Depressive Symptoms Moderate the Effects of Positive Interactions on Physiological Stress Reactivity in Married Couples

by

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ABSTRACT

This study investigated the potential influences of a marital interaction involving affectionate touch and/or positive relationship-focused conversation on physiological reactivity to a subsequent laboratory stress task, and whether depressive symptoms moderated these relations. It was hypothesized that 1) the stress task would cause cardiac sympathetic activation and cardiac parasympathetic withdrawal; and that physical affection and/or positive conversation would 2) reduce sympathetic activation as indicated by cardiac interbeat interval (IBI), cardiac pre-ejection period (PEP), and finger pulse transit time (FPTT) and 3) reduce parasympathetic withdrawal (as indicated by respiratory sinus arrhythmia; RSA) in response to stress. Further, we expected that, compared to those lower in reported depressive symptoms, those higher in depressive symptoms 4) would show blunted cardiovascular activation in response to stress across experimental conditions; and after engaging in a positive marital exchange, 5) would demonstrate a smaller interaction-related reduction in stress-related sympathetic activation; but 6) show no difference in interaction-related reduction of stress-related parasympathetic withdrawal. Participants were 183 married couples who were at least moderately happy in their marriages and in generally good health. Participants completed a measure of depression (among other questionnaires) in an online survey, then attended a 3-hour laboratory session. After measuring baseline physiology with spouses in separate rooms, couples were then randomly assigned to either touch (while sitting quietly, then hug), talk (positive conversation, but no touch), both (touch while talking, then hug), or neither (sit quietly without touching or talking). Next, participants separately performed a stress-inducing speech task about their spouses' strengths and weaknesses. Physiological indicators were recorded throughout the stress task. While positive conversation reduced husbands' stress-related parasympathetic withdrawal, it predicted greater stress-related activation in wives' PEP response. Stress reactivity (as indicated by FPTT) was reduced in husbands with lower depressive symptoms when the marital exchange included only touch or only talk, whereas for husbands with more depressive symptoms, there were no effects of the marital interaction. For wives, depressive symptoms predicted blunted cardiovascular activation regardless of positive interaction condition, as illustrated by smaller stress-related

reduction in FPTT responses. Furthermore, higher self-reported depressive symptoms predicted larger interaction-related decreases in stress-related IBI responses in wives who experienced spousal touch. This study builds on previous work and is the first to explore how depressive symptoms may influence the relations between affectionate touch and stress reactivity.

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INTRODUCTION

The association between social connection and enhanced psychological and physical well-being has been established through many studies over the last few decades (e.g., Cacioppo, Berntson, Sheridan, & McClintock, 2000; Holt-Lunstad, Smith, & Layton, 2010; House, Landis, & Umberson, 1988; Uchino, 2006). While social connection involves a variety of structural (e.g., marital status, social networks) and functional (e.g., feelings of belonging, social support) aspects of social relationships (Holt-Lunstad, Robles, & Sbarra, 2017), the pathways through which the benefits of social connection occur are not fully understood. An individual's social network provides opportunities for positive and negative experiences and interactions that may alter health-related physiology (Berkman Glass, Brissette, & Seeman, 2000; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Marriage, in particular, can provide emotional support that lowers stress and enhances psychological well-being, and reduces the risk of unhealthy behaviors and poor physical health (Kiecolt-Glaser, Gouin, & Hantsoo, 2010; Thoits, 2011; Uchino, 2004). Positive physical contact, such as physical affection between partners, also has been linked to reduced behavioral and physiological stress responses (Ditzen, Neumann, Bodenmann, von Dawans, Turner, Ehlert, & Heinrichs, 2007; Grewen, Anderson, Girdler, & Light, 2003; Light, Grewen, & Amico, 2005). As such, physical affection may serve as an important contributory mechanism for the beneficial effects of marital-type relationships[1] on emotional and physiological well-being.

Marriage and Health

Marital-type relationships play a vital role in the lives of many adults. A spouse is more often than not the most available and effective source of supportive interactions that increase overall life satisfaction (Beach, Martin, Blum, & Roman, 1993; Wan, Jaccard, & Ramey, 1996). Extensive research also substantiates the notion that married people are generally healthier than unmarried people (Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001; Manzoli, Villari,

[1] Although earlier studies suggested that legal marriages confer more benefits on the partners than do non-marital relationships involving strong commitment, cohabitation, shared goals, and other characteristics of marriage, more recent findings document the shrinkage or disappearance of the marital advantage (reviewed in Burleson, Roberts, Vincelette, & Guan, 2012). Therefore, in the current study the terms "marriage" and "marital-type relationship" are used interchangeably except when reporting specific research findings.

Pirone, & Boccia, 2007). While relationships can promote many potentially beneficial physiological changes, cardiovascular functioning in particular may play a significant role in understanding their impact on health. For example, individuals with satisfying marriages tend to demonstrate smaller blood pressure increases and better recovery in response to stress (Grewen, Girdler, & Light, 2005; Holt-Lunstad, Birmingham, & Jones, 2008) and lower risk of cardiovascular disease than unmarried individuals (Zhang & Hayward, 2006).

Despite the fact that married people, on average, enjoy better mental and physical health than the unmarried, marriage's protective effects appear stronger for men than women (Berkman & Breslow, 1983; Litwak, Messeri, Wolfe, Gorman, Silverstein, & Guilarte, 1989). Specifically, marital status seems to have a stronger effect on men's health and mortality, whereas marital quality is more important for women's health and mortality (Eaker, Sullivan, Kelly-Hayes, D'Agostino, & Benjamin, 2007; Kiecolt-Glaser & Newton, 2001). Furthermore, marital quality may have a greater influence on women's physiology compared to men's due to their increased awareness of and responsiveness to the quality of spousal interactions (Kiecolt-Glaser & Newton, 2001).

Positive Interactions in Relationships

Studying laboratory-based marital interactions offers an important window into couple functioning (Roberts, Tsai, & Coan, 2007). While much of this research focuses on psychological and physiological reactivity during conflict interactions (Levenson & Gottman, 1983; Driver & Gottman, 2004; Smith et al., 2009), positive marital interactions are equally important in characterizing and revealing the effects of social connection.

Several recent studies have explored the impact of socially supportive behaviors on health outcomes. For example, in a daily diary study, Stein and Smith (2015) explored how social support affected the association between stress and physical symptoms (e.g., body pain, dizziness, trouble sleeping) in women. They found that at higher levels of perceived stress, women with more affectionate support (i.e., expressions of love and affection) experienced smaller increases in next-day physical symptoms compared to women with less affectionate support. Moreover, receiving affection, characterized by direct verbal expression, direct nonverbal expression, and social support (Floyd & Morman, 1998), is related to marital satisfaction (Huston & Vangelisti, 1991), improved mood (Burleson, Trevathan, & Todd, 2007; Debrot, Schoebi, Perrez, & Horn, 2014) and less self-reported perceived stress (Aloia & Brecht, 2017). Though affection may be expressed through verbal exchanges or socially supportive behaviors, physical affection may be an especially important contributory mechanism to strong effects of social support on emotional and physiological well-being (Ditzen et al., 2007; Gallace & Spence, 2010; Jakubiak & Feeney, 2017).

Affectionate Touch

Healthy attitudes regarding touch have a significant positive impact on physical, psychological, and emotional well-being throughout life (Montagu, 1986; Field, 2001; Spence, 2002). This form of nonverbal social exchange can communicate security (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1973), love and care (Floyd, 2006), and even specific emotions (Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006). Gulledge and colleagues (2003) defined affectionate touch as "any touch intended to arouse feelings of love in the giver and/or the recipient." In the context of romantic relationships, Burleson, Roberts, Vincelette, and Guan (2012) built on this definition by adding that the touch is appropriate to the setting, does not interfere with goal-directed behavior, and is not oriented toward immediate sexual gratification. Moreover, affectionate touch can be reciprocal, where both the giver and receiver are participating in the touch (i.e., hugging, hand-holding, kissing) or non-reciprocal, where the giver is responsible for providing the touch (i.e., massaging, caressing, "tactile stimulation" on shoulder/arm).

While past research findings have not been consistent regarding whether men (Henley, 1973) or women (Stier & Hall, 1984) initiate more interpersonal touch, it has been found that women report more positive attitudes towards (Willis & Rawdon, 1994) and engage in more same-sex touch (Major, 1981) compared to men. Additionally, women are more likely to consider touch from a stranger of the opposite sex as unpleasant, particularly if the touch is perceived as sexual. Men, on the other hand, are less likely to perceive touch from an opposite-sex stranger in this manner (Andersen & Leibowitz, 1978; Herteinstein et al., 2006). Further, while both sexes respond positively to touch from their partners (Hanzal, Segrin, & Dorros, 2008), expressing affection seems to consistently predict husbands' marital satisfaction over time more so than wives' (Huston & Vangelisti, 1991).

Regardless of gender, touching one's partner is a behavior that signals affection, care, and concern through physical contact (i.e., Dainton, Stafford, & Canary, 1994). Trait assessments that reveal an individual's tendency to both receive and give (Floyd, 2002) verbal and physical affection are associated with a number of positive outcomes, such as more positive mood in the giver and receiver (Debrot, Schoebi, Perez, & Horn, 2014) and increased self-esteem and relationship satisfaction (Floyd, Hess, Miczo, Halone, Mikkelson, Tusing, 2005).

Positive Interactions, Affectionate Touch, and Stress Reactivity

In addition to its positive effects on individual well-being and relationship satisfaction, physical affection has also been shown to regulate immune, neural, and cardiovascular responses to stress. To illustrate, Cohen, Janicki-Deverts, Turner, and Doyle (2015) demonstrated the protective influence of hugging on the pathogenic effects of interpersonal stress. They found that, after exposure to a common cold virus, the association between frequency of interpersonal conflict and infection risk was lower for participants who received more frequent hugs in their daily lives (Cohen et al., 2015). Furthermore, Coan, Shaefer, and Davidson (2006) found that women who held their husband's hand while receiving cues for an electric shock had attenuated activation in neural threat responses compared to no hand holding, and that the amount of attenuation was positively related to ratings of marital satisfaction. Additionally, receiving both nonverbal and verbal affection from one's spouse was associated with steeper diurnal cortisol cycles, which is predictive of healthy stress responding (Floyd & Riforgiate, 2008). More specifically, research has demonstrated the effectiveness of verbal support in attenuating heart rate and blood pressure responses to laboratory stress (Lepore, Allen, & Evans, 1993; Thorsteinsson & James, 1999). As verbal support is typically intended to provide emotional support, the associated positive affect may downregulate the effects of negative affective states on stress physiology (Fredrickson, Mancuso, Branigan, & Tugade, 2000).

Furthermore, Grewen and colleagues (2003) found that both women and men in romantic couples who were assigned "warm partner contact" (which included engaging in a positive relationship-focused conversation while touching in a comfortable way, then hugging) had lower systolic and diastolic blood pressure and heart rate responses to subsequent laboratory stress tasks than did those from a control group who sat quietly separate from their partners. Ditzen and colleagues (2007) also studied the effects of verbal social support and positive physical touch on women's stress response. They found that women who received a neck and shoulder massage from their partner prior to a standardized laboratory stressor experienced significantly lower heart rate increase in response to the task, whereas verbal social support alone was not associated with reduced stress response. Thus, physical affection and verbal support have regulatory qualities that conflict with stress (reviewed in Burleson & Davis, 2014).

Physiological Stress Reactivity

Activation of the autonomic nervous system (ANS) is a major aspect of the physiological response to stress. As such, ANS measurement plays a significant role in research exploring social influences of close relationships on cardiovascular health. In fact, reduced ANS activation has been suggested as a mediator between positive relationship interactions and wellbeing (Ditzen et al., 2007; Kiecolt-Glaser & Newton, 2001; Robles & Kiecolt-Glaser, 2003). Autonomic reactivity can be characterized using cardiovascular indices that separately assess the sympathetic and parasympathetic (vagal) branches' independent contributions to cardiovascular functioning (Berntson, Cacioppo, & Quigley, 1991). Considering the complicated, dynamic, and interacting response patterns of these autonomic branches, it is important to collect separate measurements of the two branches' activation to fully understand stress-related changes in cardiac responses.

Useful indicators of ANS activity include cardiac interbeat interval (IBI), cardiac pre-ejection period (PEP), and respiratory sinus arrhythmic (RSA). Speeding of the heart may reflect an increase of acceleratory sympathetic activity, a decrease of decelerator parasympathetic activation, or some combination of both (Berntson, Cacioppo, & Quigley, 1993; Berntson, Cacioppo, Quigley, & Fabro, 1994; Berntson, Quigley, & Lozano, 2007). Consequently, although they are highly valid and reliable measures of stress responding, both heart rate and IBI (the time between successive heartbeats) are indicators of the joint functioning of both ANS branches. Cardiac pre-ejection period (PEP), however, is a time interval between specific components of the cardiac cycle that is influenced almost solely by sympathetic activation (Berntson et al., 1994); as activation increases, PEP becomes shorter (and the heart speeds up).

A large proportion of the parasympathetic component of the ANS influence on the cardiovascular system is provided by the vagus cranial nerve, which serves to slow the intrinsic heart rate. An index of its activity, otherwise known as “vagal tone,” is typically estimated from respiratory sinus arrhythmia (RSA; Grossman, Stemmler, & Meinhardt, 1990). RSA is a naturally occurring variation in heart rate that occurs during a breathing cycle (Berntson et al., 1997), where larger values indicate more parasympathetic activation; lower RSA is therefore associated with faster heart rate. In relation, research has shown that consistent interactions with close companions lead to increases in resting vagal tone (Holt-Lunstad, Uchino, Smith, & Hicks, 2007; Kok & Fredrickson, 2010), which is believed to reflect an enhanced ability to self-regulate (Beauchaine, 2001, 2012; Porges, 1995, 2003). Furthermore, while phasic RSA tends to decrease from baseline in response to stress, reactive increases (or attenuated decreases) to stressors have been linked to effortful control and regulatory engagement (Butler, Wilhelm, & Gross, 2006).

Another reliable indicator of the stress response is the time between cardiac contraction (based on electrocardiogram) and the arrival of a wave blood at the finger (based on finger plethysmography). This interval is called finger pulse transit time (FPTT), and it reflects both the strength of the heartbeat and the constriction of blood vessels. As both of these are influenced by the sympathetic branch, shorter pulse transmission times indicate greater sympathetic activation (Thayer & Levenson, 1983), although parasympathetic deactivation may also be involved (Contrada, Del Bo, Levy, & Weiss, 1995).

During active stress tasks, IBI, PEP, and FPTT are typically shortened and RSA is reduced, whereas social support often buffers these effects (e.g., Kamarck, Manuck, & Jennings, 1990).

Depression and Positive Interactions

Studies have shown that depressed individuals tend to seek more social support than non-depressed individuals when coping with stress (Coyne, Aldwin, & Lazarus, 1981; Folkman & Lazarus, 1986). Ironically, however, individuals reporting more depressive symptoms may be less capable of creating and positively responding to supportive interactions with their spouses (Coyne, 1976; Davila, Bradbury, Cohan, & Tochluk, 1997). As such, interactions in couples with a depressed partner were found to be uneven, negative, and asymmetrical, whereas interactions without a depressed partner were positive, supportive, and reciprocal (Hautzinger, Linden, & Hoffman, 1982). Moreover, couples where one or both partners endorse depressive symptoms report fewer positive conversations and less physical and verbal affection than do non-depressed couples (Coyne, Thompson, & Palmer, 2002; Rehman, Gollan, & Mortimer, 2008; Ruscher & Gotlib, 1988).

Although depression is a disorder of mood and emotion, the nature of mood or emotion-related changes in depression is not completely established. Current research supports the emotional context insensitivity view, in which emotional reactions are blunted in both positive and negative contexts. In a recent meta-analysis of 19 laboratory studies, those with depression showed reduced subjective, behavioral, and physiological reactivity to both positive and negative stimuli, including laboratory stress tasks (Bylsma, Morris, & Rottenberg, 2008). Thus, although affectionate touch—typically a positive stimulus—may ordinarily attenuate stress by reducing the negative perception of stressful situations (Jakubiak & Feeney, 2017), those with depressive symptoms may not benefit to the same degree. In this case, receiving affectionate touch might interfere with improving or even worsen a stressful situation.

Depression and Stress Reactivity

Given links among depression, stress, and cardiovascular disease, multiple studies have examined the relationship between depression and cardiovascular reactivity to laboratory stressors. Notably, those with higher depressive symptoms demonstrate reduced cardiovascular stress responses, illustrated by reduced blood pressure and heart rate reactivity to laboratory stress tasks (Carroll, Phillips, Hunt, & Der, 2007; Phillips, 2011; Salomon, Bylsma, White, Panaite, & Rottenberg, 2013) even when those stress tasks are perceived as highly stressful (de Rooij, Schene, Phillips, & Roseboom, 2010; Salomon, Clift, Karlsdóttir, & Rottenberg, 2009). Studies focused specifically on cardiac sympathetic activation are few and found no relation between PEP reactivity and depressive symptoms (Light, Kothandapani, & Allen, 1998; Salomon et al., 2009). Findings comparing parasympathetic responses to stress in depressed individuals to those in non-depressed individuals are mixed, with results supporting increased vagal activity (Liang et al., 2015), no real change (Rottenberg, Clift, Bolden, & Salomon, 2007), and decreased vagal activity (Hughes & Stoney, 2000).

Although some literature links depression to reduced baseline vagal activity (Beauchaine, 2001), depressed adults show higher vagal activity and lower negative affect when socializing with a partner, friend, or family member compared to socializing with a stranger or being alone (Schwerdtfeger & Friedrich-Mai, 2009). This supports the notion that, even though their autonomic reactivity to stress is atypical, depressed individuals may still respond with parasympathetic activation, a protective resource provided by affectionate touch to buffer stress.

Current Study and Hypotheses

The current study used an experimental design to disentangle and examine the potential effects of affectionate touch and positive relationship-focused conversation on cardiovascular responses to a subsequent laboratory stressor. First, it was hypothesized that 1) the stress task would cause cardiac sympathetic activation and cardiac parasympathetic withdrawal (i.e., IBI, PEP, FPTT, and RSA would all go down in value). Next, it was predicted that physical affection and/or positive relationship-focused conversation would 2) reduce cardiac sympathetic activation (as indicated by smaller decreases in IBI, PEP, and FPTT) and 3) reduce cardiac parasympathetic withdrawal (as indicated by smaller decreases in RSA) in response to stress. The study further explored the moderating influences of self-reported depressive symptoms on the effects of touch and positive conversation on physiological stress reactivity. Based on previous research, it was also hypothesized that 4) higher reported depressive symptoms would result in blunted cardiovascular activation in response to a laboratory stressor (as indicated by smaller decreases in IBI, PEP, FPTT). Finally, it was hypothesized that after engaging in a positive marital exchange, those who reported higher depressive symptoms would 5) demonstrate smaller interaction-related reductions in stress-related cardiac sympathetic activation than those with lower depressive symptoms (stress-related IBI, PEP, and FPTT decreases would be larger because positive interactions would be less effective) and 6) not differ in interaction-related reduction of stress-related cardiac parasympathetic withdrawal (stress-related RSA would decrease equally due to positive interactions, regardless of depressive symptoms).

METHODS

Participants

Married couples were recruited from the community (greater Phoenix area) through social media, flyers, and word-of-mouth to participate in the "Healthy Couples Study." To be eligible, couples were required to be married for 6 or more months, endorse a current marital happiness rating of greater than 2 (on a scale where 1 was very unhappy to 7 being perfectly happy), have no serious chronic illness, use no beta- or calcium channel-blocker medication, and have a body mass index of less than 33.

One hundred and eighty-two couples (364 spouses) were included in the analyses. The mean age of the wives in the sample was 33.9 years (SD = 9.4) and the husbands was 35.5 years (SD = 9.5), with the average marital duration being 7.8 years (SD = 8.3). Of the wives in the sample, 78.7% were Caucasian, 12.6% Latino, 4.3% Asian American, 2.6% African American, 0.4% Native American, and 0.4% Pacific Islander. Of the husbands, 78.7% were Caucasian, 14.3% Latino, 3% Asian American, 2.2% African American, 0.4% Native American, and 0.4% Pacific Islander. Over one quarter of the husbands (32.4%) and wives (31.1%) held a baccalaureate degree. Most of the husbands (70.4%) were employed full time and 42.5% of the wives held full time employment. Finally, approximately 56% of husbands and wives reported annual family incomes of more than $50,000.

Measures

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) is a widely used measure which assesses the frequency of occurrence during the past week of both feelings and behaviors typical of depression. The CES-D consists of 20-item self-report measures of which each item was reported on a 4-point scale assessing how often the items occurred in the past week. The scale ranged from 1 (*"rarely or less than one day"*) to 4 (*"most of the time or 5-7 days"*). A composite with the average of these items was created with a Cronbach's alpha score of .86 for wives (M = 1.44, SD = 0.41) and .82 for husbands (M = 1.45, SD = 0.34).

"Warm Fuzzies" form. The "warm fuzzies" form was a list of pre-determined items (e.g., how we first met, our wedding or honeymoon, our children, vacations we've taken). Using a scale of 0 (*"not at all"*) to 6 (*"a great deal"*), participants rated the extent to which thinking about or talking about each item would make them feel closer to their spouse. Results were used by the experimenters to select a positive topic for the couples' subsequent conversation (if applicable, depending on experimental condition).

Physiological recordings. Measurements of IBI, PEP, FPTT, and RSA were acquired using hardware and software from Mindware Technologies Ltd (Gahanna, OH). IBI, PEP, and RSA were measured via electrocardiography and impedance cardiography, and FPTT was measured via electrocardiography and finger plethysmography. All of these are noninvasive assessments of autonomic nervous system effects on cardiovascular activity.

Study Design

This study is a 2 (affectionate touch versus no touch) by 2 (relationship-positive conversation versus no conversation) design, which yields 4 touch-talk manipulations: touch and talk (participants conversed about a previously determined relationship-positive topic while touching legs and holding hands, then hugged), touch and no talk (participants sat side by side touching legs and holding hands, without conversing or looking at each other, then hugged), talk and no touch (participants sat next to each other without touching while conversing about the positive topic, then stood), and finally no talk and no touch (partners sat next to each other without touching or talking and listened to an educational recording through headphones, then stood). In the two no-talk conditions, a curtain was drawn between participants' upper bodies to prevent facial communication.

Procedure

After completing and passing the eligibility screening process, husbands and wives filled out morning and evening diary entries every day for 14 days. After the two weeks, spouses separately completed an online questionnaire which included the CES-D (Radloff, 1977). Once this was completed, the participants were scheduled for a 3-hour laboratory session. Laboratory sessions took place at different times of the day based on participant and research assistant availability. The participants were asked to not consume caffeine or alcohol at least 4 hours before the scheduled session.

When the participants arrived at the lab, a researcher greeted the couple, guided them to the experiment room, and seated them in adjacent chairs. The participants then filled out an informed consent document, after which their weight and height were measured. Then, husbands and wives moved into separate rooms and completed a series of questionnaires collecting information on most recent medication and caffeine intake, initial affective ratings, the "warm fuzzies" questionnaire, and positive and negative spousal qualities. The research assistants then attached electrodes to the participants' torso for electrocardiography and impedance cardiography, a respiration belt was placed around the rib cage, and a finger-pulse plethysmograph was placed on the middle finger. Once the physiological signals were checked and acceptable quality was confirmed, a 3-minute initial (individual) baseline was recorded with spouses still in separate rooms. After this, the randomly-assigned "mover" (the spouse who moved in and out of the main study room during all study tasks except the manipulation period) joined their spouse in the main study room and a second 3-minute (joint) baseline was recorded as spouses sat quietly next to one another separated by a curtain.

Next, both spouses stayed in the same room to participate in one of the 4 randomly assigned manipulations for approximately 5 minutes. Depending on the manipulation condition, they were instructed that they would either be: sitting next to each other with their legs touching as much as possible and holding hands/linking arms while having a conversation with their spouse (about a topic previously determined using the "warm fuzzies" scale), only touching (as previously described) while listening to an educational recording with a curtain drawn between them, only conversing about a positive topic, or sitting next to each other and, without touching or talking, listening to an educational recording using headphones with a curtain drawn between them. For those in a condition that involved touching, after the five-minute interaction, they were told to stand for a 30-second full ventral hug. Before the manipulation began, the participants had a "practice" hug to make sure they understood what to do after the five minutes was over. If the assigned condition did not involve touching, the participants stood next to each other for 30 seconds after the five-minute interaction. After the manipulation, spouses moved to separate rooms for a stress task, which was a variation of the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993). This task involved a 4-minute preparation for a public speech about their partner's strengths and weaknesses (which were written down and rated at the beginning of the study), a 3-minute delivery of the speech in front of a camera, then 6 one-minute periods of performing serial subtraction as quickly as possible. Participants rated the speech and math tasks immediately after they were completed. After the stress tasks, the mover went back into the main study room where spouses completed a recovery manipulation of touching or no touching (as performed previously; neither recovery condition involved talking). Couples then recorded final affective ratings as well as reactions to the second manipulation period. At the end of the study, all sensors were removed, the participants were debriefed, and $90 was distributed to each couple.

RESULTS

Overview of Analysis

To understand the associations among positive interactions, depressive symptoms, and measurements of autonomic reactivity, correlations were conducted using SPSS 24. To test Hypothesis 1, we conducted repeated measures analysis of variance (ANOVA) using SPSS 24. To test Hypotheses 2-6, we conducted path analyses using Mplus Version 8 (Muthén & Muthén, 1998-2017) using a maximum likelihood estimator. Examination of the bivariate correlation matrices did not reveal problems with multicollinearity (see Table 1a and Table 1b). As spouses' physiological outcome variables were unrelated, the hypothesis-testing models were specified separately for husbands and wives (see Table 2).

Preliminary Data Analyses

Data reduction. IBI, PEP, FPTT, and RSA measures were averaged across minutes to create mean scores for the individual baseline and speech preparation epochs. A change score (Δ) was calculated for IBI, PEP, FPTT, and RSA: Δ = speech preparation – individual baseline. We focused on the speech preparation portion of the stress task because participants spoke aloud during the speech delivery and serial subtraction, which can alter the physiological measurements of interest. We tested the hypotheses using the individual baseline (with participants in separate rooms) as it relates to the independent nature of the stress task (with participants in separate rooms). Finally, listwise deletion was applied to the analyses, which removed participants who were missing physiological recordings for individual baseline or speech preparation, resulting in a sample of 181 husbands and 183 wives.

Correlations. Correlational analyses were conducted for all study variables for wives (Table 1a) and husbands (Table 1b) separately, as well as between wives and husbands (Table 2). Results revealed that in wives, all physiological outcomes variables were related to one another except for RSA and FPTT. Depressive symptom scores were also unrelated to all physiological outcome variables (Table 1a).

Table 1a. *Means, Standard Deviations, and Pearson Correlations among Δ Physiological Measures and Depressive Symptoms for Wives*

	M	*SD*	*1*	*2*	*3*	*4*
1. Depressive symptoms	1.43	.38				
2. Δ IBI	-65.32	65.28	.05			
3. Δ PEP	-13.36	3.55	.10	.35***		
4. Δ FPTT	-75.12	67.92	.09	.37***	.21**	
5. Δ RSA	-13.35	28.73	.07	.45***	.21**	.07

Note. *N*s ranged from 166 to 183. **p < .01, ***p < .001

All physiological outcome variables were related within husbands except for RSA and PEP as well RSA and FPTT. Furthermore, CESD scores were unrelated to any physiological outcomes in husbands (Table 1b).

Table 1b. *Means, Standard Deviations, and Pearson Correlations among Δ Physiological Measures and Depressive Symptoms for Husbands*

	M	*SD*	*1*	*2*	*3*	*4*
1. Depressive symptoms	1.44	.32				
2. Δ IBI	-55.06	71.49	.09			
3. Δ PEP	-3.65	8.88	.13	.54***		
4. Δ FPTT	-13.98	41.08	.09	.34***	.29***	
5. Δ RSA	.09	.63	.03	.34***	.08	.14

Note. *N*s ranged from 166 to 181. ***p < .001

Finally, most of the physiological outcome variables were not associated between wives and husbands, except for Husbands' IBI with Wives' PEP responses. Depressive symptoms scores were also positively related between husbands and wives, as expected (Table 2).

Table 2. *Pearson Correlations among Δ Physiological Measures and Depressive Symptoms Between Wives and Husbands*

	Husbands				
Wives	*1*	*2*	*3*	*4*	*5*
1. Depressive symptoms	.35***	.00	-.02	-.03	-.13
2. Δ IBI	.03	.10	.02	.09	.04
3. Δ PEP	-.02	.16*	.01	.01	.06
4. Δ FPTT	.11	-.05	.03	-.03	-.04
5. Δ RSA	-.00	.02	-.08	.00	.04

Note. *N*s ranged from 166 to 183. *$p < .05$, ***$p < .001$

Hypothesis Testing

Hypothesis 1. Hypothesis 1 proposed that stress tasks would cause cardiac sympathetic activation and cardiac parasympathetic withdrawal, where IBI, PEP, FPTT, and RSA would all go down in value, and the change scores would be negative. In wives, IBI, PEP, and FPTT decreased significantly from baseline to the speech preparation task, which suggests that the task elicited a stress response. However, RSA did not significantly differ from baseline to the stress task, which contradicts our hypothesis (Table 3a).

Table 3a. *Testing for Physiological Stress Responses in Wives*

	Δ	*F (df)*	*p*
IBI	-65.32	183.27 (1, 182)	< .001
PEP	-6.43	124.11 (1, 166)	< .001
FPTT	-13.36	33.87 (1, 176)	< .001
RSA	-.0791	2.13 (1, 182)	.146

Note. *N*s ranged from 166 to 183.

For husbands, IBI, PEP, and FPTT decreased significantly from baseline to the speech preparation task, suggesting the task elicited a stress response. However, RSA significantly increased from the individual baseline to the stress task, suggesting parasympathetic activation. This contradicts our hypothesis as we predicted parasympathetic withdrawal in response to stress (Table 3b).

Table 3b. *Testing for Physiological Stress Responses in Husbands*

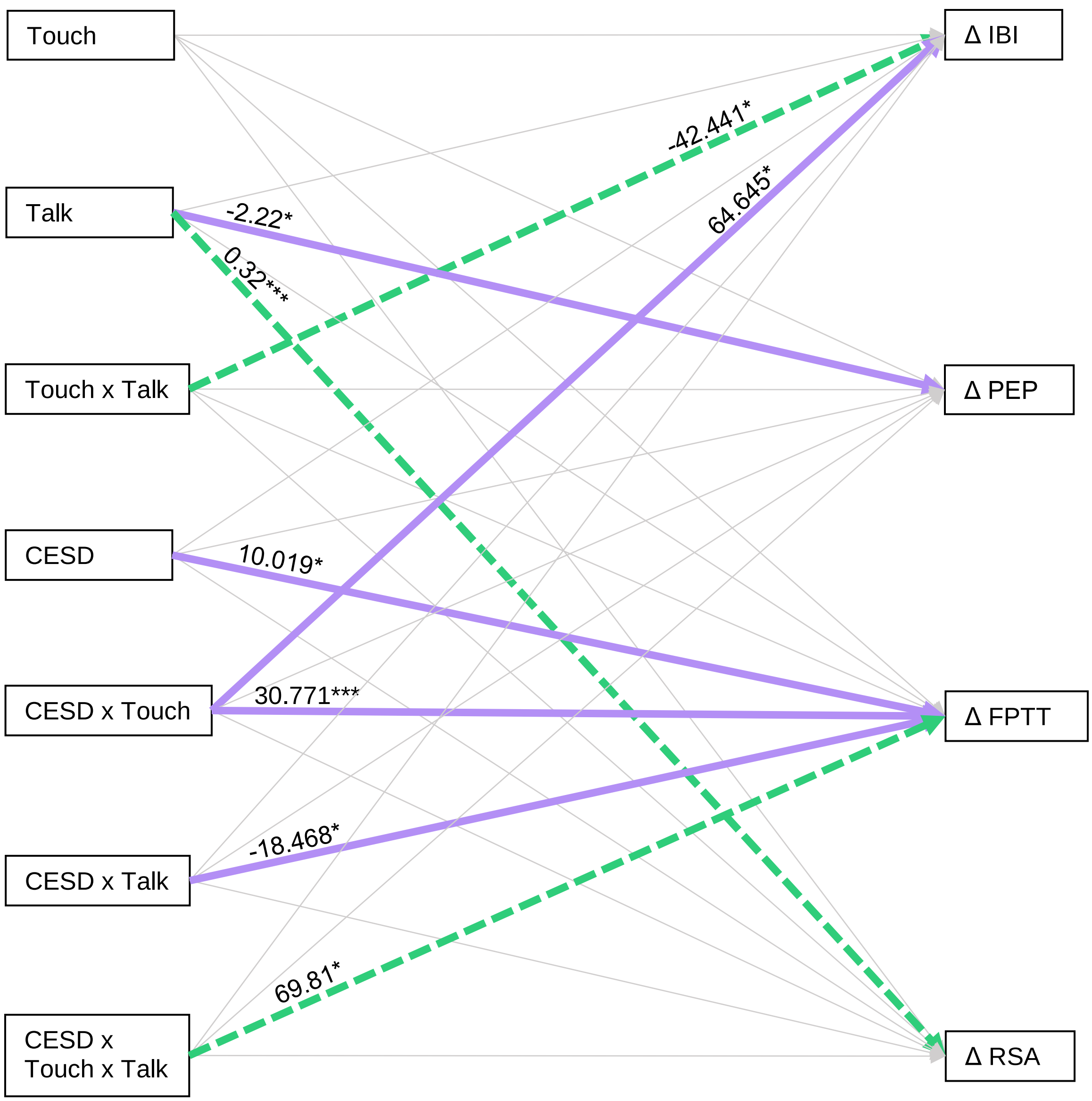
	Δ	*F (df)*	*p*
IBI	-55.06	107.95 (1, 181)	< .001
PEP	-3.65	28.34 (1, 167)	< .001
FPTT	-13.97	20.24 (1, 174)	< .001
RSA	.0925	3.94 (1, 180)	.049

Note. *N*s ranged from 166 to 181.

Hypotheses 2-6. To investigate whether assignment to a touch and/or talk manipulation predicted subsequent physiological stress reactivity, and whether depressive symptoms moderated these relationships, path analyses were used to simultaneously test a set of multivariate regression equations for each spouse. To determine if these models fit the data, we examined the goodness-of-fit indices: chi-square, root mean square error of approximation (RMSEA), and comparative fix index (CFI). Typically, acceptable fit indices are defined as a non-significant chi-square, RMSEA < 0.06, and CFI > 0.95 (Hu & Bentler, 1999).

Two separate models were examined. Both comprised linear regressions with touch condition (mean-centered), talk condition (mean-centered), a touch x talk interaction term, depressive symptoms (mean-centered), and its two-way interactions with touch and talk, plus its three-way interaction with touch X talk as predictors. Dependent variables were as follows: Δ physiological outcomes (IBI, PEP, FPTT, RSA) for wives and Δ physiological outcomes (IBI, PEP, FPTT, RSA) for husbands. For simplicity, summaries of results from wives' and husbands' models are presented together in Figure 1.

Figure 1. *Linear Regressions of Positive Interaction Manipulations, Depressive Symptoms, and their Interactions Predicting Change from Individual Baseline to Speech Preparation (Δ) for Physiological Outcomes Separately for Wives and Husbands*



Note. Wives' paths are solid (purple) and husbands' paths are dashed (green). Unstandardized estimates are above the corresponding relationship. Light gray paths are all non-significant ($p > .05$). *$p < .05$ ***$p < .001$

As all the models were originally just-identified, the non-significant model-estimated correlation between physiological outcomes for wives (FPTT and RSA) and husbands (PEP and RSA) were set to 0, making the models over-identified. Table 4 shows a very good fit for both wives' and husbands' models.

Table 4. Fit Indices for Path Models

Fit Index	Δ Wives	Δ Husbands
χ^2	0.15	1.63
df	1	1
RMSEA (confidence interval)	0.00 (0.00, 0.14)	0.06 (0.00, 0.22)
CFI	1.00	0.99

Positive interactions and stress reactivity in wives. Our second hypothesis was that positive spousal interaction would reduce subsequent cardiac sympathetic activation. Contrary to this hypothesis, being assigned to a touch condition did not significantly predict physiological stress reactivity for wives (all *p* values > .05; see Tables 5 and 6). Furthermore, assignment to the talk conditions led to shorter Δ PEP, indicating greater physiological reactivity in wives, which also does not support our second hypothesis (Table 5). Our third hypothesis, which proposed that positive interactions would reduce cardiac parasympathetic withdrawal in response to stress, also was not supported in wives as we did not find any effects for Δ RSA (Table 6).

Table 5. *Change from Individual Baseline to Speech Preparation (Δ) for PEP and IBI by Spouse*

	Husbands					Wives				
	B	*S.E.*	*β*	*t*	*p*	*B*	*S.E.*	*β*	*t*	*p*
Δ PEP										
Touch	.325	1.298	.018	.251	.802	-.940	1.093	-.063	-.861	.389
Talk	-1.994	1.301	-.112	-1.532	.125	**-2.22**	**1.058**	**-.150**	**-2.099**	**.036**
Depressive symptoms	2.468	2.270	.089	1.087	.277	1.995	1.403	.103	1.422	.155
Touch X Talk	1.986	2.557	.056	.776	.438	1.172	2.216	.039	.529	.597
Touch X depressive symptoms	-6.832	4.528	0.123	-1.509	.131	2.670	2.934	.069	.910	.363
Talk X depressive symptoms	-1.629	4.598	-.029	0.354	.723	5.546	2.892	.142	1.918	.055
Touch X talk X depress symptoms	16.948	9.131	.149	1.856	.063	-3.002	5.707	.038	-.526	.599
Δ IBI										
Touch	-1.957	10.520	-.014	-.186	.852	5.732	9.476	.044	.605	.545
Talk	5.581	10.498	.040	.532	.595	3.592	9.449	.028	.380	.704
Depressive symptoms	25.498	15.726	.117	1.621	.105	15.695	13.603	.092	1.154	.249
Touch X Talk	**-42.441**	**21.026**	**-.151**	**-2.019**	**.044**	-5.669	18.931	-.022	-.299	.765
Touch X depressive symptoms	-51.910	31.417	-.119	-1.652	.098	**64.645**	**27.298**	**.190**	**2.368**	**.018**
Talk X depressive symptoms	-12.572	31.573	-.029	-.398	.690	-23.874	27.079	-.070	-.882	.378
Touch X talk X depress symptoms	77.389	63.065	.086	1.227	.220	.385	54.331	.001	.007	.994

Positive interactions and stress reactivity in husbands. Our third hypothesis was supported for husbands as we found a main effect of talk condition on husbands' Δ RSA responses (Table 6). Engaging in a positive spousal conversation led to significantly smaller stress-related RSA decreases, indicating less parasympathetic withdrawal, than not engaging in a conversation. We also found a touch by talk interaction effect on husbands' Δ IBI response (Table 5). Although no specific combination of touch and talk conditions were related to changes in husbands' IBI, it seems that talking while not touching appeared to decrease IBI reactivity ($b = 26.38$, $SE = 15.26$, $t(1) = 1.73$, $p = .08$), whereas talking while touching increased IBI reactivity ($b = -23.60$, $SE = 15.40$, $t(1) = -1.53$, $p = .13$), rather than further decreasing it (Figure 2).

Figure 2. *Husbands' Δ IBI as a Function of Spousal Touch and Positive Conversation*

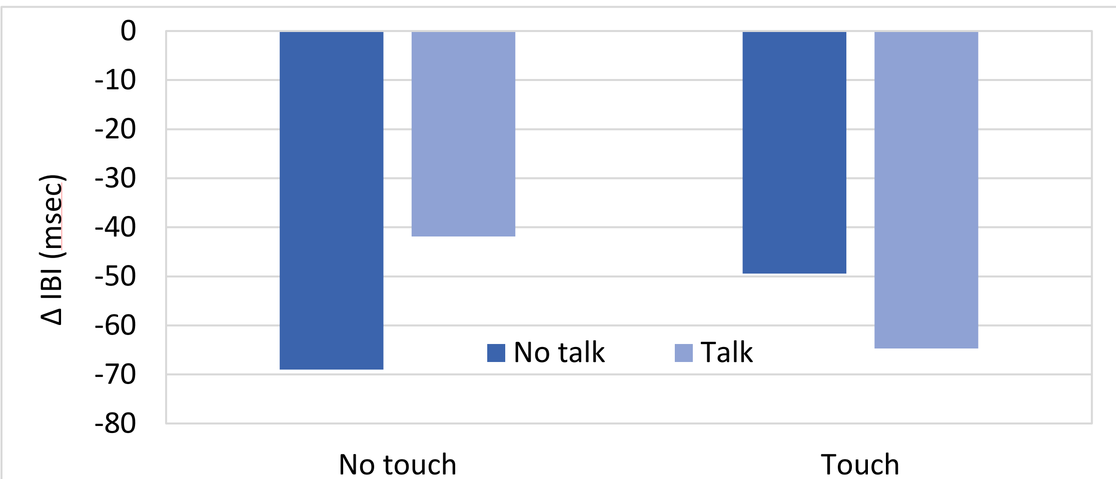


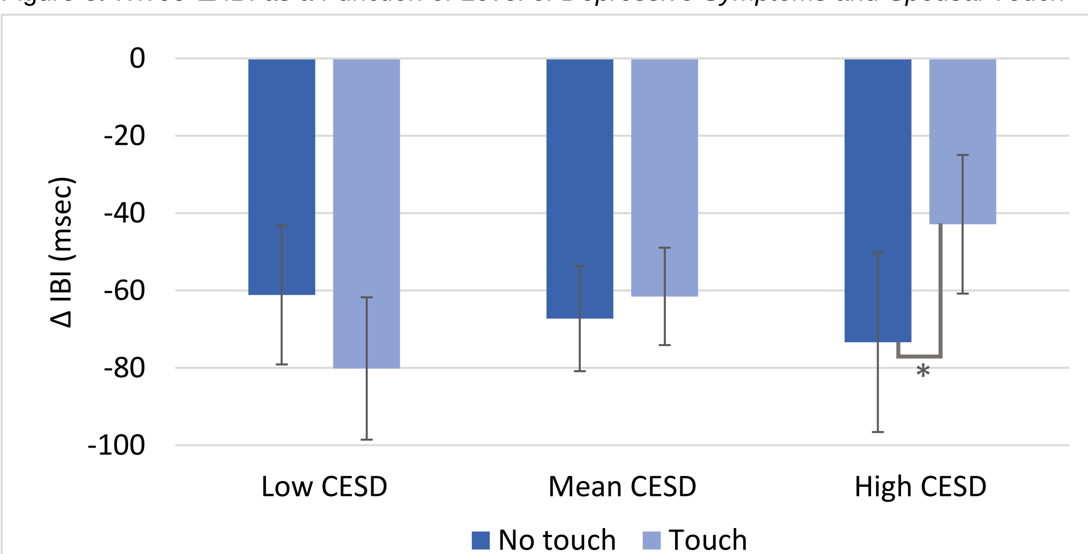
Table 6. Change from Individual Baseline to Speech Preparation (Δ) for FPTT and RSA by Spouse

	Husbands					Wives				
	B	*S.E.*	*β*	*t*	*p*	*B*	*S.E.*	*β*	*t*	*p*
Δ FPTT										
Touch	2.758	5.918	.034	.466	.641	-3.949	4.570	-.065	-0.864	.388
Talk	-.555	5.886	-.007	-.094	.925	-4.695	4.581	-.077	-1.025	.305
Depressive symptoms	9.713	7.152	.076	1.358	.174	**10.019**	**4.442**	**.126**	**2.256**	**.024**
Touch X Talk	-17.155	11.740	-.105	-1.461	.144	3.615	9.170	.030	.394	.693
Touch X depressive symptoms	-14.489	14.267	-.057	-1.016	.310	**30.771**	**8.821**	**.193**	**3.488**	**< .001**
Talk X depressive symptoms	-9.060	14.351	-.035	-.631	.528	**-18.468**	**8.866**	**-.115**	**-2.083**	**.037**
Touch X talk X depress symptoms	**69.810**	**28.608**	**.134**	**2.440**	**.015**	-31.236	17.785	-.096	-1.756	.079
Δ RSA										
Touch	-.140	.092	-.111	-1.524	.127	-.168	.113	-.115	-1.478	.139
Talk	**.320**	**.092**	**.253**	**3.476**	**.001**	-.012	.114	-.008	-.103	.918
Depressive symptoms	.015	.160	.007	.092	.927	.146	.164	.076	.892	.372
Touch X Talk	.108	.185	.043	.583	.560	.162	.228	.055	.710	.478
Touch X depressive symptoms	-.042	.323	-.011	-.129	.898	.397	.325	.104	1.221	.222
Talk X depressive symptoms	.454	.324	.115	1.403	.161	-.215	.331	-.056	-.650	.516
Touch X talk X depress symptoms	.208	.652	.026	.318	.750	-.076	.656	-.010	-.116	.908

It was also hypothesized that 4) higher reported depressive symptoms would result in blunted cardiovascular activation in response to a laboratory stressor; 5) after engaging in a positive marital exchange (touch, talk, or both), compared to those lower in depressive symptoms, those who reported higher depressive symptoms would have smaller interaction-related reductions in stress-related cardiac sympathetic activation; and 6) stress-related RSA reduction would not be moderated by depressive symptoms.

Depressive symptoms, positive interactions, and stress reactivity in wives. Supporting our fourth hypothesis, greater depressive symptoms predicted less overall sympathetic activation across touch and talk conditions for wives, as indicated by Δ FPTT responses. This effect was qualified by three significant interactions of depressive symptoms with touch/talk conditions. First, depressive symptoms moderated the effect of touch on wives' Δ IBI and Δ FPTT responses (Table 5) to the stress task. Simple slopes analyses revealed that for wives self-reporting higher depressive symptoms, engaging in an interaction which involved affectionate touch predicted lower physiological reactivity to the stressor (b = 30.49, SE = 15.03, $t(1)$ = 2.03, p = .04), as characterized by smaller reductions in Δ IBI (Figure 3).

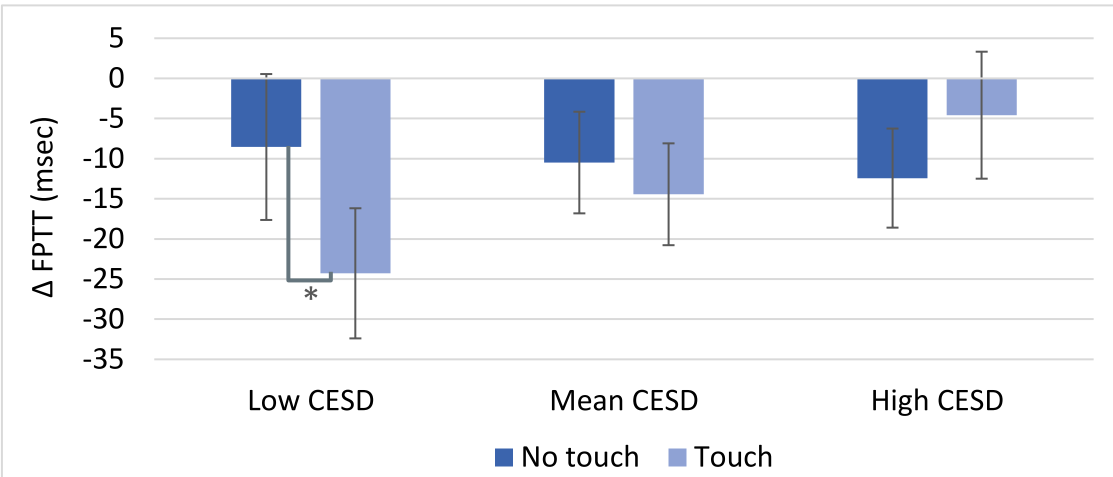
Figure 3. *Wives' Δ IBI as a Function of Level of Depressive Symptoms and Spousal Touch*



*p < .05

On the other hand, wives with lower depressive symptoms had greater physiological stress reactivity (b = -15.74, SE = 6.21, $t(1)$ = -2.53, p = .01), as characterized by smaller stress-related reductions in Δ FPTT when in a touch condition (Figure 4). Both findings contradict our fifth hypothesis, where we predicted that those with higher depressive symptoms would not experience as much touch-related reduction in sympathetic activation as those with lower depressive symptoms. These findings show the opposite.

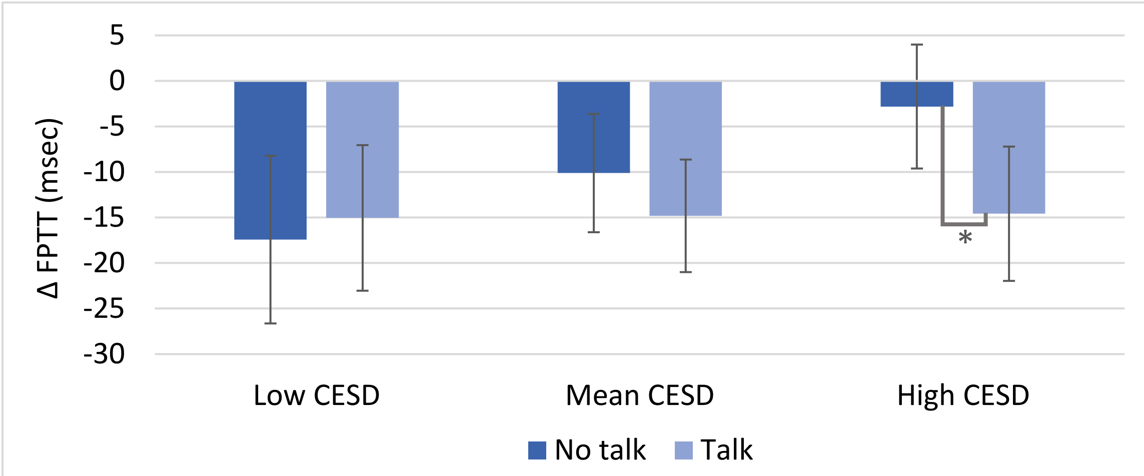
Figure 4. *Wives' Δ FPTT as a Function of Level of Depressive Symptoms and Spousal Touch*



*p < .05

Additionally, for wives, there was a significant moderation effect of depressive symptoms for talk condition on Δ FPTT response (Table 6). Specifically, among wives with higher depressive symptoms, positive conversation led to higher stress-related FPTT responses compared to those who did not participate in a positive conversation with their spouse (b = -11.77, SE = 5.12, $t(1)$ = -2.30, p = .02; Figure 5). This contradicts the expected effects of both conversation and depressive symptoms. There also appears to be a simple effect of depressive symptoms on reactivity among wives who did not have a positive conversation with their spouses. This effect, if significant, would be consistent with the overall blunting effect of depression on stress reactivity. Hypothesis 6 proposed that depressive symptoms would not moderate the positive interaction-related decreases in stress-related parasympathetic withdrawal. For wives, we found no effects on Δ RSA to be moderated (Table 6).

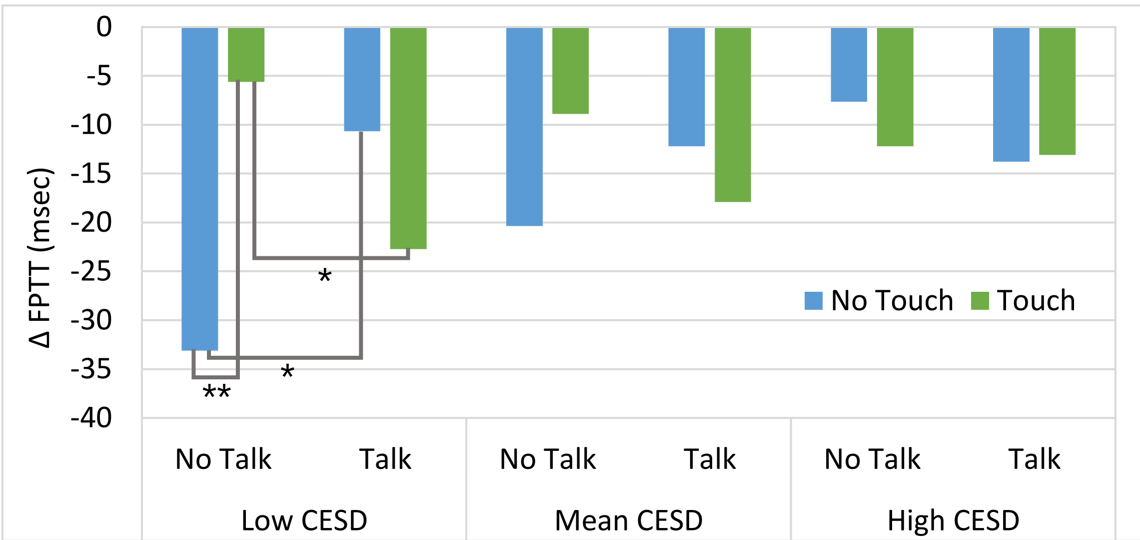
Figure 5. *Wives' Δ FPTT as a Function of Level of Depressive Symptoms and Positive Conversation with Spouse*



*$p < .05$

Depressive symptoms, positive interactions, and stress reactivity in husbands. Unlike wives, husbands did not show an overall blunting of stress-related cardiovascular activation. Although Hypothesis 4 was not supported for husbands, we found a significant 3-way interaction of depressive symptoms and both touch and talk conditions in predicting husbands' Δ FPTT (Table 6). For husbands low in depressive symptoms, the touch effect was highly significant when they were not conversing (b = 27.50, SE = 8.85, $t(1)$ = 3.11, p = .002), and it was in the expected direction, as stress reactivity was reduced (Figure 6). Furthermore, for husbands low in depressive symptoms, the talk effect was significant when they did not touch (b = 22.45, SE = 10.74, $t(1)$ = 2.09, p = .04), and it was in the expected direction (Figure 6). These findings support Hypothesis 5, as those with high levels of depressive symptoms experienced lower interaction-related reduction in stress-related FPTT response than those with low levels of depressive symptoms. On the other hand, among husbands with low depressive symptoms, for those who touched, conversation led to greater stress reactivity (b = -17.12, SE = 8.36, $t(1)$ = -2.05, p = .04), which is opposite to our predictions for both conversation and depression (Figure 6). For those who conversed, the touch was not significant, but the means also do not support the hypothesis of lowered stress reactivity through touch or depressive symptoms (b = -12.06, SE = 10.32, $t(1)$ = -1.17, p = .24; Figure 6). Finally, Hypothesis 6 proposed that depressive symptoms would not moderate the positive interaction-related decreases in stress-related parasympathetic withdrawal. For husbands, we a main effect of talk on Δ RSA, but there were no significant interactions including depressive symptoms (Table 6).

Figure 6. *Husbands' Δ FPTT as a Function of Depressive Symptoms and Touch / Talk Condition*



*$p < .05$, **$p < .01$

DISCUSSION

The current study examined whether a positive marital interaction involving affectionate touch or positive conversation would influence wives' and husbands' physiological reactivity to a subsequent stress task, and whether these relationships would be moderated by self-reported depressive symptoms. We focused on physiological outcomes previously shown to indicate levels of sympathetic activation (PEP), parasympathetic activation (RSA), and more complex interactions between sympathetic and parasympathetic activation (IBI, FPTT), as the activity of both autonomic branches may contribute to the association between positive interactions and wellbeing (Ditzen et al., 2007; Grewen et al., 2003; Holt-Lunstad, et al., 2007). Specifically, we calculated a change score (Δ) for physiological stress reactivity by subtracting individual baseline physiology from stress task physiology separately for wives and husbands for each outcome measure. Support for our hypotheses was mixed for both husbands and wives.

Reduced Stress Reactivity after Positive Interactions

Conversation reduced stress reactivity. In support of Hypothesis 3, compared to husbands who did not, husbands who had a positive conversation with their spouses had less parasympathetic withdrawal, illustrated by smaller stress-related decreases in RSA. Furthermore, we found a significant touch by talk condition interaction for husbands, where talking while not touching appeared to decrease IBI reactivity. These results extend previous findings suggesting that husbands may benefit more from verbal support from their partner compared to other forms of support (Ditzen et al., 2007). Men may benefit more from verbal interactions because wives are better at providing effective verbal support compared to husbands (Glynn, Christenfeld, & Gerin, 1999), and the underlying mechanisms that facilitate this ability may extend to verbal interactions in general.

Moderation by depressive symptoms. For husbands as a group, we found evidence of benefits only for positive conversation. Accounting for depressive symptoms, however, revealed effects of affectionate touch on their stress reactivity. Husbands with lower levels of depressive symptoms benefited from either form of positive interaction when experienced by itself. In other words, they experienced an "all or nothing" pattern of reduced stress reactivity (as indicated by

FPTT) when either only touching or only having a positive conversation with their spouse compared to greater stress reactivity when doing both or neither. We expected the effects of touch and conversation to be additive, but these findings suggest that they are not. We speculate for participants engaging in both touch and conversation, each activity may have distracted from and weakened the effects of the other.

Moreover, we expected that individuals with higher depressive symptoms would benefit less from touch and from positive conversation than those with lower depressive symptoms. Unexpectedly, we found that wives with higher depressive symptoms showed greater touch-induced reductions in stress reactivity (as characterized by IBI response). It could be argued that while women with higher depressive symptoms do not frequently engage in affectionate behaviors with their spouses at home (Coyne et al., 2002), they may experience a benefit from receiving “invisible support” through touch, as this bypasses potential negative influences on self-esteem resulting from explicitly seeking support or feeling incompetent (Bolger, Zuckerman, & Kessler, 2000; Robinson, Hoplock, & Cameron, 2015).

Depressive symptoms and blunted stress reactivity. We found partial support for our fourth hypothesis, as wives with higher depressive symptoms demonstrated blunted physiological stress reactivity in their FPTT responses. This extends previous findings indicating hypoactivity of autonomic stress response in individuals with depression and further demonstrates a relationship between depressive symptoms and reduced cardiac reactivity and vascular activation (Carroll et al., 2007; Salomon et al., 2009). Studies have found that varying levels of depressive symptomology predict dampened stress reactivity to stressors which involve active coping, such as speech tasks, compared to passive stressors, such as cold pressor tasks (Salomon et al., 2009; Salomon et al., 2013; Schwerdtfeger & Rosenkaimer, 2011). Due to the active nature of the stress task in our study, wives with higher depressive symptoms may have been less able to engage in the task (Carroll et al., 2007).

Heightened Stress Reactivity after Positive Interactions

Conversation heightened stress reactivity. In addition to not showing a beneficial effect of touch in reducing subsequent stress reactivity, the wives in our sample also did not show a benefit from a positive spousal conversation. Rather, talking about a positive relationship topic (versus not talking) predicted greater decreases in wives' PEP response to the stress task. This is similar to previous findings of women having no reduction in physiological stress response from a partner's verbal support before a stress task (Ditzen et al., 2007). Moreover, although the conversations were designed to enhance feelings of closeness and connectedness (similar to Grewen et al., 2003), it may be that the instructed nature of the conversations led to increased cognitive effort and prevented sufficient connectedness. This may have interfered with the ability of the interaction to provide resilience resources or to decrease the perceived stressfulness of the subsequent speech task (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003).

Moderation by depressive symptoms. Also contrary to expectations, for women with lower depressive symptoms, affectionate touch heightened stress reactivity to the subsequent laboratory stress task as indicated by FPTT. For husbands low in depressive symptoms, those who touched while conversing with their partner also experienced greater FPTT reactivity. For both women and men, physical touch increased ANS activation to a subsequent stressor, perhaps via greater attention to the presence of others and/or to one's own body and emotional state.

For women with higher depressive symptoms, conversation led to greater stress reactivity. A possible explanation for this finding may be that depressed women tend to demonstrate more negative mood after a spousal interaction (Gotlib & Whiffen, 1989). This may reflect a greater tendency for depressed women to ruminate about their negative mood (Nolen-Hoeksema, 1987), in turn becoming more susceptible to increased reactivity in response to a stressor.

No Influence of Affectionate Touch on Stress Reactivity

Contrary to our second and third hypotheses, we did not find significant main effects of touch predicting any indicators of physiological stress reactivity for wives or husbands. Thus, the stress-buffering effects of affectionate touch on physiological responses to subsequent stress observed in previous research (reviewed in Jakubiak & Feeney, 2017) did not extend to this study. One possible explanation for this is that the effect of the touch was not strong enough to provide a “carryover effect” on subsequent reactivity (Kamarck et al., 1990). Furthermore, because people vary in the positive interactions they find helpful, it may be that the affectionate touch procedure fell short of the expectations and ideals of the couples in our sample, rendering it an ineffective buffer against subsequent stress (High & Steuber, 2014; Pierce, Sarason, & Sarason, 1991; Xu & Burleson, 2001).

Limitations

One limitation of this study is the possibility that the specific instructions given to our participants to hold hands and touch legs during the touch manipulations led to behavior that was too mechanical to provide protective benefits of touch against stress as were found in previous studies (Ditzen et al., 2007; Grewen et al., 2003). Another possibility is that although we intended the conversation to be positive, and therefore directed participants to discuss a topic we had identified as one that was positive for them, they may have felt awkward or unnatural discussing an “assigned” topic. Although our goal was to ensure comparability of the manipulations between couples, the manipulations may instead have been less effective. Furthermore, as the study occurred in a public (laboratory) setting, the associated responses were probably not equivalent to natural responses occurring in a private setting (Gottman & Krokoff, 1989).

Additionally, although this was an experimental design, most of the significant findings emerged in the context of moderation by individual differences in depressive symptoms. Given that interactions with depressive symptoms are correlational relationships, they must be interpreted with caution. These relationships should be examined with longitudinal data to support the directionality of the present results.

Future Directions

Moreover, as couples vary in the amount of affection they express in their daily lives (Braiker & Kelley, 1979; Orden & Bradburn, 1968), future analysis should utilize the daily diary data collected in this study to explore how other potential moderators such as frequency of touch or negative/depressed mood over a two-week period influence reactivity to an acute social stressor. Finally, to elicit stronger benefits of affectionate touch against stress, future research should consider more general instructions for positive interaction manipulations which allow the participants to engage in touch behaviors that are regularly practiced for them as a couple. Along with testing “natural” couple-specific touch behaviors, this future research also should collect self-report data on the perceived reciprocity of the touch as it may influence subsequent stress reactivity.

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