PREDICTING SATISFACTION WITH SPOUSE RESPONSES AMONG PATIENTS WITH RHEUMATOID ARTHRITIS

by

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Abstract

Despite an abundance of research demonstrating the importance of social support for health outcomes, much less is known about what causes a person to feel supported. Past research has focused on between-person analyses, meaning that the degree of within-person variance and the within-person covariates of satisfaction with support are largely unknown. The current study used a daily diary methodology to investigate both within- and between-person factors related to satisfaction with spouse responses. The sample was comprised of 69 married individuals with rheumatoid arthritis. Participants completed an initial background interview, followed by twice-daily telephone interviews for one week. The first research question addressed whether variance in satisfaction with responses was within- or between-person. Results showed that a significant portion of the variance was within-person in the morning (45%) and the evening (40%) interviews. The second question addressed whether within- and between-person variance in satisfaction with responses could be explained by illness-related variables (e.g., pain severity), personality, mood, and types of support provided by the spouse. Multilevel analysis revealed that esteem support was positively associated, and negative spouse responses were negatively associated, with both within- and between-person variance in satisfaction with responses. These effects were present in both concurrent and lagged analyses. Positive affect and pain had only concurrent associations with satisfaction with spouse responses. At the between-person level, age was positively associated, and marital dissatisfaction and fatigue were negatively associated with average levels of satisfaction with spouse responses. The third research question investigated factors related to the variance of a participant’s satisfaction with spouse responses over the course of the week (i.e., their lability in satisfaction with responses). Marital dissatisfaction and
negative spouse responses were related to greater lability over the course of the week, whereas positive affect and positive spouse responses were associated with lower lability. Overall, the current study found a significant portion of explainable variance in satisfaction with spouse responses, both within- and between-participants. Future research should investigate cross-level interactions, as well as factors associated with satisfaction with support outside the marital relationship and among other populations.
Preface

The data used in this thesis was collected by Drs. Susan Holtzman and Anita DeLongis at the Centre for Health and Coping Studies at the University of British Columbia (Vancouver campus). The current author, R. Thomas Beggs, was responsible for screening the dataset for the current study, compiling variables, and combining datasets for analysis. The current author was also responsible for data analysis, interpretation, and authorship of this manuscript. Dr. Susan Holtzman oversaw all aspects of the project. The data collection was approved by UBC’s BREB, approval number B04-0086 (PI: A. DeLongis; CO-I: S. Holtzman) “UBC Rheumatoid Arthritis Project: Coping with Chronic Illness Among Couples”
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Dedication

To Linden, my primary support giver: I’d be half the man without you.
1 Chapter: Introduction
1.1 Social support and health

The impact of social support on emotional and physical health outcomes has been well established in the scientific literature. For example, high levels of social support have been reliably associated with lower rates of mood and anxiety disorders, more rapid recovery from physical illness, and overall lower rates of morbidity and mortality (Sarason & Sarason, 2009). Perhaps most tellingly, a seminal review by House, Landis, and Umberson (1988) argued that a lack of social support was as deleterious to health as major risk factors such as smoking. This suggestion has been quantified in a recent meta-analysis: the all-cause mortality rates related to a lack of social support rival or exceed those of smoking, obesity, lack of exercise, and excessive alcohol intake (Holt-Lunstad, Smith, & Layton, 2010). Specifically, the results showed that across an average study duration of seven and a half years, those with adequate social relationships had a 50% greater chance of survival when compared to those with lacking social relationships.

Given this vast and consistent body of literature, it is no longer a question of if there is a relationship between social support and health, but how support influences health (Braveman, Egerter, & Williams, 2011). An understanding of the key aspects of social relationships and how they impact health is essential for developing effective interventions to enhance the benefits of social relationships (Braveman et al., 2011; Holt-Lunstad et al., 2010). However, despite the proven health benefits of social relationships and calls in the literature for targeting social support in psychosocial interventions, surprisingly little research has explored the antecedents of social support (Kitamura et al., 2002; Knoll, Rieckmann, & Kienle, 2007). In other words, the question remains as to what exactly contributes to our perceptions of support.
In an attempt to address this key question, the current study was designed to investigate determinants of day-to-day satisfaction with responses in a sample of individuals living with chronic pain. Although social support has been conceptualized in a variety of ways over the years, satisfaction with spouse responses was chosen as the outcome variable of interest for two main reasons. First, perceived satisfaction with support highlights the evaluative component of social support, and it has been most strongly associated with health outcomes in past research (Haber, Cohen, Lucas, & Baltes, 2007; Uchino, 2004). For example, in the context of rheumatoid arthritis (RA), perceived satisfaction with support has consistently been found to be associated with lower pain, and better mood, and less functional disability (Brown & Wallston, 1989). Second, for most adults, the majority of social support is provided within the context of a few close relationships, and research has shown that if these close relationships are lacking, social support from other sources cannot make up for the disparity (Sarason & Sarason, 2009). As such, there have been a number of calls in the literature to focus on close, supportive relationships, rather than broad-level social support, when trying to understand health outcomes. The current study employed a daily diary methodology to examine sources of variability in satisfaction with spouse responses.

Multilevel statistical modeling was used to allow for a simultaneous examination of within- and between-person factors that may contribute to a person feeling more satisfied with the support that has been provided to them. This approach allowed for an investigation of fluctuating within-person factors, such as mood and pain, and more stable between-person factors such as personality and marital dissatisfaction. If satisfaction with spouse support does indeed fluctuate in response to modifiable conditions, such as the number of negative spouse support behaviours, then it may be amenable to intervention. Knowledge allowing for
this type of intervention would be a boon for patients, their families, and the scientific community.

1.2 The evolution of social support

Ever since the work of Darwin, the importance of social networks to basic human survival has been acknowledged (Sarason & Sarason, 2009). However, to be able to understand the various recent conceptualizations of social support, a brief, focused historical review is required.

Among the early influential ideas was the notion that social support was simply the presence or absence of human contact. An example of this thinking is evident in an early and popular review by Cassel (1976), who suggested that the size of one’s social network was the aspect of social support that was most predictive of health outcomes. Although social support researchers recognized that there could be both positive and negative dimensions of social relationships, the quality of one’s support network was not the main focus of study at the time (Cassel, 1976). Perhaps in foresight of the complicated web of social support research that was to follow, Cassel warned that stress and social factors would likely not have a direct, predictable effect on health, but instead act on the body, and disease, in complex ways. As such, the social environment would not be related to specific “stress diseases,” but instead be implicated in the course of all disease.

In the same year that Cassel argued for the importance of social network size in health outcomes, Cobb (1976) presented his own conceptualization of social support. He defined social support as “information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations” (Cobb, 1976, p. 300). Cobb’s definition was unique in that it highlighted the importance of an individual’s beliefs about their social support network. In particular, he emphasized that believing one is cared
for and loved are important aspects of close, intimate relationships. In addition to introducing the idea that beliefs and perceptions were important aspects of social support, Cobb argued that these perceptions could be modified by supportive exchanges. Despite acknowledging some findings to the contrary, Cobb felt that the preponderance of evidence was sufficient at that time to declare that “we should start now to teach all our patients, both well and sick, how to give and receive social support” (Cobb, 1976, p. 300).

Research into social support subsequently proliferated. As knowledge increased, social scientists began to distinguish between two key conceptualizations of support: received and perceived support. The term “received support” refers to the type and/or amount of support actually provided to an individual during a specific timeframe. In contrast, “perceived support” refers to the perceived ability to access support should a person need it, or a global assessment of satisfaction with the support that has been provided. As such, perceived support emphasizes the evaluative component of social support that was introduced by Cobb (1976). However, in 1984, the presumption of a strong, direct link between the support a person receives and the support a person perceives was challenged. In that year, Sandler and Barrera conducted a study to determine whether social support would buffer the effects of stress on the psychological symptoms of college students. The authors included both measures of received support and perceived satisfaction with support—and found almost no correlation between the two (r = .01, p = .94; Sandler & Barrera, 1984). Furthermore, only perceived satisfaction with support was related to the outcome variables of interest in the study (which were anxiety and depression). This surprising and counter-intuitive outcome undermined the notion that the support a person perceives is directly linked to the support one receives.
Since Sandler and Barrera’s study was first published almost 30 years ago, the majority of subsequent studies have also found a relatively small correlation between received support and perceived support. In fact, according to a recent meta-analysis of 23 studies, the correlation between received and perceived support appears to be only \( r = .32 \) (95% C.I.: .30 - .34; Haber et al., 2007). Although this represents a statistically significant correlation, it shows that received support explains a mere 10-15% of the variance in perceived support, indicating that other factors must play a significant role in determining whether an individual feels supported by their social network.

The disconnect between perceived and received support poses a significant problem for both research and intervention efforts. If perceived support is associated with positive health outcomes, but it is not strongly related to the actual support a person receives, then what is it related to? From that question came a shift in the mindset of social support researchers. Researchers moved away from the support actually provided to a person and instead focused on stable personal variables as the proposed antecedents of perceived social support. Whereas perceived social support was initially viewed primarily as a product of the environment, it soon became viewed as a product of the person (e.g., Sarason & Sarason, 1986). On the basis of this frame of reference, some researchers have hypothesized that perceived social support, while an important aspect of people’s lives and health, is not particularly amenable to intervention. In line with this approach, perceived social support has been viewed as akin to a stable personality construct, or a redundant correlate of overall relationship satisfaction (Kaul & Lakey, 2003; Sarason & Sarason, 2009).

1.3 The stability of social support

There has been some empirical support for the idea that perceived support is a stable, between-person trait. For example, several studies have noted that levels of perceived support
remain relatively consistent despite changes to the network of the support recipient (Sarason & Sarason, 1986).

Furthermore, studies have demonstrated that social support has buffering effects against the development of chronic diseases. It stands to reason that were social support not relatively stable, it could not have an effect on diseases that develop over long periods of time, such as coronary heart disease (Uchino, 2009). Some research has also supported the notion that individual differences in personality shape both how social support is elicited and perceived (Maisel, Rauer, Marshall, & Karney, 2010).

Despite theoretical and empirical literature suggesting that perceived social support may be a stable trait, the test-retest reliability of measures of perceived satisfaction with support are typically in the moderate range, and decrease as the time between measurements increases (Coventry, Gillespie, Heath, & Martin, 2004; Kendler, 1997; Knoll et al., 2007; Sandler & Barrera, 1984; Sarason & Sarason, 1986). This suggests that although satisfaction with support shows stability, it also varies within individuals over time.

Evidence from twin studies provides further support for this notion. In one such study on identical twins, genetic components played a significant role in predicting variance in perceived support from a person’s relatives (49%; Kendler et al., 1997). However, despite this heritable portion of the construct, significant variance was also attributable to shared environmental factors (20%; e.g., a characteristic of a parent with whom both twins have contact) and individual-specific factors (30%; e.g., a peer group that one twin is exposed to, but not the other). Another study using longitudinal methods estimated the environmental variability of perceived social support at between 59 and 78%, depending on time of measurement (Bergeman & Neiderhiser, 2001). This study found that not only was there
significant environmental variance contributing to differences in perceived social support, but that those environmental influences changed for the individual considerably over time as well (Bergeman & Neiderhiser, 2001). In addition, recent studies using animal models have shown that neurological changes in response to social support occur throughout development and into early adulthood (Curley, Jensen, Mashoodh, & Champagne, 2011).

In summary, although there is a degree of stability in perceived social support, there is also substantial evidence of significant fluctuation over time. This time-variant fluctuation in perceived social support, if it can be understood, is a potential avenue for increasing support in order to similarly affect health outcomes.

1.4 Methodological limitations in the social support literature

The vast majority of studies to date on the relationship between perceived support and its correlates have been cross-sectional. This has been due, in part, to the prevailing conceptualization of perceived social support as a stable trait, and has hindered our understanding of the fluctuating nature of perceptions of support (Kafetsios & Nezlek, 2012; Uchino, Bowen, Carlisle, & Birmingham, 2012). Cross-sectional methods are useful for gaining an initial understanding of the relationships between variables early in research programs. However, there is an underlying assumption in the continued use of cross-sectional methods that a single time of measurement is sufficient to capture the relationship between social support and its covariates. Another related assumption is that the subject will react in a similar way not only across time points, but also across situations (Uchino et al., 2012). This perspective is an expected consequence of the popular belief that perceived social support is a stable trait, but it does not sufficiently acknowledge the multitude of factors related to social support (Kafetsios & Nezlek, 2012).
In fact, the heavy reliance on cross-sectional research designs has been criticized as one of the reasons for slow progress and misconceptions in the social support literature (Hobfoll, 2009). Social relationships are dynamic and unfold over time, and methods of measurement must be capable of taking these complexities into account. In a work largely devoted to refocusing the attempts of researchers to link psychological aspects of social support to physiological outcomes, Uchino and colleagues (2009) suggested that within-person designs, and daily diary methods in particular, could help further our understanding of social support and related variables. Using such a within-person design can lead to discoveries that would not have been possible with a cross-sectional design. This is because within-person variance is statistically independent of between-person variance (Nezlek, 2003).

In general, recent research has not conceptualized social support as an outcome variable, or investigated it as such (Kafetsios & Nezlek, 2012; Knoll et al., 2007). However, if significant within-person variability exists, it lends strength to a conceptual view of perceived social support as a changing variable that is potentially amenable to intervention.

1.5 Context: Chronic pain and rheumatoid arthritis

One specific chronic pain condition that has received attention in terms of social support is rheumatoid arthritis (RA). This disease affects up to one percent of the North American population, and most people are diagnosed between the ages of 40 and 50 (Alamanos & Drosos, 2005). Rheumatoid arthritis is characterized by frequent fluctuations in joint swelling and stiffness, fatigue, and pain. The costs of arthritis, both economic and personal, are staggering. Twelve and a half billion dollars are spent annually in the United States on medical treatments for arthritis alone (Cantor, 2002). An additional economic burden of 22.8
billion dollars a year is estimated from the loss of productive work time (Ricci et al., 2005). The personal toll of the disease is no less important. The average lifespan of a patient diagnosed with RA is 3-10 years less than those without a diagnosis (Alamanos & Drosos, 2005). At the psychosocial level, the main symptoms of RA are invisible, which can lead to the patient feeling rejected, unsupported, or disbelieved by those in the social environment (Kool et al., 2010).

Research has supported the importance of social support in disease progression in RA. While biological and medical factors are the antecedents of most chronic pain conditions, often the course of the disease is affected and extended by psychosocial factors (Turk & Melzack, 2011). For example, in one study, perceived availability of emotional and instrumental social support at baseline were predictive of RA pain and functional disability at three and five year follow-up (Evers, Kraaimaat, Geene, Jacobs, & Bijlsma, 2003). Others have found that a lack of social support is linked to greater interference with daily life and greater pain in RA after one year (Smith, Wallston, & Dwyer, 1995; Waltz, Kriegel & van’t Pad Bosch, 1998).

There is also evidence of the importance of within-person factors in RA patients. An example can be seen in the work of Conner et al. (2006), who studied disease and emotional vulnerabilities in RA patients who were formerly depressed. Using between-persons analysis, there were no differences between the formerly depressed and the never depressed in the amount of pain experienced or their daily mood. However, when the authors looked within-person, it became clear that the formerly depressed RA patients had significantly stronger associations between their pain and their daily emotions than those without a history of depression (Conner et al., 2006).
Studies using daily diary methods have also found that relationship factors fluctuate significantly within people in a RA sample. In one such study, relationship enjoyment varied more within people day-to-day (57%) than between people overall (43%; Davis, Affleck, & Zautra, 2006). The same study found a similar pattern for relationship stress: 72% of the variance occurred within people, compared to only 28% between. As such, a better understanding of both social support and within-person factors in RA patients can be used to help mitigate disease progression and symptoms.

1.6 The correlates and antecedents of satisfaction with responses

The following sections present a synthesis of the research conducted to date on the factors associated with higher or lower levels of perceived social support. This is divided into two broad sections: those hypothesized to be more invariant over time (i.e., between-person factors), and those correlates generally hypothesized to vary with time (i.e., within-person factors). Where possible, special attention has been given to findings in chronic pain populations.

1.6.1 Time-invariant correlates of satisfaction with responses

The following section addresses those correlates and antecedents that have generally been shown to be more stable over time and across situations.

1.6.1.1 Personality

Personality factors were among the first variables to be explored as antecedents of satisfaction with support (e.g., Lakey, McCabe, Fisicaro, & Drew, 1996), and have been linked to satisfaction with support among individuals with early onset RA (Suurmeijer et al., 2005). In the broader social support literature, two personality variables have been linked to social support most consistently: extraversion and neuroticism (Cutrona et al., 1997).
1.6.1.1 Extraversion
Extraversion is a personality trait that reflects differences in how people engage with the social environment (Costa & McCrae, 1992). Generally, those higher in extraversion tend to be more gregarious, whereas those low in extraversion have lower levels of energy and tend to be more socially withdrawn. Research has suggested that extraversion is related to social support in a number of ways, including increasing the tendency to both provide and receive social support (Cutrona et al., 1997).

For instance, in cross-sectional studies of university students, ratings of perceived availability of support have been found to be significantly correlated with extraversion (Swickert, Hittner, & Foster, 2010; Swickert, Rosentreter, Hittner, & Mushrush, 2002). The effect for extraversion appeared to be particularly strong for ratings of perceived belonging, or the participant’s belief that they had someone to do activities with. Findings have also indicated that extraversion is positively associated with various forms of received social support (e.g., advice or information, comfort, positive social experiences, material support), as well as size of one’s social support network and frequency of social contact (Swickert et al., 2002). Similarly, among women, high levels of extraversion have been linked to perceived availability of social support (Kitamura et al., 2002). However, there have been studies that have failed to find an association, as well (e.g., Rascle, Bruchon-Schweitzer, & Sarason, 2005), and no study to-date has looked at the association between perceived social support and extraversion in a chronic pain sample.

1.6.1.2 Neuroticism
Neuroticism is a construct that relates to a person’s emotional stability (Costa & McCrae, 1992). Those who score higher on measures of neuroticism tend to have higher levels of negative affect (i.e., depression, anxiety, irritability), whereas those lower in neuroticism tend
to be more calm and emotionally stable. Researchers have often found a link between higher neuroticism and less perceived social support. For example, in a sample of married couples, higher neuroticism among support recipients predicted lower ratings of spouse supportiveness, over and above the number of supportive and negative behaviours actually received (Cutrona, Hessling, & Suhr, 1997). Neuroticism has also been found to be correlated with lower levels of available support in healthy Japanese women (Kitamura et al., 2002). Similarly, wives’ increased emotional stability was related to greater satisfaction with support from husbands (Dehle & Landers, 2005).

### 1.6.1.2 Marital dissatisfaction

Despite the fact that social support is at times conceptualized as an overall index of number of available support providers, most support is actually received within the context of a few close relationships (Sarason & Sarason, 1986). Research has shown that the quality of these close relationships is also important; it is not enough to simply be married, one has to be satisfied in the relationship as well (Coyne & DeLongis, 1986). Relationship satisfaction has been correlated with perceived beneficial support, and negatively correlated with perceived problematic support, in married and cohabitating RA patients (Lehman et al., 2011).

Interestingly, some authors have found that relationship satisfaction itself accounts for more variance in perceived support than does received support (Kaul & Lakey, 2003).

### 1.6.2 Time-variant predictors of social support

At the within-person, time-variant level, a number of factors have been identified which may be associated with satisfaction with responses.

#### 1.6.2.1 Positive support interactions

Although satisfaction with social support has generally been conceptualized as a stable trait in recent years, if satisfaction with responses is to be the target of psychosocial intervention,
it is important to identify specific helpful types of support. Indeed, previous correlational research has supported that these interactions have a small but significant effect at the between-person level (see Haber et al., 2007 for a review). Other work using a sample of married couples, showed that the number of support behaviours provided was predictive of perceptions of spouse support in a sample of married couples (Cutrona, Hessling, & Suhr, 1997; Cutrona & Suhr, 1992). There is also a significant link between provided social support as reported by the spouse and perceived social support at the latent level (Vinokur, Schul, & Caplan, 1987).

However, specific types of support have yet to be investigated as possible predictors of satisfaction with responses in a within-person design. Past research has identified several prominent types of received support: emotional, informational, and instrumental (Barrera, 1986; Cohen & Wills, 1985; Langford, Bowsher, Maloney, & Lillis, 1997). Emotional support is characterized by the provision of love, nurturance, and encouragement. Informational support refers to the provision of information, advice, and help via problem-solving. Instrumental support is the provision of concrete, observable support (e.g., looking after household chores, making meals, or providing a ride).

1.6.2.2 Negative support interactions

Beyond simply considering a relationship to be either positive or negative for health outcomes, researchers must consider the fact that the same relationship can be a source of both positive and negative interactions (Beach, Martin, Blum, & Roman, 1993; Uchino, Holt-Lunstad, Uno, & Flinders, 2001). Furthermore, these two types of interactions appear to operate independently. For example, recent studies have found no significant association
between beneficial support and problematic support provided by the spouse in the context of individuals coping with RA (Lehman et al., 2011).

Among chronic pain populations, negative support interactions (such as criticism or complaining about the patient) can have a potent impact on the quality of social relationships and wellbeing. Research has shown that negative support interactions with a spouse or loved-one have powerful effects on patient mood, coping style, and disease outcome (Griffin, Friend, Kaell, & Bennett, 2001; Hughes, Andel, Small, Borenstein, & Mortimer, 2008; Ingram, Jones, Fass, Neidig, & Song, 1999; Lal & Bartle-Haring, 2011). In fact, because positive interactions are typically the norm in close relationships, negative interactions can actually have a larger effect when they do occur (Abbey, Abramis, & Caplan, 1985; Rook, 1987). For example, a study on chronic pain patients found an inverse association between negative spouse responses and satisfaction with support (Cano, 2004). In HIV patients, a negative correlation was found between perceived blaming (criticism, fault-finding, and disapproval) and satisfaction with support (Ingram et al., 1999). These results are similar to the experimental findings of Cutrona et al. (1997), who reported that in interpersonal interactions between healthy married couples, more negative support from the spouse was related to less satisfaction with support.

1.6.2.3 Positive and negative affect

Positive affect refers to a wide range of positive feelings and emotions, including enthusiasm, pride, and excitement (Watson, Clark, & Tellegen, 1988). Conversely, negative affect refers to negative feelings and emotions such as guilt, fear, and irritability. Cross-sectional and longitudinal research has demonstrated that both positive and negative affect play a role in determining an individual’s level of satisfaction with support (Beach et al., 1993). Research
has shown that when people are in more positive, happy moods, their evaluations of social interactions are also more positive (Forgas, Bower, & Krantz, 1984). Those who are happy also tend to approach more rewarding social activities (Lyubomirsky, King, & Diener, 2005).

In terms of negative affect, Nicholas, Coulston, Asghari, and Malhi (2009) found that higher levels of anxiety and depression were related to lower levels of perceived support in a chronic pain sample. In a longitudinal study of cancer patients, anxiety, depression, and anger were predictive of lower perceived support at later time points, controlling for initial levels of support (Alferi, Carver, Antoni, Weiss, & Durán, 2001). Similar results have been found in non-pain samples, where anxiety and depression lead to less perceived support from spouses (Vinokur et al., 1987). In contrast, no relationship was found between either state or trait negative affect and an initial measurement of perceived social support in a daily diary study of undergraduate students (Siewert, Antoniw, Kubiak, & Weber, 2011). However, given that the social support measure was administered only once and the sample was small (n = 30), it is possible that the study lacked statistical power to find significant effects. Another noteworthy consideration is that while perceptions of support may decrease as anxiety increases, a partner’s attempts at support provision have been shown to actually increase in the presence of anxiety (Iida, Seidman, Shrout, Fujita, & Bolger, 2008).

1.6.2.4 Variations in daily pain

Joint pain characterized by fluctuating intensity and duration is one of the hallmark symptoms of RA. Longitudinal studies have shown that changes in pain are an important predictor of changes in overall emotional, psychological, and social well-being (Courvoisier et al., 2012). Furthermore, there is preliminary evidence from studies using daily process procedures that on days when RA patients experience more than their average levels of pain,
they report more relationship stress and less relationship enjoyment (Davis et al., 2006).

Therefore, pain was included as a possible covariate of perceived social support.

1.7 The current study

A vast body of literature has shown that social support, and in particular perceived social support, is very important in relation to health. However, a person’s perceptions of support are not as strongly related to the support that person actually receives as would be expected. Perceived social support shows moderate stability, but apart from early interest in fluctuations in received social support, research has focused on stable correlates and antecedents (Kafetsios & Nezlek, 2012; Knoll et al., 2007). Despite continued, widespread calls for improving social support via psychosocial interventions (Cobb, 1976; Braveman et al., 2011), research over the past 35 years has had only moderate success in determining what leads individuals to feel satisfied with their support networks and to feel that support is there if they need it.

Using a sample of RA patients and a daily process methodology, the current study increased scientific understanding of the construct of perceived support by addressing three main research questions. First, it examined the extent to which satisfaction with spouse responses vary within and between individuals over a one-week time period. Second, it investigated within- and between-person factors that are associated with satisfaction with spouse support. The investigation of these within-person factors was a unique aspect of the current study. Another unique aspect of the second research question was that while previous studies have provided some support for bivariate associations between global perceived social support and the independent variables used in the current study, analyses including multiple predictors are rare. Also, no study has used a multilevel approach and included
perceived social support as the outcome variable of interest. The third research question
related to the degree to which each person’s ratings of satisfaction with support fluctuate over
the week. Given that some individuals may fluctuate more than others in their day-to-day
ratings of satisfaction with support, this study also examined between-person factors related
to this difference.

1.8 Research Questions and Hypotheses

1.8.1 Research question 1

To what degree is perceived satisfaction with responses a within-person or between-person
variable? Much of the research conducted on social support has been correlational and cross-
sectional. This is, at least in part, a consequence of social support often being conceptualized
as a stable, between-person variable. However, it is reasonable to expect that a complex
construct such as social support would be comprised of both stable and fluctuating
components. Indeed, while perceptions of social support show some stability over time, there
is also evidence for variability. However, much of this evidence comes from test-retest
reliabilities that indicate moderate stability over weeks, months or years. Using a daily diary
methodology, an estimate of the proportion of variance within- and between-people in
satisfaction with spouse responses over a one-week period was calculated.

1.8.2 Hypothesis 1

Based on past literature demonstrating moderate test-retest reliability in perceptions of
support, it was hypothesized that there would be significant variance in the AM and PM
ratings of satisfaction with spouse support both between participants and also within
participants over the course of the 14 daily diary interviews.
1.8.3 Research question 2

What are the within- and between-person factors associated with daily satisfaction with spousal support among patients with RA? Despite social support being recognized as an important factor for our health, there has been surprisingly little research conducted on its antecedents. If researchers, clinicians, and public health officials are going to increase social support in order to increase the health of the population, the factors that contribute to high levels of satisfaction with responses must be understood. Past research has generally focused on between-person analyses. However, if there is significant within-person variability in satisfaction with responses, sources of this variation also need to be understood. Furthermore, past studies have typically focused on a single predictor of satisfaction with responses at a time (i.e., personality, received support, mood, and relationship satisfaction), rather than using a more comprehensive multivariate approach. The current study investigated satisfaction with spouse responses as an outcome variable, and used a multivariate and multilevel approach to do so.

Using a daily diary design, the current study also employed both a concurrent and a lagged analysis of the factors associated with satisfaction with responses. In the concurrent analysis, patients’ ratings of potential covariates of PM satisfaction with responses were analyzed within time points. In the lagged analysis, patients’ AM ratings of potential antecedents were used to predict PM levels of satisfaction with responses. The PM rating of satisfaction with responses was selected as the outcome variable instead of the AM rating because the lagged effects of mood, social interactions, and disease variables over the course of the day were of interest.
Between-person correlates of satisfaction with responses were also examined. These between-person factors were measured during a background interview conducted before the daily diary phase of the study, and were correlated with satisfaction with responses at the second level (i.e., between-person level) of analysis. The participant’s average levels of the daily diary variables were also considered at the between-person level. Thus, analyses provided a comprehensive, multivariate investigation of both within- and between-person predictors of satisfaction with responses.

1.8.4 Hypothesis 2

Past research has shown associations between perceived support and received support, mood, personality and marital dissatisfaction. It was hypothesized that at the within-person level, and in both lagged and concurrent analyses, increases in levels of pain intensity, negative affect, and negative spousal interactions would be associated with decreases in PM satisfaction with responses. Positive spousal interactions and positive affect were expected to be associated with greater PM satisfaction with responses. At the between-person level of analysis, higher levels of extraversion and marital dissatisfaction were predicted to be associated with greater satisfaction with responses, and higher levels of neuroticism were predicted to be associated with lower satisfaction with responses. In an exploratory analysis, subscales of positive spouse responses were investigated independently. Each of the subscales (solicitous, informational, instrumental, and esteem support) was predicted to be associated with increased satisfaction with spouse responses.

1.8.5 Research question 3

*What factors are associated with variability in patients’ day-to-day satisfaction with responses ratings?* If perceived satisfaction with responses shows lability (i.e., variability
within people across time points), it is possible that some patients fluctuate more than others in their ratings of satisfaction with responses. High levels of affective lability have been shown to be an important predictor of poor health behaviours, including binge eating (Greenberg & Harvey, 1987), and have been investigated in studies on autoimmune diseases (Langosch et al., 2008). Chronic pain populations are also more emotionally labile than the general population (Asmundson, Coons, Taylor, & Katz, 2002). Although rare, some research has viewed lability as an outcome variable. For example, it has been shown that adverse life events predict increased fluctuation in a person’s depression and anxiety (Mackinnon, Henderson, & Andrews, 1990). Given that high levels of fluctuation in satisfaction with responses are also likely to have negative consequences for wellbeing, in an exploratory analysis, the correlates of a participant’s degree of lability in satisfaction with responses were explored.

1.8.6 Hypothesis 3

Participants who were higher in neuroticism, average negative affect, levels of pain, frequency of fatigue, marital dissatisfaction, functional disability, and negative responses were predicted to have higher levels of lability in satisfaction with spouse responses. Participants who were higher in extraversion, positive affect, and positive spouse responses were predicted to have lower levels of lability.
2 Chapter: Method

2.1 Overview

Data for the current study were taken from a larger prospective study examining the role of psychosocial factors in adjustment to rheumatoid arthritis (RA; Holtzman & Delongis, 2007). Only the procedures and measures used in the current study will be discussed here. Patients with RA completed an initial telephone interview, as well as brief, structured, twice-daily telephone interviews for seven days. This daily process methodology allowed for an investigation of the daily fluctuations in study variables, both within and across days. The UBC Research Ethics Board approved all study procedures.

2.2 Participants

2.2.1 Sample

The final sample included in the present analyses consisted of 69 individuals diagnosed with RA, living outside the Lower Mainland of British Columbia, Canada. On average, participants were 59 years old (range: 29 to 82, $SD = 10.9$), and were predominantly female (84%), and Caucasian (86%). The higher proportion of women in this sample is characteristic of RA in general, where a ratio of women to men reported in the epidemiological literature is between 2:1 and 3:1 (Alamanos & Drosos, 2005). On average, patients had been diagnosed with RA for 17 years, ($SD = 12.7$). Ninety-six percent of the sample was married, and the remaining 4% were cohabitating. Twenty-eight percent of the participants were employed at the time of the study, 36% were retired, 17% were on disability or temporarily laid off, 10% were on sick leave, and 7% were working as homemakers.
2.2.2 Recruitment

An initial contact letter was mailed out to 800 adult RA patients over the age of 18 who were randomly selected from the Mary Pack Arthritis Society database of patients and who had previously agreed to be contacted about participation in research. The letter described the study and asked for interested patients to contact the research office. Patients who did so then went through a brief telephone screening interview to verify their eligibility. Inclusion criteria were: a diagnosis of RA, pain due to RA during the previous month, and fluency in English. All participants were mailed a small gift, valued at approximately ten dollars, upon completion of the initial telephone interview and were given the option to be entered into a draw for $1000.

2.2.3 Response rate and attrition

Of the 800 contact letters that were sent out, 85 were returned to our office due to an incorrect mailing address, and six of the intended recipients had passed away. A total of 202 potential participants contacted our research office in response to our mail-out. Of these 202 respondents, 42 declined to be screened for eligibility due to: not having been diagnosed with RA (\(n = 14\); i.e., they received the letter in error), being too busy (\(n = 9\)), being too ill (\(n = 3\)), having been in too many studies (\(n = 1\)), or an unspecified reason (\(n = 15\)). Ultimately, 160 patients with RA agreed to the eligibility screening and to participate in the study. Of these, 52 were excluded due to the fact that they were not married or in a common-law relationship, 20 declined to participate following screening, 17 were excluded following the initial screening due to the fact that they had not experienced RA pain in the past month, and two were excluded due to their failing to complete both the initial interview, and at least 60% of the daily interviews. This left a total sample of 69 participants for the current study.
2.3 Procedure

Eligible participants completed an initial structured background interview over the telephone, which lasted approximately 30 minutes. Participants were then asked to complete a series of brief ten-minute structured telephone interviews twice daily for one week (for a total of 14 interviews). Participants were typically called at their homes, and were asked to ensure they were in a place where they could speak privately. Interviews were scheduled for approximately six hours after the participants had woken up in the AM. This delay allowed time for the participants to have interactions with the spouse before the interview took place. A second interview was conducted six hours after the first. These comprised the “AM” and “PM” interviews, respectively.

Fourth year female undergraduate students conducted both the initial and the daily interviews, with the same interviewer being assigned to each participant for the duration of the study. Interviewers received intensive training on the use of structured research interview techniques (Singer & Presser, 1989), including responding to participants in a neutral tone. Interviewers received close supervision from the PI (SH) throughout the study. All interviews were audio taped (with participants’ permission) to ensure protocol adherence, as well as for transcription of participant answers to open-ended questions. The first four or five of each interviewer’s daily interviews were reviewed, and extensive feedback was provided. Interviewers also attended bi-monthly meetings in order to discuss any issues or concerns related to the interview process. Further audio recordings were reviewed at random throughout the remainder of the interview process, in order to ensure continued adherence to the structured interview procedure.
2.4 Measurement

2.4.1 Initial interview measures

The following information was gathered from participants during the initial telephone interview.

2.4.1.1 Demographics and study-specific characteristics

Participants were asked to report their age, identified gender, identified race, employment status, education and income. Participants also reported their RA disease duration, in years since diagnosis.

2.4.1.2 Personality

Participants completed the NEO Five Factor Inventory (NEO-FFI) measure of personality (Costa & McCrae, 1992). The NEO-FFI is a shorter, 60-item version of the NEO-PI-R, that is rated on a 5-point Likert scale from “strongly agree” to “strongly agree.” The NEO-FFI has shown good test-retest reliability and internal consistency, and has been validated against other measures of personality (Costa & McCrae, 1992). Of interest for the current study were the neuroticism and extraversion subscales. Both of these subscales have shown good validity, and are appropriate for use in a wide range of populations, including chronic pain patients (Schmidt, Hooten, & Carlson, 2011).

2.4.1.3 Functional disability

Functional disability was measured using the modified version of the health assessment questionnaire (MHAQ; Pincus, Swearingen, & Wolfe, 1999). This scale measures difficulties in performing daily activities, such as getting in and out of bed, or walking. Participants rated eight such activities on scale from one (without any difficulty) to four (unable to do). The scale has shown good reliability and validity, and has been frequently used in the study of rheumatic disease populations (Pincus et al., 1999).
2.4.1.4 Marital dissatisfaction

Marital dissatisfaction was measured using a brief 21-item version of the Marital Satisfaction Inventory, similar to the MSI-Revised (Whisman, Snyder, & Beach, 2009). Higher scores on the scale indicate higher levels of relationship discord. The MSI-R has shown good test-retest reliability over a six-week period in both males and females, as well as good discriminative abilities.

2.4.1.5 Fatigue

Fatigue is a characteristic symptom of RA (Smith, Wallston, & Dwyer, 1995). In the current study, the frequency and intensity of fatigue were measured in the initial telephone interviews. Patients were asked to indicate how often they felt fatigued in the last week on a scale from one (never) to 10 (all the time). Patients were also asked to rate the intensity of fatigue on a scale from zero (no fatigue) to 10 (fatigue as bad as it could be). The intensity and frequency of fatigue were combined to form a single score.

2.4.2 Daily interview measures

The following scales were used to gather information from participants during the twice-daily telephone interviews. In the first interview, approximately six hours after waking, participants were asked to answer the questions as they related to their experiences to that point in their day. In the second interview, approximately six hours later, participants were asked to reflect on their experiences in the time between the first interview and the second. Most of the measures used for the daily interviews were modified versions of full-length scales, which had been shortened to reduce participant burden. This is accepted practice in daily process research (Bolger, Davis & Rafaeli, 2003), and objective measures have shown that patient reactivity is not a problem for repeated daily measures of pain and mood (i.e.,
there is no problem using these scales in a repeated measures application; Aaron, Turner, Mancl, Brister, & Sawchuck, 2005).

2.4.2.1 Pain intensity

A numeric rating scale (NRS) was used to measure pain intensity (Dworkin et al., 2005; Jensen, Karoly, & Braver, 1986; Salaffi, Sarzi-Puttini, Ciapetti, & Atzeni, 2011). The NRS asks participants to rate their pain on an eleven-point scale from 0 (no pain) to 10 (pain as bad as it could be). This is the best-practice method of measuring pain, and was ideal for the present study as it is generally preferred by participants, can be given in verbal form (Dworkin et al., 2005), and has shown good validity in subjective pain ratings for rheumatic patients (Jensen et al., 1986; Salaffi et al., 2011).

2.4.2.2 Negative and positive affect

The Derogatis Affects Balance Scale was used to measure positive and negative affect (Derogatis, 1975). This scale has shown good internal consistency and test-retest reliability (Derogatis & Rutigliano, 1996). The depression and anxiety subscales were combined for use as a repeated measures indicator of negative affect. These subscales were combined into a composite score of negative affect due to the significant correlation between the two subscales (average across time points: $r = 0.69$, range: .53 - .89). Cronbach’s alpha for the combined measure of negative affect was .89.

2.4.2.3 Extent of contact with the spouse

A measure of the degree to which the RA patient saw their spouse was included in the daily diaries. As it is possible that too little contact in and of itself could be negatively associated with satisfaction with responses, it was included for consideration in the analyses. Patients
were asked, “to what extent did you see or speak to _______ so far today/since the last interview”? They were asked to rate their answer on a scale from 1 (not at all) to 4 (a lot).

2.4.2.4 Perception of spouse responses

The modified version of the received support subscale of the Berlin Social Support Scales (BSSS; Schulz & Schwarzer, 2000) was used in the current study. This scale is designed to measure supportive and unsupportive responses. Although developed for and validated on chronically ill patients (Schulz & Schwarzer, 2004; Schulz & Schwarzer, 2000), it focuses on general responses, not those that are illness-specific. Participants were asked to think about their partner and answer questions regarding emotional, instrumental and informational support they were provided by that person. Responses were rated on a scale from 1 (not at all) to 4 (a lot); 0 was selected if the item did not apply.

The positive spouse subscale asked participants to report on the helpful behaviours of their support person, and assessed four items reflecting emotional support (e.g., “(He/she) showed you that (he/she) loves and accepts you”), two items reflecting informational support (e.g., “(He/she) helped me find something positive in my situation”) and three items reflecting instrumental support (e.g., “(He/she) took care of things you could not manage on your own”). In order to reduce participant burden, only four of the six emotional support scale items in the BSSS were used in the twice-daily interview. These items were selected based on an evaluation of their relation to the situations likely to be encountered by RA patients.

In the view of the author, two of the emotional support items reflected patient perceptions of a solicitous spouse response. The operant conditioning model of chronic pain has suggested that certain ways of responding to chronic pain patients may actually lead to
increases in their pain (Fordyce, 1982). Solicitous support in particular has been identified as a type of response that can lead to increases in pain behaviours and disability (McWilliams, Dick, Bailey, Verrier, & Kowal, 2012). The items “(He/she) comforted you when you were feeling bad” and “(He/she) expressed concern for your condition” were combined and used as the solicitous subscale for the current study.

The remaining two emotional support items were combined to form another subscale. The items “(He/she) showed you that (he/she) loves and accepts you” and “(He/she) made you feel valued and important” had no solicitous aspect, and rather reflected the perception of an attempt to make the patient feel loved and valued. They formed the esteem support subscale in the current study.

Three items from the BSSS measured perceptions of negative response. To assess whether support persons avoided patients, the original scale item “Left me alone” was reworded to “(He/she) avoided me,” to emphasize the negative aspect of the response. Also included was the item “(He/she) complained about you.” The item “(He/she) did not show much empathy for me” was excluded from analysis because of some patient reports indicating the item was confusing; furthermore, empathy was already the subject of an item on the emotional support scale.

2.4.2.5 Satisfaction with spouse responses
During each interview, participants were asked, “To what extent were you satisfied with the way in which your (husband/wife) responded to you (so far today/since we last spoke).” Responses were based on a 5-point Likert scale (0 = does not apply, 1 = not at all, 2 = a little, 3 = somewhat, 4 = a lot).
2.5 **Statistical analysis plan**

What follows in this section is an overview of the statistical procedures that were used to evaluate the study hypotheses.

2.5.1 **Within and between subjects analysis (WABA): Overview**

WABA is a procedure that provides an estimate of the variance in a construct that is within- or between-people. It allowed for an investigation of the appropriate level of analysis for satisfaction with responses and its covariates. Hypothesis 1 stated that there would be significant variance in PM ratings of satisfaction with spouse responses both between participants and also within participants. In the first step, WABA was used to determine whether the variance in satisfaction with spouse support was primarily within-person, between-person, both, or neither (Castro, 2002). For example, if PM satisfaction with responses had only between-person variance, the repeated measure approach of daily diaries would provide no additional information over a cross-sectional approach. Inferences regarding the appropriate level of analysis in WABA are made both based on statistical and practical significance. The latter tests are based on angular differences between the sources of variance in a variable (either within a person or between people; Yammarino & Markham, 1992).

In the next step of WABA, PM satisfaction with responses was paired with each daily predictor. The association between each of the two variables was examined for the source of its variance (within-person, between-person, both, or neither). Through these associations, WABA is used as a first step in evaluating which variables to enter into a multilevel modeling (MLM) equation, and at what level to enter them (Castro, 2002; O’Connor, 2004).
2.5.2 Multilevel modeling analysis: Overview

MLM estimates the effects of both within- and between-person independent variables (IVs) on a repeated measures dependent variable (DV), in a single analysis. Benefits of this analytic approach include its robustness to missing data and its ability to deal with data that are non-independent (such as is the case with repeated measures designs; Bolger, Davis, & Rafaeli, 2003). Within-person factors were modeled at Level 1 of the MLM analysis, and between-person factors are modeled at Level 2. In Level 1, variables from the repeated measures daily diary were related to the daily DV to estimate a regression equation for each person. For instance, AM pain intensity can be regressed on PM satisfaction with responses for each participant, and the relationship between the variables can be estimated. In Level 2, the individual differences in the DV’s regression intercepts derived from Level 1 analyses were correlated with the between-person factors, such as marital dissatisfaction and extraversion.

The MIXED MODELS procedure in SPSS v. 20 was used to conduct all MLM analyses. Multicollinearity (when two predictor variables are very highly related) can be a problem for MLM analyses. However, multicollinearity is most generally a concern in testing interactions (Tabachnick & Fidell, 2007), which was not done in the current study. Centring of predictor variables, a procedure where an individual value is subtracted from the group or grand mean, is used in conditions where multicollinearity is an issue. It is also used to help with the interpretation of certain research questions. Because the current study focused on change within people over the course of the day, group mean (or person-mean) centring of Level 1 predictor and control variables was employed (Bolger et al., 2003). In person-mean centring, an individual’s daily score is subtracted from the mean of the same individual’s
daily scores on a given variable. Thus, a group-mean centred variable indicates days on which a person had higher or lower than their normal levels of that variable. For person-centred Level 1 predictors, the slope estimates of fixed parameters are interpreted as the relationship between the predictor and the DV at average levels of other Level 1 predictors (Raudenbush & Bryk, 2002). In order to have the intercept interpretable, while also addressing the issue of autoregression, person-mean centring was used for the Level 1 control, AM satisfaction with responses. In this context, the intercept is interpreted as the expected level of PM satisfaction with responses when a participant has experienced their average level of AM satisfaction with responses.

When person-mean centring is used for Level 1 variables, information as to a person’s overall level on a particular variable is lost; person-centred variables have a mean of zero, by definition. In order to keep information regarding the average level on such variables in the analyses, each person’s mean must be added as a Level 2 variable (Hox, 2002; Raudenbusch & Bryk, 2002). The inclusion of the person mean values as Level 2 covariates tests for differences between people on these variables.

2.5.2.1 MLM estimation and resampling techniques

Bootstrapping, a resampling technique, was used to estimate the fixed effects of parameters in the model. It is an empirical estimation procedure, wherein significance levels are determined based on the sample, rather than assumptions about normality of variable distributions. It leads to more accurate estimates of fixed parameters and their standard errors in cases where there are violations of normality in the data or small sample sizes (van der Leeden, Meijer, & Busing, 2008). The most robust form of bootstrapping for MLM is the cases bootstrap, wherein the resampling is done within the individuals in the study, as
opposed to across all of the individuals (van der Leeden et al., 2008). A consequence of the robustness is decreased power, but cases bootstrapping also has only one assumption: the model itself needs to be properly specified (van der Leeden et al., 2008). Because WABA analysis was used to guide the level at which the daily diary variables were entered into analysis, that requirement was met.

An issue that may arise in cases bootstrapping is when there are too few Level 1 instances of the DV per Level 2 unit (i.e., too few days of measurement per person) to get an accurate estimate. Simulation studies have shown that this is a serious issue with only three Level 1 instances per Level 2 unit, and that with each additional Level 1 measurement, the estimation improves significantly (van der Leeden et al., 2008). For most people in the current study, there were seven instances of the Level 1 DV, which should be sufficient for stable estimates. However, to be sure of the robustness of the estimates, another resampling technique was used to validate the findings. Simple bootstrapping is another resampling method that has more assumptions (e.g., heterogeneity of residuals) but is not affected by a small number of Level 1 instances (van der Leeden et al., 2008). The final lagged, split model was estimated using both cases bootstrapping and simple bootstrapping in order to ensure the robustness of the parameter estimates.

Maximum likelihood (ML) was selected as the estimation procedure for overall model fit. When only evaluating fixed effects, ML allows for a direct comparison of the deviance (-2 Log Likelihood) between subsequent nested models, in order to evaluate whether added parameters have improved model fit. ML is also robust to violations of assumptions related to the normality of distributions, particularly when there are more than 50 Level 2 instances, and when only fixed effects are estimated (Hox, 2002). Given that there
were 69 participants in the current study, the model estimates resulting from analyses can be considered reliable.

2.5.2.2 Concurrent and lagged analyses
Given that participants completed interviews both in the AM and the PM, two within-day investigations of satisfaction with responses were possible: concurrent and lagged analyses. In the concurrent analyses, PM variables, such as PM instrumental support, were examined in relation to PM satisfaction with responses, controlling for AM levels of the DV. In the lagged analyses, AM covariates were used to predict PM satisfaction with responses, while controlling for AM levels of satisfaction with responses (Bolger et al., 2003).

2.5.2.3 Positive and Negative Spouse Responses: Full Scale and Subscale Analyses
As mentioned earlier, the BSSS measure of positive responses has a number of subscales. In the full scale model of the current study, two subscales were used: positive spouse responses, and negative spouse responses (Schultz & Schwarzer, 2000). The positives spouse responses subscale was comprised of the informational, instrumental, esteem, and solicitous support items. The negatives responses subscale was comprised of the negative support items. In the subscale split models (a set of exploratory analyses), the independent effects of each of the four positive support subscales (informational, instrumental, solicitous, and esteem support) were also investigated. This provided additional information regarding which specific types of positive spouse responses were the most important covariates of satisfaction with responses. This split model also included negative responses as an independent subscale.

2.5.2.4 Models analyzed
Because of the concurrent and lagged analyses (Section 2.5.2.2), and the full and subscale models (Section 2.5.2.3), a total of four multi-level models were built in the current study. For clarity and brevity, they were each named. First, a concurrent model with the full social
support scale was evaluated (CF model). Second, a concurrent model with individual subscales was modeled (CS model). Third, a lagged model with a full social support scale was built (LF model). Fourth, a lagged model with individual subscales was evaluated (LS model).

2.5.2.5 Model building step one: Intercepts-only model

Using the procedure for exploratory model building outlined by Hox (2002), the first step was to evaluate an intercepts-only model. The intercept-only model provides two important pieces of information. First, the intraclass correlation (ICC) is calculated, which is an indicator within MLM of within- and between-person variance in the DV. Second, the -2 Log Likelihood is estimated, which is an estimate of model fit. As model building continues, and significant covariates are added to the equation, the -2 Log Likelihood is expected to decrease, as it is presented in a smaller-is-better format.

In the current study, the question of the level of variance in the DV was already established in the WABA analysis. Therefore, the ICC was of less importance than if that was not the case. WABA has benefits over the ICC, in that it can be used to evaluate all of the repeated measures variables, not just the DV. It also allows for tests of both statistical significance and practical significance (Castro, 2002). For these reasons, the main use of an intercepts-only model in this study was to determine the baseline -2 Log Likelihood for comparison with subsequent models.

2.5.2.6 Model building step two: Adding Level 1 covariates

The second step in the exploratory model-building process outlined by Hox (2002) is to estimate fixed Level 1 predictors one at a time. The order of entry of the Level 1 variables was guided by WABA. Specifically, the Level 1 variables were entered into the model in
order of the strength of their within-person, bivariate association with the DV, with the strongest variables added first. If a variable did not show a significant relationship in these bivariate correlations, it was not considered for inclusion in the MLM analysis.

The contribution of these variables to the model was evaluated by the degree of improvement in model fit. When fixed effects are being evaluated, and when Maximum Likelihood is used as the method of estimation, the difference between the -2 Log Likelihood in subsequent nested models is informative as to the effects of the covariates added. Specifically, the difference between -2 Log Likelihood of nested models provides a $\chi^2$ value, with the degrees of freedom equal to the difference in the number of parameters estimated in the smaller and larger models (Hox, 2002). If the calculated $\chi^2$ value is significant based on the degrees of freedom, the variable added has contributed significantly to improving model fit, and the variable is retained in the model. If a Level 1 variable did not significantly improve model fit it was excluded from subsequent analysis in that model. If there was a discrepancy between the significance of a covariate per the $\chi^2$ and the Wald statistic (the parameter estimate in the model itself), the former was taken to be correct, as per Hox (2002).

2.5.2.7 Model building step three: Adding Level 2 covariates

Level 1 predictors that were significant in the above analysis were retained, and brought forward to the third and final step of a fixed coefficient two-level MLM analysis: adding the Level 2 covariates. In this case, variables were tested at the between-person level for significant relationships to average, or between-person satisfaction with responses. The order of entry for the Level 2 variables was guided by their bivariate correlation with between-
person satisfaction with responses; those variables with the strongest bivariate correlation were added first.

The Level 2 covariates that were tested in the model were evaluated in the same manner as the Level 1 variables: if there was a significant improvement in model fit upon their inclusion, they were retained. They were excluded if they failed to improve the model fit.

2.5.3 Multiple regression analysis: Overview

In order to test Hypothesis 3, that addressed the lability in satisfaction with responses between people, multiple regression analysis was run using SPSS REGRESSION. The outcome variable was lability in satisfaction with social support. Lability was operationalized as the standard deviation for each participant’s satisfaction with responses scores across the 14 time points. Once calculated, lability actually becomes a between-person variable (Hooker, 1991). Therefore, unlike the analyses used to test Hypothesis 2, this was a purely between-person, aggregate-level analysis. In terms of the outcome variable, the more times a person is measured on a variable, the more stable estimates of variability are (Bolger et al., 2003). Therefore, both AM and PM satisfaction with responses scores were used to determine the lability in satisfaction with responses for each person.

Due to a lack of previous research to indicate hierarchy in the importance of predictor variables, the purported predictors lability in satisfaction with responses were entered in a single block (Field, 2009). An initial, bivariate correlation table was compiled, and those variables that were significant correlates of lability were included in the block entry. Bootstrapping is a resampling technique that can be used in regression used to make an empirical sampling distribution. Because bootstrapping was used for the parameter estimates,
several of the usual assumptions of multiple regression related to the distribution of variables and error variances were of no concern. Even with bootstrap estimates, linear relationship between the predictor and outcome variables is still important, and the effects of uni- and multivariate outliers, although attenuated, are still a threat to the validity of the regression estimate. Those assumptions were checked before finalizing the analysis. Multicollinearity statistics were also evaluated for the analysis.
3 Chapter: Results

3.1 Response rate and descriptive statistics
Response rates on the twice daily interviews were excellent, with 99% of the possible 966 AM and PM interviews completed by the participants. Sixty-two of the included participants completed all of the 14 twice daily interviews, six participants missed only one interviews, and one participant missed four. Out of a possible 483 PM interview sessions, PM satisfaction with responses was reported 443 times, for a 92% overall response rate on the outcome variable. See Table 1 for the mean and standard deviations of the daily interview variables.

All of the participants in the current study completed the initial background interview. Table 2 shows the mean and standard deviation for the Level 2 variables determined in the initial interviews, and Tables 6, 7, and 8 show the bivariate correlations among those variables, as well as with the person’s average satisfaction with responses.

3.2 Within and Between Analysis (WABA): Findings
Section 3.2.1 addresses Hypothesis 1: whether Level 1 variables (and satisfaction with responses in particular) vary primarily within- or between-people. Section 3.2.2 reports the level of covariance results of WABA for use in the guidance of the subsequent MLM analyses.

3.2.1 Level 1 variables: is variance within- or between-people?
Results of WABA analyses showed that there was significant variability in PM satisfaction with responses at both the within- and between-person level. The obtained Eta squared indicated that 40% of the variability in the measure was within-person over the 7-day period. The remaining 60% of the variability in the DV resulted from differences between people.
In terms of the Level 1 predictors, AM satisfaction with responses showed slightly more within-person variability than did PM satisfaction, at 45%. Three other Level 1 predictors showed a good degree of variability at both levels: extent of contact with the spouse (AM: 53%, and PM: 50% within-person), informational support (AM: 43%, and PM: 35% within-person), and negative responses (AM: 57%, and PM: 61% within-person). Although the remaining Level 1 variables consisted of primarily between-person variance, none of them had less than 20% of their variability at the within-person level. Table 3 provides the WABA output for these analyses, and Figure 1 shows the results in graphical form.

3.2.2 Level 1 predictors: is covariance within- or between-people?
The second step in WABA analysis is to determine whether the covariance between a predictor and the DV occurs primarily within- or between-people. This analysis was particularly informative for the MLM analysis that was to follow. For instance, if there was no within-person covariance between a Level 1 predictor and the DV, but there was between-person covariance, the proper level of analysis for the predictor is at Level 2 in MLM. It is also possible for covariance to occur at both levels of analysis, or to have no covariance between constructs.

Tables 4 and 5 display the results of the WABA analysis of covariance for both the AM and PM predictors with PM satisfaction with responses, at both the within- and between-person levels. Figure 2 provides a graphical representation of the AM covariances with PM satisfaction with spouse responses. All of the PM Level 1 variables showed significant within-person covariance with PM satisfaction with responses. Most of the AM Level 1 predictors showed a significant within-person association with PM satisfaction with responses, and were entered into MLM analysis in order of the strength of that association.
However, three AM predictors showed little within-person covariance with PM satisfaction with responses: pain, positive affect and negative affect. They were excluded from consideration in the MLM analysis on that basis. One AM predictor, solicitous support, showed a trend towards a within-person association \((p = .09)\), and was therefore evaluated in the MLM analysis.

At the between-person level of analysis, the AM covariates were all significant except for two (pain and negative affect). The same was true of the PM covariates, with one exception: PM negative affect showed a trend towards a between-person association \((p = .10)\), and was therefore estimated in a step of the MLM analysis.

### 3.3 Multilevel modeling analysis: Findings

#### 3.3.1 Assumptions of estimation and outliers

In terms of screening for outliers, using person-centred scores on Level 1 variables has a consequence: their mean is, by definition, zero. This means that if individual instances were removed or altered, the mean score on that variable for that individual would no longer be zero, which could affect the estimation and interpretation of parameters. Furthermore, when data are dependent or grouped, investigations of univariate normality are done within each group (or person, in this case). Given that there were only seven points of measurement for each of the Level 1 variables, to inspect histogram plots looking for data points disconnected from the group would be of little utility. As such, there was no search performed for univariate outliers within Level 1 instances (i.e., within individuals).

Searching for multivariate outliers in multiple regression is usually done using Mahalanobis distances (Field, 2009). However, the procedure is particularly sensitive to violations of the assumptions of normality. Given that many of the Level 1 variables were significantly skewed and leptokurtic, Mahalanobis distances were not calculated. Fortunately,
the use of cases bootstrapping allows for robust parameter estimates, despite violations such as skewness and leptokurtic distributions (van der Leeden et al., 2008).

3.3.2 Models built
For the sake of brevity, a breakdown of the steps of the models built in MLM will only be presented for the first of the four models investigated: the concurrent full (CF) model. The final model is also presented in Table 9. The rules for model building were the same across all four models: first, Level 1 controls were added. Next, Level 1 predictors were entered in order of their association with the DV (based on WABA). Finally, Level 2 means, controls, and covariates were entered (in the order of the strength of their bivariate association with the DV). In all four models, the Level 1 control was person-centered AM satisfaction with support. At Level 2, age was entered as the lone control variable. Gender was excluded from MLM analyses due to its non-significant bivariate association with satisfaction with spouse responses. The results of the concurrent, subscale model are reported in Table 10, the results of the lagged full model are reported in Table 11, and the results of the lagged subscale model are presented in Table 12.

3.3.3 Concurrent, full model analysis
The first model investigated was the concurrent, non-split model. As such, spouse responses were entered as two subscales: positive responses and negative responses. All Level 1 predictor variables were PM variables, with the exception of AM satisfaction with responses, which was included as a control variable.
3.3.3.1 Step 1: Intercept-only model and Level 1 control variable

The first step in model building is to estimate the intercept-only model. The intercept-only model (or null model) is one in which the outcome variable is estimated in terms of its overall average, the difference between people on their values of this measure, and the variability within people on this measure. It is represented by the equation:

\[ \text{Level 1: } Y_{ij} = b_{0j} + r_{ij} \]
\[ \text{Level 2: } b_{0j} = y_{00} + u_{0j} \]

At Level 1, PM satisfaction with responses \((Y_{ij})\) on any particular day results from the average PM satisfaction with responses of particular person over all measured days \((b_{0j})\), and that day’s deviation from this average \((r_{ij})\). At Level 2, the Level 1 intercept for any particular person \((b_{0j})\) results from their average satisfaction with responses \((y_{00})\), and the variance that is not explained by the model \((u_{0j})\). With the three parameters of the intercept-only model estimated (fixed and random estimates of the intercept, and residual variance) the -2 Log Likelihood was 891.669.

With the baseline intercept-only model determined, AM satisfaction with responses was included as a Level 1 control variable. The addition of AM satisfaction with responses resulted in a significantly better model fit, \(\chi^2(1, N = 483) = 891.669 - 814.136 = 77.53, p < .0001\). Therefore, it was retained as a control variable for further steps in analysis.

3.3.3.2 Step 2: Level 1 covariates

The next section of model building was to add the Level 1 covariates, in order of the strength of their within-person bivariate correlation with PM satisfaction with responses in WABA analysis (see Tables 4 and 5). The PM variables are here listed in their order of entry: 1) positive spouse responses, 2) negative spouse responses, 3) positive affect, 4) extent of spouse contact, 5) negative affect, and 6) pain severity.
PM positive spouse responses showed the strongest association and was entered first. Its inclusion resulted in a significant improvement in model fit $\chi^2(1, N = 483) = 814.136 - 756.267 = 57.869, p < .0001$. It was therefore retained in the model. PM negative responses was evaluated in the model in the next step. Its inclusion also resulted in significant improvement in the -2-LL, $\chi^2(1, N = 483) = 756.267 - 742.777 = 13.490, p = .0002$.

PM positive affect had the next highest bivariate correlation with PM satisfaction with responses. It was evaluated next in the model. It contributed significantly to model fit, $\chi^2(1, N = 483) = 742.777 - 735.921 = 6.856, p = .009$, and was included in subsequent analyses. Although the extent of contact with the spouse showed a significant bivariate association with the DV in WABA analysis, it did not significantly improve the MLM fit: $\chi^2(1, N = 483) = 735.921 - 733.497 = 2.424, p = .119$. This variable was therefore excluded from subsequent steps. Similarly, PM negative affect failed to improve the fit of the model, and was not included in subsequent analyses, $\chi^2(1, N = 483) = 735.921 - 734.017 = 1.904, p = .168$. Interestingly, the variable with the weakest bivariate correlation with the DV (PM pain) did improve model fit. PM pain reduced the -2-LL significantly, $\chi^2(1, N = 483) = 735.921 - 730.224 = 5.697, p = .017$. It was therefore retained in subsequent analyses, as the final level one covariate of PM satisfaction the support. The model to this point is illustrated in Figure 3; variables higher on the page are associated with higher daily satisfaction with responses, and those lower on the page are associated with lower daily satisfaction.

3.3.3.3 Step 3: Adding Level 2 covariates
After all of the centred Level 1 covariates had been evaluated, Level 2 variables were tested in the model. The mean of the control variable, AM satisfaction with responses, was not included as a potential covariate in any of the analyses. This is because it is uninformative to
correlate the average PM satisfaction with responses with the AM value, without predicting an effect of time itself. Furthermore, there was no significant difference between a person’s mean AM satisfaction with responses and their mean PM satisfaction with responses \((t_{(490)} = -1.01, \text{mean difference } = .035, \text{Cohen's } d = .06, 95\% \text{ confidence interval } = -.108 - .033)\), making autoregression a serious concern. As there were no time-dependent predictions in the current study, the mean level of AM satisfaction with responses was of no interest as a covariate of PM satisfaction with responses, it was excluded.

The order of entry of the Level 2 covariates was determined by the strength of their bivariate correlation with average PM satisfaction with responses. Tables 6, 7, and 8 show these correlations. For the concurrent, full subscale model, the order of Level 2 covariate entry was as follows: PM positive responses, marital dissatisfaction, PM positive affect, PM negative responses, PM extent of contact, fatigue, age, neuroticism, and extraversion. Although neuroticism and extraversion were not significant in their bivariate association (see Table 8), they were considered for inclusion in the model due to previous research supporting an association.

The addition of the first of the Level 1 means, mean PM positive support, led to a large improvement in the fit of the model: \(\chi^2(1, N = 483) = 730.224 - 688.398 = 41.826, p < .0001\). Marital dissatisfaction was entered into the model in the next step. It also led to an improvement in fit, \(\chi^2(1, N = 483) = 688.398 - 674.221 = 14.177, p = .0002\), and was retained in the model.

Similarly, the inclusion of the mean PM positive affect for a person led to an improvement in model deviance: \(\chi^2(1, N = 483) = 674.221 - 664.213 = 10.008, p = .0016\), as did the inclusion of mean negative spouse responses \(\chi^2(1, N = 483) = 664.213 - 660.188\)
= 4.025, \( p = .045 \). They were retained in the analysis. However, the average extent of contact with the spouse did not significantly improve the model, and was excluded, \( \chi^2(1, N = 483) = 660.188 - 660.034 = 0.154, p = .695. \)

Average fatigue was entered next, its inclusion led to a significant improvement in the model \( \chi^2(1, N = 483) = 660.188 - 643.933 = 16.255, p < .0001 \). Similarly, the inclusion of the age of the participant contributed to model fit \( \chi^2(1, N = 483) = 643.933 - 624.688 = 19.245, p < .0001 \). Although not correlated at the bivariate level, neuroticism did improve the model itself when added in the next step \( \chi^2(1, N = 483) = 624.688 - 617.031 = 7.657, p = .0057 \). It was retained in the model. Extraversion, however, did not improve the model, and was excluded \( \chi^2(1, N = 483) = 617.031 - 616.482 = 0.549, p = .459. \) The between-person covariates in this model are shown in Figure 4.

The final concurrent, full subscale model, with covariates at both levels, is represented in the following equation:

**Level 1:**  
\[ Y_{ij} = b_{0j} + b_{1j} (AM satisfaction with spouse responses) + b_{2j} (PM positive spouse responses) + b_{3j} (PM negative responses) + b_{4j} (PM positive affect) + b_{5j} (PM pain) + r_{ij} \]

**Level 2:**  
\[ b_{0j} = y_{00} + y_{11} (average PM positive spouse responses) + y_{12} (marital dissatisfaction) + y_{13} (average PM positive affect) + y_{14} (average PM negative responses) + y_{15} (fatigue) + y_{16} (age) + y_{17} (neuroticism) + u_{0j} \]

In the model, a patient’s PM satisfaction with responses \( (Y_{ij}) \) is related to their average PM satisfaction with responses \( (b_{0j}) \), and the daily deviances from their average AM satisfaction with responses, and their PM positive support, negative responses, positive affect, and pain, as well as variance not explained by the model \( (r_{ij}) \). Their average PM satisfaction with
responses \((b_0)\) is related to the average across all participants \((y_0)\), their mean PM positive responses, positive affect, and negative responses. It is also related to their levels of marital dissatisfaction, their average fatigue, their age, and level of neuroticism, as well as variance not explained in the model \((u_0)\). Overall, compared to the intercept-only model, the final model was a significantly better fit, \(\chi^2 (15, N = 483) = 891.669 - 617.031 = 274.638, p < .0001\).

### 3.3.4 Concurrent, subscale split model analysis

The concurrent subscale split analysis investigated PM covariates of PM satisfaction with responses. At the within-person level, PM esteem support, negative responses, instrumental support, positive affect, and pain were all associated with PM satisfaction with responses. At the between-person level, PM esteem support, marital dissatisfaction, negative responses, fatigue, informational support, age, and neuroticism were all contributors to improving model fit. See Table 10 for parameter estimates of the variables included in the final model. Compared to the intercept-only model, the final model was a significantly better fit \(\chi^2 (16, N = 483) = 891.669 - 595.335 = 296.334, p < .0001\).

### 3.3.5 Lagged, full subscale model analysis

The lagged, full subscale model investigated AM predictors of PM satisfaction with responses. At the within-person level, positive responses and negative responses were significantly associated. At the between-person level, positive responses, positive affect, marital dissatisfaction, negative responses, fatigue, age, extraversion, and neuroticism were all associated with the DV. See Table 11 for parameter estimates of the variables significant in the model. Compared to the intercept-only model, the final model was a significantly better fit \(\chi^2 (114, N = 483) = 891.669 - 697.480 = 194.189, p < .0001\).
3.3.6 Lagged, subscale split model analysis
For this analysis, the subscale split was used, meaning that AM informational, instrumental, emotional, solicitous, and negative responses were entered as separate variables. In the model itself, esteem support and negative responses were significant within-person predictors of satisfaction with responses, as illustrated in Figure 5. Between-people, esteem support, marital dissatisfaction, negative responses, fatigue, age, and neuroticism all contributed to improvement in model fit, as illustrated in Figure 6. Overall, the model was a significant improvement over the intercept-only model $\chi^2 (12, N = 483) = 891.669 – 692.941 = 199.031$, $p < .0001$. See Table 12 for parameter estimates of the variables in the final model.

3.3.7 Random coefficients model
A random effects model, where the regression slopes for the relationship between the Level 1 predictors and the DV are allowed to vary between people, was not fitted in the current study. The reason for this was three-fold. First, fixed coefficient models show robust estimation with only 50 second-level instances (people), whereas random coefficients models need significantly greater numbers for reliable estimates (Hox, 2002; Kreft & De Leeuw, 1998), and current study had 69 people. Second, in anticipation of this power issue, the person-mean centring techniques chosen provided the most information possible from a fixed coefficient model. However, they are extremely difficult to interpret in a random coefficient model (Hox, 2002). Third, in the current study, attempts to allow Level 1 predictors to vary in a random coefficient model resulted in a failure to converge. Failure to converge is an issue with the Maximum Likelihood estimation procedure, whereby the iterations of the model do not reach a definitive stopping point. It is not an uncommon problem in models specifying random coefficients, and those low in power.
3.3.8 Estimating variance explained

Because variance is estimated at two (or more) levels in a multilevel analysis, the estimation of the variance explained by the model is complex (Hox, 2002). In a random slopes model, variance explained becomes almost inestimable, due to the complexity of the model structure. In a fixed-coefficients model (where only the intercept of the outcome variable is random) if Maximum Likelihood estimation methods are used, it is possible to estimate the variance explained at each of the levels of analysis (Hox, 2002). This is achieved by comparing the residual variance of the intercepts-only model at Level 1 and Level 2 to the residual variance of the final model at Level 1 and Level 2.

Using this approach estimates of variance explained were calculated, the non-split, concurrent model explained 20% of the within-person variance and 81% of the between-person variance in the DV, PM satisfaction with responses. The concurrent, split subscale model explained 24% of the within-person variance, and 84% of the between-person variance, and with the same number of total parameters as the non-split model. In the lagged analysis of the non-split model, 5.8% of the within-person variance, and 68% of the between-person variance was explained. In the split-subscale lagged analysis, 6.2% percent of the within-person variance was explained, and 72% of the between-person variance was explained.

3.3.9 Bootstrap parameter estimation check

As discussed in the MLM analysis plan, simple and cases bootstrapping have different strengths and weaknesses. In the current study, the small number of AM and PM interviews (n =7) mean that cases bootstrapping estimates may not be optimally accurate. On the other hand, simple bootstrapping has more assumptions related to the distribution of variables. Primary analyses were all run using cases bootstrapping. In order to ensure that these
estimates were valid, simple bootstrapping estimates were also calculated for one of the four models (the full, concurrent model). The parameters estimated by these two resampling methods are compared in Table 14. There are slight differences between the estimates, most notably that the bootstrap estimates of bias were greater in the simple estimation procedure, and the effect size estimates correspondingly lower. That said, the resulting estimates were virtually identical, with no parameter estimate going from significant to non-significant, or vice-versa. Overall, the concordance between the two estimation methods adds confidence to the results of the analyses.

3.4 Multiple regression lability analysis: Findings

Because both AM and PM satisfaction with responses scores were to be used to create the lability variable, a bootstrap estimate of the dependent t-test was conducted to ensure there were no differences between AM and PM levels. Results indicated no significant difference ($t(490) = -1.01$, mean difference = .035, Cohen’s $d = .06$, 95% confidence interval = -.108 -.033). A check of normality in AM and PM satisfaction with responses was also conducted and there was leptokurtosis evident in the difference scores between AM satisfaction with responses and PM satisfaction with responses (kurtosis = 4.01; significance tests not appropriate given that n = 491). The leptokurtic result was the consequence of a large number of difference scores that were equal to zero.

A comparison of the AM satisfaction standard deviations and the PM satisfaction with responses standard deviations was also conducted. The difference scores were not significantly skewed ($z = 1.19$) but were leptokurtic ($z = 2.90$). For this reason, bootstrap estimates were used in the dependent t-test. The results indicated no significant differences between AM and PM satisfaction with responses standard deviations ($t(66) = .944$, mean difference = .037, Cohen’s $d = .24$ 95% confidence interval = -.329 -.114). On the basis of
these analyses, the seven AM and seven PM ratings of satisfaction with responses were combined into 14 ratings per person, in order to maximize the stability of the estimates of each person’s standard deviation. Because multiple regression is not robust to missing data, a check was run using SPSS EXPLORE for the Level 2 variables recorded in the initial interviews. No variable had more than 5% missing values. This low level of missing data made it unnecessary to conduct a further test of whether the missingness was related to other variables (Tabachnick & Fidel, 2007). Given that scores appeared to be missing at random, the variable mean was used to impute missing data points.

Due to the large number of potential covariates, a correlation with lability in spouse responses was calculated for each, as shown in Table 15. Only those variables with a significant correlation to lability were included in the regression analysis. Included for analysis were marital dissatisfaction, positive spouse responses, negative responses, and positive affect.

Data were then checked for the presence of univariate outliers. Inspection of histograms and z-scores showed no instances of concern. Next, variables were checked for multivariate outliers. Using the estimation and criterion of Mahalanobis distances recommended by Tabachnick & Fidel (2007), none of the variables of interest had outliers in the multivariate space. The closest case had a Mahalanobis distance of 18.619, well below the critical value, $\chi^2 = 29.588$. The residual scatterplot of the regression solution was also examined. The plot itself exhibited acceptable properties, indicating no major violations of normality, heteroskedasticity, or linearity. However, after initial analyses, one case did prove to be an outlier in the multivariate solution (standardized residual = 3.52). The case was excluded, and the analyses were rerun without it. Collinearity diagnostics revealed a single
conditioning index greater than 30 (the fifth dimension had an index of 33.10), but no variance proportion above .50. Therefore, multicollinearity was not a concern in the analyses.

The bootstrap estimates of the individual covariates are presented in Table 16. R for regression was significantly different from null, \( F(4, 68) = 13.21, p < .001 \). \( R^2 \) was estimated at .456, and the adjusted \( R^2 \) was .422, indicating that 42% of the variability in lability in satisfaction with responses was explained by the included variables.
### 3.5 Tables

Table 1
Descriptive statistics for AM daily interview measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM satisfaction with support</td>
<td>427</td>
<td>1-4</td>
<td>3.36</td>
<td>0.87</td>
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<tr>
<td>AM pain</td>
<td>477</td>
<td>0-10</td>
<td>4.05</td>
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<td>1.27</td>
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<td>AM negative support</td>
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<td>3.38</td>
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Table 2
Descriptive statistics for Level 2 variables

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<td>Extraversion</td>
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<td>Neuroticism</td>
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Table 3
Within- and Between-Person Analysis of Variance Results

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<td>0.69</td>
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<td>AM Solicitous Support</td>
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<td>Within-Person Correlation</td>
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<td>AM Pain</td>
<td>0.002</td>
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<td>1.72</td>
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Table 5
Within- and Between-Person Analysis of PM Covariance With PM Satisfaction with Support

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<th>Variable</th>
<th>Within-Person Correlation</th>
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<td>-0.122</td>
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<td>0.018</td>
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<td>0.199</td>
<td>3.91</td>
<td>0.000</td>
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<td>PM Negative Affect</td>
<td>-0.172</td>
<td>3.38</td>
<td>0.001</td>
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<td>0.000</td>
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<td>9.38</td>
<td>0.000</td>
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<td>PM Solicitous Support</td>
<td>0.138</td>
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<td>0.008</td>
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Table 6
Bivariate correlations of Level 1 AM means with PM satisfaction with spouse responses

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<td>2 Extent of contact</td>
<td>.291*</td>
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<td>3 Pain</td>
<td>-.187</td>
<td>-.113</td>
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<td>4 Positive affect</td>
<td>.438**</td>
<td>.0136</td>
<td>-.363**</td>
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<td>5 Negative affect</td>
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<td>-.169</td>
<td>.473**</td>
<td>-.561**</td>
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<td>6 Negative responses</td>
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<td>-.033</td>
<td>.201</td>
<td>-.369**</td>
<td>.459**</td>
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<td>7 Positive responses</td>
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<td>.435**</td>
<td>.235</td>
<td>.223</td>
<td>-.029</td>
<td>-.223</td>
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<td>8 Informational support</td>
<td>.382**</td>
<td>.212</td>
<td>.393**</td>
<td>-.062</td>
<td>.222</td>
<td>.032</td>
<td>.733**</td>
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<td>9 Instrumental support</td>
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<td>.528**</td>
<td>.204</td>
<td>.224</td>
<td>-.121</td>
<td>-.179</td>
<td>.904**</td>
<td>.516**</td>
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<td>10 Esteem support</td>
<td>.688**</td>
<td>.338**</td>
<td>-.094</td>
<td>.439**</td>
<td>-.191</td>
<td>-.336**</td>
<td>.790**</td>
<td>.399**</td>
<td>.634**</td>
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<tr>
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<td>.462**</td>
<td>.258*</td>
<td>.328**</td>
<td>.077</td>
<td>.11</td>
<td>-.219</td>
<td>.894**</td>
<td>.742**</td>
<td>.692**</td>
<td>.617**</td>
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<td>12 PM Satisfaction with responses</td>
<td>.831**</td>
<td>.305*</td>
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<td>.376**</td>
<td>-.132</td>
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<td>.547**</td>
<td>.279*</td>
<td>.477**</td>
<td>.630**</td>
<td>.417**</td>
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</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Table 7
Bivariate correlations of Level 1 PM means with PM satisfaction with spouse responses

<table>
<thead>
<tr>
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<td>-0.023</td>
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<td>Positive affect</td>
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<td>-0.399**</td>
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<td>4</td>
<td>Negative affect</td>
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<td>0.529**</td>
<td>-0.618**</td>
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<td>Negative responses</td>
<td>-0.018</td>
<td>0.197</td>
<td>-0.383**</td>
<td>0.372**</td>
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<td>0.435**</td>
<td>0.157</td>
<td>0.254*</td>
<td>-0.043</td>
<td>-0.199</td>
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<td>7</td>
<td>Informational support</td>
<td>0.353**</td>
<td>0.22</td>
<td>0.081</td>
<td>0.112</td>
<td>-0.013</td>
<td>0.750**</td>
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<td>-0.012</td>
<td>-0.128</td>
<td>0.912**</td>
<td>0.567**</td>
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<td>Esteem support</td>
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<td>0.469**</td>
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<td>0.801**</td>
<td>0.420**</td>
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<td>0.350**</td>
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<td>-0.233</td>
<td>0.906**</td>
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<td>0.735**</td>
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<td>0.462**</td>
<td>-0.202</td>
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<td>0.675**</td>
<td>0.374**</td>
<td>0.589**</td>
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** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Table 8
Bivariate correlations among Level 2 variables and PM satisfaction with responses

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<tr>
<td>2 Age</td>
<td>-0.233</td>
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<td>3 Years since diagnosis</td>
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<td>4 Years married</td>
<td>-0.098</td>
<td>0.501**</td>
<td>0.215</td>
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<td>0.24</td>
<td>0.061</td>
<td>0.206</td>
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<td>0.085</td>
<td>0.219</td>
<td>0.692**</td>
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<td>0.094</td>
<td>0.012</td>
<td>0.135</td>
<td>0.101</td>
<td>0.056</td>
<td>0.146</td>
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<tr>
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<td>0.101</td>
<td>-0.088</td>
<td>0.099</td>
<td>0.136</td>
<td>0.392**</td>
<td>0.484**</td>
<td>0.299*</td>
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<td>-.057</td>
<td>-.435**</td>
<td>-.267*</td>
<td>-.324**</td>
<td>-.278*</td>
<td>-.540**</td>
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<td>0.03</td>
<td>-.111</td>
<td>-.296*</td>
<td>-.441**</td>
<td>-.147</td>
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</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
### Table 9
MLM parameter estimates, concurrent full subscale model, outcome variable: PM satisfaction with responses

<table>
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<th>Parameters included</th>
<th>Parameter estimate</th>
<th>Bias</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
<th>95% Confidence Interval</th>
<th>Cohen's d</th>
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<tr>
<td>Interception</td>
<td>2.191</td>
<td>-0.015</td>
<td>0.326</td>
<td>0.001</td>
<td>1.564 - 2.854</td>
<td>1.70</td>
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<tr>
<td>Level 1:</td>
<td></td>
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<td></td>
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<tr>
<td>AM satisfaction with responses</td>
<td>0.081</td>
<td>-0.005</td>
<td>0.065</td>
<td>0.217</td>
<td>-0.047 - 0.218</td>
<td>0.14</td>
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<td>0.060</td>
<td>0.000</td>
<td>0.009</td>
<td>0.001</td>
<td>0.043 - 0.077</td>
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<td>0.058</td>
<td>0.014</td>
<td>0.025 - 0.248</td>
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<td>0.001</td>
<td>0.022</td>
<td>0.007</td>
<td>-0.103 - -0.015</td>
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<td>Average PM positive responses</td>
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<td>0.000</td>
<td>0.006</td>
<td>0.001</td>
<td>0.048 - 0.071</td>
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<tr>
<td>Average PM positive affect</td>
<td>0.263</td>
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<td>0.045</td>
<td>0.001</td>
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<td>-0.246</td>
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<td>1.96</td>
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<td>Age</td>
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<td>0.000</td>
<td>0.002</td>
<td>0.003</td>
<td>0.002 - 0.012</td>
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<td>0.043</td>
<td>0.001</td>
<td>0.124 - 0.297</td>
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</tbody>
</table>

* Bootstrap results are based on 1000 samples

Note: Proportion of between-person variance explained by the final model: 81%; proportion of within-person variance explained by full model: 20%.
Table 10
MLM parameter estimates, concurrent split subscale model, outcome variable: PM satisfaction with responses

<table>
<thead>
<tr>
<th>Parameters included</th>
<th>Parameter estimate</th>
<th>Bias</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
<th>Bootstrapa</th>
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<th>Cohen's d</th>
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<td></td>
<td>Lower</td>
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<td>0.001</td>
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<td>AM satisfaction with responses</td>
<td>0.059</td>
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<td>0.063</td>
<td>0.354</td>
<td>-0.072</td>
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<td>0.104</td>
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<tr>
<td>PM positive affect</td>
<td>0.103</td>
<td>0.002</td>
<td>0.061</td>
<td>0.111</td>
<td>-0.021</td>
<td>0.225</td>
<td>0.19</td>
</tr>
<tr>
<td>PM pain</td>
<td>-0.049</td>
<td>0.001</td>
<td>0.022</td>
<td>0.031</td>
<td>-0.089</td>
<td>-0.002</td>
<td>0.25</td>
</tr>
<tr>
<td>Level 2:</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Average esteem support</td>
<td>0.266</td>
<td>-0.001</td>
<td>0.020</td>
<td>0.001</td>
<td>0.223</td>
<td>0.305</td>
<td>3.33</td>
</tr>
<tr>
<td>Marital dissatisfaction</td>
<td>-0.143</td>
<td>-0.008</td>
<td>0.169</td>
<td>0.323</td>
<td>-0.490</td>
<td>0.206</td>
<td>0.21</td>
</tr>
<tr>
<td>Average negative responses</td>
<td>-0.265</td>
<td>0.005</td>
<td>0.053</td>
<td>0.001</td>
<td>-0.365</td>
<td>-0.157</td>
<td>1.23</td>
</tr>
<tr>
<td>Fatigue</td>
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<td>-0.001</td>
<td>0.014</td>
<td>0.001</td>
<td>-0.138</td>
<td>-0.084</td>
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</tr>
<tr>
<td>Average informational support</td>
<td>0.033</td>
<td>0.000</td>
<td>0.019</td>
<td>0.050</td>
<td>-0.005</td>
<td>0.070</td>
<td>0.45</td>
</tr>
<tr>
<td>Age</td>
<td>0.010</td>
<td>0.000</td>
<td>0.002</td>
<td>0.001</td>
<td>0.005</td>
<td>0.015</td>
<td>1.08</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0.216</td>
<td>0.003</td>
<td>0.040</td>
<td>0.001</td>
<td>0.137</td>
<td>0.296</td>
<td>1.32</td>
</tr>
</tbody>
</table>

a Bootstrap results are based on 1000 samples

Note: Proportion of between-person variance explained by the final model: 84%; proportion of within-person variance explained by full model: 24%.
Table 11
MLM parameter estimates, lagged full subscale model, outcome variable: PM satisfaction with responses

<table>
<thead>
<tr>
<th>Parameters included</th>
<th>Parameter estimate</th>
<th>Bias</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
<th>Lower</th>
<th>Upper</th>
<th>95% Confidence Interval</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.431</td>
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<td>0.311</td>
<td>0.001</td>
<td>1.814</td>
<td>3.026</td>
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<td>1.98</td>
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<td>Level 1:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM satisfaction with responses</td>
<td>0.075</td>
<td>-0.005</td>
<td>0.074</td>
<td>0.318</td>
<td>-0.079</td>
<td>0.214</td>
<td></td>
<td>0.11</td>
</tr>
<tr>
<td>AM positive responses</td>
<td>0.023</td>
<td>0.000</td>
<td>0.009</td>
<td>0.009</td>
<td>0.006</td>
<td>0.040</td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>AM negative responses</td>
<td>-0.111</td>
<td>0.001</td>
<td>0.042</td>
<td>0.010</td>
<td>-0.194</td>
<td>-0.027</td>
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<td>0.30</td>
</tr>
<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean positive responses</td>
<td>0.051</td>
<td>0.000</td>
<td>0.006</td>
<td>0.001</td>
<td>0.041</td>
<td>0.061</td>
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<td>2.27</td>
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<td>-0.010</td>
<td>0.184</td>
<td>0.125</td>
<td>-0.639</td>
<td>0.101</td>
<td></td>
<td>0.36</td>
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<tr>
<td>Marital dissatisfaction</td>
<td>0.225</td>
<td>-0.003</td>
<td>0.047</td>
<td>0.001</td>
<td>0.125</td>
<td>0.316</td>
<td></td>
<td>1.22</td>
</tr>
<tr>
<td>Mean negative responses</td>
<td>-0.235</td>
<td>0.004</td>
<td>0.054</td>
<td>0.001</td>
<td>-0.333</td>
<td>-0.116</td>
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<td>1.07</td>
</tr>
<tr>
<td>Fatigue</td>
<td>-0.136</td>
<td>-0.001</td>
<td>0.017</td>
<td>0.001</td>
<td>-0.170</td>
<td>-0.103</td>
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<td>1.97</td>
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<td>0.000</td>
<td>0.003</td>
<td>0.002</td>
<td>0.002</td>
<td>0.014</td>
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<td>0.66</td>
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<tr>
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<td>0.276</td>
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<td>0.048</td>
<td>0.001</td>
<td>0.178</td>
<td>0.363</td>
<td></td>
<td>1.42</td>
</tr>
</tbody>
</table>

* Bootstrap results are based on 1000 samples

Note: Proportion of between-person variance explained by the final model: 67%; proportion of within-person variance explained by full model: 6%.
Table 12  
MLM parameter estimates, lagged subscale model, outcome variable: PM satisfaction with support

<table>
<thead>
<tr>
<th>Parameters included</th>
<th>Parameter estimate</th>
<th>Bias</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
<th>Lower</th>
<th>Upper</th>
<th>Cohen's $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.988</td>
<td>0.002</td>
<td>0.309</td>
<td>0.001</td>
<td>1.373</td>
<td>2.571</td>
<td>1.59</td>
</tr>
<tr>
<td>Level 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM satisfaction with responses</td>
<td>0.083</td>
<td>-0.003</td>
<td>0.077</td>
<td>0.281</td>
<td>-0.064</td>
<td>0.232</td>
<td>0.12</td>
</tr>
<tr>
<td>AM esteem support</td>
<td>0.075</td>
<td>0.001</td>
<td>0.029</td>
<td>0.013</td>
<td>0.019</td>
<td>0.137</td>
<td>0.29</td>
</tr>
<tr>
<td>AM negative responses</td>
<td>-0.104</td>
<td>0.002</td>
<td>0.043</td>
<td>0.014</td>
<td>-0.185</td>
<td>-0.019</td>
<td>0.27</td>
</tr>
<tr>
<td>Level 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean esteem support</td>
<td>0.258</td>
<td>-0.002</td>
<td>0.020</td>
<td>0.001</td>
<td>0.215</td>
<td>0.299</td>
<td>3.13</td>
</tr>
<tr>
<td>Marital dissatisfaction</td>
<td>-0.082</td>
<td>-0.009</td>
<td>0.186</td>
<td>0.614</td>
<td>-0.452</td>
<td>0.283</td>
<td>0.11</td>
</tr>
<tr>
<td>Mean negative responses</td>
<td>-0.232</td>
<td>0.001</td>
<td>0.052</td>
<td>0.001</td>
<td>-0.338</td>
<td>-0.128</td>
<td>1.10</td>
</tr>
<tr>
<td>Average fatigue</td>
<td>-0.127</td>
<td>-0.001</td>
<td>0.016</td>
<td>0.001</td>
<td>-0.158</td>
<td>-0.098</td>
<td>2.05</td>
</tr>
<tr>
<td>Age</td>
<td>0.013</td>
<td>0.000</td>
<td>0.003</td>
<td>0.001</td>
<td>0.008</td>
<td>0.019</td>
<td>1.15</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0.281</td>
<td>0.001</td>
<td>0.045</td>
<td>0.001</td>
<td>0.190</td>
<td>0.367</td>
<td>1.57</td>
</tr>
</tbody>
</table>

* Bootstrap results are based on 1000 samples

Note: Proportion of between-person variance explained by the final model: 72%; proportion of within-person variance explained by full model: 6%.
Table 13
Summary of significant findings for repeated measures variables predicting satisfaction with responses

<table>
<thead>
<tr>
<th>Covariate</th>
<th>WABA</th>
<th>Analysis (MLM)</th>
<th>WABA</th>
<th>Analysis (MLM)</th>
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<tr>
<td></td>
<td>WP, C BP, C WP, L BP, L</td>
<td>Full, C Subscale, C Full, L Subscale, L</td>
<td>WP BP WP BP WP BP WP BP</td>
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<tr>
<td>Extent of contact</td>
<td>* * * *</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pain</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>* *</td>
<td>* * *</td>
<td>* * *</td>
<td>* * *</td>
</tr>
<tr>
<td>Negative affect</td>
<td>* t</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative responses</td>
<td>* * * *</td>
<td>* * * *</td>
<td>* * * *</td>
<td>* * * *</td>
</tr>
<tr>
<td>Positive responses</td>
<td>* * * *</td>
<td>* * * *</td>
<td>* * * *</td>
<td>* * * *</td>
</tr>
<tr>
<td>Informational support</td>
<td>* * *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental support</td>
<td>* * *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esteem support</td>
<td>* * *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solicitous support</td>
<td>* * t</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * = statistically significant in the analysis (p < .05), t = trend (p < .10)

WP = Within-person (Level 1); BP = Between-person (Level 2)
C = Concurrent analyses; L = Lagged analyses
Table 14
Comparison of parameter estimates using cases bootstrapping and simple bootstrapping (split, lagged model)

<table>
<thead>
<tr>
<th>Estimation method:</th>
<th>Parameters included</th>
<th>Parameter estimate</th>
<th>Bias</th>
<th>Std. Error</th>
<th>Sig. (2-tailed)</th>
<th>Lower</th>
<th>Upper</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Cases</td>
<td>Intercept</td>
<td>1.988</td>
<td>0.002</td>
<td>0.309</td>
<td>0.001</td>
<td>1.373</td>
<td>2.571</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>AM satisfaction with responses</td>
<td>0.083</td>
<td>-0.003</td>
<td>0.077</td>
<td>0.281</td>
<td>-0.064</td>
<td>0.232</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>AM esteem support</td>
<td>0.075</td>
<td>0.001</td>
<td>0.029</td>
<td>0.013</td>
<td>0.019</td>
<td>0.137</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>AM negative responses</td>
<td>-0.104</td>
<td>0.002</td>
<td>0.043</td>
<td>0.014</td>
<td>-0.185</td>
<td>-0.019</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>Mean esteem support</td>
<td>0.258</td>
<td>-0.002</td>
<td>0.020</td>
<td>0.001</td>
<td>0.215</td>
<td>0.299</td>
<td>3.13</td>
</tr>
<tr>
<td></td>
<td>Marital dissatisfaction</td>
<td>-0.082</td>
<td>-0.009</td>
<td>0.186</td>
<td>0.614</td>
<td>-0.452</td>
<td>0.283</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Mean negative responses</td>
<td>-0.232</td>
<td>0.001</td>
<td>0.052</td>
<td>0.001</td>
<td>-0.338</td>
<td>-0.128</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>Average fatigue</td>
<td>-0.127</td>
<td>-0.001</td>
<td>0.016</td>
<td>0.001</td>
<td>-0.158</td>
<td>-0.098</td>
<td>2.05</td>
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<tr>
<td></td>
<td>Age</td>
<td>0.013</td>
<td>0.000</td>
<td>0.003</td>
<td>0.001</td>
<td>0.008</td>
<td>0.019</td>
<td>1.15</td>
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<tr>
<td></td>
<td>Neuroticism</td>
<td>0.281</td>
<td>0.001</td>
<td>0.045</td>
<td>0.001</td>
<td>0.190</td>
<td>0.367</td>
<td>1.57</td>
</tr>
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<td>0.353</td>
<td>0.001</td>
<td>1.236</td>
<td>2.668</td>
<td>1.39</td>
</tr>
<tr>
<td></td>
<td>AM satisfaction with responses</td>
<td>0.083</td>
<td>-0.004</td>
<td>0.082</td>
<td>0.313</td>
<td>-0.081</td>
<td>0.250</td>
<td>0.11</td>
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<td></td>
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<td>0.001</td>
<td>0.034</td>
<td>0.026</td>
<td>0.009</td>
<td>0.139</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
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<td>0.047</td>
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<td>-0.192</td>
<td>-0.006</td>
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</tr>
<tr>
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<td>-0.001</td>
<td>0.023</td>
<td>0.001</td>
<td>0.210</td>
<td>0.303</td>
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<td>0.001</td>
<td>-0.349</td>
<td>-0.112</td>
<td>0.98</td>
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<tr>
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<td>0.001</td>
<td>0.007</td>
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<td>0.050</td>
<td>0.001</td>
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</table>

*Bootstrap results are based on 1000 samples*
### Table 15
Correlations for lability analysis

<table>
<thead>
<tr>
<th></th>
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<th>2</th>
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<td>0.012</td>
<td>0.094</td>
<td>0.135</td>
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<tr>
<td>6</td>
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<td>0.392**</td>
<td>-0.088</td>
<td>0.101</td>
<td>0.099</td>
<td>0.299*</td>
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<tr>
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<td>-0.540**</td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Negative affect</td>
<td>0.285*</td>
<td>-0.073</td>
<td>-0.014</td>
<td>0.178</td>
<td>0.384**</td>
<td>0.580**</td>
<td>-0.459**</td>
<td>0.211</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Positive affect</td>
<td>-0.219</td>
<td>-0.063</td>
<td>0.100</td>
<td>0.030</td>
<td>-0.373**</td>
<td>-0.484**</td>
<td>0.437**</td>
<td>-0.167</td>
<td>-0.593**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>Pain</td>
<td>0.610**</td>
<td>-0.003</td>
<td>0.093</td>
<td>0.090</td>
<td>0.112</td>
<td>0.415**</td>
<td>-0.212</td>
<td>0.437**</td>
<td>0.512**</td>
<td>-0.381**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Positive responses</td>
<td>0.294*</td>
<td>0.266*</td>
<td>-0.039</td>
<td>0.186</td>
<td>-0.375**</td>
<td>-0.010</td>
<td>0.038</td>
<td>0.054</td>
<td>0.054</td>
<td>0.046</td>
<td>0.235</td>
<td>0.182</td>
</tr>
<tr>
<td>13</td>
<td>Negative responses</td>
<td>-0.002</td>
<td>-0.085</td>
<td>-0.156</td>
<td>0.060</td>
<td>0.371**</td>
<td>0.169</td>
<td>-0.143</td>
<td>-0.033</td>
<td>0.320**</td>
<td>-0.361**</td>
<td>0.164</td>
<td>-0.199</td>
</tr>
<tr>
<td>14</td>
<td>Lability</td>
<td>-0.011</td>
<td>-0.157</td>
<td>0.113</td>
<td>-0.113</td>
<td>0.475**</td>
<td>0.236</td>
<td>-0.179</td>
<td>0.169</td>
<td>0.163</td>
<td>-0.367**</td>
<td>0.087</td>
<td>-0.496**</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).  
*Correlation is significant at the 0.05 level (2-tailed).
Table 16
Lability multiple regression parameter estimates

<table>
<thead>
<tr>
<th></th>
<th>Bootstrap</th>
<th>95% Confidence Interval</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Bias</td>
<td>Std. Error</td>
<td>Sig. (2-tailed)</td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.228</td>
<td>-0.013</td>
<td>0.467</td>
<td>0.615</td>
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<td>1.148</td>
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<tr>
<td>Marital Satisfaction</td>
<td>0.415</td>
<td>0.007</td>
<td>0.201</td>
<td>0.038</td>
<td>0.020</td>
<td>0.811</td>
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<td>Positive responses</td>
<td>-0.022</td>
<td>0.000</td>
<td>0.008</td>
<td>0.005</td>
<td>-0.038</td>
<td>-0.007</td>
</tr>
<tr>
<td>Negative responses</td>
<td>0.115</td>
<td>0.002</td>
<td>0.057</td>
<td>0.028</td>
<td>0.009</td>
<td>0.247</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-0.077</td>
<td>-0.002</td>
<td>0.067</td>
<td>0.260</td>
<td>-0.197</td>
<td>0.053</td>
</tr>
</tbody>
</table>

Note: bootstrap results are based on 1000 bootstrap samples
### 3.6 Figures

<table>
<thead>
<tr>
<th></th>
<th>Within</th>
<th>Between</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative responses</td>
<td>58%</td>
<td>42%</td>
</tr>
<tr>
<td>Extent of contact</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>Satisfaction with Responses</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>Informational Support</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>Positive affect</td>
<td>37%</td>
<td>63%</td>
</tr>
<tr>
<td>Negative affect</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td>Solicitous Support</td>
<td>32%</td>
<td>68%</td>
</tr>
<tr>
<td>Esteem Support</td>
<td>31%</td>
<td>69%</td>
</tr>
<tr>
<td>Instrumental Support</td>
<td>28%</td>
<td>72%</td>
</tr>
<tr>
<td>Pain</td>
<td>20%</td>
<td>80%</td>
</tr>
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</table>

*Figure 1.* Percentage of variance within and between participants on select daily diary measures, based on WABA.
Figure 2. PM covariance with PM satisfaction with spouse responses, based on WABA t-values.
Figure 3. Between-person results of MLM concurrent, full-scale analysis. Variables higher on the page are associated with higher levels of PM satisfaction with responses; those lower on the page are associated with lower levels of satisfaction. Cohen's $d$ effect sizes in brackets.
Figure 4. Within-person results of MLM concurrent, full-scale analysis. Variables higher on the page are associated with higher levels of PM satisfaction with responses; those lower on the page are associated with lower levels of satisfaction. Cohen’s d effect sizes in brackets.
Figure 5. Between-person results of MLM lagged, sub-scale analysis. Variables higher on the page are associated with higher levels of PM satisfaction with responses; those lower on the page are associated with lower levels of satisfaction. Cohen's d effect sizes in brackets.
Figure 6. Within-person results of MLM lagged, sub-scale analysis. Variables higher on the page are associated with higher levels of PM satisfaction with responses; those lower on the page are associated with lower levels of satisfaction. Cohen's d effect sizes in brackets.
4 Chapter: Discussion

Despite social support being strongly related to health outcomes, relatively little is known about what leads someone to feel satisfied with the support they receive from others. Previous research has found moderate support for an association between perceived support and the support a person actually receives, their relationship satisfaction, their mood, and their personality. However, previous studies have generally used cross-sectional and univariate methods. The current study involved an in-depth investigation into the covariates of satisfaction with spouse responses using a daily diary methodology. The sample was comprised of 69 married patients with rheumatoid arthritis (RA).

The first goal of the current study was to investigate whether variability in satisfaction with spouse responses occurred within-people, between-people, or both. Results indicated that there was significant variability in satisfaction with spouse responses both within and between participants over the course of the seven-day study period. The second goal was to test for covariates of this within- and between-person variance in satisfaction with responses. Several covariates of within-person variance were identified in both concurrent and lagged analyses, with esteem support and negative spouse responses emerging as key factors. Several significant between-person correlates were also identified, including key variables such as fatigue, age, esteem support, and negative responses. The third goal the current study was to investigate factors related to patients’ degree of within-person variability in satisfaction with spouse responses. Marital dissatisfaction, positive affect, and positive and negative responses were associated with a participant’s lability. Results of each hypothesis are discussed in more detail in the following sections.
4.1 *Hypothesis 1: Satisfaction with responses has variance within-individuals*

Consistent with the first study hypothesis, a significant proportion of variance was identified both within and between participants. Specifically, 45% of the variability in AM satisfaction with responses, and 40% of the variability in PM satisfaction with responses, occurred within-person. All Level 1 predictor variables showed significant within-person variance; none had less than 20% variance at the within-person level (See Table 3).

In contrast to some previous suggestions in the literature, these findings challenge the idea that satisfaction with support is a predominantly stable, between-person trait. The current findings are also consistent with previous daily diary research that has demonstrated significant within-person variance in spousal relationship enjoyment (57%; Davis, Affleck, & Zautra, 2006). Davis and colleagues used a sample similar to the current study (i.e., predominantly female RA patients). Other studies have similarly reported a significant portion of within-person variance in support satisfaction (Kafetsios & Nezlek, 2012).

The idea that individuals may vary in their levels of satisfaction over time is also consistent with previous findings indicating that measures of perceived support demonstrate only a moderate stability. For example, a study on cataract surgery patients used path analysis and found that over one week, perceived support from all sources was only 66% stable (Knoll et al., 2007). Furthermore, studies have shown that the longer the time between measurements of perceived support, the lower the reliability of test-retest ratings (e.g., Sarason & Sarason, 1986). Global ratings of satisfaction with support in particular have also proven less stable than other measurements of support (such as received support; Coventry, Gillespie, Heath, & Martin, 2004; Knoll et al., 2007; Sandler & Barrera, 1984).
Aside from showing that variance in perceived social support is related to genetics, twin studies have also suggested that a non-trivial proportion of variance in ratings of perceived support from friends, relatives, and confidants comes from environmental factors (Kendler, 1997). Another similar study followed 431 pairs of twins over a six-year period and estimated the non-genetic variability in perceived availability and adequacy of social support at between 59 and 78% (Bergeman & Neiderhiser, 2001).

Despite these findings suggesting within-person variability in social support over time, most research efforts have conceptualized satisfaction with support as a stable, between–person variable. This was done both explicitly in terms of theory and hypothesis, and implicitly through the choice of research question and design (Uchino et al., 2012). It is understandable why previous research would have primarily used a between–person approach to the measurement and analysis of satisfaction with support. Perhaps foremost, it is the approach used in most areas of psychological research. Conducting daily diary interviews, which allow simultaneous within- and between person analyses, is a time-consuming endeavor for both the researcher and the participants. The analyses of the data are also typically more complex than the analyses of cross-sectional data. However, the reliance on cross-sectional research methods has also been proposed as one of the reasons for the slow progress in social support research (Hobfoll, 2009). While the current study’s daily diary findings confirm that a significant proportion of variance in support is indeed between–person, they also indicate that a significant portion of the variance in satisfaction with spouse responses is missed in a cross-sectional approach. The current study supports the view that satisfaction with spouse responses, at least when assessed over a one week period, has both within- and between-person variability. Thus, as Uchino and colleagues (2009) have stated,
future research should incorporate both levels of analysis in study design, hypotheses, and analytic methods to understand this complex construct.

4.2 Hypothesis 2: Variability in satisfaction with spouse responses can be explained

The overarching supposition of Hypothesis 2 was that the within- and between-person variance in satisfaction with responses could be explained by psychosocial and disease-related factors. This was a somewhat novel approach: not only was satisfaction with responses analyzed at within- and between-person levels in the current study, it was also viewed as the outcome variable of interest. This is in contrast to the majority of past research, which has examined social support as a predictor or moderator of health conditions, rather than an outcome (Kafetsios & Nezlek, 2012; Knoll et al., 2007).

Previous research on the topic has shown links between perceptions of social support and received support, personality, and marital satisfaction. However, the associations have generally been modest, and these factors have generally been investigated in isolation of each other. In contrast, the current study used a multivariate and multilevel approach, and was able to explain substantial variance in satisfaction with spouse responses. Specifically, in the concurrent full subscale (CF) model, 81% of the between-person variance, and 20% of the within-person variance was explained. In the concurrent subscale (CS) model, 84% of the between-person variance, and 24% of the within-person variance was explained. The lagged full subscale (LF) model accounted for 67% of the between-person variance and 5.8% of the within-person variance. The lagged subscale (LS) model accounted for 72% of the between-person, and 6.2% of the within-person variance in satisfaction with responses (see Tables 9-12). The individual factors involved in these analyses are discussed in detail in the following sections.
4.2.1 Positive spouse responses and esteem support

Perhaps not surprisingly, an association of satisfaction with responses with positive spouse responses was one of the most consistent findings. When participants reported higher than usual levels of positive responses from their spouse, they reported higher levels of satisfaction with those responses on the same day. This was true both in concurrent measurements and over the course of the day (see Table 13). There was also a significant effect for positive spouse responses when the average levels were considered—patients who reported higher overall levels of positive responses were generally higher in satisfaction with spouse responses.

One important question posed in the subscale analysis of the current study was whether certain types of support had a greater impact on satisfaction with spouse responses than others. When positive spouse responses were broken down into subscales, emotional-esteem support was a particularly strong predictor. If patients endorsed the esteem items “[my spouse] showed me that he/she loves and accepts me” and/or “[my spouse] made me feel valued and important” to a higher degree than usual, they were more likely to report satisfaction with their spouse’s responses, even six hours later. These esteem support items specifically reflected perceptions of love and respect received from one’s partner. Participants who had higher average scores on these statements across the study period also tended to have higher average levels of satisfaction with responses. In many of the subscale analyses, esteem support was the only type of “positive” spouse response that was significant in the model predicting satisfaction with responses, and it was significantly related in every one of the analyses of the current study (see Table 13). Based on the WABA and MLM analyses, esteem support was more significant for overall patient satisfaction with spouse
responses than receiving advice (informational support), tangible assistance (instrumental support), or sympathy for their illness (solicitous support).

A tendency for esteem support to outweigh other support variables has also been reported in previous research. Following coronary bypass surgery, esteem support was the only form of support that was significantly associated with both a patient’s emotional well-being and health indicators across four time-points in a year-long study (King, Reis, Porter, & Norsen, 1993). Esteem support was shown to have a greater magnitude of effect than informational or instrumental support, and also had a greater magnitude of effect than a combined scale of all of the support factors (King et al., 1993).

In another study, a lack of emotional support was shown to be predictive of mortality in heart attack survivors, whereas instrumental support showed no relation (Berkman, Leo-Summers, & Horwitz, 1992). In a study conducted on a sample of child sexual abuse survivors, esteem support was the type of support most preventative against the development of post traumatic stress disorder (Hyman, Gold, & Cott, 2003). Helpful in understanding these findings, research has shown that esteem and emotional support are generally perceived as more nurturing and less controlling than informational or instrumental support (Trobst, 2000).

Having a single subscale so strongly related to satisfaction with responses is a boon in terms of future research and clinical recommendations. Were it just that in the subscale model all of the types of support contributed relatively evenly, and the amount of variance explained in the subscale model was similar to the full model, no additional information would have been gained. In fact, the subscale model would have been more complex, but only able to fit the data as well as the less complex model. As it was, an equally
parsimonious but more specific model was equally effective in predicting satisfaction with spouse responses.

Furthermore, having esteem support emerge as the most important type of spouse response helps with ease of recommendations to both researchers and care providers. Researchers can focus their efforts more specifically to understanding factors that may moderate the relationship between esteem support and well-being, such as gender and personality. They can also investigate the precursors of a participant’s perceptions of esteem support. For clinicians treating individuals with RA and their families, instead of a complex message where multiple aspects of support contribute to global perceptions, our findings suggest that they might be able to deliver a more clear, understandable message to their patients: behaving so that your partner feels love and respect appears to be most helpful in making them feel supported. Previous attempts to use cognitive behavioural therapy to increase social support in RA have been moderately successful (Evers, Kraaimaat, van Riel, & de Jong, 2002). However, the study focused on training patients in help-seeking behaviour and communication, not methods of increasing esteem support. Future intervention research could potentially increase effect sizes with the inclusion of more interpersonal support training, and particularly a focus on increasing esteem support in the dyad.

Despite the strength of esteem support as a predictor (compared to other types of support), it should be noted that the proportion of within-person variance explained was modest. In the concurrent analysis, 24% of the variance in satisfaction with spouse responses was explained by esteem support and four other variables (instrumental support, positive affect, and pain), and the control. In the lagged analysis, the model containing esteem support, negative responses, and the control explained 6% of the Level 1 variance. Given the
modest proportion of variance explained (especially in the lagged analysis), there must be
other factors that contribute to the within-person variance in satisfaction with spouse
responses. For instance, is it possible that despite the question being about the spouse in
particular, interactions with other people impacted the patient’s ratings of satisfaction. Such
caveats aside, explaining 6% of the variance in a complex construct after a six-hour lag using
two predictors and a control variable is noteworthy.

4.2.1.1 Considerations and limitations regarding positive responses and its subscales
In the current study, esteem support contributed significantly to model fit, whereas
informational, instrumental, and solicitous support generally did not (see Table 13). In the
process of model building, variables were entered in the order of their bivariate association
(as determined by WABA), with the strongest variables entered first. Therefore, it is a
possibility that if some of the weaker support variables were entered earlier in the model
building they may have made significant contributions to model fit. This consideration bears
more weight given that informational, instrumental, and solicitous support were all related to
greater satisfaction with responses at the bivariate level. There were also associations of
some of the positive support variables in the concurrent, but not the lagged model (see Table
13).

Given these patterns of associations, it is likely that other support subscales share
variance in satisfaction with responses with esteem support. However, as one of the goals of
model building is parsimony, strongest variables were added first. If new variables did not
contribute over and above their shared variance with the stronger predictor, their inclusion
would have only made the model more complex, without improving it. For example, within-
person, when a participant reports higher than average esteem support, they tend to also tend
to report higher than average informational support, both of which lead to higher satisfaction with responses. However, when esteem support was estimated in the model first, informational support did not improve the model over and above that association. Put another way, informational support was not strongly related to satisfaction with responses in a way that is not already explained by esteem support. Confidence in this analytic approach is gained because when just esteem support was included in lagged analysis, the proportion of variance explained was similar to when esteem support, solicitous support, instrumental support, and informational support were all entered together as “positive responses.”

It is possible that certain characteristics specific to the study or sample population were responsible for the other support variables not being significant in the model. For example, it could be that the impact of different types of support on ratings of satisfaction may vary by gender, personality, or disease severity. However, while the population of the current sample was predominantly female, previous research has also found a relationship between esteem support and satisfaction with support among husbands (Dehle & Landers, 2005).

As with most investigations into under-researched areas, the current study raises as many questions as it answers. Replication using different populations is imperative. Future research should continue to explore the role of esteem, instrumental, informational, and solicitous support in order to obtain a more complete view of the complex psychosocial construct of social support. Depending on the study, this could be as simple as including the subscales for analysis, or as complex as obtaining sufficiently large samples and investigating cross-level interactions between Level 1 and Level 2 variables. It is also worthwhile to note that although not strongly associated with satisfaction with responses in
the current study, informational and instrumental support themselves have been associated with better adjustment to physical illness (Wills, Mariani, & Filer, 1996).

4.2.2 Negative support interactions

Another highly consistent finding in the current study was the relationship between patient perceptions of negative spouse responses (i.e., complaints and avoidance) and lower levels of satisfaction with spouse responses (see Table 13). This is in keeping with the findings of previous cross-sectional and prospective research. One such study found that a greater number of negative support behaviours was related to lower ratings of supportiveness in spousal interactions (Cutrona et al., 1997). Daily diary studies have also shown that spousal strain can actually outweigh the benefits of spousal support in the prediction of negative affect (DeLongis, Capreol, Holtzman, O’Brien, & Campbell, 2004). Negative interactions in relationships tend to be relatively infrequent, and perhaps as a result, when they do occur, they tend to be noticed by those involved (Abbey et al., 1985; Holtzman, 2007; Rook, 1987). The association between negative responses and satisfaction with support has also been demonstrated in other chronic pain samples (Cano, 2004). Furthermore, research shows that positive and negative interactions operate independently: the same couple can be high in both (Uchino et al., 2001).

Higher average levels of negative responses were also associated with lower average satisfaction with responses in the current study. These stable negative responses have proven to be directly linked to health. For example, in a longitudinal study of older adults, higher levels of negative social exchanges were associated with a greater number of health concerns, more functional limitations, and lower self-rated health (Newsom, Mahan, Rook, & Krause, 2008). These infrequent but unwelcome negative interactions need to be understood by both
members of the dyad in order to minimize their occurrence and effects. Interventions should focus on decreasing negative and critical spousal responses.

4.2.3 Positive affect

When people are in more positive moods, research and theory suggest that they are more likely to evaluate social interactions positively, and to seek out rewarding social activities (Lyubomirsky et al., 2005). In the current study, positive affect was associated with higher levels of satisfaction with responses at the within-person level but only in the concurrent models. Therefore, in the current sample, positive affect seems to be associated with in-the-moment satisfaction with responses, but does not appear to having lasting effects on satisfaction over the course of the day. In contrast, a recent study suggested lingering effects of positive affect on satisfaction with support. Kafetsios and Nezlek (2012) used a diary methodology involving British and Greek undergraduate students and reported that positive affect was an antecedent to increased levels of satisfaction with support. However, the only description of the time lag used in the study was that satisfaction with support was reported “subsequently” to affect. (As soon as possible after each 10-plus minute interaction, participants reported the interaction, and then subsequently reported their satisfaction with support). Given the vagueness of the description, it is unclear to what, if any, lagged effect was present. Therefore a concurrent, within-person association between affect and perceived support is likely, whereas a lagged association is possible, but does not have strong support as of yet.

In the current study, a significant between-person effect of positive affect was only seen in one of the models: the concurrent full model. In support of this, some previous cross-sectional research has found an association between positive affect and perceptions of
support. For example, in one study participants viewed a videotape of a social interaction that they were a part of (Forgas et al., 1984). Those induced to have increased positive affect before the viewing had a more positive appraisal of those interactions. Beach et al. also found an association in a cross-sectional research (1993). Therefore, it seems likely that positive affect also has an effect on perceptions of support at the between-person level.

4.2.4 Negative affect

RA patients are at a greater risk of anxiety and depression than the average person (Covic et al., 2012). However, contrary to study hypotheses, negative affect showed only a weak and mixed association with satisfaction with spouse responses in the current study (see Table 13). Negative affect was only found to be a significant factor in some bivariate correlations, and was only a trend in others. It was not a significant factor in any of the MLM analyses. This is despite previous research showing that those with higher negative affect tend to focus on the negative aspects of interactions and experiences (e.g., Watson & Clark, 1984). In a cross-sectional study on chronic pain patients, anxiety and depression were associated with lower levels of perceived support (Nicholas et al., 2009). In another study, higher levels of depression were associated with lower levels of received support (Simonelli, 2005).

Although no significant lagged effects were identified when negative affect was considered as an antecedent of satisfaction with responses, it is possible that an effect would have been found if the temporal sequence had been reversed. Research has suggested that ineffective support from partners could be predictive of negative affect and mood (Badr, Laurenceau, Schart, Basen-Engquist, & Turk, 2010). For example, in a study of chronic pain patients, perceived social support led to increased mood on the following day (Feldman, Downey, & Schaffer-Neitz, 1999). Also using a daily process analysis, DeLongis and
colleagues (2004) examined the relation between spousal strain, spousal support, and negative affect among married couples. Spousal strain positively predicted same-day evening negative affect, whereas spousal support inversely predicted same-day evening negative affect. In addition, spousal support, but not spousal strain, predicted negative affect from one day to the next. It is therefore possible that negative affect could be primarily an outcome of a lack of satisfaction with responses, not a predictor of it. This is an area of investigation that bears consideration in future research.

4.2.5 Pain severity

In the present study, increases in pain were found to be associated with decreases in satisfaction with responses. However, this effect was only present at the within-person level in the concurrent analyses, in both WABA and MLM. In between-person analysis, average levels of pain for each participant were not correlated with their average satisfaction with responses in the current study. These findings indicate that while pain is an important in-the-moment covariate of satisfaction with responses, the increases or decreases in pain do not appear to have any lasting or persistent effects, nor do average levels of pain predict overall levels of satisfaction with responses. In terms of clinical practice, making patients aware of this could be beneficial. When patients are experiencing more than their average level of pain, they are less likely to be satisfied with the responses of their spouse in the moment, and an awareness of that trend could help put those feelings into perspective.

While pain does not appear to precede decreases in satisfaction with responses, perhaps decreases in satisfaction with responses precede increased pain. Research that has shown that pain is an extremely subjective experience, making such a hypothesis intriguing. For example, the biopsychosocial model highlights the importance of attributions to the
experience of pain (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). One previous study using a daily diary methodology has shown a trend towards a decrease in pain following a person reporting more than their average level of satisfaction with spouse responses (Holtzman, 2007). Therefore, the hypothesis that increased satisfaction with responses leads to decreased pain warrants investigation in future research efforts.

4.2.6 Fatigue

Fatigue is one of the most prominent and frequently reported symptoms of RA (Smith et al., 1995). Studies have suggested that fatigue is likely related to less enthusiasm and interest in social activities, as well as lower levels of perceived social support (Maher, Mora, & Leventhal, 2006). It has also been suggested that fatigue may affect efforts to seek support (Steiner, Bigatti, Hernandez, Lydon–Lam, & Johnston, 2010). Fatigue has been viewed as an outcome of loneliness in previous research: despite sleeping the same number of hours, lonely people report being more fatigued following day (Hawkley, Preacher, & Cacioppo, 2010). In the current study, there was a consistent relationship between higher levels of fatigue and lower satisfaction with spouse responses. Thus, while one disease variable (pain) was not strongly associated with satisfaction with spouse responses, another disease variable (fatigue) was. This is fortunate in a sense, as CBT interventions targeting fatigue have been shown to have a medium-to-large effect (Evers, Kraaimaat, van Riel, & de Jong, 2002).

In terms of limitations in the current study, fatigue was only measured during the initial interview. This approach was justifiable as researchers have argued that fatigue is a quasi-trait in RA patients, rather than a state variable (Smith et al., 1995). However, a recent daily process study on cancer patients estimated that fatigue differed 40% between-people and 60% within-people (Rumble et al., 2010). This finding indicates that it is possible that
fatigue has a within-person effect as well. Furthermore, in a daily diary study on rheumatoid arthritis patients, those whose spouses underestimated their level of fatigue reported higher levels of perceived problematic support (Lehman et al., 2011). In light of these findings, future studies should include fatigue as a daily measure, as its day-to-day relation to social support may be important.

4.2.7 Age

In the current study, the age of the participant was related to their levels of satisfaction with responses, such that older patients were generally more satisfied with their spouse’s responses over the course of the study period. However, previous findings regarding age and satisfaction with support are mixed. For example, in a study on geriatric patients, increased age was associated with less satisfaction with support (Jang, Haley, Small, & Mortimer, 2002). This was not simply the result of a reduction in support due to the death of loved ones as time passed: the study found the effect was independent of reduced social network size, or amount of support (Jang et al., 2002). Other studies have found no relation between age and either perceived or received social support; for example, no association was present in a sample of cataract surgery patients (Knoll et al., 2007). A third study using a sample of healthy individuals found a positive correlation between age and perceived adequacy of support (Bergeman & Neiderhiser, 2001). The same study found a negative correlation between age and friend support, as well as the number of relationships. However, it is worth noting that all of the participants in the current study were married or cohabitating. Therefore it is possible that when comparing the support they were receiving to that received by their widowed peers, the participants appreciated it even more. Further research into the factors associated with these mixed results is warranted.
4.2.8 Gender

In the current study, levels of satisfaction with spouse support did not differ significantly between men and women. This may have been due to the fact that the current sample was predominantly female (84%), although this gender split is typical of RA patients in general (Alamanos & Drosos, 2005). However, previous studies have also failed to find a significant main effect of gender in social support. In a sample of married and cohabitating RA patients, no significant correlations were found between gender and perceived beneficial or problematic support interactions (Lehman et al., 2011). Similarly, in a large longitudinal twin study, no significant difference was found in the average reported adequacy of support reported among men and women (Bergeman & Neiderhiser, 2001). However, a descriptive epidemiology study did report significant differences between the sexes in perceived support (Turner & Marino, 1994). It is noteworthy, however, that although they found that women reported more support from friends, family, and coworkers, there were no differences between the sexes in their perceptions of support from the spouse.

Although in the current study there was no difference between the sexes in the average level of perception of satisfaction with spouse responses, it is possible that factors associated with satisfaction would be different between the two sexes. For instance, in one study, while there were no differences in average levels of perceived support, wives tended to provide more emotional and instrumental support than husbands (Verhofstadt, Buysse, & Ickes, 2007). Other studies have shown that when women are the support providers they take their husband’s personality into account in terms of the type of support they provide (Dehle & Landers, 2005). Men, on the other hand, do not seem to be equally attuned to these contextual variables, and provide similar support to wives regardless of their personality. The
same study found an interaction between esteem support, gender and satisfaction: men who were higher in neuroticism showed a positive relationship between esteem support and satisfaction with support, whereas for those lower in neuroticism, this relationship was non-significant. The associations between social support and health outcomes also seem to be related to gender. For example, a large study found that in older women, depression was more common among those who lacked emotional support, whereas in older men, depression was more common among those who lacked tangible support (Grav, Hellzên, Romild, & Stordal, 2012).

As such, although no main effects for gender were found in the current study, it is likely an important contextual variable. By using larger sample size and a more even gender split, future research should investigate interactions between gender and the types of support provided and perceived.

4.2.9 Years since diagnosis

It is reasonable to propose that the longer a person is affected by an illness, the less support they may receive from their spouse, due to caring fatigue and relationship strain (Cano, 2004). However, there was no significant correlation between years since diagnosis and satisfaction with responses in the current study. Other studies have similarly failed to find an association between illness duration and social support. For example in a recent study of patients with RA, illness duration was not related to perceptions of beneficial or problematic support (Lehman et al., 2011). Pain duration was also unrelated to perceived spousal support in a chronic pain sample (Cano, 2004). Taken together, these findings suggest that, at least in the context of chronic pain, there is likely no main effect of the length of the illness on perceptions of support.
4.2.10 Personality

When the link between received support and perceived support was shown to be weaker than expected across a large number of studies (Sandler & Barrera, 1984), researchers began to look to personality as a predictor of perceived support. Two of the most researched personality traits, neuroticism and extraversion, have generally shown inconsistent and moderately-sized effects. This pattern of results continued in the current study, as these personality factors showed mixed patterns of association. At the correlational level, no association was found (See Table 6). However, because of their theoretical association and previous research findings, they were tested in the MLM analyses. In those analyses, neuroticism showed an association, although likely spurious, with higher satisfaction with responses; extraversion remained unrelated.

In terms of directionality, it is interesting to note that research suggests that over time, satisfaction with romantic relationships may in fact have an effect on an individual’s personality. Scollon and Diener (2006) found that over a period of nine years, increased relationship satisfaction predicted decreases in neuroticism and moderate increases in extraversion. Thus, while it was proposed that personality would predict satisfaction with responses in the current study, the reverse may also be true. Extraversion and neuroticism are discussed in the following sections.

4.2.10.1 Extraversion

Extraversion was unrelated to the satisfaction with responses in all of the study analyses. This is in contrast to some previous research that has found higher levels of extraversion to be related to greater levels of perceived and received spousal support (Cutrona et al., 1997; Swickert et al., 2010). However, one study failed to find an association between extraversion
and either relationship enjoyment or stress with a spouse in an RA sample (Davis et al., 2006). More complex effects may also be present—one study reported an interaction between extraversion and emotional support in predicting perceptions of interaction supportiveness (Cutrona et al., 1997), although the results were not replicated in another (Dehle & Landers, 2005). These mixed findings in terms of both main effect and interactions suggest that the relationship between extraversion and perceived social support may be weak. Indeed, the original proponents of the view that perceived social support was explainable by personality have also reported mixed results, and smaller effect sizes than would be predicted (Lakey et al., 1996). It would appear that in general extraversion does have some association with perceived support, but it is not likely not one of the more important factors, at least in terms of simple main effects.

4.2.10.2 Neuroticism

Neuroticism was not associated with satisfaction with responses in the bivariate analysis, but surprisingly, was significantly related to higher levels of satisfaction with spouse responses when added to each of the multilevel models. This disparity between the bivariate findings and the results of the multilevel model, in conjunction with the unexpected direction of effect, indicates that there was a negative suppressor effect involving this variable. This type of effect is due to other variables in the multivariate analysis altering the effect of neuroticism (Conger, 1974). Such suppressor effects make interpretation difficult, and the danger of confounded associations high, particularly in small samples. Therefore although neuroticism was significant in the models these results should be considered spurious.

In terms of the inclusion of neuroticism in future research, some findings suggest the importance of considering gender in the relationship between neuroticism and support; in one
study, the relationship was only significant for women, not for men (Dehle & Landers, 2005). The same study found an interaction with gender, where for men, those who were higher in neuroticism received more esteem support from their wives. Given the importance of esteem support, this interaction could be an important factor, and future research should include an investigation of this interaction. There is also evidence to support the hypothesis that similarities in personality between support provider and recipient are important to perceptions of support (Lutz & Lakey, 2001), and a link between neuroticism and perceived availability of support has also been shown (Kitamura et al., 2002). For these reasons, further investigations into the role of neuroticism in perceived support are warranted.

4.2.11 Marital dissatisfaction

Marital dissatisfaction was significantly correlated at the bivariate level, and also significantly related to support satisfaction in all of the multilevel models. As would be expected, those who had higher levels of marital dissatisfaction had lower levels of satisfaction with spouse responses. Previous research has also found support for this association (e.g., Lal & Bartle-Haring, 2011), and perceived beneficial support has been shown to be related to relationship satisfaction in RA patients (Lehman et al., 2011). Also of note, some previous research has found that marital satisfaction is more strongly associated with perceived support than is received support (Kaul & Lakey, 2003).

Although marital quality has often been viewed as a direct predictor of satisfaction with support from the spouse, there is also evidence that satisfaction with responses precedes marital satisfaction. For instance, social support provisioned and elicited by newlywed women has been shown to predicted marital outcomes at a 2 year follow-up (Pasch & Bradbury, 1998). Other studies have found that marital dissatisfaction can moderate the
relationship between social interactions and affective outcomes. For instance, for dyads with generally higher levels of spousal strain, negative spousal interactions have only a moderate link to next-day negative affect. However, in the context of dyads with generally lower levels of spousal strain, the effect was significantly more pronounced: negative spousal interactions led to significantly more negative affect the following day (Delongis et al., 2004). Therefore, negative interactions have a longer-lasting effect in relationships that are generally harmonious. Given consistency of support for the association between marital dissatisfaction and perceived support, future efforts should include the measure when the participants are a part of a dyad, and also consider possible moderating effects.

4.3 Hypothesis 3: Lability in satisfaction with spouse responses

Hypothesis 3 related to patients’ lability in their ratings of satisfaction with spouse responses. More generally speaking, lability refers to the amount of variability a person shows in their ratings when measured on multiple occasions. Given that cross-sectional, between-person research cannot address lability, it has rarely been evaluated in past research. In the current study, higher levels of negative spouse responses across the study period, as well as higher levels of marital dissatisfaction, were related to greater lability in satisfaction with spouse responses. Lower levels of lability were associated with greater aggregate levels of positive affect and positive spouse responses across the study period (see Table 16). Contrary to predictions, neuroticism did not show an association with lability, despite emotional lability being viewed as a component of neuroticism (Scheier, Carver, & Bridges, 1994). Similarly, disease variables such as functional disability, fatigue, and pain did not show an association (see Table 15).
Emotional lability has received a great deal of attention in studies of medical conditions such as lupus, ADHD, and stroke (Langosch et al., 2008; Sobanski et al., 2010; Tang et al., 2009). In contrast, lability in satisfaction with responses has not been previously investigated. However, social support variables have been included in previous investigations as predictors of lability in other psychological constructs: lower social impact and social engagement have been associated with greater lability in self-concept (Molloy, Ram, & Gest, 2011). Research has also been conducted in chronic pain samples, showing that the population is more prone to emotional lability than the general population (Asmundson et al., 2002). Given that there are some concurrent associations between mood and satisfaction with responses indicated in the current study, future research could investigate if fluctuations in these variables co-occur. Further research is required to determine the health effects of lability in satisfaction with spouse responses, and whether lability is amenable to intervention in order to alter health outcomes.

### 4.4 Limitations and future directions

There were several limitations of the current study. In terms of methodology and analysis, only within-time point and within-day analyses were evaluated. This means that while there were effects shown within-days, the possibility of effects occurring across days was not investigated. An inter-day investigation is especially intriguing given that in the current sample, participants’ ratings varied more between days than within days. The current sample also used a six-hour time lag between the morning and evening interviews. It is possible that some of the factors would appear more or less important if a different lag were measured.
Due to the sample size, random effects and cross-level interactions were not specified in the current study. Future research should use larger samples in order to investigate the intriguing hypotheses possible when using these complex estimation techniques.

The current study also used a global rating of social support—participants’ rating of their perceived satisfaction with the support provided by their spouse. Perceived support has been shown to be the most important type of support, but it is susceptible to the same biases associated with any self-reported measure (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Also, despite the fact that social support occurs in a dyad, only the perceptions of the RA patient were investigated in the current study; needless to say, the perceptions of the support provider are also important. For example, one study found that spouses who are more accurate in their ratings of their partner’s osteoarthritis pain responded less negatively to their partners, and also responded with more emotional support (Martire et al., 2006). The behaviour of the patient also influences the spouse: one study found that wives’ verbal disclosure of arthritis pain was associated with reduced spousal well-being, and also with reduced provision of emotional support by the spouse (Stephens, Martire, Cremeans-Smith, Druley, & Wojno, 2006).

In terms of barriers to support provision, there are also instances in which support attempts fail. For instance, for arthritic patients who value being independent, increased support leads to increased depression and to no increase in self-efficacy (Martire, Schulz, & Parris, 2011). Another possible barrier to support lies in the suggestion that the type of support provided must match the type of support the recipient desires in order to be effective (e.g., Cutrona et al., 1997). These dyadic interactions, as well as interactions between participant characteristics, are an exciting area for further investigation.
In terms of generalizability of the results of the current study, there are four main considerations. First, the sample was comprised specifically of patients suffering from RA, a painful autoimmune disease with symptoms that fluctuate significantly over time. Second, as is the case in the prevalence of RA generally, most of the participants were female. Third, and again characteristic of RA, the sample in the current study had an average age of 59 years. Finally, all of the participants were heterosexual and either married or common law.

For the first consideration, it is interesting to note that RA-related factors (e.g., pain and functional disability) were generally not associated with satisfaction with responses in the present study (see Tables 8 and 13). This raises the possibility that the models in the current study would also be a good fit for the general population. Because most of the final models do not include disease-specific variables (with the possible exception of fatigue), a similar constellation of variables could be associated with satisfaction with support in the general population. However, it is also possible that the overall experience of RA or other chronic pain conditions leads to a different set of correlates of satisfaction support than the general population.

While no main effects of gender were found for satisfaction with responses, it is possible that gender is a moderator of perceptions of social support. For instance, while esteem support emerged as a key predictor of satisfaction with responses in the current sample of predominantly female patients, it is possible that different factors would be more strongly associated for men. A larger sample, and specifically one with a more even split of males and females, would be able to investigate such a question.

The average participant in the sample was 59 years of age. Again, different factors may be more or less important for satisfaction with responses over the lifespan. Given that
age was a significant factor in the current model, this concern carries even more weight. Therefore, as with all new research findings, replication is imperative before the results can be applied to new populations.

Finally, the participants in the current study were all heterosexual and married or cohabitating, and the support and response items the patients answered were all related to interactions they had with their spouse. Therefore, the current study is an indication of the factors that are important between those in close, intimate heterosexual relationships. These factors and may or may not be the same the factors that would be important within same sex couples, larger family units, or between friends and coworkers.

4.5 The continued investigation of social support

Research indicates that social support has a statistically and clinically significant effect on health outcomes. However, research on social support has been hindered by the vast array of ways in which the construct has been conceptualized in the literature, and as a result, some now consider it a “fuzzy” variable (Holt-Lunstad et al., 2010). In fact, despite over 40 years of research, there remains no consensus on an operational definition of social support (Sarason & Sarason, 2009; Uchino, 2004). Some claim that this lack of operationalization stems from the fact that social support is an abstract concept (Coyne & DeLongis, 1986), whereas others consider it to be a meta-construct (Vaux, Riedel, & Stewart, 1987). While this complexity makes social support a challenging topic of study, it is also likely what makes it a powerful predictor of overall health.

Questions related to health and social support are difficult to address, but they are a top priority for social science researchers. The list of “Harvard Problems”—the ten most important topics for social science—includes two questions that the current study addresses:
1) what methods can be used to encourage people to look after their health, and 2) why do social processes remain stable or change (Giles, 2011)? In relation to the first question, social support has been proven to be an important predictor of health (Holt-Lunstad et al., 2010), but our understanding of social support itself has typically lagged behind our understanding of its importance. In relation to the second question, by gaining understanding of both the stability and fluctuations in social support, an aspect of the constancy and flux in social processes in general is elucidated. If researchers can fully understand social support at both within- and between-person levels, it will be part of the answer to both of these questions.

Although daily diary methods are more burdensome than cross-sectional methods for both the researcher and the participants, they offer an ecological and statistically powerful method of inquiry (Laurenceau & Bolger, 2005). An investigation into a variable as complex as social support requires such advanced procedures if an accurate reflection of its nature is to be constructed. The current study was a comprehensive investigation into the factors that influence perceptions of social support. Esteem support, or feeling loved and respected by your partner, was an important social variable in the current study, with effects in all analyses, at both the within- and between-person levels. Negative responses were related to lower satisfaction with spouse responding, again at both levels. Increased fatigue was associated with less satisfaction, and increased age was associated with more satisfaction with spouse responses at the between-person level. These results will advance both clinical practice and future research among individuals living with RA, and will increase our understanding of a critically important covariate of health: perceived social support.
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