

The Effects of Spousal Interactions on Affect and Next-Day Somatic Symptoms

by

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## ABSTRACT

The present study examined daily survey data collected from married couples over the course roughly 14 days. I investigated the relationships of the morning quality ratings of three distinct spousal interactions conversation (physical affection, and sexual activity) reported in mornings on later-day positive and negative affect, as well as next-day intensity of negative somatic symptoms (e.g. headaches, dizziness, aches and pains). Hierarchical linear modeling was used to estimate path models for both husbands and wives. Direct and indirect effects were observed. Results showed that quality of conversation and physical affection increased later-day positive mood for both husbands and wives; however, positive quality activity increased later-day positive affect for wives only. Quality of sexual activity decreased later-day negative affect for wives only. Less later-day negative affect decreased next-day intensity of symptoms for both husbands and wives. Lastly, quality of sexual activity decreased later-day negative affect, which decreased next-day somatic symptoms for wives. This was the only significant indirect effect. Implications are that high marital quality is important for maintaining psychological health for both spouses, and physical health, particularly for wives.

## DEDICATION

For Mike, my fiancée and best friend, who gave me strength, support, love  
throughout this entire project.

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## TABLE OF CONTENTS

	Page
LIST OF TABLES .....	vi
LIST OF FIGURES .....	vii
INTRODUCTION .....	1
Marital Status, Marital Quality, and Health.....	1
Marital Stress and Health .....	3
Affect and Health .....	5
Positive Communication and Health .....	6
Physical Affection and Health .....	8
Sexual Intimacy and Health .....	9
Sex Differences in Touch Perceptions.....	11
The Current Study .....	11
METHOD .....	12
Participants .....	12
Procedure .....	13
Measures .....	16
Quality of Interactions with Spouse.....	16
Positive and Negative Affect.....	16
Intensity of Somatic Symptoms .....	17
RESULTS .....	18
Preliminary Analyses .....	18
Model Estimation .....	19

	Page
Quality of Interactions Predicting Affect.....	20
Affect Predicting Somatic Symptoms.....	20
Quality of Interactions Predicting Symptoms with Affect Included.....	21
DISCUSSION .....	21
Interpretation of Findings.....	21
Quality of Interactions Predicting Affect.....	22
Affect Predicting Somatic Symptoms.....	22
Quality of Interactions Predicting Symptoms with Affect .....	23
Limitations.....	24
Conclusions .....	26
REFERENCES .....	27
APPENDIX	
A    CORRELATIONS AMONG INTERACTIONS, AFFECT, AND SOMATIC SYMTPOMS.....	35
B    RELATIONS BETWEEN INTERACTIONS AND AFFECT .....	37
C    RELATIONS BETWEEN AFFECT AND SYMPTOMS .....	39
D    RELATIONS BETWEEN INTERACTIONS, AFFECT, AND SYMPTOMS.....	41
E    DIAGRAM OF DAILY DATA TIMING.....	43
F    HYPOTHESIZED MODEL AMONG ALL VARIABLES .....	45
G    MODELS PREDICTED BY CONVERSATION .....	47
H    MODELS PREDICTED BY PHYSICAL AFFECTION.....	49

	Page
I MODELS PREDICTED BY SEXUAL INTIMACY .....	51

LIST OF TABLES

Table	Page
1.1. Pearson Correlations for, Quality of Spousal Interactions, Positive and Negative Affect, and Intensity of Somatic Symptoms for Husbands .....	27
1.2. Pearson Correlations for, Quality of Spousal Interactions, Positive and Negative Affect, and Intensity of Somatic Symptoms for Wives.....	27
2. Relations between Quality of Spousal Interactions and Positive and Negative Affect: Non-Mediated Models for Husbands and Wives .	29
3. Relations between Positive and Negative Affect and Next-Day Intensity of Somatic Symptoms: Non-Mediated Models for Husbands and Wives.....	31
4. Relations between Quality of Spousal Interactions and Next-Day Intensity of Somatic Symptoms: Direct Paths in Mediated Models for Husbands and Wives.....	33



## LIST OF FIGURES

Figure	Page
1. Diagram of daily data collection timing .....	35
2. Hypothesized model of the relationships between quality of conversation, physical affection, or sexual activity with spouse, positive and negative affect, and next-day intensity of somatic symptoms for husbands.....	35
3.1. Observed model of the relationships between quality of conversation with spouse, positive and negative affect, and next-day intensity of somatic symptoms for husbands.....	37
3.2. Observed model of the relationships between quality of conversation with spouse, positive and negative affect, and next-day intensity of somatic symptoms for wives.....	37
4.1. Observed model of the relationships between quality of physical affection with spouse, positive and negative affect, and next-day intensity of somatic symptoms for husbands.....	39
4.2. Observed model of the relationships between quality of physical affection with spouse, positive and negative affect, and next-day intensity of somatic symptoms for wives .....	39
5.1. Observed model of the relationships between quality of sexual activity with spouse, positive and negative affect, and next-day intensity of somatic symptoms for husbands.....	41

Figure	Page
5.2. Observed model of the relationships between quality of sexual activity with spouse, positive and negative affect, and next-day intensity of somatic symptoms for wives .....	41

## The Effects of Spousal Interactions on Affect and Next-Day Somatic Symptoms

The relationship one develops with a spouse, or life partner, is perhaps the most significant interpersonal relationship. Marriage is a legal, and often sacred, pronouncement of love, loyalty, and longing for one person for the remainder of one's life. There are numerous social, legal, and personal benefits to marriage, and in fact, married people are generally healthier than unmarried people (Gove, Hughes, & Style, 1983; House, Landis, & Umberson, 1988; Robins & Regier, 1991; Wood, Rhodes, & Whelan, 1989). However, the act of marriage is not the only predictor influencing health. There are many specific aspects of marital relationships that predict mental and physical health outcomes—factors such as marital happiness, healthy communication, physical affection, sexual relations, and external stress. This paper reviews current research findings in this area and discusses implications for marriage and marital-type relationships (i.e., long-term commitments that include cohabitation). Significant effects and relevance of the aforementioned factors are described in sub-sections to detail the psychological and physiological health implications of good marital relationships. Furthermore, the presented evidence regarding these effects of marriage provides the foundation for the behaviors, outcomes, and hypotheses investigated in the current research.

### **Marital Status, Marital Quality, and Health**

Many studies have investigated the health benefits of marriage and found conclusive evidence of lowered risk of illnesses, faster recovery from sustained

injuries, lower risk for morbidity, and longer life span with chronic life-threatening diseases (Coyne et al., 2001; Johnson, Backlund, Sorlie, & Loveless, 2000; Robles & Kiecolt-Glaser, 2003) among married versus unmarried individuals. However, factors in addition to marital status are also important. Other researchers have investigated the effects of marital quality on health, and found that high levels of reported marital satisfaction and support are more important in predicting health and stress outcomes, such as decreased ambulatory blood pressure, than marital status alone (Grewen, Girdler, Amico, & Light, 2005; Holt-Lunstad, Birmingham, & Jones, 2008). This implies that many marriage-related qualities are mediators of the influence of marital status on health.

Most current literature on marital satisfaction, marital happiness, marital quality, and other related measures (which are terms often used interchangeably) suggests detrimental effects of poor marital quality on physical and mental well-being. However, when marital quality is high, there appears to be a positive impact on both physiological (Ditzen, Hoppmann, & Klumb, 2008) and psychological well-being (Gove et al., 1983).

In the following review, “marital quality” will refer to all of the aforementioned characteristics, unless authors specified multiple separate outcomes in their results. This is due to the notion that marital quality is the over-arching construct, and that marital satisfaction and marital happiness are components. The next few sections demonstrate the importance of a healthy relationship and how relationship quality is related to behaviors, psychological states, and health outcomes in spouses.

Poor marital quality has been linked to detrimental physiological effects. Those who report poor marital quality have significantly worse health outcomes, such as cardiovascular diseases, than those who report higher marital quality (Baker et al., 2000; Ben-Shlomo, Smith, Shipley, & Marmot, 1993; Matthews & Gump, 2002). These effects on physical health are especially prominent in women (Gallo et al., 2003; Kiecolt-Glaser & Newton, 2001). Poor marital satisfaction can have adverse consequences on health even when one is merely thinking about a partner in a negative way. A study by Berry and colleagues (2001) found that individuals who rated their marital satisfaction as poor had higher concentrations of salivary cortisol after envisioning their poor-quality relationship for a few minutes compared to those who envisioned a neutral scenario.

Fewer studies have investigated the positive effects of marital quality. Troxel and colleagues (2005) found that women who rated their marital quality as high were less likely to develop cardiovascular disease compared to those with low ratings of marital quality or those who were divorced or widowed. Additionally, better marital quality has been linked to reduced left ventricular mass in married couples. Enlarged left ventricular mass is implicated in high blood pressure and other cardiovascular issues (Baker et al., 2000).

### **Marital Stress and Health**

Marital stress is defined as chronic, unpleasant interactions between spouses that increases overall daily stress, and increases the frequency and intensity of health issues (Berry & Worthington, 2001). Orth-gomer and colleagues (2000) discovered marital stress was a better predictor than work stress of negative

cardiovascular outcomes, such as high blood pressure, in women. In addition, other researchers have found that marital stress increased psychological distress, such as depression, and decreased quality of health habits and cardiovascular outcomes (Kiecolt-Glaser & Newton, 2001; Whisman, 2001). Lastly, marital conflict was shown to increase depressive symptoms and worsen physical health outcomes in both men and women in several studies (Burman & Margolin, 1992; Choi & Marks, 2008; Whisman, 2001).

Stress spillover is the effect of unrelated stressful elements in one's external environment on stress and interpersonal conflict in one's intimate relationships, as defined by Neff and Karney (2004). These researchers found that stress spillover has detrimental effects on marital quality. Researchers have also found that negative perceptions of spousal behavior increased when stress spillover was high. For example, some studies have shown that in married couples with high relationship discord, stress spillover was associated with more general distress and poorer perceived health (Whisman & Uebelacker, 2006); as well as lower ratings of the quality of spousal interaction (Repetti, 1989).

Social support has been shown to act as a buffer between stress spillover and marital quality (Dehle, Larsen, & Landers, 2001), particularly for wives experiencing role strain (Brock & Lawrence, 2008). However, the authors elaborated on the notation that social support needs to be interpreted as such to be effective. Particularly for wives, the interpretation of social support from their husbands was especially necessary. These two studies illustrate the importance of perceived social support on marital quality.

It is unlikely that married couples with low marital quality and high marital stress report their interactions with each other as positively as do couples that report feeling generally happier with each other, as theorized by Repetti (1989). In one study, couples with high perceived marital quality engaged in positive interactions more frequently than couples with poor perceived marital quality (Williams, 1979). In addition to marital stress, various other marriage-related factors contribute to health outcomes in married couples.

### **Affect and Health**

Affect and affect regulation can contribute to psychological and physiological health outcomes. Carrere and colleagues (2005) provided support for this by demonstrating that the inability to regulate negative mood, specifically in the context of anger, was predictive of depressive symptoms for married women and poor physical health in married men. Although gender differences are observed, particularly in internal versus external manifestations, the common theme stands that negative affect has detrimental effects in married couples.

Social interactions, specifically marital interactions, influence positive and negative affect on a daily basis (Gable, Reis, & Downey, 2003). A concept that has helped us understand couple dynamics is coregulation. Sbarra and Hazan (2008) defined coregulation as the fluctuation of psychological and physiological indicators by the influence of one person on another, and vice versa. It is prominent in married couples. For example, the presence of negative affect in one spouse precedes negative affect in the other spouse (Sbarra & Hazan). Butner and colleagues (2007) found that spouses who experience the same social interactions

have roughly the same ratings of positive and negative affect due to this effect of coregulation. Furthermore, coregulation was consistently stronger on days where spouses interacted more frequently compared to days where they spent very little time together. Saxbe and Repetti (2010) found similar results, where negative affected predicted spousal negative affect, but positive affect did not predict spousal positive affect. Also, low perceived marital quality decreases coregulatory effects. We suspect that due to a general negativity bias (Peeters & Czapinski, 1990), negative affect may have a more pronounced effect than positive affect. Peeters and Czapinski (1990) hypothesized that negative stimuli are more complex, carry more informational value, and require more cognitive processing than positive stimuli.

### **Positive Communication and Health**

Positive communication in marriage is an important contributor to a healthy relationship. One type of positive communication is affectionate communication, which is defined as communication with the intent of instilling positive emotions in the other person and having those emotions reciprocated (Floyd et al., 2005). Affectionate communication is essential to maintaining a healthy, intimate marriage (Floyd & Riforgiate, 2008; Huston, Caughlin, Houts, Smith, & George, 2001). Relationships have been found between affectionate communication and cardiovascular health (Floyd, 2006; Floyd, Hesse, & Haynes, 2007), psychological stress (Floyd, 2006), and mental stability (Floyd et al., 2005). Floyd and Riforgiate (2008) found that increased frequency of affectionate communication lowered spouses' daily levels of cortisol, both in the morning and evening, and influenced



rates of cortisol change. Moreover, more frequent affectionate conversation decreases stress, as measured by oxytocin levels (Floyd, Pauley, & Hesse, 2010).

Communication occurs through facial affect, choice of words, positive energy, body language, and listening/response behaviors (Broadwell & Light, 2005; Gottman & Notarius, 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). While the intent of relaying certain emotions is important in communication, the interpretation of the communication from one's spouse is also vital. Communication interpreted as emotionally supportive is associated with lower blood pressure over long periods of time. As with most aspects of marriage, poor communication can have detrimental effects. Poor communication patterns in married couples has been linked to higher ambulatory blood pressure (Kiecolt-Glaser et al., 1993).

Hertenstein and colleagues (2006) extended the literature on tactile communication by demonstrating that humans can accurately detect six different emotions through touch, one of the emotions being love. This tactile communication of love is commonly referred to as physical affection. Physical affection and touch may be even more significant than verbal communication in marriage. Touch is a primitive need demonstrated in a variety of mammalian species, such as primates (Dunbar, 2010) and humans (Field, 2010). While physical affection has been studied in a variety of social contexts over the years, the psychological and physiological effects of physical affection on health outcomes in romantic relationships have only begun to be understood.

## **Physical Affection and Health**

The relationship between marital quality and touch is critical to maintaining a healthy marriage. Studies have shown physical affection to be linked to higher marital quality (Gulledge, Gulledge, & Stahmann, 2003) and perceptions of intimacy (Mackey, Diemer, & O'Brien, 2000). These studies focused on the reported quality of physical affection and not its frequency.

Physical affection appears to reduce stress and cardiovascular responses in happily married couples. Studies have shown that physical affection enervates the stress response and decreases overall levels of cortisol and blood pressure (Grewen, Anderson, Girdler, & Light, 2003; Grewen et al., 2005; Holt-Lunstad, Uchino, Smith, Olson-Cerny, & Nealey-Moore, 2003; Light, Grewen, & Amico, 2005) when perceived partner support is high. Additionally, quality of health increased when perceived emotional support, in the form of sexual and non-sexual physical affection from a significant other was high (Seeman, Berkman, Blazer, & Rowe, 1994; Uchino et al., 1996), which is displayed through sexual and non-sexual physical affection (Grewen et al., 2003). Floyd and colleagues (2009) investigated the effects of affectionate touch, specifically kissing, on stress and mood in married couples, and identified significant increases in relationship satisfaction and stress reduction in the group that increased their frequency of kissing. Physiological tests further demonstrated significantly reduced levels of cholesterol from increased frequency of kissing.

Social supportive behaviors in the form of physical affection have been shown to reduce stress activation in the autonomic nervous system (DeVries,

Glasper, & Detillion, 2003). For example, Coan and colleagues (2006) investigated the effects of touch in women when either their husband or experimenters gave them physical comfort while experiencing a threat simulation. Women who were able to hold the hand of their husbands while experiencing the threat simulation had less negative affect and autonomic nervous system arousal than women who held the hand of an experimenter, as measured by an fMRI. Additionally, emotion regulation scores were higher in women who held the hands of their husbands. This effect was strengthened when rating of marital quality was high. It is plausible that supportive touch provided by one's spouse dampens the effect of stress in the autonomic nervous system, which has positive outcomes on one's affect and health.

Cortisol and other hormones are also implicated in the powerful effects of touch on the nervous system. Physical affection in married couples has been shown to decrease cortisol (Ditzen et al., 2007) as well as mediate the relationship between positive affect and cortisol secretion (Ditzen et al., 2008). Other endocrine systems are also affected. Endogenous opioids released by the hypothalamic system (i.e. oxytocin and vasopressin) are highly responsive to touch (Carter, 1998; DeVries et al., 2003). Lastly, researchers have found that more expressed social support in married couples, presented as physical affection, significantly increased oxytocin in both men and women (Grewen et al., 2005; Holt-Lunstad et al., 2008).

### **Sexual Intimacy and Health**

Another touch factor that contributes to marital quality is sexual intimacy. While frequency of sexual intimacy may decrease as the length of a marriage increases (Call, Sprecher, & Schwartz, 1995; Doris Svetlik, Keith Dooley, Weiner,

Williamson, & Walters, 2005), this is not linked to a decline in quality (Adams & Turner, 1985; Doris Svetlik et al., 2005). While some researchers have found that the quality of sexual encounters predicts marital quality (Cupach & Comstock, 1990). Svetlik and colleagues (2005) identified a significant relationship between frequency of physical and sexual encounters and marital quality. Long-term married couples (one of the spouses was a caregiver for the other spouse) reported perceived relationship loss, which was significantly related to a decrease in marital quality. Perceived relationship loss was also significantly predicted by a decreased opportunity to engage in physical affection and sexual activity with their spouse. As shown, frequency and quality of physical interactions as predictors of marital outcomes provide mixed results.

Anders and colleagues (2007) found that women reported feeling more intimate with their partners, more pleasure, and more positive affect in general after sexual intercourse than physical affection the morning after such activities took place. However, women reported feeling more intimate and having more positive affect after engaging in physical affection with their partner than engaging in no physical contact at all. These results suggest that both sexual activity and physical affection are important for maintaining a healthy relationship.

Although touch is highly influential on psychological and physiological states, the mere presence of one's spouse may be more than enough to weaken the stress response. One study found that the presence of a trusted intimate partner reduced autonomic nervous system activity, as measured by cortisol concentration, even in the absence of touch (Heinrichs, Baumgartner, Kirschbaum, & Ehlert,

2003). These findings imply that proximity of a trusted intimate partner could be as powerful as physical affection.

### **Sex Differences in Touch Perceptions**

Some studies have provided results on the differences between men and women and their perceptions of physical affection and touch. Hanzal and colleagues (2008) found that men generally respond more positively to proceptive intimate touch by their significant others than women. Men also rated feelings of sexual desire as more intense than did women. Women rated feeling more warmth and loved than men when their spouse touched them intimately. As shown, sex differences are apparent in physical affection outcomes.

### **Current Study**

Overall, it is apparent that many studies support relationships between various aspects of marital quality and physical health. Spousal differences have been observed in many studies, but the interpretations are inconsistent. Furthermore, many studies have investigated these relationships in cross-sectional studies and not longitudinal studies, which handicaps the ability to capture the ever-changing interpersonal dynamic between spouses.

The current study used morning and evening diary data collected over a two-week period to explore these issues. We investigated the effects of the reported quality of positive conversation, physical affection, and sexual activity on positive and negative affect later that day, and potential direct and indirect effects of these self-reports on the intensity of next day somatic symptoms. Spousal differences were also investigated. Our hypothesis was that higher quality of positive

interactions between spouses (conversations, physical affection, and sexual relations) would be associated with higher positive affect and lower negative affect later the same day, which would in turn be associated with less intense somatic symptoms on the following day.

## **Method**

### **Participants**

Married couples enrolled in a three-part study on stress and physical affection between spouses called The Healthy Couples Project, which included daily morning and evening diaries, a 45-minute questionnaire three days before their lab appointment, and finally a three-hour lab appointment. Participants were compensated for all three parts after their lab appointment with a total of \$160.00 per couple for completion. Compensation varied depending upon the number of consecutive diary submissions each participant provided from the entry to the completion of enrollment. Spouses from this study completed between 9 and 30 days of diary submissions. The total number of observations for these analyses was 6284 (3142 morning entries; 3142 evening entries).

One hundred married couples (200 spouses) were included in the analyses ( $M$  age of males=35.53,  $SD$ =6.78,  $Range$ =24-53;  $M$  age of females=32.87,  $SD$ =6.67,  $range$ =22-50). Ethnicity of couples was 11% Latino and 89% Non-Latino. The majority of Non-Latinos identified as Caucasian; however, actual percentages were not documented at the time of enrollment. Distinction was made between Latinos and Non-Latinos due to hypothesized ethnicity differences in perceptions of physical affection and touch. Eligible-enrolled couples had been

married for at least 6 months; both spouses read and spoke English fluently; and both spouses consented to participate.

### **Procedure**

Participants were asked to complete 14 days of online assessments. Specifically, each participant was asked to fill out brief online questionnaires every morning and every evening for these two weeks, separately from their spouse. Participants were briefly trained on how to complete online diaries, either by viewing an online training video or by talking on the phone to a research assistant. Participants were strongly advised to avoid back-filling and attempting to remember the events and emotions felt from previous days, and, instead, were permitted to fill out assessments after their designated 14 days to make up for missed days. Furthermore, participants were encouraged to generate honest responses without working together, and enabled to skip any items they felt uncomfortable answering.

Each couple was assigned their own ID number (e.g., 101). To ensure confidentiality between spouses, each spouse was assigned her or his own user ID (e.g., 101husband and 101wife), and password, which were sent to each participant's personal e-mail account. Theoretically, husbands would not have access to their wives' assessments, and vice versa. Participants were not given access to view or edit their previously-submitted assessments.

Data were omitted from the analyses for various reasons. (1) Data from 18 couples were deleted entirely from the dataset. Of these couples, 16 completed too few (< 5) entries for morning and evening assessments. The other two couples deleted from the dataset filled out paper assessments during their designated 14

days, which later were deemed unreliable due to lack of timestamps documenting submission. (2) Individual data entries also were flagged and deleted from the dataset from a variety of participants for the following reasons. First, entries were deleted if the timestamps indicated back-filling (e.g., the participant missed a day and filled out two entries in one day, submitted an evening diary on the following morning, or submitted a morning diary in late afternoon). Second, some submissions appeared twice in the dataset within a few seconds of each other, with items answered identically. We assumed this was a glitch in the online data collection program; therefore, we deleted all identical second entries. Lastly, due to unforeseen events, 7 couples began their assessments then stopped filling them out for a period of time (i.e., between a week to a month). These couples resumed their diaries later. To avoid unwanted temporal effects, the first entries for these couples were deleted from the dataset.

A high percentage of participants' daily morning and evening assessment submissions did not temporally coincide with their spouses' data. For example, one spouse might start a day earlier than their counterpart, or end a day later. As another example, the majority of participants missed at least one submission for their morning or evening assessments since they were asked not to back-fill. Each couples' morning and evening assessment data were checked thoroughly, and only matching study days were included in the analyses (i.e., each participant had the same number of morning and evening assessments submissions as their spouse, on the same dates).



Morning and evening assessments were recorded with Google Document Forms. Participants accessed these forms every morning after they woke and every evening before they slept. The morning assessment questioned participants about their sleep, the quality of conversations or physical touch interactions with their spouse, and their mood since their last evening assessment. The evening assessment inquired about these and other kinds of interactions with their spouse and their ratings of these interactions, and their mood, since that morning's assessment. The evening assessment also asked about other kinds of interactions with their spouse and interactions with others (e.g., family, friends, and coworkers) as well as ratings of those interactions, reports of stress and coping, and reports of somatic symptoms since their last evening assessment. Morning assessments were significantly shorter in length than evening assessments, to accommodate participants' typical morning routines. Evening assessments contained the bulk of the daily diary data collected from each participant. None of the participants included in the following analyses reported experiencing any discomfort or feeling burdened by these assessments.

Each participant reported their status as wife or husband at the beginning of every submission, as well as their couple number. Couple numbers were assigned at enrollment. Each row of data corresponded to a couple number variable (e.g. 100) and a spouse differentiation variable (e.g. wife or husband). This allowed for the possibility of within-subjects analyses and between-subject analyses, with spouse as the between-subjects variable.

## Measures

The daily measures consisted of items that were carefully chosen to increase validity of the variables. Each survey item was carefully explained to attenuate any confusion from participants. For example, few items asked participants to skip over them if the situation or feeling did not apply. The variables included in the model are explained in detail: quality of interactions with spouse, positive and negative affect, and intensity of next day somatic symptoms.

**Quality of Interactions with Spouse.** The quality of interactions with one's spouse was reported every morning. Participants disclosed whether certain interactions with their spouse had occurred over the course of the previous night, which included: a conversation, physical affection, and sexual relations. Participants responded to items about these events if they occurred, and left the items blank if the events did not occur. The items corresponding to these events asked participants to rate the following on a 1 (not at all) to 5 (extremely) scale: enjoyableness, satisfaction, closeness to partner, sense of belonging, influence on thinking or behavior, stressfulness, anxiousness, and influence on coping. Stressfulness and anxiousness were reverse-coded. Event-related items left blank were given a score of 0. Ratings for each event were averaged. Composite variables included in these analyses were *quality of conversation* with spouse, *quality of physical affection* with spouse, and *quality of sexual activity* with spouse.

**Positive and Negative Affect.** Affect was reported every evening before sleep, based on the time since the morning assessment. Positive affect included 9 items: interested, jovial, strong, enthusiastic, alert, inspired, determined, attentive,

and active. Negative affect included 10 items: distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid. Items were clustered based on the Positive and Negative Affect Scale (PANAS) subscales for positive affect and negative affect (Watson, Clark, & Tellegen, 1988).

**Somatic Symptoms.** Intensities of somatic symptoms were reported every evening before bed, based on the last 24 hours. Somatic symptoms were rated on a scale of 1 (very mild) to 5 (very intense). Scale scores were averaged into a single composite, which included the following items: forgetfulness, trouble breathing, difficulty concentrating, gastrointestinal distress, dizziness or vertigo, muscle soreness, cold or flu-like symptoms, allergies, heart pounding or racing, numbness or tingling sensation, and hot or cold spells. Participants were instructed to leave all items blank that did not apply, and these items were given a value of 0. Although these symptoms do not share common etiologies, all items were used in the composites to account for individual differences in the type of non-specific symptom typically reported. A lagged composite variable was created to estimate effects of previously mentioned variables on next-day somatic symptom intensity.

Because the data comprised repeated daily observations of spousal interactions, positive and negative affect, and somatic symptoms, data were nested within spouse. Hierarchical linear modeling (under Mplus Version 6.11, Muthen, 2011) was used to account for this lack of independence among data points. Multilevel path model parameters were estimated, and potential mediation was examined using Kenny and colleagues' framework (Kenny, Kashy, & Bolger, 1998). Positive and negative affect were the presumed mediators in the analyses.

All dependent variables were treated as continuous, even though all scales had 5 or fewer ratings to choose from. Gender was coded as a dichotomous variable, where the value of 1 represented husbands and 2 represented wives.

We hypothesized the quality of interactions between spouses as reported in the mornings regarding the previous evening (conversation<sub>day t (morn)</sub>, physical affection<sub>day t (morn)</sub>, and sexual activity<sub>day t (morn)</sub>) would significantly predict intensity of next-day unpleasant physical symptoms (somatic symptoms<sub>day t+1</sub>), such that more positive spousal interaction ratings would be related to less intense next-day somatic symptoms. Furthermore, we predicted that positive and negative affect reported in the evenings (positive affect<sub>day t (eve)</sub> and negative affect<sub>day t (eve)</sub>) would mediate the relationship between quality of interactions with spouse and intensity of next-day somatic symptoms. Mediated and non-mediated models were estimated, separately for both husbands and wives, and spousal differences were examined by comparing path coefficients (Paternoster, Brame, Mazerolle, & Piquero, 1998). An alpha level of .05 was used for all analyses.

## **Results**

### **Preliminary Analyses**

Pearson's correlations among all of the variables are presented for both husbands and wives (see Table 1.1 and Table 1.2). The three quality-of-interaction variables (conversation, physical affection, and sexual activity) were all slightly to moderately positively correlated with each other for both spouses. Positive affect was only slightly positively related to conversation and physical affection, but not sex, for both spouses. Positive affect and negative affect were only slightly

negatively correlated for both spouses. Lastly, negative affect was slightly correlated with next-day somatic symptoms for both spouses.

### **Model Estimation**

As noted above, we hypothesized that higher quality of positive interactions between spouses (conversations, physical affection, and sexual relations) would be associated with higher positive affect and lower negative affect later the same day, which would in turn be associated with less intense somatic symptoms on the following day. First, separately for husbands and wives, we evaluated the three quality-of-interaction variables (for conversation, physical affection, and sexual activity) as predictors of intensity of next-day somatic symptoms. None of these relations were significant, which precluded us from testing for mediation using the standard approach (Aiken, West, & Reno, 1991). However, as noted above, theory led us to expect significant relations between quality-of-interaction variables and affect and between affect and next-day symptoms. Exploratory analyses supported these relationships, so we elected to further explore the relations among the variables.

Part of the model in 5.2 appeared to meet criteria for *inconsistent mediation*, as defined by MacKinnon, Fairchild, and Fritz (2007). The criteria for inconsistent mediation states that mediation can occur as long as the sign of the direct path and the indirect path are opposite. In these cases, the total effect is likely to be very small because the direct and indirect effects will cancel each other out. We decided to examine the indirect paths first for all models (the solid lines in all figures) and then examine effects of including the direct path into the model (the dotted lines in

all figures). Figure 2 displays the hypothesized models, and Figures 3.1 through 5.2 display all of the observed models. In these figures, husbands' coefficients and significance values were reported first, followed by wives.'

**Quality of Interactions predicting Affect.** These relationships were investigated first (see Table 2). More positive ratings of conversations and physical affection with spouse reported in the mornings significantly increased later-day positive affect for both husbands and wives; more positive ratings of sexual activity did not increase later-day positive affect for husbands, but did for wives. For negative affect as the outcome, more positive ratings of conversations and physical affection did not significantly decrease later-day negative affect. However, more positive ratings of sexual activity significantly decreased later-day negative affect for wives, but not for husbands. These results show gender differences observed when quality of sexual activity was the predictor, such that positive quality of sexual activity predicted increased positive mood and decreased negative mood for wives, but not husbands.

**Affect predicting Somatic Symptoms.** The relationships between positive and negative affect and next-day intensity of somatic symptoms were observed next (see Table 3). Positive affect did not predict next-day somatic symptoms for either husbands or wives. However, negative affect predicted increased next-day intensity of somatic symptoms for both husbands and wives. These effects are consistent with prior research, suggesting that the influence of negative affect is stronger than the influence of positive affect (Peeters & Czapinski, 1990).

**Quality of Interactions predicting Symptoms with Affect included.** As stated at the beginning of this section, we were not able to test for mediation using the standard methods due to a lack of significance in all direct paths. Direct paths were added to the model (the dotted lines) (1) to examine influences on the indirect paths once the direct paths were added to the models, and (2) to test for possible *inconsistent mediation*. We found that negative affect only was an inconsistent mediator in the relationship between quality of sexual activity and next-day intensity of somatic symptoms for wives (see Table 4). The other two models for wives (with conversation and physical affection as the IVs), and all three models for husbands were not mediated. The results from the one mediated effect for wives suggest that higher quality of sexual activity significantly decreases next-day somatic symptoms by decreasing later-day negative affect for wives only.

### **Discussion**

This study used daily data collection to investigate the effects of positive marital interactions on reduced acute health outcomes, and the mediated effects of positive and negative affect. Spouses reported daily quality of interactions, including conversation, physical affection, and sexual activity, as well as daily affect and daily intensity of a variety of negative somatic symptoms. Indirect and direct effects were observed, and inconsistent mediation was tested. Many paths were found to be significant and necessary to discuss further. Non-significant paths were also important to discuss.

### **Quality of Interactions Predicting Affect**

The data demonstrated similar findings for both husband in wives when predicting affect from quality of spousal interactions. More positive ratings of quality of conversation and physical affection reported on in the mornings significantly increased positive affect reported later in the day. Furthermore, positive ratings of these two interactions did not significantly decrease negative affect reported later in the day. These results imply that conversation and physical affection had over the course of a night affects husbands and wives' affect similarly. However, spousal differences were observed in reports of quality of sexual activity. Husbands' later-day affect was not affected at all, whereas wives' positive affect increased and negative affect decreased as a result of highly rated quality of previous sexual activity with their husbands. These findings are peculiar, and raise interesting discussion points. It is possible that we made Type II error, such that power for our analyses was not high enough. As stated previously, quality of spousal interactions was only rated when the event occurred and items left blank were coded as 0, or non-applicable. Visually, the data showed the frequency of reported sexual encounters to be much lower than the frequency of reported conversations and physical affection encounters. Furthermore, there were occurrences of one spouse reporting a specific event while the other spouse did not.

### **Affect predicting Somatic Symptoms.**

Surprisingly, no spousal differences were observed in the paths between positive and negative affect and intensity of somatic symptoms. Positive affect did not significantly influence next-day intensity of somatic symptoms for husbands or



wives. However, negative affect did significantly decrease next-day symptoms for both husbands and wives. In fact, both paths were significant at the .001 level. As hypothesized, negative affect seems to have a stronger effect on symptoms than positive affect, potentially due to the adverse psychological and physiological outcomes associated with feeling negative affectivity. Other studies have examined the physical impact of negative affectivity and have identified many negative health outcomes, such as poorer cardiovascular health and more reports of physical pain (Peeters & Czapinski, 1990). As with spousal interactions on symptoms, we did not estimate effects of affect on same-day somatic symptoms for reasons mentioned previously regarding lagged onset of acute health outcomes. Furthermore, affect and symptoms were measured at the same daily intervals; therefore, causality could not be inferred by comparing these measures.

### **Quality of Interactions Predicting Symptoms with Affect Included**

All direct paths were non-significant for both husbands and wives. It is possible that the elapsed time between the reported quality of interactions and next-day symptoms are is too long. Indirect paths were estimated between quality ratings of the three types of spousal interactions (conversation, physical affection, and sexual activity), positive and negative affect, and intensity of next-day somatic symptoms by following the criteria for *inconsistent mediation*. We failed to reject the null hypotheses for all mediated effects for husbands and wives except one. We found that for wives higher ratings of sexual activity reported over the course of a night decreased negative affect, which then decreased next-day intensity of somatic symptoms. One possible explanation is that wives are more influenced by sexual

interactions with their husbands, such the health benefits of having sexual interactions one night carry over more than 24 hours later. These results were in line with similar results found by Ditzen and colleagues (2008). These researchers suggested that beneficial effects from intimate contact are stronger in women than in men. These results suggest interesting implications for the power of sexual intimacy on health, particularly for married women.

### **Limitations**

There were a few methodological limitations to our study. First, we did not include spouse as a between-subjects variable and, therefore, did not examine spousal interaction effects. Instead, we ran two separate models for both husbands and wives. We also did not include any other between-subjects variables to examine interaction effects. We suspect there are other daily measured variables that may account for much of the unexplained variance, such as sleep quality, work or financial stress, or health behaviors. Finally, we were not able to incorporate baseline measures into the model, such as baseline depression, since participants were asked to report on said baseline measures after their diary days were completed.

The analyses in this study did not account for age, which may have an impact on how married people react to spousal interactions physically and psychologically. Physical health may be compromised by poor marital quality for younger couples due to health behaviors, whereas psychological health may be more affected by marital quality in older couples (Umberson, Williams, Powers, Liu, & Needham, 2006). In other words, married couples may react differently to

their interactions based on their age. Another potential limitation involving age involves the physiological differences between younger and older women. Post-menopausal and transitioning women may experience different effects of affectionate touch than pre-menopausal women. For example, a study by Light and colleagues (2005) found that the frequency of warm spousal physical contact in pre-menopausal women decreased blood pressure and increased oxytocin; however, these effects may be different in post-menopausal women due to hormonal changes. Menstrual cycle phase, which may be related to both mood (Davydov, Shapiro, & Goldstein, 2004) and sexual behavior (Burlison, Trevathan, & Gregory, 2002) and influences stress responses (Girdler, Pedersen, Stern, & Light, 1993; Ossewaarde et al., 2010) also was not accounted for in these analyses.

In terms of length of marriage, couples in the current study were required to be married for at least 6 months to control for limerent behavior (Tennov, 1988), such as infatuation and obsession, which is often displayed at the beginning of many relationships. A common misconception is that once the infatuation ceases, a couple no longer experiences romantic love. However, meta-analysis by Acevedo and Aron (2009) showed that romantic love (without obsessive components) is expressed in long-time marriages, and significantly predicts marital satisfaction, psychological health, and self-esteem. In fact, another study found that the longevity of a marriage was the best predictor of increasing lifespan due to health behaviors and health status (Dupre, Beck, & Meadows, 2009).

Our analyses did not account for individual differences. Some personality traits have been shown to influence physical illness. For example, hostility, such as

anger and cynicism, increase risk of coronary heart disease and other cardiac diseases, and increase mortality risk (Smith, Glazer, Ruiz, & Gallo, 2004). In addition, negative affect, such as depression and anxiety, also produce the same cardiovascular risks (Suls & Bunde, 2005). We hoped that random selection would dilute any unwanted confounds of individual differences.

### **Conclusions**

Regardless of limitations, this study sought to understand the psychological and physiological health benefits of a being happily married. Marital quality was assumed to be measured in reported quality of spousal interaction, including conversation, physical affection, and sexual activity. The effects of these spousal interactions were investigated on daily positive and negative affect, as well as next-day intensity of somatic symptoms. While only a few paths were found to be significant, we can state with accuracy that psychological and physiological health are impacted by the quality of marriage through various interpersonal mechanisms.

## REFERENCES

- Acevedo, B. P., & Aron, A. (2009). Does a long-term relationship kill romantic love? *Review of General Psychology, 13*(1), 59.
- Adams, C. G., & Turner, B. F. (1985). Reported change in sexuality from young adulthood to old age. *Journal of Sex Research, 21*(2), 126-141.
- Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*: Sage Publications, Inc.
- Baker, B., Paquette, M., Szalai, J. P., Driver, H., Perger, T., Helmers, K., et al. (2000). The influence of marital adjustment on 3-year left ventricular mass and ambulatory blood pressure in mild hypertension. *Archives of Internal Medicine, 160*(22), 3453.
- Ben-Shlomo, Y., Smith, G. D., Shipley, M., & Marmot, M. G. (1993). Magnitude and causes of mortality differences between married and unmarried men. *Journal of epidemiology and community health, 47*(3), 200-205.
- Berry, J. W., & Worthington Jr, E. L. (2001). Forgivingness, relationship quality, stress while imagining relationship events, and physical and mental health. *Journal of Counseling Psychology; Journal of Counseling Psychology, 48*(4), 447.
- Broadwell, S. D., & Light, K. C. (2005). Hostility, conflict and cardiovascular responses in married couples: A focus on the dyad. *International journal of behavioral medicine, 12*(3), 142-152.
- Brock, R. L., & Lawrence, E. (2008). A longitudinal investigation of stress spillover in marriage: Does spousal support adequacy buffer the effects? *Journal of Family Psychology, 22*(1), 11.
- Burleson, M. H., Trevathan, W. R., & Gregory, W. L. (2002). Sexual behavior in lesbian and heterosexual women: relations with menstrual cycle phase and partner availability. *Psychoneuroendocrinology, 27*(4), 489-503.
- Burman, B., & Margolin, G. (1992). Analysis of the association between marital relationships and health problems: An interactional perspective. *Psychological bulletin, 112*(1), 39.
- Butner, J., Diamond, L. M., & Hicks, A. M. (2007). Attachment style and two forms of affect coregulation between romantic partners. *Personal Relationships, 14*(3), 431-455.

- Call, V., Sprecher, S., & Schwartz, P. (1995). The incidence and frequency of marital sex in a national sample. *Journal of Marriage and the Family*, 639-652.
- Carrere, S., Mittmann, A., Woodin, E., Tabares, A., & Yoshimoto, D. (2005). Anger dysregulation, depressive symptoms, and health in married women and men. *Nursing research*, 54(3), 184.
- Carter, C. S. (1998). Neuroendocrine perspectives on social attachment and love. *Psychoneuroendocrinology*, 23(8), 779-818.
- Choi, H., & Marks, N. F. (2008). Marital conflict, depressive symptoms, and functional impairment. *Journal of Marriage and Family*, 70(2), 377-390.
- Coan, J. A., Schaefer, H. S., & Davidson, R. J. (2006). Lending a hand. *Psychological Science*, 17(12), 1032.
- Coyne, J. C., Rohrbaugh, M. J., Shoham, V., Sonnega, J. S., Nicklas, J. M., & Cranford, J. A. (2001). Prognostic importance of marital quality for survival of congestive heart failure. *The American journal of cardiology*, 88(5), 526-529.
- Cupach, W. R., & Comstock, J. (1990). Satisfaction with sexual communication in marriage: Links to sexual satisfaction and dyadic adjustment. *Journal of Social and Personal Relationships*, 7(2), 179-186.
- Davydov, D. M., Shapiro, D., & Goldstein, I. B. (2004). Moods in everyday situations: Effects of menstrual cycle, work, and personality. *Journal of psychosomatic research*, 56(1), 27-33.
- Dehle, C., Larsen, D., & Landers, J. E. (2001). Social support in marriage. *American Journal of Family Therapy*, 29(4), 307-324.
- DeVries, A. C., Glasper, E. R., & Detillion, C. E. (2003). Social modulation of stress responses. *Physiology & behavior*, 79(3), 399-407.
- Ditzen, B., Hoppmann, C., & Klumb, P. (2008). Positive couple interactions and daily cortisol: On the stress-protecting role of intimacy. *Psychosomatic medicine*, 70(8), 883-889.
- Ditzen, B., Neumann, I. D., Bodenmann, G., von Dawans, B., Turner, R. A., Ehlert, U., et al. (2007). Effects of different kinds of couple interaction on cortisol and heart rate responses to stress in women. *Psychoneuroendocrinology*, 32(5), 565-574.

- Doris Svetlik, R. N., Keith Dooley, W., Weiner, M. F., Williamson, G. M., & Walters, A. S. (2005). Declines in satisfaction with physical intimacy predict caregiver perceptions of overall relationship loss: A study of elderly caregiving spousal dyads. *Sexuality and Disability, 23*(2), 65-79.
- Dunbar, R. I. M. (2010). The social role of touch in humans and primates: Behavioural function and neurobiological mechanisms. *Neuroscience & Biobehavioral Reviews, 34*(2), 260-268.
- Dupre, M. E., Beck, A. N., & Meadows, S. O. (2009). Marital trajectories and mortality among US adults. *American journal of epidemiology, 170*(5), 546-555.
- Field, T. (2010). Touch for socioemotional and physical well-being: A review. *Developmental Review.*
- Floyd, K. (2006). Human affection exchange: XII. Affectionate communication is associated with diurnal variation in salivary free cortisol. *Western Journal of Communication, 70*(1), 47-63.
- Floyd, K., Boren, J. P., Hannawa, A. F., Hesse, C., McEwan, B., & Veksler, A. E. (2009). Kissing in marital and cohabiting relationships: Effects on blood lipids, stress, and relationship satisfaction. *Western Journal of Communication, 73*(2), 113-133.
- Floyd, K., Hess, J. A., Miczo, L. A., Halone, K. K., Mikkelson, A. C., & Tusing, K. J. (2005). Human affection exchange: VIII. Further evidence of the benefits of expressed affection. *Communication Quarterly, 53*(3), 285-303.
- Floyd, K., Hesse, C., & Haynes, M. T. (2007). Human affection exchange: XV. Metabolic and cardiovascular correlates of trait expressed affection. *Communication Quarterly, 55*(1), 79-94.
- Floyd, K., Pauley, P. M., & Hesse, C. (2010). State and Trait Affectionate Communication Buffer Adults' Stress Reactions. *Communication Monographs, 77*(4), 618-636.
- Floyd, K., & Riforgiate, S. (2008). Affectionate communication received from spouses predicts stress hormone levels in healthy adults. *Communication Monographs, 75*(4), 351-368.
- Gable, S. L., Reis, H. T., & Downey, G. (2003). He Said, She Said A Quasi-Signal Detection Analysis of Daily Interactions Between Close Relationship Partners. *Psychological Science, 14*(2), 100-105.

- Gallo, L. C., Troxel, W. M., Kuller, L. H., Sutton-Tyrrell, K., Edmundowicz, D., & Matthews, K. A. (2003). Marital status, marital quality, and atherosclerotic burden in postmenopausal women. *Psychosomatic medicine*, 65(6), 952-962.
- Girdler, S. S., Pedersen, C. A., Stern, R. A., & Light, K. C. (1993). Menstrual cycle and premenstrual syndrome: Modifiers of cardiovascular reactivity in women. *Health Psychology*, 12(3), 180.
- Gottman, J. M., & Notarius, C. I. (2002). Marital research in the 20th century and a research agenda for the 21st century. *Family Process*, 41(2), 159-197.
- Gove, W. R., Hughes, M., & Style, C. B. (1983). Does marriage have positive effects on the psychological well-being of the individual? *Journal of Health and Social Behavior*, 122-131.
- Grewen, K. M., Anderson, B. J., Girdler, S. S., & Light, K. C. (2003). Warm partner contact is related to lower cardiovascular reactivity. *Behavioral Medicine*, 29(3), 123-130.
- Grewen, K. M., Girdler, S. S., Amico, J., & Light, K. C. (2005). Effects of partner support on resting oxytocin, cortisol, norepinephrine, and blood pressure before and after warm partner contact. *Psychosomatic medicine*, 67(4), 531-538.
- Gulledge, A. K., Gulledge, M. H., & Stahmann, R. F. (2003). Romantic physical affection types and relationship satisfaction. *The American Journal of Family Therapy*, 31(4), 233-242.
- Hanzal, A., Segrin, C., & Dorros, S. M. (2008). The Role of Marital Status and Age on Men's and Women's Reactions to Touch from a Relational Partner. *Journal of Nonverbal Behavior*, 32(1), 21-35.
- Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological psychiatry*, 54(12), 1389-1398.
- Hertenstein, M. J., Keltner, D., App, B., Buleit, B. A., & Jaskolka, A. R. (2006). Touch communicates distinct emotions. *Emotion*, 6(3), 528.
- Holt-Lunstad, J., Birmingham, W., & Jones, B. Q. (2008). Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. *Annals of Behavioral Medicine*, 35(2), 239-244.



- Holt-Lunstad, J., Uchino, B. N., Smith, T. W., Olson-Cerny, C., & Nealey-Moore, J. B. (2003). Social relationships and ambulatory blood pressure: Structural and qualitative predictors of cardiovascular function during everyday social interactions. *Health Psychology, 22*(4), 388.
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241*(4865), 540-545.
- Huston, T. L., Caughlin, J. P., Houts, R. M., Smith, S. E., & George, L. J. (2001). The connubial crucible: Newlywed years as predictors of marital delight, distress, and divorce. *Journal of Personality and Social Psychology, 80*(2), 237.
- Johnson, N. J., Backlund, E., Sorlie, P. D., & Loveless, C. A. (2000). Marital Status and Mortality: The National Longitudinal Mortality Study. *Annals of epidemiology, 10*(4), 224-238.
- Kenny, D. A., Kashy, D. A., & Bolger, N. (1998). Data analysis in social psychology. *The handbook of social psychology, 1*, 233-265.
- Kiecolt-Glaser, J. K., Malarkey, W. B., Chee, M. A., Newton, T., Cacioppo, J. T., Mao, H. Y., et al. (1993). Negative behavior during marital conflict is associated with immunological down-regulation. *Psychosomatic medicine, 55*(5), 395-409.
- Kiecolt-Glaser, J. K., & Newton, T. L. (2001). Marriage and health: his and hers. *Psychological bulletin, 127*(4), 472.
- Light, K. C., Grewen, K. M., & Amico, J. A. (2005). More frequent partner hugs and higher oxytocin levels are linked to lower blood pressure and heart rate in premenopausal women. *Biological Psychology, 69*(1), 5-21.
- Mackey, R. A., Diemer, M. A., & O'Brien, B. A. (2000). Psychological intimacy in the lasting relationships of heterosexual and same-gender couples. *Sex Roles, 43*(3), 201-227.
- MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual review of psychology, 58*, 593.
- Matthews, K. A., & Gump, B. B. (2002). Chronic work stress and marital dissolution increase risk of posttrial mortality in men from the Multiple Risk Factor Intervention Trial. *Archives of Internal Medicine, 162*(3), 309.

- Muthen, B. O. (2011). Analysis of longitudinal data using latent variable models with varying parameters.
- Neff, L. A., & Karney, B. R. (2004). How does context affect intimate relationships? Linking external stress and cognitive processes within marriage. *Personality and Social Psychology Bulletin*, 30(2), 134-148.
- Orth-Gomer, K., Wamala, S. P., Horsten, M., Schenck-Gustafsson, K., Schneiderman, N., & Mittleman, M. A. (2000). Marital stress worsens prognosis in women with coronary heart disease. *JAMA: the journal of the American Medical Association*, 284(23), 3008-3014.
- Ossewaarde, L., Hermans, E. J., van Wingen, G. A., Kooijman, S. C., Johansson, I. M., Backstram, T., et al. (2010). Neural mechanisms underlying changes in stress-sensitivity across the menstrual cycle. *Psychoneuroendocrinology*, 35(1), 47-55.
- Paternoster, R., Brame, R., Mazerolle, P., & Piquero, A. (1998). Using the correct statistical test for the equality of regression coefficients. *Criminology*, 36(4), 859-866.
- Peeters, G., & Czapinski, J. (1990). Positive-negative asymmetry in evaluations: The distinction between affective and informational negativity effects. *European review of social psychology*, 1(1), 33-60.
- Repetti, R. L. (1989). Effects of daily workload on subsequent behavior during marital interaction: The roles of social withdrawal and spouse support. *Journal of Personality and Social Psychology*, 57(4), 651.
- Robins, L. N., & Regier, D. A. (1991). *Psychiatric disorders in America: the epidemiologic catchment area study*: Free Press.
- Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: pathways to health. *Physiology & behavior*, 79(3), 409-416.
- Saxbe, D., & Repetti, R. L. (2010). For better or worse? Coregulation of couples' cortisol levels and mood states. *Journal of Personality and Social Psychology*, 98(1), 92.
- Sbarra, D. A., & Hazan, C. (2008). Coregulation, dysregulation, self-regulation: An integrative analysis and empirical agenda for understanding adult attachment, separation, loss, and recovery. *Personality and Social Psychology Review*, 12(2), 141-167.

- Seeman, T. E., Berkman, L. F., Blazer, D., & Rowe, J. W. (1994). Social ties and support and neuroendocrine function: The MacArthur studies of successful aging. *Annals of Behavioral Medicine*.
- Smith, T. W., Glazer, K., Ruiz, J. M., & Gallo, L. C. (2004). Hostility, anger, aggressiveness, and coronary heart disease: An interpersonal perspective on personality, emotion, and health. *Journal of personality*, 72(6), 1217-1270.
- Suls, J., & Bunde, J. (2005). Anger, anxiety, and depression as risk factors for cardiovascular disease: the problems and implications of overlapping affective dispositions. *Psychological bulletin*, 131(2), 260.
- Troxel, W. M., Matthews, K. A., Gallo, L. C., & Kuller, L. H. (2005). Marital quality and occurrence of the metabolic syndrome in women. *Archives of Internal Medicine*, 165(9), 1022.
- Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychological bulletin*, 119(3), 488.
- Umberson, D., Williams, K., Powers, D. A., Liu, H., & Needham, B. (2006). You make me sick: Marital quality and health over the life course. *Journal of Health and Social Behavior*, 47(1), 1-16.
- van Anders, S. M., Hamilton, L. D., Schmidt, N., & Watson, N. V. (2007). Associations between testosterone secretion and sexual activity in women. *Hormones and Behavior*, 51(4), 477-482.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063.
- Whisman, M. A. (2001). The association between depression and marital dissatisfaction. In S. R. H. Beach (Ed.), *Marital and family processes in depression: A scientific foundation for clinical practice*. (pp. 3-24). Washington, DC: US: American Psychological Association.
- Whisman, M. A., & Uebelacker, L. A. (2006). Impairment and distress associated with relationship discord in a national sample of married or cohabiting adults. *Journal of Family Psychology*, 20(3), 369.
- Williams, A. M. (1979). The quantity and quality of marital interaction related to marital satisfaction: A behavioral analysis. *Journal of Applied Behavior Analysis*, 12(4), 665.

Wood, W., Rhodes, N., & Whelan, M. (1989). Sex differences in positive well-being: A consideration of emotional style and marital status. *Psychological Bulletin; Psychological Bulletin*, 106(2), 249.

APPENDIX A  
CORRELATIONS AMONG INTERACTIONS, AFFECT, AND SOMATIC  
SYMPTOMS

Table 1.1

*Pearson Correlations for, Quality of Spousal Interactions,  
Positive and Negative Affect, and Intensity of Somatic  
Symptoms for Husbands*

Variable	1	2	3	4	5	6
1. Conversation with	–					
2. PA with spouse <sup>a</sup>	.55	–				
3. Sex with spouse <sup>a</sup>	.24	.40	–			
4. Daily positive affect <sup>b</sup>	.16	.21	.04	–		
5. Daily negative affect <sup>b</sup>	.01	.00	-.05	-.08	–	
6. Symptoms <sup>a</sup>	-.07	-.03	-.01	.02	.22	–

Table 1.2

*Pearson Correlations for Quality of Spousal Interactions,  
Positive and Negative Affect, and Intensity of Somatic  
Symptoms for Wives*

Variable	1	2	3	4	5	6
1. Conversation with	–					
2. PA with spouse <sup>a</sup>	.57	–				
3. Sex with spouse <sup>a</sup>	.24	.37	–			
4. Daily positive affect <sup>b</sup>	.28	.22	.07	–		
5. Daily negative affect <sup>b</sup>	-.04	-.07	-.07	-	–	
6. Symptoms <sup>a</sup>	.05	.00	.01	-	.23	–

*Note.* N=XX. PA=physical affection.

<sup>a</sup>Values could range from 0 to 5.00. <sup>b</sup>Values could range from 1.00 to 5.00.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

## APPENDIX B

### RELATIONS BETWEEN INTERACTIONS AND AFFECT

Table 2.

*Relations between Quality of Spousal Interactions and Positive and Negative Affect: Non-Mediated Models for Husbands and Wives*

Model parameter	Label <sup>a</sup>	Non-Mediated	
		Coefficients	<i>ps</i>
<i>HUSBANDS:</i>			
Conversation → Positive affect	b1	.119	>.05
Physical affection → Positive affect	b1	.137	>.001
Sexual activity → Positive affect	b1	.036	ns
Conversation → Negative affect	b2	.002	ns
Physical affection → Negative affect	b2	.000	ns
Sexual activity → Negative affect	b2	-.022	ns
<i>WIVES:</i>			
Conversation → Positive affect	b1	.202	>.001
Physical affection → Positive affect	b1	.138	>.001
Sexual activity → Positive affect	b1	.061	>.061
Conversation → Negative affect	b2	-.015	ns
Physical affection → Negative affect	b2	-.033	ns
Sexual activity → Negative affect	b2	-.034	>.01

*Note.* Six total separate models were run (three for husbands and three for wives).

<sup>a</sup> Refers to path labels in Figure 3.1 through Figure 5.2.



## APPENDIX C

### RELATIONS BETWEEN AFFECT AND SOMATIC SYMPTOMS

Table 3.

*Relations between Positive and Negative Affect and Next-Day Intensity of*

*Somatic Symptoms: Non-Mediated Models for Husbands and Wives*

Model parameter	Label <sup>a</sup>	Non-Mediated	
		Average Coefficients	<i>ps</i>
<i>HUSBANDS:</i>			
Positive affect → Somatic symptoms	c1	.023	ns
Negative affect → Somatic symptoms	c2	.224	>.001
<i>WIVES:</i>			
Positive affect → Somatic symptoms	c1	.004	ns
Negative affect → Somatic symptoms	c2	.244	>.001

*Note.* Six total separate models were run (three for husbands and three for wives).

<sup>a</sup> Refers to path labels in Figure 3.1 through Figure 5.2.

APPENDIX D

RELATIONS BETWEEN INTERACTIONS, AFFECT, AND SOMATIC  
SYMPTOMS

Table 4.

*Relations between Quality of Spousal Interactions and Next-Day Intensity of Somatic Symptoms: Direct Paths in Mediated Models for Husbands and Wives*

Model parameter	Label <sup>a</sup>	Mediated with Positive Affect		Mediated with Negative Affect	
		Coefficients	<i>ps</i>	Coefficients	<i>ps</i>
<i>HUSBANDS:</i>					
Conversation → symptoms	d1	.003	ns	.001	ns
Physical affection → symptoms	d1	.003	ns	.000	ns
Sexual activity → symptoms	d1	.001	ns	-.005	ns
<i>WIVES:</i>					
Conversation → symptoms	d2	-.001	ns	-.004	ns
Physical affection → symptoms	d2	.001	ns	-.006	ns
Sexual activity → symptoms	d2	.000	ns	-.008	>.05

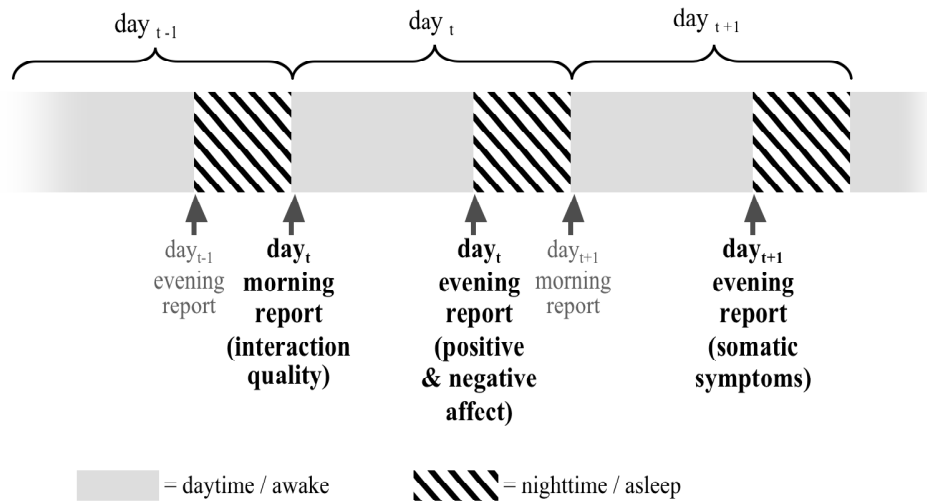
*Note.* Six total separate models were run (three for husbands and three for wives).

<sup>a</sup> Refers to path labels in Figure 3.1 through Figure 5.2.

APPENDIX E

DIAGRAM OF DAILY DATA TIMING

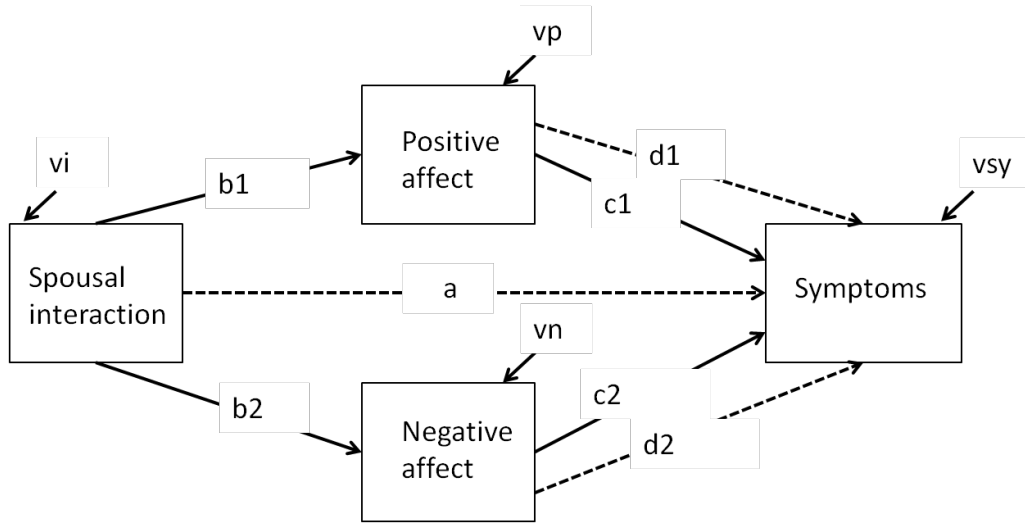
Figure 1.



APPENDIX F

HYPOTHESIZED MODEL AMONG ALL VARIABLES

Figure 2.





APPENDIX G

MODELS PREDICTED BY CONVERSATION

Figure 3.1

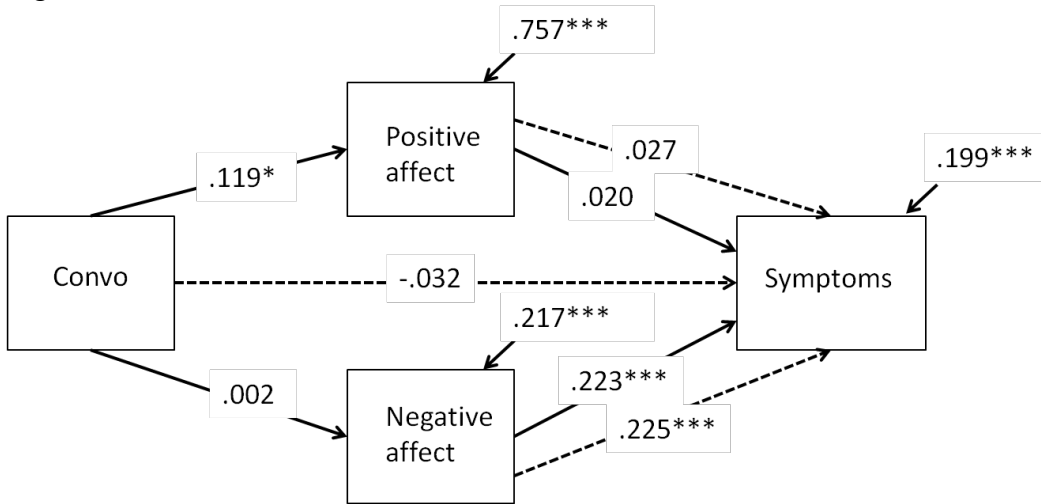
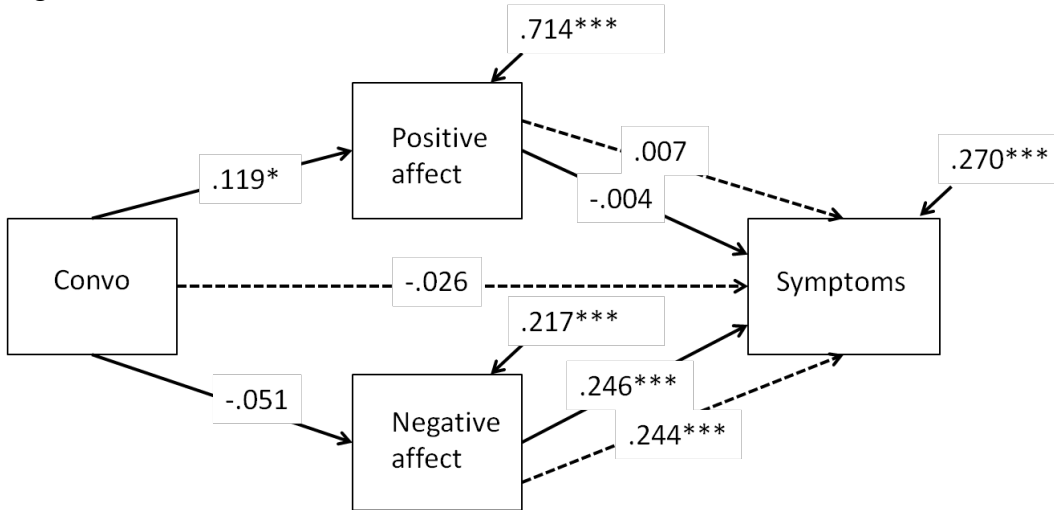


Figure 3.2



## APPENDIX H

### MODELS PREDICTED BY PHYSICAL AFFECTION

Figure 4.1

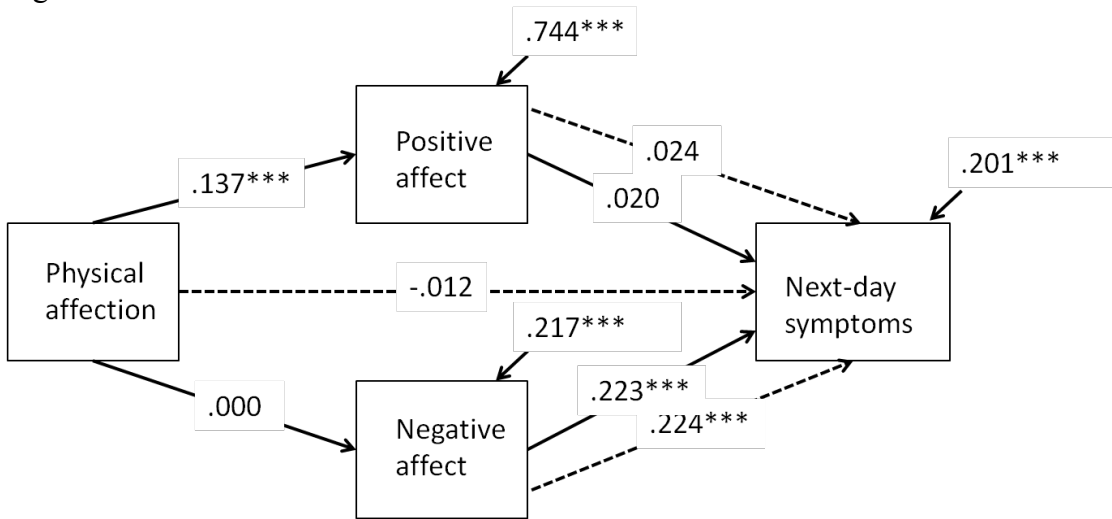
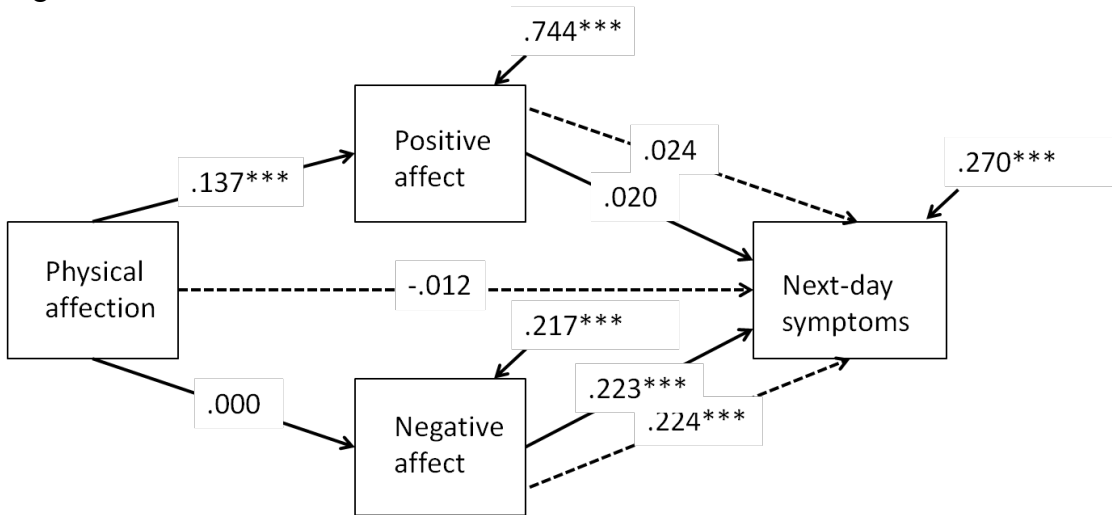


Figure 4.2



APPENDIX I

MODELS PREDICTED BY SEXUAL INTIMACY

Figure 5.1

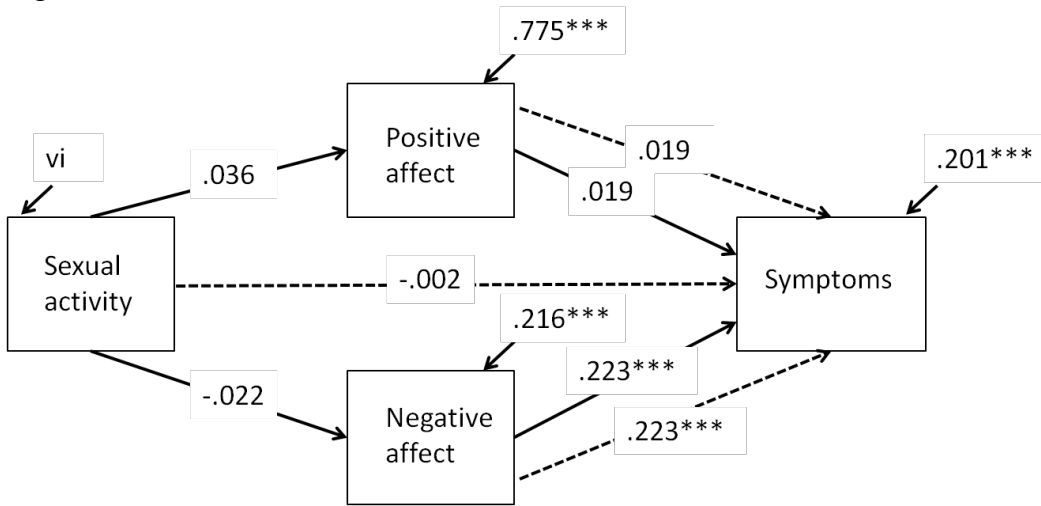


Figure 5.2

