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**THE MEDIATING ROLE OF COPING BEHAVIORS IN THE RELATION
BETWEEN PARTNER RELATIONSHIP QUALITY AND INFANT STRESS
SIGNS**

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Abstract

Perceived social support and overall relationship quality between a pregnant woman and her partner could affect an infant's future emotional distress. There are many ways that a couple could cope behaviorally with conflicts that result from poor relationship quality. Indeed, a pregnant woman's coping behaviors in response to stress have been shown to associate with her newborn infant's stress signs. It is also possible that a pregnant woman's coping behaviors could have a mediating effect between partner relationship quality and infant stress signs. This study explored whether the effects of partner relationships on newborn stress are mediated by a pregnant mother's behaviors. Participants included 162 pregnant women and their infants. Measures consisted of questionnaires to assess women's self-reports of relationship quality, coping behaviors, and depressive symptoms during the prenatal period. Behavioral data include coded observations of the pregnant women's flight, prosocial, and displacement behaviors during the speech portion of the Trier Social Stress Test, and measures of infant stress coded from the stress/abstinence scale of the Neonatal Intensive Care Unit Network Neurobehavioral Scale (NNNS). The hypotheses of this study were that (1) a negative partner relationship in pregnancy will associate with more infant stress signs and that (2) the flight, prosocial, and displacement behaviors of the mother will each (separately) mediate this relation. It was found that partner relationship quality was not significantly associated with infant stress signs. Furthermore, flight, prosocial, and displacement behaviors did not mediate the relation between partner relationship quality and infant stress. Because of previously known associations between coping behaviors and depression, exploratory analyses were run with these two variables and partner relationship quality. The analyses were Zero-order Pearson's r correlations, linear regressions, and an indirect effect model. It was found that partner relationship quality, dysfunctional coping, and depression were all associated. Dysfunctional coping also mediated the relation between partner relationship quality and symptoms of depression. Further research is needed to examine the association between partner relationship quality, a mother's behavior, and infant stress. The findings on the mediating role of dysfunctional coping between relationship quality and depression highlight the importance of coping behaviors and add to previous research on the topic.

Introduction

Stress during pregnancy can be detrimental to both the mother and a developing fetus (Bergman et al., 2007). Specifically, stress from relationship strain between a pregnant woman and her partner could be very consequential. For instance, relationship difficulties have been associated with infant outcomes, such as cognitive development, temperament, and distress (Alexander et al., 2017; Bergman et al., 2007; Stapleton et al., 2012). In this study, we examined the association between pregnant women's romantic relationship quality with her partner and newborn stress.

We also looked at the possible influence of coping behaviors on this association. Coping behaviors are behaviors that a person uses to respond to a stressor. There are many strategies and behaviors that can be used to cope with stress (Carver, Scheier, & Weintraub, 1989). When dealing with stress from relationship strain, a person may cope through behaviors such as falling silent during conflict, blaming, or submitting to their partner. Behaviors like these have been shown to be negatively associated with perceived relationship quality (Knoblock-Fedders et al., 2014). This means that coping behaviors could relate to the amount of stress a person feels from relationship strain. Recently, it has been found that a mother's coping behaviors during pregnancy are associated with infant stress signs (Vlisides-Henry, 2019). Considering this, it is possible that coping behaviors could play a part in the relation between partner relationship quality and infant outcomes.

Stress, Relationship Quality, and Infant Outcomes

Researchers have known for some time that a poor quality of relationship between partners after birth can affect a child's emotional wellbeing (Owen & Cox, 1997). Relationship conflict can cause parents who are usually warm and caring to seem frightened or frightening. This can cause a disorganized attachment (i.e., emotional bond between a parent and child) due to the child seeing the caregiver both as a source of comfort and a source of fear (Owen & Cox, 1997). The conflicting views of their caregiver will cause an infant to be more distressed in the long term. However, the consequences of poor partner relationship quality may emerge earlier than previously thought. Researchers have found that parents' relationship quality before birth can have an effect on the infant soon after birth, even before an attachment can form (Alexander et al., 2017; Bergman et al., 2007; Stapleton et al., 2012).

Stressful life events can have multiple effects on an infant. Bergman et al. (2007) examined how stress during the prenatal period predicts an infant's cognitive abilities and temperament. In the study, mothers with full term infants self-reported their stressful life events and relationship quality. Researchers later conducted an assessment to measure the infants' cognitive ability and temperament when they were 14 to 19 months old. Stressful life events were associated with lower infant cognitive ability and a more fearful temperament. Furthermore, relationship strain accounted for the majority of the total prenatal stress-related variance of stressful life events on infant cognitive ability and fearfulness. This study demonstrated that stress that a mother experiences during the prenatal period may have a great effect on the infant. It also showed how relationship quality is a particular source of stress during pregnancy that is associated with infant developmental outcomes.

Alexander et al. (2017) studied the effect of mother's social support, including partner relationship, on infant colic, defined by excessive fussiness and crying. The causes of infant colic are still uncertain. However, we understand that colicky infants appear to be highly distressed, even if they are otherwise healthy (Johnson, Cocker, and Chang, 2015). Interviews were conducted over the phone with over 3000 women who were at least 34 weeks gestation and one

month after birth. High social support (including relationship happiness) during the prenatal period was associated with lower levels of infant colic after birth. This study adds more evidence to the association between partner relationship quality during the prenatal period and infant outcomes. However, researchers still relied on the caregivers' report of infant colic, rather than observing it themselves, which could introduce bias into how data were collected.

Stapleton et al. (2012) studied the effect of mothers' romantic relationship quality during pregnancy on the emotional well-being of mothers and infants after birth. Data were collected using self-report questionnaires and the Social Support Effectiveness interview (SSE; Rini et al., 2006) at 18-20 weeks and 24-26 weeks gestation, as well as 6-8 weeks postpartum. Mothers who perceived more support from their partner during pregnancy felt less emotional distress after pregnancy. They reported their infants to be less distressed as well. This study provided further evidence for the association between partner relationship quality and infant well-being. It also showed that these effects can be seen as soon as 6-8 weeks after birth. However, this study, like those previously mentioned, relied on mothers' reports of infant distress. There is a need for a more objective measure of infant stress, because mothers may be biased by personal feelings or opinions when they report their infant's distress levels. This limitation will be addressed in the present study.

All of the studies mentioned above suggest that there is a relation between partner relationship quality and infant outcomes, such as distress. The current study will add to previous research by specifically using the Stress/Abstinence subscale of The Neonatal Intensive Care Unit Network Neurobehavioral Scale (NNNS; Lester, Tronick, & Brazelton, 2004) to measure stress signs. The NNNS provides a way for researchers to objectively examine infant neurobehavior (e.g., reflexes, muscle tone, central nervous system activity). This measure has many subscales, one of which is stress/abstinence signs, and was originally developed to assess withdrawal symptoms in drug exposed infants (Lester et al., 2004). By using a validated examination to assess infant stress signs, rather than self-report questionnaires filled out by parents, we are able to capture unique data that is not affected by maternal perception. The NNNS can also be administered within 48 hours of birth, limiting post-womb environmental exposure, which none of the other measures mentioned in the previous studies have done. Thus, the current study will examine the association between relationship quality and an objective measure of infant distress. Further, despite known relations between relationship quality and infant well-being, specific factors undergirding these relations are still relatively unclear. Therefore, we will also examine whether the manner in which a pregnant woman copes with stress has an effect on this association.

Relationship Quality and Coping Behaviors

In addition to infant outcomes, studies have also shown an association between partner relationship quality and coping behaviors. Coping behaviors are defined as the way a person behaviorally deals with a stressor, such as conflict (Bodenmann et al., 2006; Ptacek & Dodge, 1995). Knobloch-Fedders et al. (2014) looked at the associations between coping behaviors, relationship quality, and depression using self-report questionnaires and video recordings of conflict. The coping behaviors examined were demand, withdraw, and submit behaviors. Demand behaviors included blaming, accusing, criticizing, or demanding change from a partner. Withdraw behavior included those that separate oneself from conflict, such as falling silent, getting defensive, or refusing to discuss an issue. Submit behaviors included deferring to, yielding to, or complying with a partner.

Couples with higher relationship distress (i.e., a poor relationship quality) were more likely to receive demanding behavior from a partner and respond with withdrawal or submission.

This suggests that the coping behaviors a person engages in could greatly impact the stress a person can feel in a relationship. For instance, using withdrawal behaviors to separate oneself from the stressor (i.e., conflict) stops conflict resolution. Always submitting to one's partner has the same effect. The inability to resolve conflicts causes distress and negatively affects partner relationship quality. Overall, Knobloch-Fedders et al. (2014) shows that relationship quality and coping behaviors are associated. Relevant to the present research, it is also possible coping behaviors during the prenatal period could also be a factor that influences infant stress.

In this study, we will be using the Ethological Coding System for Interviews (ECSI; Troisi, 1999) to measure coping behaviors. The ECSI was developed to assess a patient's behavior during psychiatric interviews to improve the quality of diagnosis. The ECSI assesses flight (e.g., separating oneself from a stressor), prosocial (i.e., submission and affiliation), and displacement behaviors (among other behavior patterns). The ECSI could be useful in examining behaviors that could tell how a pregnant mother could cope with stress, such as relationship strain, during the prenatal period.

Vlisides-Henry (2019) used the ECSI to examine the mediating role of respiratory sinus arrhythmia (RSA) and coping behaviors in the relation between maternal stress during the prenatal period and infant stress after birth. He used the same sample of 162 pregnant women that was used in this study. The NNNS (Lester et al., 2004) was used to measure infant stress signs. The Perceived Stress Scale (PSS; Cohen, 1988), a self-report questionnaire, was used to measure maternal stress. He found that maternal flight behaviors (coded from the ECSI) were associated with infant stress signs, but maternal stress was not significantly associated with infant stress signs. This provided evidence for the relation between maternal coping behaviors and infant distress. However, the PSS only examines stress levels in general (i.e., there are no items that specifically examine partner relationship quality/stress).

Despite this finding, it may still be important to examine the social support from one's partner (i.e., partner relationship quality) in this relation. For example, Walsh et al. (2019) examined the differences between infants born to mothers who were healthy, psychologically stressed (e.g., more depressed and anxious) and physically stressed (e.g., higher blood pressure, Body Mass Index, and calorie intake). The infant outcomes assessed included gestational age at birth, secondary sex ratio, and preterm birth. Interestingly when controlling for social support, the differences in these groups regarding secondary sex ratio and gestational age at birth were no longer significant. The effect on preterm births also became weaker. Thus, social support from a mother's partner may be an important factor to consider with respect to predicting infant outcomes.

Vlisides-Henry's (2019) finding that flight behaviors were associated with infant stress signs would agree with fetal programming theory, which states that the prenatal experiences of a mother can affect infant outcomes (Glover, 2011). Partner relationship quality is also associated with signs of infant distress (Alexander et al., 2017; Stapleton et al., 2012) and coping behaviors (Knobloch-Fedders et al., 2014). Thus, coping behaviors could play a role in the relation between partner relationship quality and infant stress, though no known studies have examined coping behaviors as a mediator of this relation.

Hypotheses

This study aims to find further evidence of the relation between partner relationship quality during the prenatal period and infant stress signs after birth and if a mothers' coping behaviors could mediate this association. This study could help parents and health care providers reduce infant stress, which could in turn mitigate an infant's long-term susceptibility to physical and mental illnesses. A poor relationship quality with one's partner, even in the prenatal period,

predicts more infant stress (Alexander et al., 2017; Bergman et al., 2007; Stapleton et al., 2012). Problematic coping behaviors, which can result from poor relationship quality, also predict infant stress (Vlisides-Henry, 2019). Thus, it is likely that relationship quality affects coping behaviors, which affect infant stress. The hypotheses of this study are:

- A negative partner relationship on the SSE, will be associated with higher infant stress signs on the Stress/Abstinence subscale of the NNNS.
- The flight, prosocial, and displacement behaviors of the mother will each (separately) mediate the relation between partner relationship quality and infant stress signs.

Method

Participants

Participants in this study included 162 English- and Spanish-speaking pregnant women and their infants that participated in a larger study of the intergenerational transfer of emotional dysregulation (Lin et al., 2019; Ostlund et al., 2019). Pregnant participants were recruited if they were in the third trimester of their pregnancy, had a body mass index between 17 and 27 before pregnancy, and were 18-40 years old. Due to the aims of the larger study, pregnant women with high levels of emotion dysregulation were oversampled in relation to the general population. Participants who had a diagnosed psychotic disorder, a multiple pregnancy, or ongoing serious health complications, such as heart disease or cancer, were excluded from the study.

About three-quarters (75.9%) of the participants were married, and 97.5% were in a current romantic relationship. Participants were 29.0 years old on average ($SD = 5.2$). 79.0% of the pregnant women were White, 27.2% were Hispanic/Latina, 9.3% were Asian, 3.1% were American Indian or Alaskan Native, 1.2% were Black/African American, 1.2% were Hawaiian or Pacific Islander, and 6.2% were Multiracial (see Lin et al., 2019 for more information on demographic information of adult participants). The NNNS exam was administered to 155 out of the possible 162 newborns (95.7%). Exams could not be administered to seven newborns due to parental decline/withdrawal ($n = 5$), maternal incarceration ($n = 1$), or fetal demise ($n = 1$). Infants were full term on average, meaning they were born between 39 weeks and 40 weeks 6 days gestation ($M_{\text{weeks}} = 39.3$, $SD = 1.2$, range: 34.1-41.4). About half of the infants (47.5%) were male, 24.7% were delivered via C-section, and the average birth weight was 3362.5 g ($SD = 491.3$). The majority of infants were White/Caucasian (72.5%), 29.1 % were Hispanic/Latinx, 20.3 % were multiracial, 2.7 % were Asian, 1.6% were Black/African American, 1.1 % were an American or Alaskan Native, and 0.5 % were multiracial (see Ostlund et al., 2019 for more information on infant participants).

Measures and Procedures

Sampling Procedures. The intended sample size for the larger study was 162 women, due to power analyses the principal investigators ran prior to data collection. Participants were recruited from local obstetrics and gynecology clinics affiliated with the University of Utah during prenatal care visits. The research team for the larger study on the intergenerational transfer of emotion dysregulation was provided with a list of potentially eligible women each week as well as their appointment times. Recruitment materials, such as brochures, flyers, social media posts, and other advertisements were also distributed throughout the community. Potential participants completed a two-step screening process that included completing the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) and filling out questionnaires related to the exclusion criteria mentioned above. A large group of women (639) were screened for eligibility (459 from clinics, 156 from community sources, and 24 who did not report their

recruitment source) and 221 were found to be eligible. Of the 221 that were eligible, 181 women were enrolled in the study and emailed a packet of online self-report questionnaires to fill out before a scheduled lab visit. Of the 181 women enrolled, 19 were excluded due to completing less than half of the study protocol. This left a final sample of 162 women. See Lin et al. (2019) for more information on sampling procedures.

Measures

Partner relationship quality. The Social Support Effectiveness Interview (SSE; Rini et al., 2006) was used to measure partner relationship quality. It is an effective measure of perceived relationship quality and has been used with samples of pregnant women in Stapleton et al. (2012) and Rini et al. (2006). The SSE is a 27-item interview that asks participants to analyze their partner's effectiveness as a support mechanism within the past 3 months. The interview is divided into three types of support (task, emotional, and informational) as well as negative effects received from the partner. The current study will only use the emotional support subscale. Questions ask participants to rate how often in the past three months they wanted each type of support from their partner on a scale from 1 (*never*) to 5 (*very often*) as well as other questions assessing the quality of support (e.g., the extent to which the woman wishes it was different). A total score is obtained by standardizing the scores, and then summing those scores within the different subscales. Higher scores in these subscales indicate greater support. The negative effects section asks the mother about how often her partner makes her feel negative emotions (e.g., stupid, guilty, unworthy). Higher scores in this subscale indicate greater negative effects. The SSE was originally designed to be about the current source of social support for the participant. This study reworded the questions to specifically ask about participants' current partner. Only participants who were in a current romantic relationship ($n = 158$) completed the SSE.

Coping Behaviors. Participants' coping behavior was coded using the Ethological Coding System for Interviews (ECSI; Troisi, 1999) from video recordings of the Speech Task of the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993). The summary scores of the ECSI used in this study are flight, prosocial, and displacement behaviors (Troisi, 1999). Four trained research assistants, who were blind to any study aims, coded the video recordings. See Vlisides-Henry (2019) for study aims and more information on coding and coder training. Research assistants were unable to code 15 videos due to experimenter mistakes (e.g., poor camera angles or camera never being turned on) or participant distress. 147 videos out of the original 162 participants were available for coding. Interrater reliability was computed following the recommendations of Hallgren (2012) and were as follows: flight ($ICC=.85$), displacement ($ICC=.94$), and prosocial ($ICC=.80$; Vlisides-Henry, 2019). All reliability estimates were considered acceptable.

The Brief Coping Orientation to Problems Experienced (COPE; Carver, 1997) Scale was also used to measure coping behaviors. The Brief COPE is the abbreviated version of the COPE inventory (Carver et al., 1989). It is a 28-item self-report questionnaire that asks participants about ways they cope with stress in their life (e.g., "I've been turning to work or other activities to take my mind off things", "I've been criticizing myself"). Participants are asked to report how much they identify with each behavior on a scale of 1 (*I haven't been doing this at all*) to 5 (*I've been doing this a lot*). Carver (1997) separates the measure into 14 subscales. However, this study used subscales that were created by Cooper, Katona, and Livingston (2008) based on other studies on coping strategies (see Coolidge et al., 2000). These subscales include emotion-focused strategies, problem-focused strategies, and dysfunctional coping strategies. All of the new

subscales used the questions from the original Brief COPE (Carver, 1997). This measure was used in exploratory analyses discussed later.

Infant Stress. The NICU Network Neurobehavioral Scale (NNNS; Lester et al., 2004) was used to assess infant stress. It was administered by examiners who were certified and trained at the hospital after birth. The NNNS is a physical examination consisting of 115 items with thirteen summary scores that looks at an infant's neurological integrity, reflexes, muscle tone, and behavioral functioning. The exam was originally developed to measure the effects of at-risk and drug-exposed infants but has also been shown to be useful in measuring stress signs in healthy infants (Lester et al., 2004). The entire NNNS was conducted for every infant. However, the summary score for stress/abstinence signs was selected a priori to test the current study's hypotheses to specifically measure infant stress. The stress/abstinence scale is obtained by the examiner marking "yes" or "no" to the presence of 49 items that are divided into 7 categories (physiological, autonomic, CNS, skin, visual, gastrointestinal, and state). The summary score is a mean of the dichotomized answers to at least 40 of those items. See Lester et al. (2004) for details on the exam.

Depression. Because of previously known relations between coping behaviors and depression, the Center for Epidemiologic Studies Depression (CESD; Radloff, 1977) was used to measure symptoms of depression. The CESD is a 20-item self-report questionnaire that assesses participants depressive symptoms over the past week (e.g., "I was bothered by things that usually don't bother me"). Response options range from 1 (*rarely or none of the time [less than one day]*) to 4 (*most or all of the time [5-7 days]*).

Study Procedures. After participants had completed the screening process, they were emailed a packet of questionnaires, including the Brief COPE and CESD, as well as an abbreviated consent form. Participants completed these questionnaires and the abbreviated consent form before coming in for the initial lab visit at the University of Utah between 26- and 40-weeks gestation ($M = 33.58$, $SD = 2.99$; see Lin et al., 2019). At the start of the lab visit, participants provided consent for the study. After this, participants were connected to sensors to measure physiological data that were used in the larger project but were irrelevant to this study. Then a 10-minute baseline period occurred, and then the Trier Social Stress Test (TSST) was conducted. The TSST started with a 3-minute preparation, or anticipatory, period. Before this anticipatory period, participants were told to imagine that were giving a speech to a panel of behavior coding experts explaining their qualifications for a job they had applied for. The participants were also told that they had five minutes to give their speech and to stand facing the camera. Then they were given a pencil and paper to take notes in preparation. The 3-minute anticipatory period was followed by a 5-minute Speech Task, and then a 5-minute Mathematics Task.

The speech task began when two research assistants in white lab coats, or the "behavior coding experts", came in the room with the participant. The research assistants were blind to participant self-report data and watched the speech with no emotional expression. If the participant stopped speaking early, the research assistants said, "You must speak for the full five minutes. Please continue." The TSST Math Task followed the speech task but was not used in this study (for TSST protocol, see Kirschbaum et al., 1993). The TSST was followed by a 10-minute recovery period. Participants then completed other aspects of the broader study, including the SSE (administered by trained graduate students with a battery of clinical interviews). At the end of the visit, participants received compensation (\$80) and were debriefed about the larger study. Participants were also asked to call the researchers before they gave birth.

At the hospital, the NNNS was administered by trained and certified researchers to each infant between 24 hours and 2 months after birth (M days = 3.8, Mdn days = 1.0, $SD = 8.3$,

range: 1–59 days; see Ostlund et al., 2019). Finally, participants were debriefed and compensated again (\$30). All study procedures were approved by the Institutional Review Board.

Results

Descriptive Statistics and Correlations

See Table 1 for variable descriptive information. There was a very slight negative skew in SSE scores and slight positive skews in Displacement behaviors and NNNS Stress/Abstinence scores that were deemed not necessary to address, because the distributions as a whole were still relatively normal.

Table 1
Variable Descriptive Information

	<i>n</i> (%)	<i>M</i>	<i>SD</i>	Range
<i>Infant Measures</i>				
NNNS Stress/Abstinence	155 (95.7)	0.12	0.07	0 - 0.33
<i>Maternal Measures</i>				
SSE Emotional Support	158 (97.5)	0.00	3.95	-13.69 - 6.84
Prosocial Behavior	144 (88.9)	2.17	0.73	0.35 - 4.15
Flight Behavior	145 (89.5)	1.77	0.47	0.40 - 2.90
Displacement Behavior	123 (75.9)	0.74	0.43	0 - 2.15
Dysfunctional Coping	156 (96.3)	18.80	4.53	12 - 35.0
Depressive Symptoms (CESD)	161 (99.4)	14.53	10.85	0 - 43.16

Zero-order Pearson's *r* correlations between all variables were run (Table 2). Notably, SSE Emotional Support and NNNS Stress/Abstinence were not significantly correlated. Emotional support was also not significantly related with Flight, Prosocial, or Displacement behaviors. Flight behaviors had a significant positive correlation with Stress/Abstinence (see Figure 1). More Flight behaviors displayed by a mother were associated with more infant stress signs. Neither Prosocial nor Displacement behaviors were correlated with Stress/Abstinence.

Table 2
Correlations

	1	2	3	4	5	6
1. SSE Emotional Support	—					
2. NNNS stress/abstinence	.01	—				
3. Prosocial Behaviors	.01	-.03	—			
4. Flight Behaviors	.02	.25**	.20*	—		
5. Displacement Behaviors	-.06	-.05	.05	-.02	—	
6. Dysfunctional Coping	-.31**	-.03	-.10	-.01	.08	—
7. CESD Total Score	-.34**	-.10	-.10	.03	.17	.60**

Note. * indicates $p < .05$. ** indicates $p < .01$.

Linear Regression

Before running mediation models, we ran multiple regressions. We did not include any control variables. First, we regressed Flight behaviors onto SSE, and the model was not significant ($R^2 = .0008$, $F(1,135) = .11$, $p = .74$). Then we regressed NNNS stress onto SSE and Flight behaviors (Table 3). As expected, more maternal flight behaviors predicted a higher infant

stress signs. However, Emotional support was not a significant predictor of infant stress signs. Next, we regressed Prosocial behaviors onto SSE. This model was also not significant ($R^2=.0005$, $F(1,134)=.07$, $p=.79$). Then we regressed NNNS stress onto SSE and Prosocial behaviors (Table 4). There were no significant effects found. After that, we regressed Displacement behaviors onto SSE and the model was not significant ($R^2=.003$, $F(1,116)=.30$, $p=.58$). Finally, we regressed NNNS stress onto SSE and Displacement behaviors (Table 5). There were no significant effects found.

Table 3

NNNS Stress/ Abstinence Regressed Onto Both SSE Emotional Support and Flight Behaviors

Variable	NNNS Stress Signs Summary Score		
	<i>B</i>	<i>SE</i>	95% <i>CI</i>
Constant	.05*	.02	[0.006, 0.1]
SSE Emotional Support	<.001	.002	[-0.003, 0.004]
Flight Behaviors	0.04**	.01	[0.01, .06]
R^2			0.06*
<i>F</i>			4.06

Note: $N = 137$. *CI* = confidence interval. * $p < .05$. ** $p < .01$. *** $p < .001$

Table 4

NNNS Stress/Abstinence Regressed Onto Both SSE Emotional Support and Prosocial Behaviors

Variable	NNNS Stress Signs Summary Score		
	<i>B</i>	<i>SE</i>	95% <i>CI</i>
Constant	.14***	.02	[0.1, 0.18]
SSE Emotional Support	<.001	.002	[-0.003, 0.004]
Prosocial Behaviors	-0.01	.01	[-0.03, .01]
R^2			0.008
<i>F</i>			0.53

Note: $N = 136$. *CI* = confidence interval. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5

NNNS Stress/Abstinence Regressed Onto Both SSE Emotional Support and Displacement Behaviors

Variable	NNNS Stress Signs Summary Score		
	<i>B</i>	<i>SE</i>	95% <i>CI</i>
Constant	.13***	.01	[0.1, 0.15]
SSE Emotional Support	.001	.002	[-0.002, 0.004]
Displacement Behaviors	-0.01	.02	[-0.04, .02]
R^2			0.007
<i>F</i>			0.43

Note: $N = 118$. *CI* = confidence interval. * $p < .05$. ** $p < .01$. *** $p < .001$.

Indirect Effects Models

We ran indirect effect models, to test for mediation, using the SPSS Macro PROCESS Model 4 (Hayes, 2013). The first model examined the indirect effect of SSE on NNNS stress through flight behaviors. The direct effects were identical to the multiple regression mentioned previously. The indirect effect was not significant ($B = .0001$, 95% *CI*: [-.0008, .0009]). The second model examined the indirect effect of SSE on NNNS stress through Prosocial behaviors.

The direct effects were identical to the multiple regression mentioned previously. The indirect effect was not significant ($B = 0.00$, 95% CI: [-.0006, .0004]). The third model examined the indirect effect of SSE on NNNS stress through Displacement behaviors. The direct effects were identical to the multiple regression mentioned previously. The indirect effect was also not significant ($B = .0001$, 95% CI: [-.0003, .0007]). Since none of the indirect effect models were significant, we can conclude that SSE Emotional Support does not affect NNNS Stress/Abstinence through the ESCI coping behaviors measured in the present study (i.e., flight, prosocial, and displacement). The coping behaviors measured did not mediate the relation between maternal emotional support and infant stress signs.

Exploratory Analyses: Relationship Quality, Coping Behaviors, and Depression

Due to the known relation between coping behaviors and depression (Cicognani, 2011; Chao, 2012; Knobloch-Fedders et al., 2014; Ziarko, Mojs, Piasecki, & Samborski, 2014) and the significant correlations between the Emotional Support subscale of the SSE, the Brief COPE Dysfunctional Coping subscale, and CESD total scores, we ran a series of exploratory analyses to test if dysfunctional coping acted as a mediator between partner relationship quality and the mother's depression symptoms. Emotional support, coping behaviors, and depressive symptoms were all significantly associated (see Table 1 and Figures 2-4).

First, we regressed Dysfunctional Coping onto SSE. The model was significant ($R^2 = .09$, $F(1,149) = 15.33$, $p < .001$). Next, we regressed CESD total scores onto SSE and Dysfunctional Coping. This model was also significant (Table 6). The effect of SSE on CESD scores, controlling for Dysfunctional Coping, was significant. The effect of Dysfunctional Coping, controlling for SSE Emotional Support, was also significant. As mothers reported more emotional support from their partners, they self-reported lower Dysfunctional Coping and depression. This suggested that emotional support could affect depression scores through coping behaviors.

Therefore, we also ran an indirect effect model examining the indirect effect of Emotional Support on depressive symptoms through Dysfunctional Coping. The indirect effect was significant ($B = -.49$, 95% CI: [-.8014, -.2000]). This means that Emotional Support does have an effect on depressive symptoms through Dysfunctional Coping (i.e., dysfunctional coping mediates the relationship). However, since Emotional Support is a significant predictor of CESD total score, there is only a partial indirect effect, or a partial mediation.

Table 6

CESD Total Score Regressed Onto Both SSE Emotional Support and Dysfunctional Coping

Variable	CESD Total Score		
	<i>B</i>	<i>SE</i>	95% <i>CI</i>
Constant	-13.08***	3.01	[-19.02, -7.14]
SSE Emotional Support	-0.35*	.17	[-0.69, -0.01]
Dysfunctional Coping	1.44***	.16	[1.13, 1.75]
R^2			0.43***
F			55.3

Note: $N = 151$. *CI* = confidence interval. * $p < .05$. ** $p < .01$. *** $p < .001$.

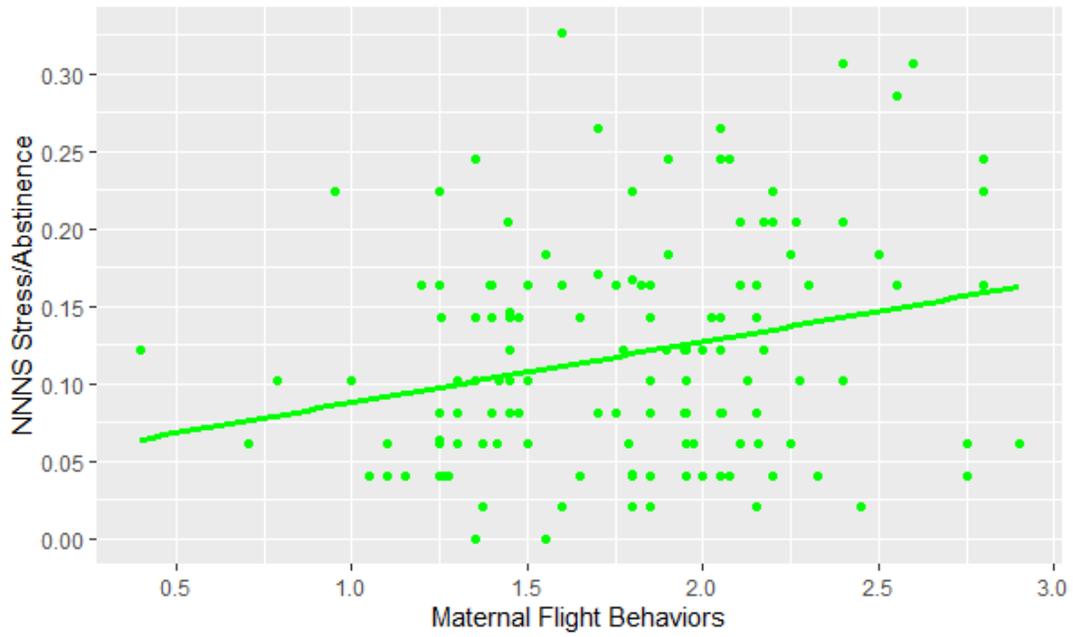


Figure 1. Scatterplot showing the positive relation between maternal flight behaviors and infant stress signs according to the Stress/Abstinence subscale of the NNS.

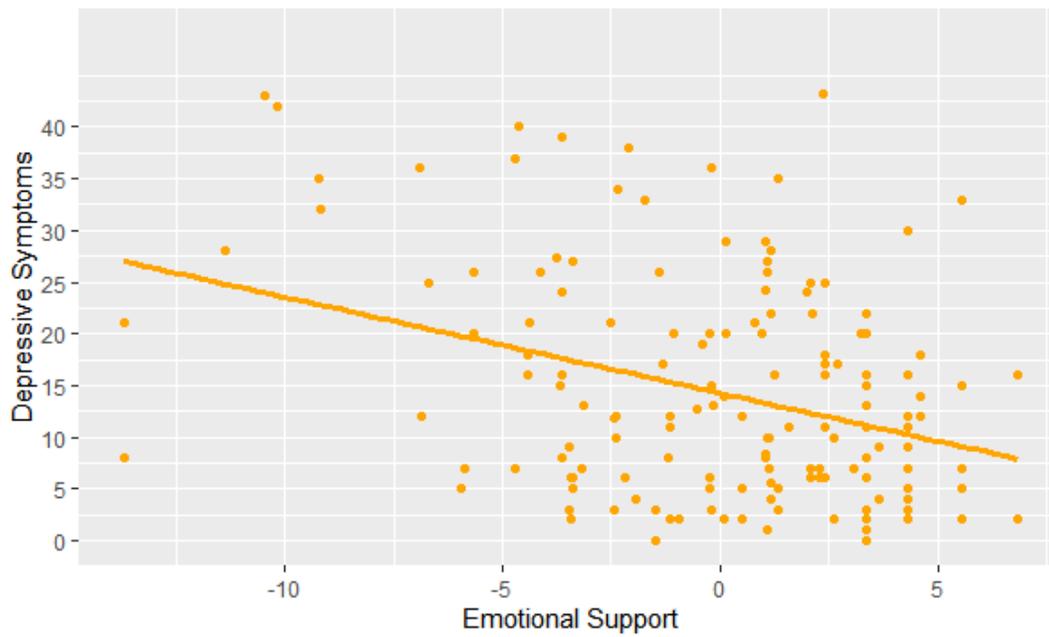


Figure 2. Scatterplot showing the negative relation between SSE Emotional Support, and depressive symptoms.

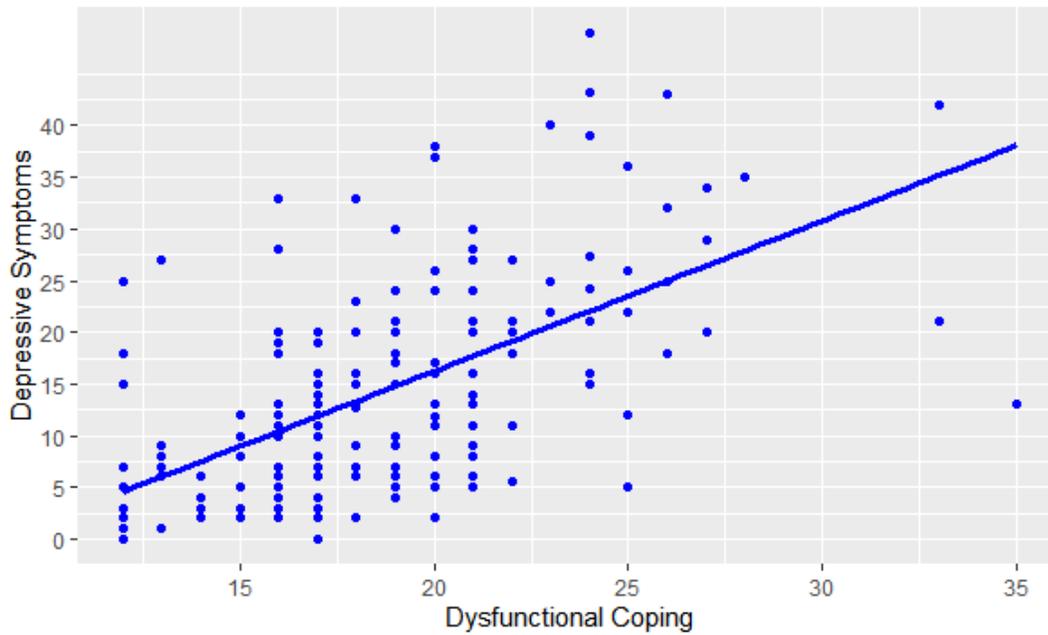


Figure 3. Scatterplot showing the positive relation between Brief COPE dysfunctional coping behaviors and depressive symptoms according to the CESD.

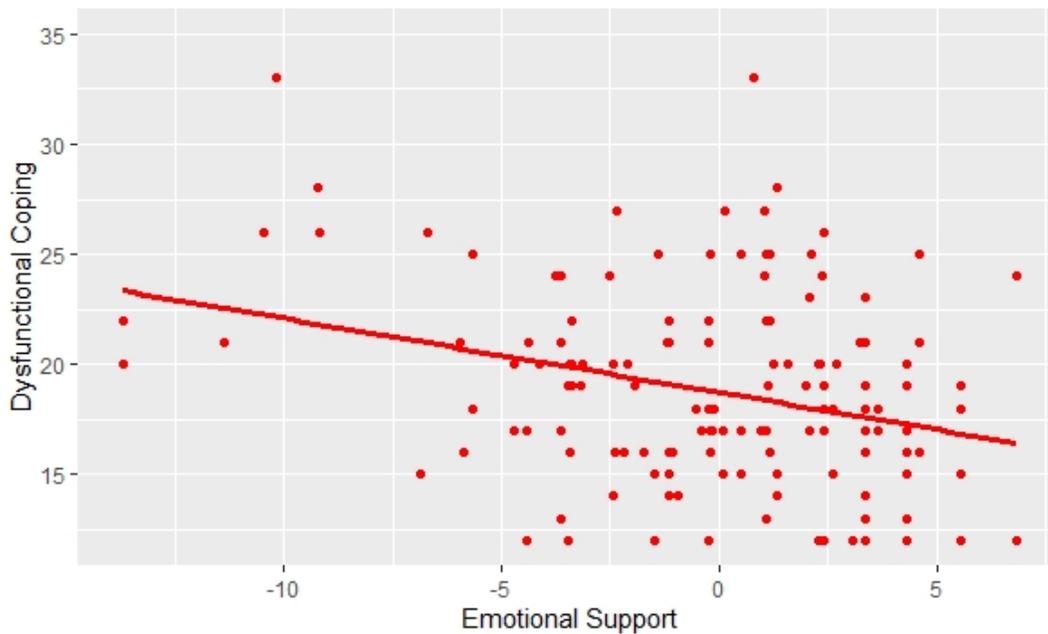


Figure 4. Scatterplot showing the negative relation between SSE Emotional Support and Brief COPE Dysfunctional Coping behaviors.

DISCUSSION

A negative partner relationship quality can be caused by relationship strain with one's romantic partner and/or partner support that is low in quantity or quality. An association has been shown between mothers who have a negative partner relationship quality and negative infant

outcomes (Alexander et al., 2017; Bergman et al., 2007; Stapleton et al., 2012). Coping behaviors are those that a person uses to manage stress. For example, a person experiencing an episode of conflict with their partner may stop talking to or looking at their partner to separate themselves from stress caused by conflict. These withdrawal behaviors have also been shown to be associated with partner relationship quality (Knoblock-Fedders et al., 2014).

Recently, it was shown that behaviors used to separate oneself from stress in an interview-like setting (i.e., flight behaviors; Troisi, 1999) may predict infant stress signs (Vlisides-Henry, 2019). To explore these processes further, we used a sample of 162 women to examine whether poor partner relationship quality was a predictor of infant stress signs, and whether coping behaviors acted as a mediator of this relation. However, there was no evidence to support these hypotheses. These findings were not consistent with previous studies on partner relationship quality and infant outcomes.

In this research, a poor relationship quality did not predict infant stress. Previous studies examined the self-reported happiness felt in a current relationship (Alexander et al., 2017), stress caused by relationship strain (Bergman et al., 2007), and the social and pregnancy-specific support given by one's partner (Stapleton et al., 2012), and all found that relationship quality was associated with newborn distress. This study operationalized relationship quality as the social support provided by one's partner by using the Social Support Effectiveness interview (SSE; Rini et al., 2006), and found no effects on infant distress. However, we only examined emotional support (instead of task support, informational support, or negative effects) because there is no accepted method for obtaining a total score for the SSE. Nonetheless, factors that relate to emotional well-being (e.g., happiness, stress from conflict) were more highly correlated in previous research (e.g., Alexander et al., 2017; Stapleton et al., 2012).

It is important to note that the social support from a partner is different from conflict distress or overall happiness in a relationship. By looking at other aspects of a relationship, such as those just mentioned, we could obtain a more complete picture of relationship quality. A couple's overall relationship quality includes more than just emotional support. Furthermore, different people may put different emphasis on different types of support, happiness, or conflict, and it may be difficult to capture how a participant truly feels about their relationship by measuring just one aspect.

In addition to measures of relationship quality, the current study also differed from previous studies in that it objectively looked at infant stress signs. This addressed limitations in past studies, which used subjective measures of infant distress. We used the NNNS (Lester et al., 2004), a standardized assessment of neurobehavioral development, to measure stress signs. Previous studies have used mothers' reports of their infants' emotional well-being and distress (Alexander et al., 2017; Stapleton et al., 2012). Using the NNNS may provide more reliable results of infant stress because the examination itself is administered by highly trained medical professionals and has been widely used and validated rigorously (see Tronick & Lester, 2013). Furthermore, it allows the researcher to measure infant neurobehavior (e.g., stress signs) within 24-48 hours after birth. The Stress/Abstinence scale of the NNNS also examines stress signs in multiple areas (i.e., physiologic, autonomic, CNS, skeletal, visual, gastrointestinal, and state). In addition to examining basic stress signs such as fussiness or crying, this subscale also looks at stress signs as defined by the central and autonomic nervous systems (e.g., tremors and sweating, respectively), among other areas (Lester et al., 2004).

No other previously mentioned studies have examined infant outcomes within 48 hours of birth. Considering this, it is noteworthy that no significant results were found when an objective measure of infant stress signs was used. It is possible that the previous studies that used subjective measures of infant distress (Alexander et al., 2017; Stapleton et al., 2012) were biased

in that mothers who have poor relationships perceived their infants as being more distressed, regardless of if they truly were. Indeed, these prior studies may have been subject to measurement artifacts, as both relationship and infant distress were self-reported. This study benefited from a multimodal approach, harnessing self-report and observed maternal and infant behavior, though this approach may have been underpowered.

In addition to the null effect on infant stress, our findings were not consistent with Knoblock-Fedders et al. (2014) that showed an association between partner relationship quality and coping behaviors. We examined behavioral responses to the TSST (Kirschbaum et al., 1993), whereas Knoblock-Fedders et al. (2014) observed participant's behavior in response to conflict with their partner. Furthermore, while null results were found when the ESCI (Troisi, 1999) was used to measure coping behaviors, significant results were obtained from exploratory analyses that used the Dysfunctional Coping subscale of the Brief COPE (Cooper et al., 2008). It is possible that the coping behaviors elicited by an interview-like setting differ from the behaviors elicited by an episode of conflict with their partner. Our task was not an episode of partner conflict. Therefore, different coping behaviors could have been elicited. This could explain the discrepancy in findings between our research and Knoblock-Fedders et al. (2014).

While there was no support for our hypotheses, our exploratory analyses yielded interesting significant results. We found that Dysfunctional Coping (Carver, 1997; Cooper, Katona, & Livingston, 2008) was positively associated with depressive symptoms, which was consistent with previous studies (Chao, 2012; Cicognani, 2011; Ziarko, et al., 2014). Partner relationship quality was also associated with depressive symptoms, albeit negatively, consistent with Knobloch-Fedders et al. (2014). In addition to these findings, an indirect effect model showed that dysfunctional coping partially mediated the effect of Emotional Support on depression. These findings suggest that dysfunctional coping strategies and a poor relationship quality could have negative implications for mental health. Furthermore, the way a person copes may be a pathway through which partner relationship quality affects mental health. Emotional Support still had a direct effect on depression, so it is possible that there could be another mediating variable at play in this relation. For example, self-efficacy, or a person's belief in their ability to accomplish goals, has been shown mediate partner relationship quality and depression (Haslam, Pakenham, & Smith, 2006). Due to the exploratory nature of these findings, further research is needed to replicate these results.

Limitations

These findings have to be considered with limitations. First off, due to the study design, we cannot affirm causality of any significant results. Also, as discussed earlier, our measure of partner relationship quality only included emotional support received from the woman's partner. This is only one aspect of a relationship, and therefore may not capture a complete view of relationship quality. We also did not examine coping behaviors that were specific to relationship conflict. This could have led to inconsistent results with past research (e.g., Knoblock-Fedders et al., 2014). Another limitation comes from the sample that was used. Most women report moderate levels of emotion dysregulation, but the sample used oversampled for low and high levels of emotion dysregulation (Lin et al., 2019). As a result, the results may not be generalizable to a typical population.

In spite of its weaknesses, the current study does have strengths. Using the NNNS (Lester et al., 2004) to measure infant stress signs likely provided more reliable and thorough results of stress signs than mothers' observations, which all other studies examining this relationship have used. We were also able to measure stress signs for the majority of infants within 48 hours of birth. No other studies have examined potential effects of partner relationship quality this soon

after birth, which helps to examine if the effect is truly associated with prenatal events. The sample is also fairly diverse, with half of our participants identifying as a racial/ethnic minority (i.e., non-White). As mentioned earlier, the sample also recruited women who had higher levels of emotion dysregulation. While this does not make our results generalizable, our sample consist of women with a wider range of relationship qualities and mental health (Lin et al., 2019). These wider ranges would increase the likelihood of finding significant results, if they were present.

Future Directions

There is still further research needed on this topic. More research needs to be done with a validated assessment of infant stress (e.g., the NNNS). This will help to address the inconsistent findings from past research on the association between partner relationship quality and infant stress. Using an objective measure of infant stress will also help to continue to reveal how potentially biased perceptions of a mother can play a role in this relation. Regarding coping behaviors, it would also be beneficial to examine coping behaviors specific to relationship conflict (e.g., demand, withdraw, and submit behaviors; Knobloch-Fedders et al., 2014), and if they are associated with infant stress signs. The exploratory analyses warrant particular attention and require a planned study for validation.

Overall, the results of this study yielded important findings on the topics of partner relationship quality, coping behaviors, and infant stress. The findings suggest that the association between partner relationship quality and infant stress needs to be examined further. Women who have a poor relationship with their partner may not give birth to a more stressed infant. However, a women's dysfunctional coping behaviors in response to a poor relationship quality could negatively affect her mental health. Knowing this can help a mother work on having healthier coping strategies that will greatly help her mental health.

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