment of infant simulators. Infant simulators are lifelike infant dolls that, unlike infant dolls used in earlier research, can be programmed to emit cries, and respond to caregiving behaviors (Rutherford, 2019). Infant simulator cries can vary both in their intensity and duration. Periods of silence can also be scattered throughout a cry bout. Moreover, the simulators can be programmed such that sensitive caregiving behavior can decrease the rate of crying, whereas insensitive or unresponsive caregiving can increase it. These programming abilities enhance the ecological validity of interactions with the infant simulator (Rutherford, 2019). Infant simulators are increasingly used in research on caregiving attitudes, caregiving behaviors, and physiological responses to infant cries (Rutherford, 2019). They allow caregiving behaviors to be observed in a standardized way by keeping characteristics of the infant (e.g., age, temperament) constant, and thereby minimizing confounding factors. Recently, infant simulators have also been used to examine how couples engage in collaboration, support, undermining, and navigating the division

of labor during caregiving tasks (Rasmussen et al., 2019). However, there are currently very few studies using the infant simulator with couples.

In Study 3, we examined couples' interactions and caregiving behavior with an infant simulator following a stress-inducing task. The current study examined the following research questions:

(RQ 1a) Is higher stress (i.e., perceived stress, or cortisol reactivity) associated with more affiliative responses towards the romantic partner and the infant simulator (i.e., support provision, feelings toward the baby) during a caregiving task?

(RQ 1b) Do people show more affiliative responses towards their romantic partner and the infant simulator when experiencing moderate levels of stress (i.e., stress manipulation, moderate stress reactivity, or moderate cortisol reactivity), as opposed to low or high levels of stress? We hypothesize that moderate stress will be associated with greater affiliation (H1b), as opposed to low or high levels of stress (H1a).

(RQ 2) Do women show more affiliative stress responses compared to men? We hypothesize that men and women would both show affiliative stress responses during the caregiving task; however, women would affiliate more following the stressor whereas men would affiliate more in response to moderate increases in cortisol (H2).

In addition to these main research questions, the current study will also explore differences across experimental conditions:

(E) Does the association between stress and affiliation differ for couples in different experimental conditions (i.e., male stressed, female stressed, both partners stressed, and control)? We do not have a directional hypothesis for the moderating role of experimental condition.

Methods

Procedure

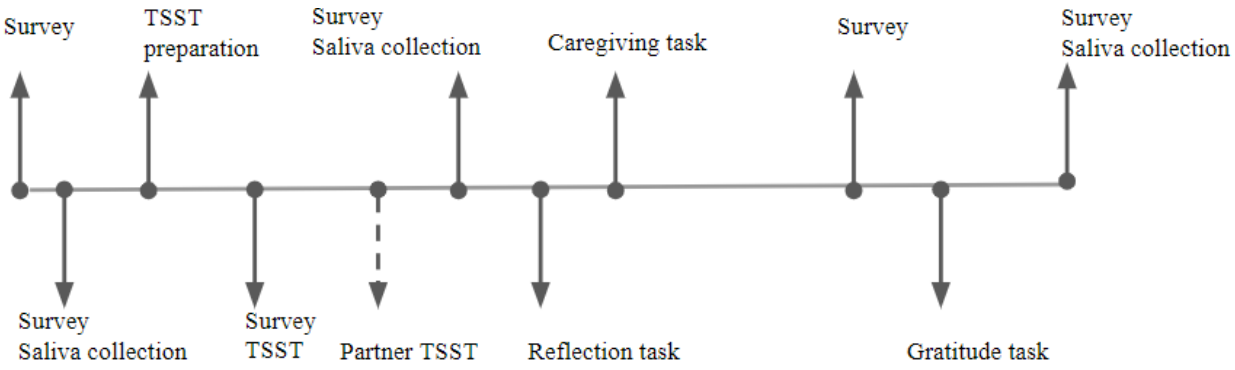
The study was reviewed by the University of Michigan's Institutional Review Board and received IRB approval. Eligible couples who were interested in the study were emailed an online baseline survey containing personality and relationship quality questionnaires. Upon completion of the survey, they were invited to come to the laboratory together for the TSST and caregiving tasks. Because of diurnal changes in hormones, lab sessions were held between the hours of Noon and 7PM (Schultheiss & Stanton, 2009). Participants were asked to avoid eating, drinking (except water), and brushing their teeth within an hour before their visit. When they arrived in the lab, couples completed surveys, the TSST, and the caregiving task (described below). They also completed surveys throughout the study (e.g., to assess perceptions of the tasks, changes in mood and feelings towards their partner) and provided three saliva samples to assess hormones, as described in more detail below.

Participants who were randomly assigned to be stressed completed a TSST protocol similar to that in Study 2, with a few differences: TSST interviews were conducted in-person with interviewers wearing masks due to the COVID-19 pandemic. At the end of the five-minute interview, in line with other effective TSST protocols (Goodman et al., 2017), participants were asked to complete a difficult mental math task for one minute (i.e., serially subtract 13 from 1022). Participants who were randomly assigned to not be stressed were given the same job descriptions and asked to prepare notes as if they were preparing for an interview. It was made clear that this was just a writing task, their notes would not be evaluated or collected, and they would not be interviewed. After preparing notes for five minutes, consistent with other TSST

control condition protocols (Het et al., 2009), they were given an easy math task (i.e., serially add 15 to zero) that they completed alone in a study room.

Following the stress manipulation, we assessed dyadic caregiving with an infant simulator. Couples were asked to imagine that the infant simulator was their baby girl, and they were instructed to comfort the baby together, in whatever way made the most sense to them, while each was wearing a sensor that made the infant simulator responsive to their caregiving behaviors. The infant simulator made crying noises based on a schedule, but responded to care (e.g., appropriate care made it stop crying, rough handling made it cry louder). The schedule set the simulated infant to be hungry, wet, lonely, or gaseous, and participants could comfort the simulated infant via feeding, diaper changes, rocking, or burping (van Anders, Tolman, & Volling, 2012). The infant simulator only responded to the appropriate response if the response lasted for a specified duration (90 seconds). As other research noted, participants interacting with infant simulators do not immediately know what the infant needs (van Anders et al., 2014). Comforting the simulated infant is challenging, and participants are not always able to do it successfully. Couples performed this task for 15 minutes and they were videotaped. An overview of the full procedure is shown in the figure below.

Figure 14. Overview of Study 3 protocol



Participants

Couples were recruited via online advertising (e.g., Craigslist, Facebook, U-M Health Research Studies) as well as flyers placed around campus and the community. Eligible participants were between the ages of 20-40 (M = 26.73; to control for age-related hormonal changes; Leifke et al., 2000), did not have children and were not pregnant (to control for differences in caregiving motivation; Probst et al., 2017). Eligible couples were also in committed (i.e., planned to be together for the foreseeable future) and cohabiting relationships. In order to be able to randomly assign all participants to one of the four experimental conditions, and to test differences as a function of sex, we only recruited couples in opposite-sex relationships. The current sample includes 77 couples across four experimental conditions: male stressed (N = 19 couples), female stressed (N = 19 couples), both male and female stressed (N = 20 couples), and neither partner is stressed (N = 19 couples). We are continuing to recruit participants and aim to reach a total sample of 100 couples (N = 25 couples per condition). Participants had been with their partner for 4.61 years on average. Their household income ranged from zero to $300,000 (*Median* = $65,000).

Measures

The baseline survey included questions about participants' demographic characteristics. All participants completed these measures independently from their partners, with assurance that their responses would be kept confidential.

Perceived stress. All lab surveys measured positive and negative affect, which included a rating of participants' perceived stress levels on a slider scale ("Stressed/Tense/Overwhelmed"; 0 = "*Not at all*", 100 = "*Extremely*"). Perceived stress was measured six times: before the stress manipulation, after the public speaking or writing tasks were explained, after the 5-minute prep

period, after the TSST interview, after the caregiving task, and after the gratitude task. The last two perceived stress measures marked the recovery from the stress manipulation. We computed self-reported stress reactivity from the first four measurements (i.e., baseline to post-stressor) using the same approach as in Study 2.

Cortisol reactivity. We collected saliva samples consistent with procedures outlined in previous research (e.g., Schultheiss & Stanton, 2009). In the lab session, participants collected their saliva samples by passively drooling into a plastic tube using a mini funnel (Poll et al., 2007). These samples were stored in a freezer until they were assayed for cortisol using enzyme immunoassays (EIA; Gozansky et al., 2005). Samples were collected before the TSST preparation (i.e., about 10-minutes after arrival in lab), after the TSST (i.e., about 10-minutes after the end of the interview or writing task), and at the end of the experiment (i.e., about 10-minutes after the end of the caregiving task). These correspond to the baseline, post-TSST, and post-caregiving cortisol levels. Currently, we have assay results from the first 53 couples (N = 14 couples for the control condition; N = 13 couples for other conditions). After preparing the cortisol data for analysis (i.e., winsorizing for men and women), we examined changes in winsorized cortisol as a function of the stress manipulation. We winsorized cortisol measures from two male and one female participant who had cortisol values that were more than three standard deviations higher than the average male and female participant. Using the first two cortisol measurements, we computed a percent change score that reflects changes from pre- to post-TSST. These change scores were not normally distributed; thus, we used log-transformed change scores in our analyses.[7]

[7] Change in the winsorized cortisol measure was not normally distributed ($W = .68$, $p < .001$). Given that there were negative values of change in the current data (Min =-62.67, Max = 775.57), we first added 100 to all scores to ensure that all values were positive. Then we log-transformed these scores, which improved normality (W = .95, $p = .008$).

Post-caregiving survey. Following the caregiving task, participants completed manipulation checks (e.g., "Did you take the task rather seriously"; 1 = "*Not at all*", 5 = "*Extremely*"; Rasmussen et al., 2019). Overall, participants reported taking the caregiving task seriously (M = 4.01). Participants were also broadly asked about their thoughts and impressions about their experience during the debriefing. Only two couples reported having difficulty treating the baby as if it was a real baby.

Affiliation. Following the caregiving task, participants rated the extent to which they and their partner were supportive towards each other during the caregiving task. We used participants ratings of their own support provision as a measure of their affiliation (e.g., "I was supportive towards my partner", "I understood the way my partner felt about things", "I appreciated my partner", "I really cared about my partner"; 1 = *Not at all*, 7 = *Extremely;* α = *.84*). They also rated how positive and negative they felt about their simulated baby on slider scales (0 = "Not at all positive/negative", 100 = "Extremely positive/negative"). We averaged positive feelings and reversed negative feelings to compute average positive feelings towards the simulated baby (α = .68), which was used as a proxy measure for how much they affiliated with the infant simulator.

Analytic plan

First, in our preliminary analyses, we examined whether perceived stress and cortisol changed differently across the four experimental groups. Next, in our main analyses, we examined whether affiliation (self-reported support and feelings toward the baby) was different across experimental groups. Similar to Study 1, we used multilevel modeling to account for the interdependence of partners within couples. We examined how actor stress condition (actor stressed vs actor not stressed), partner stress condition (partner stressed vs partner not stressed), actor sex (male vs female), and their interactions were associated with affiliation. Lastly, similar

to Study 1, we used APIMs to examine the associations between actor and partner stress (perceived stress reactivity, cortisol reactivity) and affiliation. In order to examine sex differences in these associations, we included sex as a moderator. Couples were treated as distinguishable.

Similar to Study 1, predictors that had at least interval scales were grand mean centered, binary predictors were contrast coded (e.g., Female = -1; Male = 1), and a compound symmetry covariance structure was used for the residuals. The analyses were run using the lme() function from the nlme package in R 4.0.2. Below, we report all associations that yielded a $p < .10$, although our statistical significance criterion is set at $p < .05$. Similar to Study 2, all effects are interpreted along with the effect size estimates given the small sample size. Effect sizes (i.e., Cohen's d) are estimated using the lme.dscore function from the EMAtools package.

Results

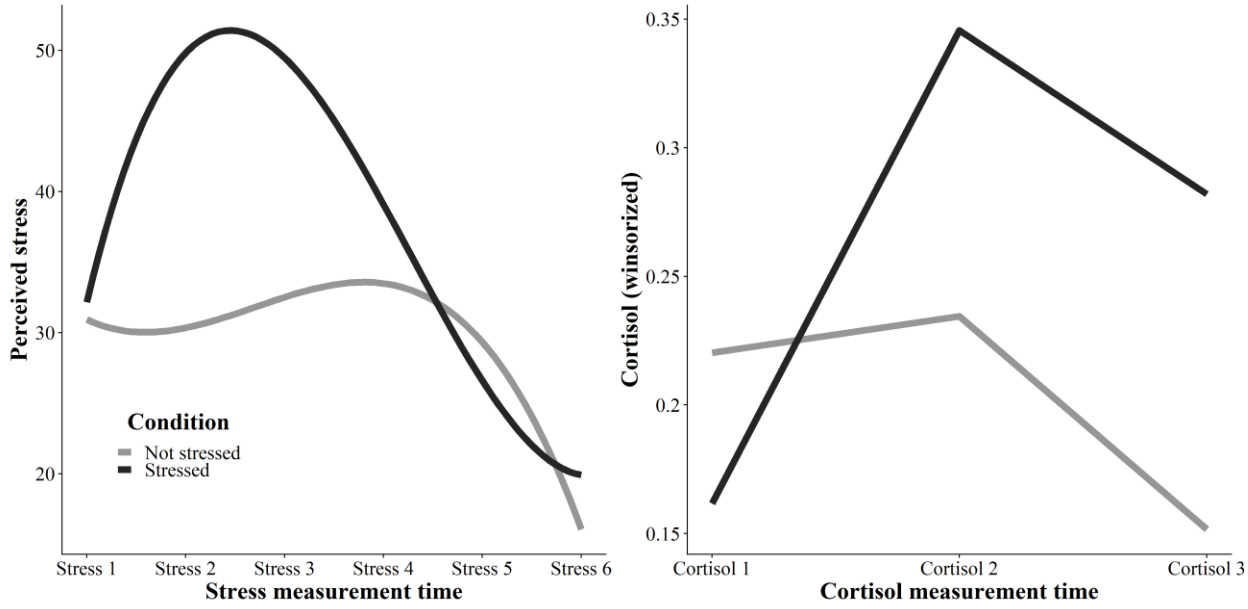
Preliminary analyses

Prior to our main analyses, we used growth curve analyses to examine whether changes in perceived stress and cortisol levels differed by condition. We found a significant interaction between completing the TSST and the quadratic effect of time (b = -.766, SE = .224, $p < .001$, d = -.252) in predicting perceived stress over time: Those who completed the TSST showed a larger quadratic effect (b = -3.227, SE = .316, $p < .001$, d = -.751) compared to others (b = -1.696, SE = .330, $p < .001$, d = -.378). We also found a significant interaction between actor and partner stress condition in predicting perceived stress (b = -3.060, SE = 1.450, p = .038, d = -.484): When participants completed the TSST, their partner's stress condition was not significantly associated with their stress (b = -1.104, SE = 1.975, p = .576, d = -.041); however if they did not complete the TSST, they had higher stress when their partner completed the TSST

(*b* = 5.015, *SE* = 2.050, *p* = .015, *d* = .180) compared to when their partner did not complete the TSST.

Next, we looked at cortisol levels over time. Given that estimating quadratic growth curves requires at least four waves of data (Kenny et al., 2006), we only examined linear changes in cortisol from pre to post-TSST. We found a significant interaction between completing the TSST and linear changes in cortisol (*b* = .093, *SE* = .046, *p* = .048, *d* = .397). Those who completed the TSST showed significant increases in cortisol (*b* = .239, *SE* = .060, *p* < .001, *d* = .790), whereas others did not (*b* = .053, *SE* = .062, *p* = .398, *d* = .169). Therefore, participants who completed the TSST showed a significant stress and cortisol reactivity. We did not find any interactions with sex.

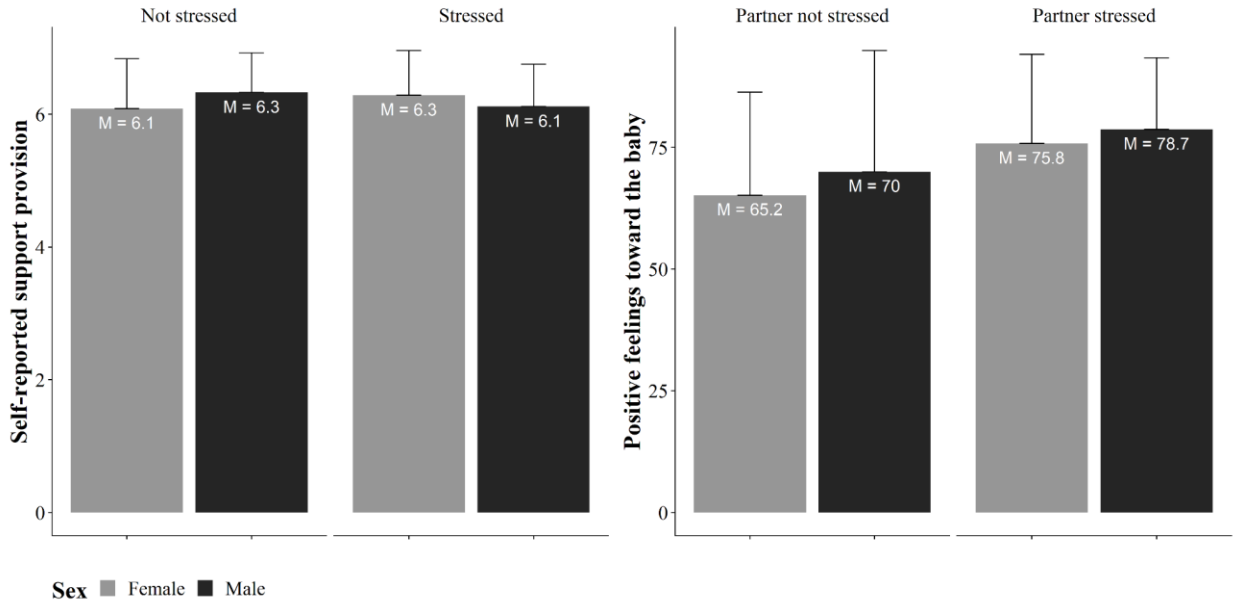
Figure 15. Changes in stress across actor stress conditions



Differences in affiliation across experimental conditions

In our main analyses, we first examined whether people showed different levels of affiliation across experimental conditions (Table 16). We found an interaction between sex and actor stress condition (b = -.105, SE = .054, p = .056, d = -.466); though it did not reach the threshold of statistical significance, it had a medium effect size. Men reported providing less support when stressed (b = -.105, SE = .072, p = .142, d = -.332), whereas women reported providing more support when stressed (b = .104, SE = .082, p = .206, d = .327); however, these simple slopes were not significant for either men or women. When we looked at how positively people felt about the infant simulator, we found an effect of the partner's stress condition (b = 5.061, SE = 1.833, p = .007, d = .896): Those whose partners were stressed felt more positively about the infant simulator.

Figure 16. Differences in affiliation across actor and partner stress conditions



Note. Error bars represent standard deviations.

Table 16
Differences in affiliation across actor and partner stress conditions

	Self-reported support provision			Self-reported feelings towards the baby		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	6.21	6.08 – 6.33	**<.001**	71.74	68.51 – 74.97	**<.001**
ASC	-.00	-.11 – .11	.988	3.25	-.38 – 6.88	.079
PSC	-.03	-.14 – .08	.567	5.06	1.43 – 8.69	**.007**
Sex	.02	-.07 – .11	.681	1.63	-2.36 – 5.61	.420
Sex*ASC	-.10	-.21 – .00	.056	1.81	-1.81 – 5.43	.324
Sex*PSC	.07	-.03 – .18	.183	-.96	-4.58 – 2.66	.600
ASC*PSC	-.00	-.12 – .12	.987	-1.28	-4.51 – 1.95	.433
Sex*ASC*PSC	.02	-.07 – .11	.682	.57	-3.42 – 4.55	.779

Note. ASC = Actor stress condition; PSC = Partner stress condition.

Associations between stress and affiliation across experimental conditions

Next, we examined associations between perceived and physiological stress reactivity and affiliation while controlling for experimental conditions (Table 17). When we examined the associations between perceived stress reactivity and affiliation, we found an interaction between sex and the quadratic effect of stress reactivity (b = -.002, SE = .001, p = .075, d = -.338), though this effect did not reach the threshold of statistical significance. Men showed a significant quadratic effect such that they provided more support to their partner when they had moderate stress reactivity (b = -.003, SE = .002, p = .049, d = -.253), whereas women did not show a significant quadratic effect (b = .001, SE = .002, p = .505, d = .085). We did not find any other significant effects on self-reported support provision. When we examined feelings toward the simulated baby, we found an interaction between sex and partner's stress reactivity (b = 1.972, SE = 1.090, p = .073, d = .340) but this effect again did not reach the threshold of statistical

significance. Men felt more positive about the baby when their partner had greater stress reactivity (*b* = .826, *SE* = 1.569, *p* = .600, *d* = .099), whereas women felt less positive about the baby when their partner had greater stress reactivity (*b* = -1.145, *SE* = 1.119, *p* = .308, *d* = -.193); however, these simple slopes were not significant for either men or women.

Table 17
Associations between perceived stress reactivity and affiliation

	Self-reported support provision			**Self-reported feelings towards the baby**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	6.26	5.58 – 6.94	**<.001**	76.10	59.80 – 92.40	**<.001**
ASC	-.02	-.14 – .10	.739	2.93	-1.10 – 6.95	.152
PSC	-.01	-.13 – .11	.866	6.88	2.97 – 1.79	**.001**
Sex	-.06	-.51 – .39	.799	-15.78	-35.87 – 4.32	.122
ASR	.03	-.04 – .10	.335	-.46	-2.85 – 1.92	.701
PSR	-.04	-.11 – .03	.240	-1.15	-3.37 – 1.07	.308
Sex*ASR	.05	-.02 – .12	.196	.30	-2.06 – 2.65	.804
Sex*PSR	-.01	-.08 – .06	.710	1.97	-.19 – 4.14	.073
ASC*PSC	-.03	-.16 – .11	.673	-2.08	-5.37 – 1.21	.214
ASR*ASR	-.00	-.00 – .00	.429	.03	-.05 – .12	.452
PSR*PSR	.00	-.00 – .00	.394	.04	-.04 – .11	.313
Sex*ASR*ASR	-.00	-.00 – .00	.075	-.01	-.09 – .08	.848
Sex*PSR*PSR	.00	-.00 – .00	.598	-.04	-.12 – .03	.227

Note. ASC = Actor stress condition; PSC = Partner stress condition; ASR = Actor stress reactivity; PSR = Partner stress reactivity.

When we examined the associations between cortisol reactivity and affiliation (Table 18), we did not find any significant effects for self-reported support provision. We also did not find any significant associations between cortisol reactivity and feelings toward the infant simulator.

Table 18
Associations between cortisol reactivity and affiliation

	Self-reported support provision			**Self-reported feelings towards the baby**		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
Intercept	6.21	5.61 – 6.80	**<.001**	6.98	47.11 – 74.86	**<.001**
ASC	-.13	-.56 – .29	.514	3.81	-5.60 – 13.22	.408
PSC	-.04	-.43 – .35	.843	6.34	-3.79 – 16.46	.206
Sex	.10	-.25 – .45	.570	2.44	-12.26 – 17.14	.733
ASC*PSC	.02	-.32 – .36	.915	1.46	-5.75 – 8.66	.678
ACR	.08	-1.84 – 2.01	.930	-23.43	-75.89 – 29.04	.363
PCR	-.12	-2.19 – 1.95	.907	-42.44	-96.19 – 11.31	.115
Sex*ACR	-.66	-2.31 – .99	.420	-5.33	-53.14 – 42.48	.818
Sex*PCR	.08	-1.75 – 1.91	.930	-6.63	-53.01 – 39.74	.769
ACR*ACR	.57	-3.78 – 4.92	.788	23.70	-85.33 – 132.73	.655
PCR*PCR	-.78	-5.46 – 3.89	.733	11.41	-47.43 – 268.24	.160
Sex*ACR*ACR	-.14	-4.13 – 3.86	.944	-32.56	-145.94 – 8.81	.556
Sex*PCR*PCR	.04	-4.19 – 4.27	.983	62.88	-97.94 – 223.70	.424

Note. ASC = Actor stress condition; PSC = Partner stress condition; ACR = Actor cortisol reactivity; PCR = Partner cortisol reactivity.

Discussion

In Study 3, we manipulated stress and examined couples' self-reported support provision and feelings towards their simulated infant during a standardized caregiving task. We found that when men and women were stressed, regardless of their partner's stress condition, they showed different levels of support provision. Stressed men provided less support and stressed women provided more support to their partner compared to their non-stressed counterparts. Although this interaction and simple-slopes for these comparisons did not reach the threshold of statistical significance, they are important to note as they are consistent with the tend-and-befriend theory. These findings were also in line with Study 1 findings: When experiencing moderate levels of stress (i.e., completing a moderately stressful task), women affiliated more, and men affiliated less compared to women and men in the control condition. Similar to Study 1, differences between men and women were very small.

Unlike Studies 1 and 2, participants who had a shared stressor with their partner were not different than those who experienced the stressor individually: We did not find interactions between actor and partner stress when predicting either support provision or feelings toward the infant simulator. However, those who had stressed partners were more affiliative towards their simulated infant. This suggests that, similar to the previous two studies, both one's own stress and their partner's stress may be predictive of affiliation.

Why might people affiliate with their simulated infant more when their partner is stressed? One possible explanation is that they are being responsive to their partner's stress. Previous research suggested that women often take over household chores on the days that their partner is more stressed (Bolger et al., 1989). In the current study, participants may have taken over the responsibility of caring for the simulated infant because they knew that their partner had

just completed a stressful task. However, it should be noted that we did not find evidence that non-stressed participants who had a partner who was stressed were different than stressed participants who also had a stressed partner in their feelings towards the simulated infant. Therefore, people may respond to their partner's stress regardless of their own stress.

The current study had several important limitations. First, the data were part of a larger ongoing study. This meant that we had lower statistical power for our analyses than the targeted statistical power, especially for those involving cortisol because hormone assays are also ongoing. Second, we used feelings towards the simulated infant as a proxy measure of affiliation. Participants' feelings towards the infant simulator may reflect factors other than their affiliative responses. For example, a participant may have felt more positively about the infant simulator if they had an easier time figuring out what it needs. Using observational measures of how much participants engaged in caregiving may be a better measure of affiliation.

Overall, Study 3 suggested that both actor and partner stress may be associated with affiliation. Similar to Study 1, the current study suggested that stressed women may affiliate more, and stressed men may affiliate less than their non-stressed counterparts. We also found that partner stress may promote affiliation with a simulated infant. Unlike the previous two studies, we did not find differences in how much people affiliate in response to individual versus shared stress.

CHAPTER 5

General Discussion

Overview

There is a long history of research on how people respond to stress. A large portion of this literature highlights the negative effects of stress on relationships. Major theoretical frameworks of stress in romantic relationships, such as the family stress model and the vulnerability stress adaptation model, suggest that stressful events decrease positive behaviors towards the partner, such as support provision (Conger & Elder, 1994; Karney & Bradbury, 1995). The current dissertation builds on a smaller body of research suggesting that people may sometimes respond to stressors with affiliative behaviors toward their partner (e.g., Clavel et al., 2017). Using cross-sectional, longitudinal, and experimental research methods, we found evidence that people, especially women, may respond to stress with affiliation towards their partner.

The idea that people may respond to stress in affiliative ways is not new. For example, Bowlby observed that people sought closeness to their family members following major stressors, and Schachter showed that people preferred to be around others over being alone when they were stressed (Bowlby, 1973; Schachter, 1959). However, the current dissertation attempted to further understand when we may observe such responses in romantic relationships, and who may be more likely to show such responses to stress. We highlighted the importance of the

different dimensions of stress, sex, and the dyadic aspects of stress in predicting affiliation in relationships.

The importance of locus, duration, and intensity of stress

The current studies demonstrate the importance of considering the locus, duration, and intensity of stress when examining affiliative responses to stress in relationships. Consistent with previous studies finding positive effects of external stress on romantic relationships (Clavel et al., 2017; Williamson et al., 2021), we focused on stressors originating from outside the relationship as a potential predictor of affiliation. We then examined the roles of stress duration and intensity. In Study 1, we found evidence for affiliative stress responses during the COVID-19 pandemic in the short-term. These findings suggested that external stressors that impact large numbers of people, such as worries about getting COVID-19, may prompt people to provide more support to their partner. The effects of pandemic-related stress were more ambivalent in the long-term: We found both positive (i.e., greater understanding) and negative (i.e., greater dismissing) associations between pandemic-related stress and support provision. These findings suggested that acute stressors that have a clear external locus may promote affiliation. It is likely that throughout the first year of the pandemic, pandemic-related stressors were perceived as more controllable (e.g., with effective masks or vaccination) and thus, less external. We also found in Study 1 that the association between the intensity of stress and affiliation may be curvilinear: The association between stress and affiliation may be different at moderate levels of stress versus low or high levels of stress. Studies 2 and 3 further examined the relationship between moderate levels of stress and affiliation using a moderately stressful experimental manipulation and found associations between the experimental manipulation and affiliation. Importantly, Study 1 examined between-person variance (i.e., people who are more stressed about the pandemic than

others), whereas Studies 2 and 3 also examined within-person variance (i.e., people who show greater *increases* in their stress levels).

The importance of sex differences

Consistent with previous research and theory (Schachter, 1959; Taylor et al., 2000), the links we found between stress and affiliation were more pronounced for women compared to men in Studies 1 and 3. In fact, in many of our findings, when moderately stressed, men showed *lower* levels of affiliation compared to women. Several findings suggested that stressed men were less understanding and more dismissive about their partner's pandemic-related stress, and provided less support to their partner during the caregiving task, compared to stressed women. Nevertheless, as Taylor also noted (2011a), these differences were often small in size. Furthermore, we also found that some effects were consistent across men and women. For example, both men and women were more supportive to their partner if they were both stressed in Study 1, or they both completed the TSST in Study 2. They also had more positive feelings toward their simulated infant when their partner completed the TSST compared to when their partner did not complete the TSST in Study 3.

Several recent studies suggested that cortisol may play a role in men's affiliative stress responses (e.g., Berger et al., 2016; Probst et al., 2017). These studies suggested that increases in cortisol, especially at moderate levels, may be associated with more affiliative responses toward conversation partners and videos of infants. Unlike these studies, we did not find significant associations between cortisol and affiliation. However, given the small sample sizes for cortisol in Studies 2 and 3, examining associations between cortisol and affiliation in men versus women may still be useful in future research. Given that men tend to show larger cortisol responses to stress manipulations than women (Kudielka & Kirschbaum, 2005), individual differences in the

intensity of cortisol reactivity may help understand sex differences proposed by the tend-and-befriend theory.

Exploring the role of dyadic stress experiences

Throughout this dissertation, we also explored the role of *dyadic* stress experiences. We examined how actor stress, partner stress, and their interaction were associated with affiliation in our dyadic analyses. We also explored the effects of both partners completing the same stressful task versus only one partner completing a stressful task in Studies 2 and 3. Studies 1 and 2 suggested that people showed greater affiliation toward their partner when their partner shared their stress both in the short- and long-term. We did not find an interaction between actor and partner stress in Study 3; however, we found that both actor stress and partner stress predicted affiliation. Overall, these findings suggested that romantic partners may affiliate more when both they and their partner are experiencing the same stressor.

Importantly, our findings on dyadic experiences of stress cannot speak to whether partners will be more affiliative when the two partners have *different* sources of stress. Previous research on affiliative stress responses highlighted the importance of the partner being impacted by the *same* stressor. First, early research on stress and affiliation suggested that stressed people preferred to be around others who were experiencing the same stressor more than others who were not experiencing the same stressor (Schachter, 1959). Second, recent research suggested that stressed partners may affiliate more in order to protect close others who are vulnerable to the same stressor (Clavel et al., 2017). Therefore, the links between dyadic stress and affiliation may be specific to shared stressors, such as a global pandemic or a shared stressful lab task that both partners have to complete. These associations may not look the same if the partners are concurrently experiencing individual, rather than shared, stressors.

Limitations and future directions

We must also note that there were barriers to the generalizability of our findings. We focused on participants from community samples who were relatively satisfied in their relationships. Such couples may perceive more available resources to deal with stressors, and experience less psychological and physiological stress compared to couples who are more distressed. For example, partners in low quality relationships may not affiliate as much with their partner during stressful times because their interactions with their partner may not alleviate their stress. Also, most of our participants had relatively high incomes. Recent research suggests that low-income couples reported that external stressors (e.g., in-laws, not having enough money) often lead to internal stressors (e.g., disagreements) in their relationship (Jackson et al., 2016). The current dissertation cannot speak to whether external stressors would promote positive outcomes in samples of couples who are low-income or distressed.

Although we examined how external stressors may promote affiliation in relationships, it is important to note that the locus of stressors may be subjective depending on partners' attributions. For example, economic stress may be blamed on the partner (e.g., partner's irresponsible spending) or to an external source (e.g., recession). Whether partners are more likely to attribute their stress internally or externally may be related to individual differences, such as commitment. In the current dissertation, all participants were in committed relationships (i.e., cohabiting, planning to be together for the foreseeable future). When people are highly committed to their relationships, they may be more willing to attribute the locus of their stressor to outside the relationship so that it does not negatively impact their feelings about their relationship. In earlier stages of relationships, when people are often less committed to their partner, stressors may be less likely to be attributed externally. Therefore, it is important to

consider what leads people in relationships to perceive stressors as external. This was beyond the scope of the present dissertation, but future research may examine how the same external stress affects affiliation in different types of relationships.

Due to the limited number of pandemic-related stress and affiliation variables that were available in Study 1, we relied on single-item measures of stress and affiliation. Similarly, in Studies 2 and 3, we used a single item to measure perceived stress in order to reduce participant burden. Previous work showed that a single-item measure asking how stressed or tense people felt showed satisfactory validity (Elo et al., 2003). Although our single item measures of support provision in Study 1 had not yet been validated, we found high correlations (*r*s > .77) between the item measuring how understanding people were and the overall measure of support provision (i.e., how supportive, understanding, validating, and caring people were) in Studies 2 and 3. Therefore, a single item measure of understanding may be a valid measure of support provision. Future studies should examine affiliative responses with reliable multi-item measures of stress and affiliation.

Another potential limitation is that we did not include same-sex couples in any of the current analyses. This was a decision made, given our interest in sex differences, to simplify models tested in our studies, and to be able to randomly assign all participating couples into experimental conditions in Study 3. This may be especially important in Study 3, because affiliation was measured during a caregiving task. The division of infant care may be impacted by traditional gender roles: Same-sex couples often report being more equitable in division of infant care compared to opposite-sex couples, whereas women tend to do more infant care than men in opposite-sex couples (Ascigil et al., 2021; Goldberg et al., 2012). Therefore, men may affiliate less with infants not because they are less likely to tend-and-befriend, but because infant

care is typically considered more related to women's gendered roles. Future work should explore how same-sex couples may differ from opposite-sex couples in their affiliative responses to stress.

In the current analyses, we mostly relied on self-reported measures of support provision and affiliation with the simulated infant. Importantly, participants' perceptions of their own behavior may differ from their actual behavior. Although we had a measure of observed support provision in Study 2, this measure was only available for a small subset of the sample. Future directions for Study 3, which is ongoing, include behavioral coding of couples interacting with their simulated infant. This will allow us to examine how actual behaviors such as support provision and caregiving may be affected by stress.

Concluding comments

A large body of literature suggests that stress can have damaging effects on romantic relationships. In this dissertation, I found that acute stress may promote affiliative behaviors when it is external to the relationship, moderate in intensity, and is shared by the two partners. We also found that women may be more likely to affiliate, whereas men may be less likely to affiliate in response to such stressors. These findings demonstrated the importance of investigating the different dimensions of stress, the role of sex, and the dyadic context in order to understand the effects of stress on relationships.

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