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Relationship Satisfaction and Health Outcomes in the Context of Personality

by

Janine N. Galione

A dissertation presented to the
Graduate School of Arts and Sciences
of Washington University
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

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Janine Galione

Washington University in St. Louis

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ABSTRACT OF THE DISSERTATION

Relationship Satisfaction and Health Outcomes in the Context of Personality

by

Janine Galione

Doctor of Philosophy in Psychology

Washington University in St. Louis, 2016

Professor Thomas F. Oltmanns, Chair

Self-reported dissatisfaction in romantic relationships is a well-documented risk factor for impaired physical health outcomes. Most research has focused on identifying the mechanisms that could potentially explain this link, but it is just as important to explore what type of person is more vulnerable to the quality of romantic relationships. Relationship satisfaction may be more consequential in the context of some personality traits than others. We examined whether each of the five factor traits interacts with self-reported relationship satisfaction to predict three health outcomes over 18 months: major physical health events, health perceptions, and health behaviors. The hypotheses for this report were tested using data from an ongoing longitudinal study designed to explore the trajectory of personality pathology and related correlates, in a community sample of adults transitioning into later life. Results suggest that when participants were dissatisfied in their relationships, they were more likely to develop a new illness and/or rate their health as dysfunctional if they had high levels of neuroticism. Additionally, as relationship satisfaction increased, higher levels of conscientiousness strengthened the link with perceived physical wellness.

Chapter 1: Introduction

There is a large and growing body of evidence supporting the important role of social relationships for physical well-being over the lifespan (Cohen, Gottlieb, & Underwood, 2000; Hill, Weston, & Jackson, 2014; Holt-Lunstad, Smith, & Layton, 2010; Miller, Chen, & Cole, 2009; Umberson, Crosnoe, Reczek, 2010). In particular, romantic relationships are a key source of social support, and relationship quality is associated with subjective and objective physical health outcomes (Holt-Lunstad, Birmingham, & Jones, 2008). Poor relationship quality is a risk factor for mortality, cardiovascular disease, impaired wound healing, and negative health perception (Robles, Slatcher, Trombello, & McGinn, 2014). Most research has focused on identifying the mechanisms that could potentially explain this link, including health behaviors, cognitive processes, and biological mediators. However, it is also important to investigate whether certain groups of individuals are more vulnerable to the effects of relationship dissatisfaction. Our basic proposal is that individuals can draw from their personality to diminish or exacerbate the negative effects of relationship dissatisfaction on physical health outcomes. Thus, the link between relationship quality and health may vary as a function of individual traits. Unfortunately, few studies have included personality as a predictor of health outcomes alongside relationship quality. This report is set up to examine whether personality moderates the link between relationship satisfaction and health outcomes in late middle-aged adults.

1.1 Relationship Satisfaction and Health Outcomes

Several longitudinal studies have identified relationship discord as a risk factor for mortality and other deleterious health outcomes (Eaker, Sullivan, Kelly-Hayes, D'Agostino, & Benjamin, 2007; Kiecolt-Glaser & Newton, 2001; Robles et al., 2014). The effect sizes of these

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relationships are comparable to the predictive ability of well-established risk factors such as health behaviors (Holt-Lunstad et al., 2010; Robles et al., 2014). In fact, relationship status and quality predicts mortality rates in subjects diagnosed with chronic medical conditions (e.g., coronary heart disease), even after adjusting for healthy lifestyle behaviors (Coyne et al., 2001; Eaker et al., 2007). Those with satisfying marriages are three times more likely to survive major surgery fifteen years post-treatment (King & Reis, 2012). Likewise, relationship dissatisfaction has been linked to the development and progression of cardiovascular (Smith et al., 2011; Smith et al., 2009), neuroendocrine (Kiecolt-Glaser et al., 1997), and immune system diseases (Kiecolt-Glaser et al., 2005; Kiecolt-Glaser et al., 1993). Thus, being in a satisfying relationship might provide a protective barrier to detrimental health problems.

These results fall within a larger literature that demonstrates the influence of social relationships on general health. A meta-analysis across 148 studies, found that individuals with adequate social support have a 50% lower risk of mortality (Holt-Lunstad et al., 2010). Conversely, loneliness is associated with many of the same conditions as relationship dissatisfaction, including unhealthy changes in cardiovascular and immune functioning (Miller, 2011). For most adults, romantic relationships are a primary source of social support, even compared to other supportive relationships. Romantic relationships may have greater bearing on health outcomes compared to other long-term relationships because partners tend to share more living space, time, finances, and physical intimacy. In fact, Holt-Lunstad and colleagues (2008) found that romantic relationships have the potential to be more beneficial or detrimental relative to other supportive relationships when predicting health outcomes. For this reason, we will be

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focusing on romantic relationships specifically, but do acknowledge the importance of other sources of social support.

According to Cohen (1988), how the field defines social support can be divided into structural or functional types. Structural measures evaluate whether interconnections exist and the frequency of interactions received. In the case of romantic relationships, structural measures would evaluate your relationship status (e.g., never married, divorced, married, widowed), length of relationship, or cohabitation. Functional measures quantify feelings of belongingness or perceived availability of relationships. Relationship satisfaction and quality are considered functional measures of support. The distinction between perceived (i.e., functional) and received (i.e., structural) support is important because individuals can feel lonely or isolated, even when surrounded by others (Hawkley & Cacioppo, 2010). Notably, perceived support is more consistently related with a range of morbidity and mortality measures (Hawkley & Cacioppo, 2010; Uchino, 2009).

This distinction applies to romantic relationships as well. Much of the earlier literature on the health enhancing properties of relationships focused on disparities between married and unmarried individuals. Although structural variables offer important information, perceived quality of romantic relationships, rather than status, tend to have more of an impact on predicting health outcomes (Loving & Slatcher, 2013). Evidence suggests that not all marriages are created equally. The effects of long-term, distressing marriages outweigh the potential benefits of increased social contact from a partner (Weisman, 1987). In other words, remaining in chronically unsatisfying relationships exhibit greater health risks than being divorced or never married (Hawkins & Booth, 2005; Holt-Lunstad et al., 2008; Williams, 2003). A review of the

literature up until the early 1990's suggests that marital stress undermines immune functioning, and marriage does not necessarily protect individuals from health problems, rather those who are unsatisfied with their relationship (or lack thereof) are at higher risk (Burman & Margolin, 1992). It is also noteworthy that other supportive relationships do not compensate for the effects of dissatisfying marriages or being unmarried on cardiovascular risk factors (Holt-Lunstad et al., 2008). In sum, relationship satisfaction scales offer more sensitive and nuanced data about relationships than measuring marital status alone. Thus, this paper will focus on measuring satisfaction regardless of relationship status (e.g., married, non-married).

There is little evidence to suggest that the effect of relationship quality on health is direct. Instead, prospective studies suggest relationship perceptions act on various pathways that eventually lead to changes in health. There are two main theoretical frameworks regarding how romantic relationships influence illness progression. The main effect model postulates that relationship satisfaction is health promoting regardless of context. This model hypothesizes that relationship satisfaction influences physiological arousal through health behaviors or increased sense of well-being. For example, happily married individuals might have more incentive for using health-promoting behaviors (e.g., diet, exercise) because they want to maintain a healthy appearance. The link between relationship satisfaction and health can be partially explained by health behaviors, psychopathology, social cognitive, affective, and biological processes (Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001; Robles et al., 2014). In the stress-buffering model, partner satisfaction acts as a protective buffer in the presence of stress. For example, stressful events may appear less daunting or individuals may have more self-confidence about

their ability to handle stress when they believe a supportive partner is present (Cohen et al., 2000).

By identifying causal pathways, the field advances its understanding of the etiology of physical illness and the role of relationships. Researchers are able to discuss why relationship dissatisfaction leads to negative health outcomes. However, we do not yet know *who* is more likely to experience health problems in the face of relationship dissatisfaction. It is important to determine which individuals are more resilient or vulnerable to the detrimental effects of failing relationships to inform theory and intervention programs. For example, the effects of relationship dissatisfaction may differ across high and low risk subgroups. If we do not know who is more likely to become activated when relationship quality is low, then treatment providers may waste time and resources targeting “low-risk” individuals. Personality offers a parsimonious measure of cognitive, emotional, and behavioral vulnerabilities that may impact the degree of risk from relationship dissatisfaction. Considering personality as a moderator will inform the consistency of the link between relationship dissatisfaction and health across individual differences (i.e., generalizability). The primary goal of this study is to determine whether the link between relationships and health is enhanced or reduced in the context of Five Factor traits (e.g., neuroticism, extraversion, openness, agreeableness, and conscientiousness). In the next section, we will develop hypotheses about which traits may affect the strength of the relation between satisfaction and physical health, and why personality should be considered as a moderator.

1.2 Personality as a Moderator

Every person involved in an unfulfilling relationship does not develop physical health problems, thus more complex models are required to better understand how these variables are

related. Little is known about how personality could influence relationship quality outcomes, even though there is an obvious need for this type of research (Robles et al., 2014). Individuals vary on how they process and adapt to the experience of romantic stress. In general, individuals cope with situations, in part, by drawing on dispositional traits. Since personality guides how people perceive, relate to, and think about their relationships, it is likely to affect how someone copes with and reacts to being in a dissatisfying relationship. For example, individuals high on neuroticism may have frequent and intense emotional reactions to slightly flawed relationships. Individuals low on neuroticism may have little emotional reaction, even when presented with significant problems, and will evoke a more even-tempered reaction. It makes reasonable sense that individuals more sensitive to relationship dissatisfaction will have enhanced physiological responses and more physical health problems. The Five Factor Model (FFM) offers a way to measure individual differences and identify “types” of individuals that are more/less sensitive to relationship dissatisfaction. We draw on personality-situation research to further explore the potential of personality as a moderator when predicting physical health.

Significant personality-situation interactions suggest that the effect of situations (e.g., dissatisfying relationship, stress, trauma, etc.) on outcomes (e.g. health) depends on personality (and vice-versa). We present several studies that examined the moderating role of personality on psychosocial variables predicting physical health. Taga and colleagues (2009) examined whether early adult personality traits moderated the relation between widowhood and mortality 64 years later. The authors found a significant interaction effect such that widowed male subjects had decreased mortality rates, if they scored higher on neuroticism at baseline. The authors interpreted these results by proposing that neuroticism provides motivation to make healthier

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choices when a spouse dies. Personality changed the trajectory of the widowhood-health relationship by influencing behavioral coping mechanisms. This finding highlights the importance of considering the interaction of marital and personality factors when predicting physical health across the life span (Taga et al., 2009).

An experimental study was designed to further investigate the benefits of self-disclosure on cardiovascular reactivity in hostile individuals. The results suggest that high levels of hostility attenuate the benefits of intimate discussions with friends. While social support generally improves cardiovascular functioning, this does not seem to be the case for individuals with hostile traits (Holt-Lunstad, Smith, & Uchino, 2008). Korotkov (2008) tested whether five factor traits moderate the stress-health behavior relationship. Notably, individuals characterized as low on neuroticism and extraversion, were more likely to practice healthy behaviors under high levels of stress. At low stress levels, individuals high in openness engaged in more health promoting behaviors, including exercise, sleeping, drinking, smoking, and nutritional eating. Results suggest that personality influences decisions to use healthy or unhealthy coping strategies under varying levels of stress. Lastly, Smith and Zautra (2002) examined disease activity in individuals diagnosed with arthritis. Results found that individuals higher in neuroticism reported more disease activity during weeks of greater interpersonal stress than those with lower neuroticism. In sum, interaction studies have shown that the threat of psychosocial risk factors on physical health depend on personality trait levels.

Certain traits may be more vulnerable to developing physical health problems when relationship dissatisfaction is present. There is some evidence to suggest that relationship dissatisfaction is more salient among individuals with high levels of neuroticism or low levels of

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agreeableness or extraversion. Individuals who score high on neuroticism are more prone to negative affectivity and responsive to negative stimuli in general (Bolger & Zuckerman 1995; Larsen & Ketelaar, 1991; Suls & Martin, 2005; Zautra, Affleck, Tennen, Reich, & Davis, 2005). Elevated neuroticism is associated with having less access to effective coping skills and more sensitivity to interpersonal stress (Bolger & Zuckerman 1995; Bouchard, 2003; Boyes & French, 2009). When faced with interpersonal stress, they are more likely to become confrontational, emotion-focused, and avoidant (Boyes & French, 2009; DeLongis & Holtzman, 2005). Thus, individuals with high neuroticism scores may be more likely to use risky behaviors, such as alcohol or overeating, to cope with failing relationships, compared to individuals low on neuroticism. Additionally, neuroticism elevates the intensity of physiological responses to stress, including sympathetic, cardiovascular, and cortisol reactivity (Lahey, 2009).

Disagreeable partners are more likely to use hostile or aggressive behaviors during conflict (Graziano, Jensen-Campbell, & Hair, 1996). Previous research indicates that, hostile behaviors in the context of relationships are risk factors for cardiovascular arousal, and other physiological changes (Smith, Glazer, Ruiz, & Gallo, 2004). Notably, hostility is related to increases in systolic blood pressure and cortisol, which are established risk factors for cardiovascular disease (Robles & Kiecolt-Glaser, 2003). It's plausible that individuals showing more signs of hostility and disagreeableness are at higher risk of harmful physiological reactivity when dissatisfaction occurs. Perhaps, the pathway between relationship dissatisfaction and negative physical health events (e.g., cardiovascular disease) is regulated by agreeableness.

Introverted individuals are especially sensitive to negative social stimuli and rejection cues (Meyer, Ajchenbrenner, & Bowles, 2005). For that reason, they may be more attuned to

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dissatisfying relationships. Additionally, introverts may lack the resources to benefit from other forms of social support when they are dissatisfied romantically. For example, an individual high in extraversion might seek comfort in friends and family during adversity, while those low on extraversion might show more restraint and inhibition. Emotional disclosure often occurs in the context of fulfilling relationships, and demonstrates a number of health benefits (Mirgain & Cordova, 2007; Smyth, 1998). For example, partners who are more open to expressing emotions have better immune functioning and fewer doctor visits (Frattaroli, 2006). Thus, limited emotional expression that often occurs with introverted partners may strengthen the link between dissatisfaction and health problems. This hypothesis is supported by research suggesting the link between Type D related traits (i.e., introversion, interpersonal sensitivity, inhibition) and physical health outcomes (e.g., HIV, pneumonia, cold, cardiovascular disease) is particularly pronounced in socially threatening or evaluative environments (Marin & Miller, 2013). In one study, wives who report both low relationship disclosure and satisfaction showed greater cortisol increase in response to an external stressor when compared to wives reporting high disclosure and/or satisfaction. In other words, relationship satisfaction was only related to a biological correlate of physical illness when introverted related traits were present (Slatcher, Robles, Repetti, & Fellows, 2010).

Conversely, deterioration resulting from dissatisfaction may be buffered if paired with a health-promoting trait, such as conscientiousness. There is a striking association between conscientiousness and engaging in healthy lifestyle behaviors, including smoking, alcohol use, diet, sexual activity, and driving style, which predicts physical health outcomes over extended periods of time (Bogg & Roberts, 2004; Caspi et al., 1997; Hampson, Goldberg, Vogt, &

Dubanoski, 2006). Moreover, high conscientiousness is indicative of self-controlled behaviors and delayed gratification that may lend itself to better health management. Therefore, conscientiousness may negate the detrimental effects of relationship dissatisfaction. For instance, imagine a partner stops helping or encouraging their significant other to engage in health promoting behaviors (e.g., leaving a reminder about your partner's dentist appointment) due to discord in the relationship. The tendency to engage in planning and goal-directed behaviors associated with conscientiousness might compensate for lack of partner support. In other words, we predict that conscientious individuals will engage in healthier lifestyle behaviors whether or not their relationship is fulfilling, showing little disruption in their functioning. Accordingly, we may not see a significant relationship between dissatisfaction and physical health outcomes when trait conscientiousness is elevated.

In addition to considering personality as a moderator, the literature offers clear links between personality traits and physical health. In general, high levels of neuroticism and low levels of conscientiousness are independently correlated with negative health conditions, behaviors, and perceptions (Goodwin & Friedman, 2006; Kern & Friedman, 2008; Lahey, 2009; Smith & MacKenzie, 2006; Weston, Hill, & Jackson, 2015; Weston & Jackson, 2015; Williams, O'Brien, & Colder, 2004). We acknowledge the possibility that personality and relationship perceptions are acting independently on illness progression. Accordingly, an alternative hypothesis would be that we find significant main effects for personality and/or relationship satisfaction on physical health, as opposed to interactions. The methodological design of this study will allow us to test for main effects and interactions.

1.3 The Current Study

Most of the existing research has centered on main effects or mediation analyses for understanding how relationship satisfaction and personality lead to physical health problems (Kiecolt-Glaser & Newton, 2001; Robles et al., 2014; Smith & MacKenzie, 2006). An important next step is to combine these fields and develop scientific questions that account for the interaction of both predictors. The aim of this paper is to further explore how relationship quality influences physical health outcomes by considering personality traits. This work will help to explain who is more vulnerable to the threat of physical illness as a result of relationship dissatisfaction. Furthermore, most studies on psychosocial factors and physical health have focused on younger adults. This methodology seems inefficient and flawed since illnesses usually manifest during later life. We have the added benefit of using a sample that exclusively includes middle-aged older adults, who are more vulnerable and likely to report health problems. Directing our attention to older samples may be imperative for understanding how psychosocial factors influence physical health across the life span. Notably, the effect of relationship dissatisfaction accumulates over time, such that relationship satisfaction impacts health outcomes more in older samples (Umberson et al., 2010; Umberson, Williams, Powers, Liu, & Needham, 2006).

The present report examines both subjective and objective physical health measures. All health outcome variables were collected over an 18-month period after baseline, and predicted from baseline measures of personality and relationship satisfaction. Objective variables provide observable information that is often recognized as more valuable for predicting physical health status (e.g., diagnosis of a new physical illness). However, it is also important to consider health

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perceptions and health-related behaviors because they are important indicators of objective diagnoses, treatment effectiveness, and service utilization (Benyamini, 2011; Ferraro, Farmer, & Wybraniec, 1997). Moreover, understanding how individuals experience physical illness, regardless of actual severity, guides case conceptualization and prognosis.

We will also use multiple sources to assess personality (i.e., combine self and informant reports) in order to improve measurement accuracy (Galione & Oltmanns, 2014). Multi-method assessment is supported by findings that suggest informant reports are better able to predict coronary activity (Smith et al., 2007) and mortality (Jackson, Connolly, Garrison, Leveille, & Connolly, 2015), even after accounting for self-reports. Although self-reports of personality provide valid information, they provide an incomplete picture of the individual (Vazire & Carlson, 2010). Informants offer an observer's perspective on personality, and are more useful for rating evaluative traits (e.g., impulsivity) and undesirable behaviors (Vazire, 2010). Thus, adding informant reports to personality variables may improve our ability to detect signs of physical wellness.

In sum, this report is designed to assess whether each of the five factor traits interacts with self-reported relationship satisfaction to predict three health outcomes over 18 months: major physical health events, health perceptions, and health behaviors. Due to the paucity of research, we can only speculate about what type of person is more sensitive to the effects of relationship satisfaction. Several predictions are offered. First, we predict that 1) higher neuroticism 2) lower agreeableness 3) lower extraversion will individually strengthen the relationship between relationship dissatisfaction and all three physical health outcomes. Also, we

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believe increasing levels of conscientiousness will decrease the effect of relationship dissatisfaction on all three physical health outcomes (e.g., buffering effect).

Chapter 2: Methods

2.1 Participants and Procedure

The hypotheses for this report were tested using data from an ongoing longitudinal study: The St. Louis Personality and Aging Network (SPAN; see Oltmanns, Rodrigues, Weinstein, & Gleason, 2014, for a more detailed description of the study methods). The SPAN study was designed to explore the trajectory of personality pathology and related correlates as a community sample transitions into later life. As part of the primary investigation, participants were required to complete extensive self-report and interview assessments. For the purposes of this report, we will only present relevant methods and measures.

Adults between the ages of 55 and 64 were recruited, with a screening process that used listed phone numbers and census data to help identify individuals within the target age range. We oversampled specific households to achieve a representative sample of middle-aged individuals living in the St. Louis metropolitan area. Baseline assessments (N=1,630) were conducted in the lab and took approximately 3.5 hours to complete. The process included semi-structured and structured interviews that are not applicable for the present paper, as well as several self-report questionnaires. Participants were then asked to complete a packet of follow-up questionnaires every six months. This report used longitudinal data over 18 months, from baseline through the third follow-up (FU1-FU3). Participants were compensated \$60 for baseline assessments, and \$20 for each 6-month follow-up.

At baseline, each participant was asked to provide details to contact an informant, preferably a significant other, to complete questionnaires about the primary participant. Informants were mailed a letter inviting them to participate in the study. Approximately 9%

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(n=155) of the participants did not have informant data; 6.5% (n=107) of the participants identified an informant, but the informant did not respond to our inquiries, 0.5% (n=9) were unable to identify an informant and 2.3% (n=39) of participants refused to provide an informant. Consenting informants completed questionnaires at home, including demographics and personality assessments, and returned paperwork in a pre-paid envelope. Informants were compensated \$30 for their participation. A small minority of the informants was not the participant's romantic partner (16.4%). Instead, their informant was either a family member (9.6%) or friend (6.2%). Of those informants who were not romantic partners, the participants reported knowing them for an average of 36.10 years (SD=15.81).

The sample for the current report was selected from the 853 participants who reported being in a stable, heterosexual romantic relationship, and provided information on relationship satisfaction and personality traits at baseline. This total does not include one participant who was identified as an outlier due to a relatively high number of physical illnesses and negative health perceptions. Twenty participants were excluded for reporting being involved in a same-sex relationship in order to maintain sample homogeneity. Unfortunately, our sample size of same sex couples was not large enough to investigate health disparities (Lick, Durso, & Johnson, 2013). We selected participants who were in the same relationship over the course of the analyses (Baseline-FU3) in order to rule out change in relationship status as a potential confounding variable. We eliminated 87 participants who went through a separation, divorce, break-up, or started a new relationship after baseline assessment. Self and informant personality measures were considered complete if less than three items were missing. Participants were included if they filled out at least one of the follow-up questionnaires, thus sample sizes varied

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depending on which outcome variable was being explored. This method resulted in the following sample sizes: Major Physical Health Events $n=712$; Health Perceptions $n=710$; and Health Behaviors $n=695$. The Statistical Analyses section below offers further details about why missing data were considered appropriate, and how it was managed within the current procedures.

Demographics for the 853 participants are in Table 1. Most participants were Caucasian (71.4%) or African American (25.8%). The average age of the sample was 59.52 ($SD=2.70$) and 41.0% were female. The participants were relatively well educated, with the majority having received at least a bachelor's degree (58.3%) and the rest earning a high school degree or less. Approximately two-thirds of the sample was employed (63.8%). Regarding marital status, the majority reported being married (85.8%), and the remaining participants varied in their relationship history: widowed (1.8%), separated (0.9%), divorced (8.7%), and never married (2.8%). Some participants reported being previously or never married, but were committed to a serious relationship when data were collected. Thus, a minority of the sample was "dating," while the rest were married. The average length of marriage was 27.08 years ($SD=11.10$), and ranged from 10 months to 46 years. Of those who had been married at some point in their life (97.2%), 63.6% were married once, 28.6% twice, 6.3% three times, and 1.5% four or more times. Compared to the overall study sample, the participants selected for this report were significantly more likely to be male $\chi^2(1, N=1630)=132.92, p < .001$; married $\chi^2(4, N=1630)=1044.29, p < .001$; Caucasian $\chi^2(2, N=1630)=36.26, p < .001$; and to have graduated from college $\chi^2(2, N=1627)=16.83, p < .001$.

Table 1. *Demographic Characteristics of Participants (N= 853)*

Sample Characteristics	N (%)
Female	350 (41.0)
Race	
White	609 (71.4)
Black	220 (25.8)
Other	24 (2.8)
Education	
Less than High School	19 (2.2)
High School Graduate	337 (39.5)
College Graduate or Higher	497 (58.3)
Marital Status	
Married	732 (85.8)
Widowed	15 (1.8)
Separated	8 (0.9)
Divorced	74 (8.7)
Never Married	24 (2.8)
Employed	544 (63.8)

2.2 Measures

2.2.1 Baseline Measures

NEO Personality Inventory Revised (NEO-PI-R; Costa & McCrae, 1992). The NEO-PI-R is a standard measure of FFM personality. It assesses five domains including neuroticism, extraversion, openness, agreeableness, and conscientiousness. Each domain consists of six lower-order facets. Together, the facets and domains consist of 240 items, and provide a comprehensive and organized assessment of personality. Items are rated on a 5-point scale, with responses ranging from *strongly disagree* to *strongly agree*. For the purposes of this report, the NEO-PI-R was administered to both participants and informants in order to formulate a more reliable composite score of personality. The informant version only differs from the participant version by having all the items written in third person. The composite score was calculated by summing the informant and self reports, and dividing this sum by two so that each source was

weighted equally. All of the results from this report that include personality measures are referring to the composite score, unless otherwise noted.

Dyadic Adjustment Scale (DAS-4; Sabourin, Valois, & Lussier, 2005). The abbreviated version of the DAS-4 is a four-question self-report scale that evaluates relationship satisfaction. The developers conducted five studies to demonstrate its reliability and validity. The DAS-4 demonstrates relatively stable scores over a 2-year period and was able to predict relationship termination as well as the complete version (Sabourin et al., 2005). Items include questions about contemplating termination of the relationship, how often things are going well, how often the subject confides in their mate, and degree of happiness in the relationship. Items are scored on a 0-5 or 0-6 scale. The total score can therefore range from 0-21, with higher scores representing more satisfaction.

2.2.2 Outcome Measures

Outcome measures included three separate scales of physical health collected every six months for 18-months after baseline (FU1-FU3). For the purpose of this paper, data obtained over the three follow-up assessments were consolidated to represent one outcome point that accounts for the entire 18-month period. Thus, statistical analyses will only focus on two time points, baseline (Time 1) and the 18-month follow-up (Time 2). The rationale for collapsing follow-up data points was to focus on the prediction of physical health constructs rather than the change in physical health over time. In other words, we did not intend to explore differences between FU1 and FU3 because it goes beyond the scope of our hypotheses. In addition, we did not expect the rate of onset for new physical illnesses to be rapid enough to show growth over an 18-month period.

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New Health Events. Participants identified the onset of new health problems at each follow-up assessment. On a self-report questionnaire, they were asked to indicate whether they had been diagnosed with a new illness or disability, if they underwent a surgical procedure, or visited a medical clinic over the previous 6 months. If they reported the onset of a new illness, they were asked to describe the condition. For the purposes of this report, a new major health event was defined as the onset of a new illness or having a surgical procedure. Specific inclusion criteria for a new health event included either: (1) Endorsing being diagnosed with a new illness or physical disability plus reporting a visit to a medical clinic or emergency room (2) Endorsing a surgical procedure plus reporting staying overnight in the hospital or having outpatient treatment. Health problems that were endorsed by participants were excluded if the description of the condition was missing, a symptom without clearly identifying a physical condition, a psychological disorder as opposed to a physical health problem, surgery for cosmetic reasons, routine testing or surgery (e.g., colonoscopy, mole removal), or an acute infection (e.g., pneumonia, bladder infection).

The following are examples of health events that met the inclusion criteria: heart disease, hypertension, high cholesterol, cancer, stroke, diabetes, rheumatic disease, chronic lung problem, gastrointestinal disorder, genitourinary problem, osteoporosis, chronic pain, brain tumor or aneurism, hernia, broken bone/torn muscle, thyroid problem, gastroesophageal reflux disease, eye problem, dental problem, ear problem, joint replacement. The other category was used for conditions that did not fit into the other categories and was used sparingly. We simply added the number of eligible conditions at each of the three follow-ups to calculate the total number of major physical health events that occurred during the follow-up period. We chose to analyze this

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outcome two different ways, as a continuous and as a binary (0/1) variable. A linear regression was used for the total number of health events calculated, and a logistic regression was used for dichotomous coding (i.e., illness was present or absent).

RAND Short Form 36 (SF-36) Health Status Inventory (HSI; Hays & Morales, 2001).

The HSI is a self-report questionnaire intended to assess subjective health experiences and functioning. The measures assess 8 health constructs including physical functioning, role limitations due to physical problems, emotional well-being, role limitation due to emotional problems, pain, general health perceptions, social functioning, and energy/fatigue. These constructs account for two higher order composite scores: Physical Health (PH), and Emotional Health (EH). Combining both domains forms the General Health (GH) composite, consisting of 12 total questions (six from each domain). For the purpose of this report, we will only be focusing on the Physical Health composite score to approximate perceptions of physical wellness. All scores were computed from recommended calculations using IRT weights (Hays & Morales, 2001), and higher scores represent healthier self-perceptions. The HSI was collected at each of the three follow-ups. Composite ratings were averaged in order to formulate one score for an outcome variable that accounts for the 18-month time span.

Health Behaviors. Alcohol consumption, tobacco use, and exercise are important determinants of physical health (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). This outcome attempts to characterize healthy lifestyle behaviors by grouping multiple risk factors into one variable. Supplementary demographic questionnaires were sent to participants at each follow-up. Participants were asked to report how often they engaged in exercise, smoking and alcohol use on a weekly or daily basis. The frequency of each behavior was summed across

follow-ups; the average was computed and translated into a z-score. We chose to sum standardized z-scores for specific health risks into an index of overall healthy behavior. The advantage of using a cluster-method is that we can estimate the overall effect of predictors on several targeted health behaviors. Analyzing health behaviors separately could potentially decrease the sensitivity of our measures because it does not account for every risk factor. To create the healthy behavior index, we added z-scores for alcohol consumption and tobacco use, and then subtracted the z-score for exercise since the direction of this behavior is considered positive. Accordingly, higher composite scores indicate riskier lifestyle behaviors.

2.3 Statistical Analyses

To analyze the potential moderating effects of personality on relationship satisfaction predicting physical health status, we conducted one multiple linear regression for each outcome. The first level of each model accounts for covariates and intrapersonal change over time for relationship satisfaction. The next step of the model analyzed main effects of all five personality factors and relationship satisfaction, while the last step includes the moderating effects of each personality factor (i.e., interactions). Once final models were established, we explored notable differences in results after removing non-significant interaction terms and personality traits. A separate logistic model was run to assess the main and interaction effects of the predictor variables on the dichotomous measure representing the onset of a new health problem.

Given the longitudinal nature of the data, personality and relationship satisfaction ratings may change over time. While change over extended periods of time may be a relevant predictor of health, we did not expect enough change to occur over 18 months to have enough predictive power (Sabourin et al., 2005; Robins et al., 2002). In addition, change is not the focus of this

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report, and there was not a significant effect of time on relationship satisfaction across the four waves, $F(2.96, 1734.71) = .70, p = .55$. With that being said, we still controlled for relationship satisfaction variance, but not personality change, since relationship satisfaction is considered a more dynamic (vs. static) variable. Change in relationship satisfaction was simply calculated by subtracting participant's baseline DAS-4 scores from the 18-month follow-up ($M = -.03$, $SD = 2.24$). Thus, positive scores on this variable indicate improvement in satisfaction. We were unable to measure changes in personality over time because follow-up data on personality was not collected at the time points included in this analysis.

We also included the following covariates in all models: gender, education, and marital status, because of past evidence that these factors have independent associations with physical health outcomes (Bennett, 2006; Kiecolt-Glaser & Newton, 2001; Robles et al., 2014). Due to small samples in several categories of marital status, participants were recoded into married and dating from baseline data for analyses (0 and 1, respectively). For education, participants were asked their highest education degree/certificate; the 9 categorical response options were then transformed to a continuous variable with a possible range of 6.5-20 years of education completed. Response options were as follows (years of education in parentheses): Elementary or Junior High (6.5); GED (12); H.S. Diploma (12); Vocational Tech Degree (14); Associate Degree (14); R.N. Diploma (15); Bachelor Degree (16); Master Degree (18); and Doctorate: M.D., Ph.D., J.D., etc. (20). Covariates were centered for all analyses.

When looking at follow-up data across each dependent variable, completed measures were not obtained from all participants. There are two potential explanations for missing data, attrition or inconsistent participation. The current attrition rate for the overall SPAN study is

11%, which is considered low for a sample size of this magnitude. This rate reflects attrition over the course of the entire study, spanning approximately seven years, and does not necessarily represent drop out from the study during the first 18 months. It was more likely that some participants filled out an outcome questionnaire at one or two of the follow-ups, but not at all three. Below we describe the procedures used in the event of missing follow-up data, which were designed to maximize sample sizes.

Inclusion for participants was considered separately for each outcome measure. A participant was included in the analysis if they completed at least one follow-up measure for that particular dependent variable. If follow-up data were missing on the HSI (i.e., only one or two follow-up measures were completed), then the average was computed for the data that were present (i.e., the total was divided by the number of follow-ups that were finished). A similar approach was used when calculating the average frequency of health behaviors (e.g., alcohol consumption, tobacco use, exercise) across the 18-month follow-up period. Missing health event data were handled on a case-by-case basis and estimated from available sources. If no follow-up data were completed, the individual was excluded from the two regressions analyzing the onset of a new physical illness. If one follow-up was collected, then the number of physical illnesses reported for that follow-up was filled in for the other two follow-ups. For example, if the participant reported one new illness at FU2, but did not complete FU1 and FU3, then one new illness was entered for the incomplete variables. If only one follow-up was missing, a conservative approach was taken and the lower number of illnesses reported for the completed outcome was estimated for the missing data. Health event missing data were estimated for approximately 154 participants.

Chapter 3: Results

3.1 Descriptive and Correlational Information

Our results indicate that participants were relatively satisfied in their romantic relationships, but the range varied widely ($M=16.31$, $SD=3.05$). The average number of new health events remained relatively low over 18 months ($M=0.66$, $SD=1.20$), although some participants experienced the onset of up to nine new illnesses. Descriptive statistics on the sample's predictor and outcome variables are provided in Tables 2 and 3, respectively. Participant relationship satisfaction was significantly correlated with all five personality traits, including neuroticism ($r=-.32$, $p<.001$), extraversion, ($r=.21$, $p<.001$), openness ($r=.13$, $p<.001$), agreeableness ($r=.15$, $p<.001$), and conscientiousness ($r=.24$, $p<.001$). The zero-order correlations of the predictor variables with each of the physical health outcomes are in Table 4. In general, lower scores of neuroticism and higher scores of conscientiousness were associated with better physical health. Participants who were satisfied in their relationships were more likely to rate their health as functional and have fewer new illnesses. Subjective ratings of physical health were significantly related to the other health outcomes, in the expected direction, such that better self ratings of physical health were related to fewer new physical illnesses ($r=-.39$, $p<.001$) and less risky health behaviors ($r=-.30$, $p<.001$). However, new major health events and health behaviors were not significantly related ($r=.08$, $p=.06$).

3.2 Effects of Relationship Satisfaction and Personality on New Major Health Events

The first regression investigated the independent and interaction effects of personality and relationship satisfaction when predicting the onset of new physical illnesses. Results are shown in Table 5, and the final model accounted for 5% of the variance explaining the diagnosis

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Table 2. *Descriptive Statistics for Independent Variables*

Independent Variable	Mean	Standard Deviation	Minimum	Maximum
Relationship Satisfaction	16.31	3.05	3.00	21.00
Neuroticism	72.62	20.01	23.00	148.52
Extraversion	109.62	17.96	52.50	155.00
Openness	108.83	17.06	58.50	160.50
Agreeableness	127.69	16.82	61.50	170.00
Conscientiousness	126.77	18.36	70.00	174.50

Table 3. *Descriptive Statistics for Physical Health Outcomes*

Dependent Variable	Mean	Standard Deviation	Minimum	Maximum
Number of New Health Events	0.66	1.20	0.00	9.00
Occurrence of New Health Event	33.40%	265(N)	0.00	1.00
Physical Health Perceptions	57.91	8.22	30.40	67.89
Alcohol Consumption	3.46	5.27	0.00	43.83
Tobacco Use	1.65	5.55	0.00	60.00
Exercise	2.50	2.46	0.00	20.00
Health Behavior Composite Score	-.04	1.79	-7.94	11.06

Table 4. *Zero-Order Correlations: Relationship Satisfaction, Personality and Physical Health Outcomes*

	Number of New Health Events	Physical Health Perceptions	Health Behavior Composite Score
Relationship Satisfaction	-.08*	.24***	-.02
Neuroticism	.14***	-.36***	.09*
Extraversion	.00	.12**	-.04
Openness	.04	.06	-.01
Agreeableness	-.06	.17***	-.15***
Conscientiousness	-.08*	.25***	-.13***

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

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Table 5. Multiple Linear Regression Model for Personality Dimensions and Relationship Satisfaction on Physical Health Outcomes

	Number of New Health Events R ² =.05			Physical Health Perceptions R ² =.23			Health Behavior Composite R ² =.06		
	B	SE	Beta	B	SE	Beta	B	SE	Beta
Gender	.09	.10	.04	.28	.61	.02	-.26	.15	-.07
Marital Status	-.27	.14	-.08	-.91	.86	-.04	.46	.21	.08*
Education	-.02	.09	-.01	4.00	.56	.26***	-.07	.03	-.12**
Rltp. Change	-.01	.02	-.01	.35	.13	.09**	-.02	.03	-.03
Rltp. Satisf.	-.01	.02	-.03	.41	.11	.15***	.02	.03	.03
N	.01	.00	.15**	-.09	.02	-.23***	.00	.00	-.01
E	.00	.00	.05	.00	.02	-.01	.00	.00	-.02
O	.00	.00	.05	-.02	.02	-.04	.01	.00	.05
A	.00	.00	-.03	.02	.02	.03	-.01	.01	-.09*
C	.00	.00	.00	.02	.02	.03	-.01	.00	-.08
N x Rltp. Satisf.	.00	.00	-.10*	.02	.01	.13**	.00	.00	-.04
E x Rltp. Satisf.	.00	.00	.00	.00	.01	.02	.00	.00	.02
O x Rltp. Satisf.	.00	.00	.00	.00	.01	.02	.00	.00	-.06
A x Rltp. Satisf.	.00	.00	-.06	-.01	.01	-.03	.00	.00	-.01
C x Rltp. Satisf.	.00	.00	-.06	.02	.01	.12**	.00	.00	-.05

* $p < .05$, ** $p < .01$, *** $p < .001$ Note. Rltp. Change = Change in relationship satisfaction; Rltp. Satisf. = Relationship satisfaction; N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. Gender (0=male, 1=female); Marital Status (0=married, 1=dating).

and treatment of new major health events. There was a significant main effect of neuroticism, however this lower-order effect was not interpreted due to the presence of a significant interaction term. A significant negative interaction between relationship satisfaction and neuroticism was found ($B = -.002$, $SE = .001$, $p = .03$). The results indicated that the magnitude of the association between relationship satisfaction and the number of physical illness diagnoses varies as a function of neuroticism. As shown in Figure 1, individuals who reported more dissatisfaction with their relationships had significantly more new illnesses when the participant had high levels of neuroticism, compared to lower levels of the trait. Similar results were obtained when we controlled for baseline number of illnesses.

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To examine whether personality and relationship satisfaction interacted to increase the probability of the occurrence of a new health event (0/1), we entered the same independent variables into a logistic regression. Adding interaction terms to the model did not improve fit or significance for predicting the outcome variable, thus we did not include them in the final model. The final model chi square ($\chi^2=18.00$, $df=10$, $p=.06$) indicates that independent predictors did not have a combined significant effect. In other words, adding all of the main effect variables into the regression did not create a model that differed significantly from no coefficients being entered. After adding personality and relationship satisfaction variables to the model, we were able to predict the occurrence of a new health event with 66.4% accuracy. Comparatively, if we knew nothing about our predictor variables, the constant coefficient predicted the outcome with 66.2% accuracy. Table 6 shows the logistic regression statistics for each of the independent predictors. Even though results should not be interpreted since the overall model was not significant, they inspired post-hoc analysis (i.e., mean comparisons). Univariate analysis indicated that among those with a new health event, neuroticism scores were significantly higher ($M=74.51$, $SD=21.17$) than among those without a new diagnosis ($M=70.91$, $SD=18.88$), $t(466.55) = -2.29$, $p = .02$.

3.3 Effects of Relationship Satisfaction and Personality on Physical Health Perceptions

Next we examined if and how relationship satisfaction and personality were related to self-rated physical health perceptions from the SF-36. As referenced above, higher scores on the outcome measure represented healthier perceptions of physical functioning. The final model accounted for 23% of the variance and Table 5 presents the statistics for specific variables. We found significant main effects for education and within-subject relationship change, such that

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Table 6. Logistic Regression Predicting New Health Event from Personality Dimensions and Relationship Satisfaction

	<i>B</i>	Wald χ^2	<i>p</i>	Odds Ratio
Gender	.004	.00	.984	1.00
Marital Status	-.222	.748	.387	.80
Education	.043	.066	.797	1.04
Rltp. Change	-.041	1.168	.280	.96
Rltp. Satisf.	-.016	.274	.601	.98
N	.012	4.576	.032	1.01
E	.005	.840	.359	1.01
O	.011	4.105	.043	1.01
A	.004	.420	.517	1.00
C	-.004	.532	.466	.99

Note. Rltp. Change = Change in relationship satisfaction; Rltp. Satisf. = Relationship satisfaction; N = Neuroticism; E = Extraversion; O = Openness to experience; A = Agreeableness; C = Conscientiousness. Gender (0=male, 1=female); Marital Status (0=married, 1=dating).

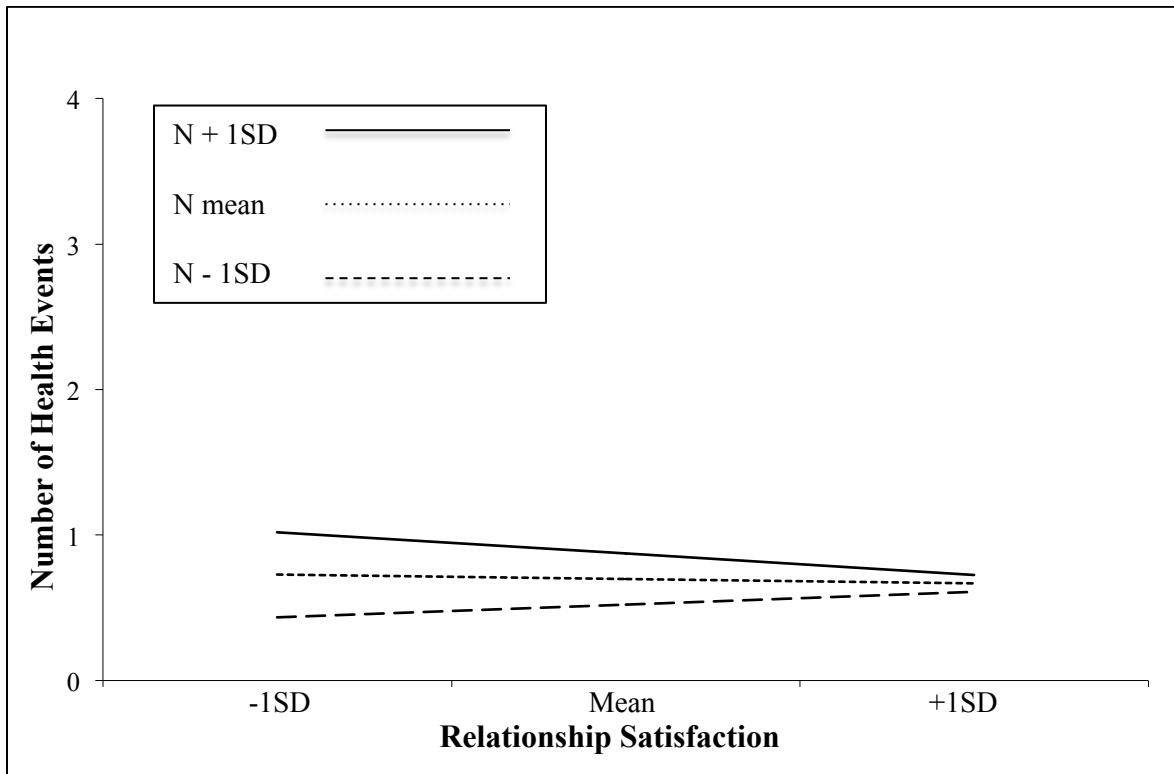


Figure 1. Interaction of Relationship Satisfaction and Neuroticism Predicting Number of Health Events During Follow-up. Slopes plotted of relationship satisfaction predicting the number of health events for three levels of neuroticism (1SD below the mean, centered mean and 1 SD above the mean).

participants with more education and increased relationship satisfaction over 18 months rated their physical health status more positively. We will not interpret main effects for personality or relationship satisfaction because there were significant interaction effects in the complete model. Results suggest that neuroticism and conscientiousness moderate the association between relationship satisfaction and perceived physical health. In other words, the relationship between perceived physical health and relationship satisfaction varies across the range of values for neuroticism and conscientiousness. Figure 2 illustrates that more relationship dissatisfaction is associated with self-rated dysfunctional health when the participant has greater amounts of neuroticism. Conversely, more satisfying relationships are linked to perceived physical wellness among individuals with higher conscientiousness (Figure 3). In order to reliably interpret the interaction in Figure 3, further analyses on the region of significance were conducted and showed that participant's conscientiousness had to be greater than 0.54 SD above the mean in order for the predicted relationship to be significant.

3.4 Effects of Relationship Satisfaction and Personality on Health Behaviors

The last regression model was designed to test whether an individual's lifestyle behaviors commonly associated with health depends on personality and/or relationship factors. The outcome variable is one score that estimates engagement in risk behaviors for major illnesses, including alcohol consumption, tobacco use, and exercise. Thus, the higher the outcome score, the more frequently the participant is using unhealthy behaviors. Although no interaction terms were significant predictors, main effects were found for agreeableness, education, and marital status (Table 5). Individuals with lower agreeableness were significantly more likely to engage in risky health behaviors (e.g., more alcohol consumption, more cigarette use, and less exercise),

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regardless of whether they were in a satisfying relationship. In terms of control variables, being married and having more education were independently predictive of more reported health-promoting behaviors.

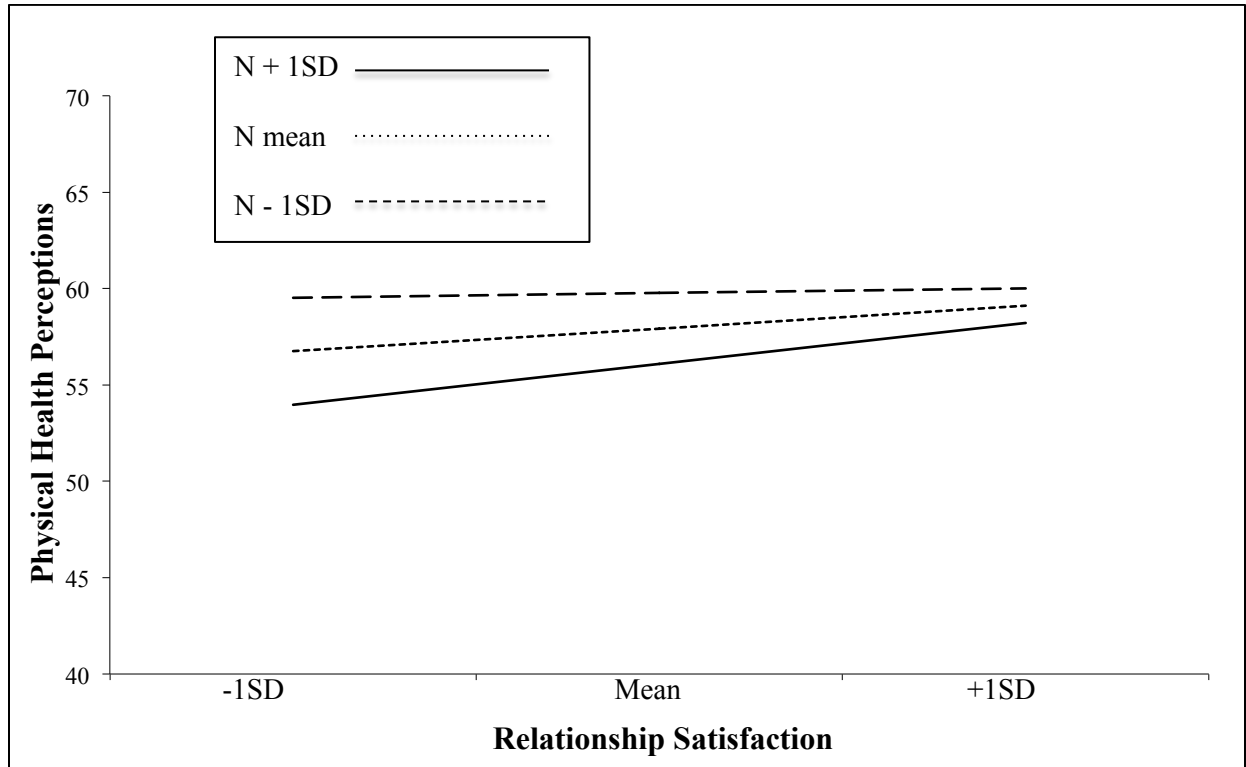


Figure 2. Interaction of Relationship Satisfaction and Neuroticism Predicting Physical Health Perceptions During Follow-up. Slopes plotted of relationship satisfaction predicting the physical health perceptions for three levels of neuroticism (1SD below the mean, centered mean and 1 SD above the mean).

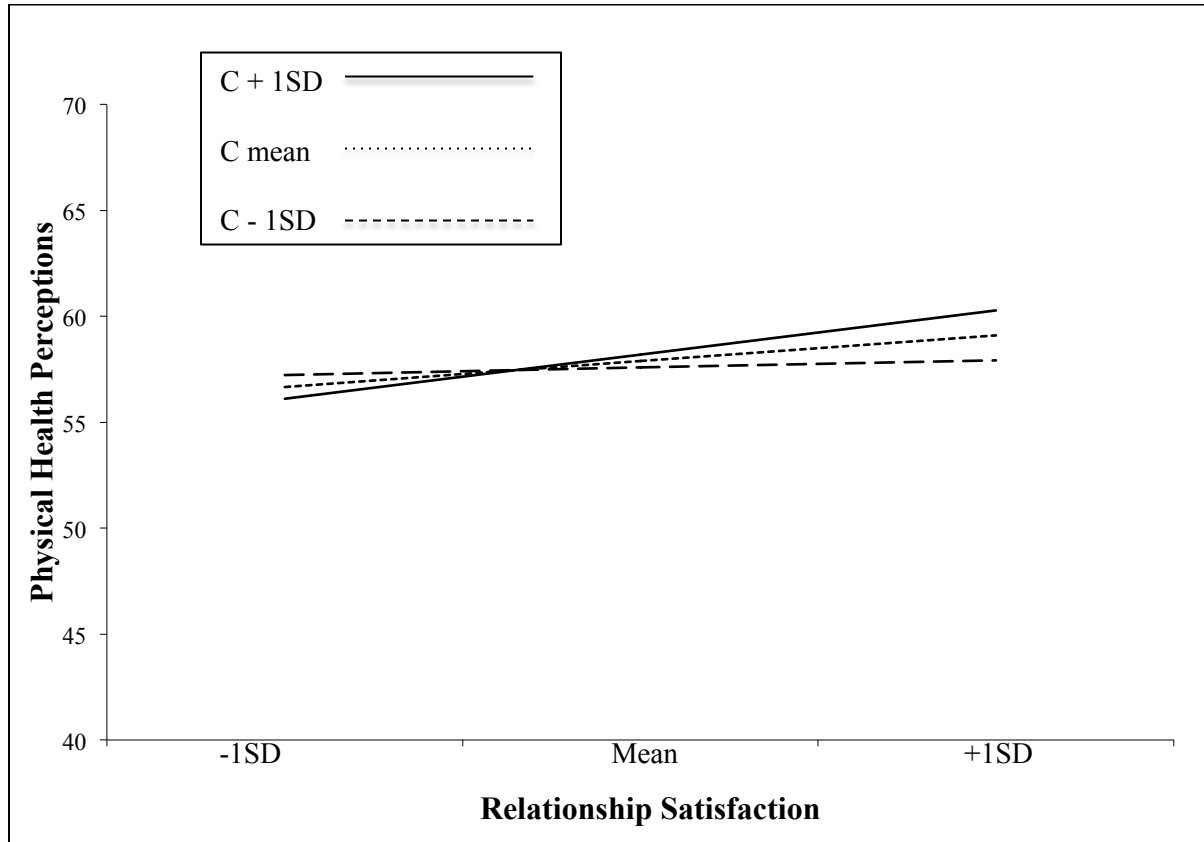


Figure 3. Interaction of Relationship Satisfaction and Conscientiousness Predicting Physical Health Perceptions During Follow-up. Slopes plotted of relationship satisfaction predicting the physical health perceptions for three levels of conscientiousness (1SD below the mean, centered mean and 1 SD above the mean).

Chapter 4: Discussion

The primary objective of this study was to investigate whether the broader context of personality offers a more comprehensive understanding of predicting physical health outcomes from relationship satisfaction. By using data on older adults who, on average, were in long-term relationships, we provided evidence to support personality as a previously unidentified moderator linking relationship satisfaction with physical health. Consistent with previous research on personality and interpersonal stress (Bolger & Zuckerman 1995; Boyes & French, 2009), we found that personality traits impact the physical health risks of perceived relationship stress. Significant personality traits showed differential effects, providing partial support for our hypotheses. Our findings indicate that when participants were dissatisfied in their relationships, they were more likely to develop a new physical illness and rate their health as dysfunctional when they have higher levels of neuroticism. In contrast to our predictions, as relationship satisfaction increases, higher levels of conscientiousness strengthened the link between satisfaction and perceived physical wellness. Agreeableness was the only personality trait to independently predict our health behavior composite score. No significant main or interaction effects were found for extraversion or openness to experience.

Our results suggest that relationship dissatisfaction is related to worse physical health outcomes over an 18-month period in late adulthood when neuroticism is elevated. This research expands on previous studies that focus on the detrimental effects of dissatisfying relationships by demonstrating poor outcomes are dependent on whether the individual has high neuroticism. Being in a dissatisfying relationship is not enough to see harmful objective or subjective physical functioning; the individual also needs to have high neuroticism. Our analyses do not answer the

question of why neuroticism is a significant moderator, but are consistent with literature associating neuroticism with more negative interpretations and appraisals of relationships (Finn, Mitte, & Neyer, 2013); poor choice of problem solving strategies employed in stressful relationships (Bouchard, 2003; DeLongis & Holtzman, 2005); elevated emotional intensity and physiological reactivity to interpersonal stress (Lahey, 2009; Norris, Larsen, & Cacioppo, 2007); and intolerance of extreme emotions (Leyro, Zvolensky, & Bernstein, 2010). Thus, individuals with high neuroticism have both an increased sensitivity to unfulfilling romantic relationships, as well as likelihood to engage in harmful coping styles in reaction to marital distress. It's possible that neuroticism influences the likelihood of engaging in health-related physiological and behavioral responses to relationship dissatisfaction, such as increased blood pressure, sustained cortisol reactivity, binge drinking, or overeating. In our sample, neuroticism was significantly correlated with engaging in unhealthy lifestyle behaviors, however this relationship did not remain significant when accounting for other personality traits.

It is important to note that these effects were found in older adults who were mostly involved in long-term, serious relationships. On average, the couples in our sample have been together for most of their adult lives, and have endured many lifestyle changes typically encountered over the life span (e.g., children, work, social networks). This analysis only captures a snapshot of the participant's lives, and we can't be sure about patterns of relationship satisfaction over long periods of time. However, it is possible that participants have stayed in their relationships for years despite chronic dissatisfaction, and adverse interactional effects between personality and dissatisfaction may have accumulated over time. Little attention has been given to life-span trajectories and older adults when considering psychosocial risk factors,

and our findings highlight the importance of composing longitudinal studies moving forward. It is important to recognize that vulnerabilities to personality and romantic relationships vary across time and phases of life, and our results shed light on one piece of the puzzle. Our results are also consistent with socioemotional selectivity theory (Carstensen, 1992), which posits an increasingly important role of significant and long-term relationships (e.g., romantic) as people age. Perhaps, relationship dissatisfaction experienced in old age is more salient than in younger adults (Uchino, 2009; Umberson et al., 2006), because older adults have narrowed their social network and place more value on their spouses. This may leave them more vulnerable to personality influences and physical health risks. Future studies should analyze these risk factors over the life-span. For now we know that dissatisfaction experienced in later adulthood predicts negative health outcomes 18 months later in the presence of neuroticism.

Although neuroticism seems to have adverse effects, conscientiousness appears to enhance the benefits of being in a satisfying relationship. According to our results, satisfied partners in romantic relationships tend to have better health perceptions if they are also high on conscientiousness. This differs from our hypothesis stating that we would not find significant interactive effects for conscientiousness, because it would compensate for the impact of dissatisfaction. There is extensive research on the positive relationship between marital quality and self-rated health symptoms, functioning, severity and adherence (Robles et al., 2014); and we now know that conscientiousness strengthens this relationship. Another interpretation of our results is that the known benefits associated with conscientiousness are only activated when your romantic relationship is going well. Previous research indicates high scores on conscientiousness are associated with favorable self-assessed physical health and lower likelihood of functional

limitations (Goodwin & Engstrom, 2002; Goodwin & Friedman, 2006). This trend is fairly consistent across healthy and medically diagnosed populations. However, our study suggests that low romantic distress is needed for this relationship to be significant. Conscientiousness also had a robust bivariate correlation with the health behavior composite score, and approached significance as an independent predictor when accounting for other personality factors and relationship satisfaction. Again, this agrees with well-replicated studies on conscientiousness, health promoting behaviors and longevity across the lifespan (Bogg & Roberts, 2004; Kern & Friedman, 2008; Takahashi, Edmonds, Jackson, & Roberts, 2013). This makes sense when considering conscientiousness is partially defined as the tendency to be self-controlled, goal-oriented, and responsibility. Overall, the pattern of results for conscientiousness reflects that this personality trait in particular promotes better health-related behaviors and cognitions.

Disagreeableness, defined by more hostility, competitiveness, and mistrust, had a direct effect on engaging in more risky health behaviors (i.e., more alcohol consumption, more tobacco use, and less exercise). This is consistent with previous literature, especially when considering the association between hostility and smoking behaviors (Hampson et al., 2006; Wong, Na, Regan, & Whooley, 2013). There are also some indications that the link between agreeableness and health behaviors spans as far back as childhood (Hampson et al., 2006; Hampson, Goldberg, Vogt, & Dubanoski, 2007). It is notable that agreeableness remained a significant predictor even when accounting for conscientiousness and other personality traits. It may be the case that the factors that we chose to include in the health behaviors composite score are more readily associated with agreeableness, but if other factors were considered (e.g., eating behaviors, attending doctor appointments), we may have seen a different pattern of results. Post-hoc

analyses that examined health behaviors individually demonstrated that conscientiousness might play more of an important role than indicated when combining the variables (see Appendix).

In contrast to other measures of physical health, we did not find significant interactive effects when predicting health behaviors. Instead, we found significant main effects for personality, but not relationship satisfaction. One possible explanation for this difference is that the health behaviors we measured in this analysis may not reflect patterns of behaviors that individuals use to cope with unsatisfying relationships. For example, we did not include eating behaviors or sleep in the composite score. Another explanation is that marital status, rather than perceived support, matters more for engaging in health behaviors (see below). Lastly, it may be possible that the age of our population explains why we did not find a significant interaction. Perhaps younger individuals with certain traits engage in risky health behaviors when they're dissatisfied in their relationships, but not older adults. If our high risk participants used to engage in unhealthy behaviors, but do not currently, then we would still see significant effects for health perceptions and physical illnesses.

We found important and interpretable main effects with our demographic covariates included in the regression models. Lower education was independently associated with unhealthy behaviors and perceptions. We discovered these findings even though education is usually attained early in life, and we focused on an older adult sample, highlighting the long-lasting effects of education across the lifespan. Our findings on education fit within the broader context of socioeconomic disparities in health psychology (Adler & Newman, 2002; Pampel, Krueger, & Denney, 2010). Less educated populations have fewer opportunities to learn about the harmful effects of unhealthy behaviors, and may not fully understand the potential long-term

consequences. Moreover, education shapes occupation and health-care possibilities, and may influence the availability of resources to promote a healthy lifestyle or medical interventions. In order to implement effective policies and interventions to change health disparities associated with education and other socioeconomic determinants, it will be important to further establish causal pathways that target the protective factors of education attainment.

Recent studies comparing functional and structural relationships suggest perceived support in romantic relationships, and in general, offer more consistent physical health benefits than received support (Uchino, 2009). Despite this recent trend, our study shows that not being married, regardless of satisfaction levels, was associated with a higher chance of engaging in risky health behaviors. This is a notable finding since aging is usually associated with decreased impulsivity and increased health awareness. The association between marital status and health behaviors found in this study further demonstrates the protective health benefits of marriage in older adults. It may be possible that marriage provides accountability or encourages self-regulation even when the relationship is not seen as supportive. Another factor to consider is that married couples are more likely to cohabit and share resources, which may discourage reckless behaviors through extrinsic culpability.

The mounting evidence for psychosocial determinants of health, and our findings, beg the question of how to treat or reduce the risk of interpersonal and personality factors. Or, whether it is even possible to reduce the risk of negative physical health outcomes by targeting psychosocial factors. The potential health benefits of couple focused interventions were illustrated in a meta-analysis of studies evaluating their efficacy on chronic physical illness. The paper found promising results indicating improvements in pain across 33 studies. In addition, it

was suggested that partners with low relationship quality might benefit most from couple-oriented interventions (Martire, Schulz, Helgeson, Small, & Saghafi, 2010). Evidence also suggests that couple interventions may generate immediate biological effects. For example, Holt-Lunstad and colleagues (2008) investigated whether a “warm touch” intervention between couples influenced physiological stress systems linked to health outcomes. Husbands in the “warm touch” group had significantly lower 24-hour systolic blood pressure post-treatment compared to a control group. Moreover, a clinical trial study found that cortisol responses to an experimental conflict discussion were significantly reduced after couples relationship education was provided, compared to before (Ditzen, Hahlweg, Fehm-Wolfsdorf, & Baucom, 2011).

A strength of including personality as a moderator is that it generates practical information about who might benefit most from interventions. Considering personality and other psychosocial measures coincides with recent shifts in healthcare to focus more on integrative models and preventative medicine. An unparalleled study by Israel and colleagues (2014) used brief measures of personality in 1,000 young adults to predict indicators of poor physical health at middle-age. The authors concluded that including screeners in routine healthcare is a simple, yet inexpensive and effective, way to target high-risk populations (e.g., high neuroticism, relationship dissatisfaction), and guide individualized care. In addition, the acceptance and promotion of interventions to change personality traits linked to better health, particularly conscientiousness, is gaining steam (Mroczek, 2014). In fact, theory-driven efforts to increase conscientiousness are already underway (Chapman, Hampson, & Clarkin, 2014; Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2014). The clinical implications of our results support

the public health significance of developing brief, behavioral personality and psychosocial interventions that can be implemented in universal settings, such as primary care.

If effective treatments are within reach, clinicians may consider routinely evaluating relationship satisfaction and personality traits alongside medical vital signs. In an ideal setting, assessing for psychosocial stressors would be analogous to measuring blood pressure or body temperature, such that data are collected regardless of presenting complaints. When patients report neurotic characteristics and unhappy romantic relationships, the clinician would then be better equipped to provide comprehensive care. Moreover, the literature on loneliness and social support suggests that satisfaction should be assessed more broadly across relationships. It may be possible that satisfaction in other relationships (e.g., friends, family) may compensate for failing romantic relationships. Future studies should investigate whether the effects found in this study are specific to long-term romantic relationships to inform best assessment procedures.

4.1 Limitations

Possible limitations should be acknowledged. First, the number of moderators tested may have increased the chance of finding a Type I error. A limitation of the statistical design was that the predictor variables, personality and relationship satisfaction, were moderately correlated with each other. Including both risk factors in the regression model forced their independence and, thus, shared variance was not accounted for. In other words, the variables were competing against each other, even though their covariation is theoretically relevant. It's possible that analyzing each variable as an independent risk factor may have led to spurious effects. To begin to compensate for this problem, we conducted separate post-hoc regressions for each of the five personality factors. In other words, we analyzed each personality factor's main and interaction

effects independently to assess whether overlap between personality factors accounted for non-significant results. Rerunning the analyses did not show drastic changes from the reported results. However, this did not account for the collinearity between personality and relationship satisfaction. It should be noted that the current research is unique because we examined personality and relationship as simultaneous predictors of physical health, which has not been systematically tested in prior research, and is theoretically relevant. Overlap is often treated as a problem to be overcome through statistical control, but in this case may be better seen as informative. Future studies may want to consider including the shared variance between personality and relationship stress to predict relevant outcomes.

4.2 Conclusions and Future Directions

Significant interactions from our results indicate the context of personality is pivotal in understanding the role of relationship satisfaction on physical health. Thus, pathways to predict physical health outcomes might be more complicated than we think. We provided further support for including psychosocial variables in pathway analyses on subjective and objective physical health outcomes. However, it's likely that comprehensive models will include both mediators and moderators. For example, specific personality traits may evoke biological and behavioral responses (e.g., increased blood pressure, smoking, overeating) that increase the vulnerability of relationship dissatisfaction. Future studies should focus on answering the question: What are the mechanisms by which personality increases reactivity to relationship dissatisfaction? This type of research is important because it will give us a more nuanced understanding of how personality and social support promote or reduce good health as people age.

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Overall, our findings suggest that identifying risk factors for physical health is complex and may depend on particular patterns of personality and relationship variables. The key findings from this paper are that in happy romantic relationships, conscientious individuals tend to have better physical health outcomes; while in unhappy relationships, individuals with high neuroticism tend to have worse outcomes.

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APPENDIX

Multiple Linear Regression Model for Personality Dimensions and Relationship Satisfaction on Specific Health Behaviors

	Alcohol R ² =.07			Tobacco R ² =.09			Exercise R ² =.06		
	B	SE	Beta	B	SE	Beta	B	SE	Beta
Gender	-1.50	.21	-.14**	.29	.44	.03	-.04	.20	-.01
Marital Status	.07	.44	.00	1.78	.62	.11**	-.23	.28	-.03
Education	.15	.62	.08*	-.29	.07	-.16***	.13	.03	.16***
Rltp. Change	-.10	.07	-.04	-.02	.09	-.01	.03	.04	.03
Rltp. Satisf.	.06	.09	.03	.12	.08	.06	.03	.04	.04
N	.01	.08	.02	-.01	.01	-.05	.00	.01	.00
E	-.02	.01	-.05	.01	.01	.05	.01	.01	.04
O	.05	.01	.15***	.00	.01	.00	.01	.01	.05
A	-.03	.01	-.09*	-.04	.01	-.12**	-.01	.01	-.04
C	.03	.01	.08	-.05	.01	-.16***	.01	.01	.09
N x Rltp. Satisf.	.00	.00	-.01	-.01	.00	-.06	.00	.00	.02
E x Rltp. Satisf.	.00	.00	-.01	.01	.00	.07	.00	.00	.02
O x Rltp. Satisf.	-.01	.01	-.05	-.01	.01	-.06	.00	.00	.03
A x Rltp. Satisf.	.00	.00	-.01	.00	.01	-.01	.00	.00	.01
C x Rltp. Satisf.	.00	.00	.01	-.01	.00	-.05	.00	.00	.05

* $p < .05$, ** $p < .01$, *** $p < .001$ Note. Rltp. Change = Change in relationship satisfaction; Rltp. Satisf. = Relationship satisfaction; N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. Gender (0=male, 1=female); Marital Status (0=married, 1=dating).