SLEEP QUALITY AS A MEDIATOR OF THE RELATIONSHIP BETWEEN ATTACHMENT ANXIETY AND HEALTH OUTCOMES DURING ROMANTIC CONFLICT

by

Rachael E. Quickert

A thesis submitted to the Department of Psychology in conformity with the requirements for the degree of Master of Science

Queen’s University
Kingston, Ontario, Canada
(August, 2016)

Copyright © Rachael E. Quickert, 2016
Abstract

Attachment anxiety, or a fear of abandonment by those close to you, is an important predictor of many individual and interpersonal outcomes. Individuals high in attachment anxiety are more likely to experience physical illness due to disrupted immune functioning and deregulated stress responses. I was interested in examining potential mechanisms accounting for why individuals high in attachment anxiety are more likely to become ill. One variable that has been demonstrated to mediate the relationship between stress and health is sleep quality. As attachment anxiety is characterized by the experience of stress and worry over abandonment by romantic partners, I predicted sleep quality would mediate the relationship between attachment anxiety and health. Further, I predicted attachment anxiety would interact with romantic threat, in that individuals high in attachment anxiety who perceive threat to their relationships would have poor sleep quality (compared with individuals low in attachment anxiety and individuals high in anxiety who do not perceive threat) which would mediate the most unhealthy outcomes. I tested these hypotheses using three online diary studies. In the first two studies, participants completed a seven-night diary describing their sleep quality, health, and interaction with their partner. In Study 3, I surveyed participants once a week for eight weeks to examine longer-term health outcomes. Sleep quality did indeed mediate the relationship between attachment anxiety and various health outcomes over one week (Study 2), and showed a trend towards mediating effects over two months (Study 3). Interestingly, however, attachment anxiety did not interact with perceived romantic threat to predict health in the mediation analyses. Implications for sleep as a mediating variable are discussed, as well as the lack of attachment anxiety by romantic threat interaction.
Acknowledgements

First and foremost, I would like to thank my supervisor, Dr. Tara MacDonald, for all of her support, encouragement, and guidance throughout this process. I consider myself very lucky to have Tara as a mentor. I would also like to thank my thesis committee, Dr. Lee Fabrigar and Dr. Ron Holden, for their thoughtful comments and suggestions for improvement. I would like to express much gratitude to my mother, father, and sister, Madeline. I’m very blessed to have such a supportive and loving family. I would also like to acknowledge my partner, Riley, for all of his encouragement and support. He was the rock that I could cling to through this amazing and unpredictable adventure. Last but not least, I would like to express sincere gratitude to my friends, family, teachers, and peers for being there for me. I feel so fortunate to have them in my life and appreciate all that they have done to help me along the path of completing my thesis.
Table of Contents

Abstract ........................................................................................................................................ ii

Acknowledgements ................................................................................................................... iii

Table of Contents ...................................................................................................................... iv

List of Tables ............................................................................................................................... viii

List of Figures .............................................................................................................................. ix

Chapter 1: Introduction ................................................................................................................ 1

  Relationships and Health ......................................................................................................... 1
  Romantic Relationships and Health ......................................................................................... 2
  Mechanisms Linking Relationships and Health ....................................................................... 3
  Individual Differences and Health ........................................................................................... 3
  Attachment Orientations .......................................................................................................... 4
  Attachment Orientations and Health ....................................................................................... 5
  Attachment, Sleep and Health ................................................................................................ 6
  Support for Sleep as a Mediator Hypothesis ......................................................................... 8
  Initial Research Supporting the Sleep as a Mediator Hypothesis ........................................... 10
  The Present Studies ................................................................................................................. 11

Chapter 2: Study 1 ..................................................................................................................... 12

  Method ...................................................................................................................................... 12
    Participants ............................................................................................................................. 12
    Measures and Procedures .................................................................................................... 13
    Data Analytic Strategy ........................................................................................................ 16
Attachment Anxiety and Partner Interaction Quality Predicting Sleep Quality

Mediation Analyses

Results

Correlation Analyses

Do attachment anxiety and partner interaction quality interact to predict sleep quality?

Does sleep mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality?

Discussion

Chapter 3: Study 2

Method

Participants

Measures and Procedures

Data Analytic Strategy

Results

Correlation Analyses

Do attachment anxiety and partner interaction quality interact to predict sleep quality?

Does sleep mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality?

Discussion

Chapter 4: Study 3

Method

Participants
Measures and Procedures........................................................................................................ 50
Data Analytic Strategy ............................................................................................................ 52
Results.................................................................................................................................... 53
Correlation Analyses............................................................................................................ 53
Do attachment anxiety and partner interaction quality interact to predict sleep quality? 54
Does sleep mediate the relationship between attachment anxiety and health outcomes,
controlling for partner interaction quality? ........................................................................ 56
Discussion.......................................................................................................................... 65
Chapter 5: General Discussion............................................................................................. 68
Summary of Findings............................................................................................................ 68
Implications.......................................................................................................................... 76
Limitations and Future Directions ....................................................................................... 78
Conclusions.......................................................................................................................... 81
References............................................................................................................................. 82
Appendix A: Ethics Documents............................................................................................ 91
Appendix B: Demographic Questions.................................................................................... 99
Appendix C: Study 1 Nightly Conflict and Health Questionnaire ....................................... 100
Appendix D: Study 1 Time-Lagged Sleep Mediation Analyses............................................. 103
Appendix E: Study 2 Nightly Conflict and Health Questionnaire......................................... 108
Appendix F: Study 2 Time-Lagged Sleep Mediation Analyses ............................................. 112
Appendix G: Study Three Weekly Check-In Questionnaire ................................................. 118
Appendix H: Meta-Analyzed Correlations Among Variables Averaged Across Studies 1 to 3 ........................................................................................................................................................................ 121

Appendix I: Ethics Clearance Form.................................................................................................................................................................................. 122
List of Tables

Table 1: Composite Variable for Study 1 ................................................................. 16
Table 2: Study 1 Descriptive Statistics and Correlations ...................................... 20
Table 3: Composite Variables for Study 2 .............................................................. 35
Table 4: Study 2 Descriptive Statistics and Correlations ...................................... 37
Table 5: Altered Composite Variable for Study 3 .................................................. 52
Table 6: Study 3 Descriptive Statistics and Correlations ...................................... 54
Table 7: Attachment Anxiety, Partner Interaction Quality and the Interaction of Attachment Anxiety and Partner Interaction Quality to Predict Sleep Quality: Summary of Results Across Studies 1 to 3 ............................................................. 70
Table 8: Sleep Quality Mediating the Relationship Between Attachment Anxiety and Health Outcomes, Controlling for Partner Interaction Quality: Summary of Results Across Studies 1 to 3 ........................................................................................................................................... 73
Table 9: Combined Correlation Coefficients Meta-Analyzed Across Studies 1 to 3 .............. 121
List of Figures

Figure 1: Sleep Mediation Hypothesis ................................................................. 9
Figure 2: Hypothesized Attachment Anxiety by Relationship Threat Interaction to Predict Sleep Quality ......................................................... 10
Figure 3: Interaction Between Attachment Anxiety and Relationship Threat to Predict Sleep Quality the Night Following Data Collection (Study 1) ........................................ 22
Figure 4: Sleep Quality Mediating the Relationship Between Attachment Anxiety and Emotional Responding, Controlling for Partner Interaction Quality (Study 2) ......................... 41
Figure 5: Sleep Quality Mediating the Relationship Between Attachment Anxiety and Cognitive Experience, Controlling for Partner Interaction Quality (Study 2) ................................ 43
Figure 6: Sleep Quality Mediating the Relationship Between Attachment Anxiety and Health Interference, Controlling for Partner Interaction Quality (Study 2) .............. 46
Figure 7: Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Emotional Responding, Controlling for Partner Interaction Quality (Study 3) ................... 58
Figure 8: Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Cognitive Experiences, Controlling for Partner Interaction Quality (Study 3) ............... 60
Figure 9: Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Physical Symptoms of Illness, Controlling for Partner Interaction Quality (Study 3) ....... 61
Figure 10: Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Health Interference with Life, Controlling for Partner Interaction Quality (Study 3) ........ 64
Chapter 1

Introduction

Imagine a scenario where a romantic couple, Kate and Will, get in an argument. The couple leaves the issue unresolved overnight. Although Will gets a full night of sleep, Kate worries throughout the night about what will happen to their relationship. She wonders about the status of their relationship and continuously relives the argument, looking for signs that Will does not love her anymore. The next day, Kate has trouble concentrating, feels down, and experiences the onset of a cold. Will, on the other hand, feels as healthy as the day before. I was interested in what might account for differences in health outcomes for couples in conflict (e.g., in the vignette above, why Kate became sick after the romantic conflict while Will remained healthy). One trait that may characterize individuals such as Kate is that of attachment anxiety, fear of abandonment by close others (Bowlby, 1969; Hazan & Shaver, 1987). I predicted that individuals high in attachment anxiety, relative to low in attachment anxiety, would ruminate about the potential loss of their partner post-conflict, and this rumination would lead to sleeping difficulties. The poor sleep quality exhibited by those high (relative to low) in attachment anxiety would subsequently mediate the relationship between attachment anxiety and poor health outcomes after relational conflict.

Relationships and Health

Close relationships with others are one of the most important components to a meaningful life (Berscheid, 1985). One of the many benefits of satisfying social relationships is enhanced mental and physical health (see Tay, Tan, Diener, & Gonzalez, 2013 for a review). Individuals in long-term, positive relationships tend to live longer and healthier lives than those who lack close interpersonal ties. Relationships with others predict positive health outcomes
through physical, psychological and emotional care (Reis & Franks, 1994). By having others to hold us accountable for our medical regimes and to assist in these regimes, we may be more motivated and able to engage in health behaviours. Close relationships also provide intimacy and social support which are associated with enhanced wellbeing, decreased chance of disease, and improved prognosis of illness when it does occur (Reis & Franks, 1994; Tay et al., 2013). Individuals who have sufficient social support are more likely to be optimistic and positive when battling illness, which is one of the many reasons for better prognoses (Zabalegui, Cabrera, Navarro, & Cebria, 2011). Indeed, there are clear links in the literature between relationships and health.

**Romantic Relationships and Health**

Many researchers have assessed the relationship between marriage and health. Burman and Margolin (1992) reported that individuals who are married are at a decreased risk of mortality and disease morbidity than those who are unmarried. However, further research exploring associations between marriage and health has established that this relationship is more complex than a simple main effect. In a recent meta-analysis, Robles, Slatcher, Trombello, and McGinn (2014) reported that the relationship between marriage and health is small at best, and that there are many important moderators of this relationship. Kiecolt-Glaser and Newton (2001) noted that researchers must differentiate between negative and positive experiences in intimate relationships, because both are predictive of health outcomes. Although positive, supportive relationships are associated with healthy outcomes due to social support, low levels of stress, and positive interactions, stressful and unsatisfying relationships are associated with unhealthy outcomes. In fact, unfulfilling relationships may be better predictors of health outcomes than fulfilling relationships (Ewart, Taylor, Kraemer, & Agras, 1991). Kiecolt-Glaser et al. describe
relationships that are associated with poor health to involve hostile interaction, frequent conflict and low support. Further, as relationships can influence our self-concept (Aron, Aron, Tudor, & Nelson, 1991) and self-esteem (Knee, Canevello, Bush, & Cook, 2008), it can be quite a severe stressor when our relationships are going poorly. This may lead to unhealthy coping behaviours and neglecting to engage in the healthy routines we are used to (e.g., Rodriguez, Knee, & Neighbors, 2014).

**Mechanisms Linking Relationships and Health**

Although research has grown over the past twenty years examining relationships and health, and the influence of social support is well documented, other physiological and psychological mechanisms underlying this relationship are less well understood. There is some support for sleep quality as a mediator of the relationship between experiences in romantic relationships and health. For example, sleep quality is an important buffer against stress effects on emotional responding for young couples (Flueckiger, Lieb, Meyer, Witthauer, & Mata, 2015). Sleep quality can be defined in many ways, but encompasses both the amount of time spent sleeping, and the restfulness of the sleep. The relationship between marital quality and sleep quality is both strong and positive, as noted in a recent meta-analysis (Troxel, Robles, Hall, & Buysse, 2007). The researchers note that this relationship is not necessarily causal and could be bidirectional, as sleep problems and marriage problems often coexist and can influence one another. Sleep is therefore potentially an important mechanism connecting relationship experiences and health.

**Individual Differences and Health**

The research on sleep, relationships and health is useful and potentially clinically applicable, however many people can relate to being in occasionally-stressful, sometimes sleep-
deprived romantic relationships. To further explore who is at most risk of poor health outcomes, it would be useful to explore individual difference variables. Less is known about how individual differences influence the experience of romantic relationships and subsequently impact later health outcomes (Cohen, 2004). A focus on individual personality traits could help researchers further parse who is most at risk of deleterious health outcomes from stressful and unsatisfying relationships.

In the past three decades, researchers have started exploring the relationships among personality, close relationships and health. Individual differences in coping with stress are an important predictor in health outcomes (Ratliff-Crain & Baum, 1990). For example, individuals who report more daily hassles (small, chronic stressors) in their lives are at a greater risk for disease and mortality relative to those who report fewer daily hassles (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). In fact, these daily hassles (e.g., too many things to do) are more predictive of health than major life events (e.g., being fired at work; DeLongis et al., 1982).

Further, positive affect is also correlated with health through physiological (a direct influence on immune functioning), social (seeking support) and behavioural means (motivation to engage in health-related behaviours; Salovey, Rothman, Detweiler, & Steward, 2000). These individual difference variables can be applied to a romantic context (e.g., those who experience more daily hassles in a relationship, compared with those who experience less, may have worse health outcomes). In this set of studies, I hypothesized that the relationship between stressors and health outcomes would be greater for those high, relative to low, in attachment anxiety.

**Attachment Orientations**

Attachment orientations can be used to predict behaviour both in individual and interpersonal contexts. The theory of attachment was first introduced by John Bowlby in 1969,
who proposed that experiences as a child with one’s primary caregivers influence how one perceives, experiences, and evaluates close relationships throughout life. Through experiences with others individuals construct an internal working model of how dependable close others are in their lives. This internal working model activates attachment-related behaviors, especially when threat to a relationship is perceived. Attachment styles were first introduced as categories of secure and insecure attachment and used to predict behaviour in children (Ainsworth, Blehar, Walters, & Wall, 1978; Bowlby, 1969). Later, Hazan and Shaver (1987) employed attachment theory to predict behaviour in adult romantic relationships. Currently, attachment is theorized as two continuous dimensions: attachment anxiety and attachment avoidance (Fraley & Waller, 1998). Individuals high in attachment anxiety fear abandonment, experience intense negative emotions during conflict, engage in cognitive rumination and excessively demand reassurance that they will not be abandoned. Individuals high in attachment avoidance fear intimacy and strive to maintain autonomy and distance from their partners during conflict. These two dimensions are generally moderately correlated, with a recent meta-analysis reporting an average correlation of .41, \(p < .001\) (Cameron, Finnegan, & Morry, 2012). It has been demonstrated that attachment orientations can predict how individuals respond to stress and interpersonal conflict (Simpson & Rholes, 2012).

**Attachment Orientations and Health**

Attachment orientations are correlated with many health-related outcomes. Individuals who score high in attachment anxiety and/or avoidance generally exhibit poorer health due to hyperactivation of the hypothalamic pituitary adrenal axis (HPA axis; regulates the body during periods of stress) and weaker immune responses (fewer cells fighting off infection and illness; Stanton & Campbell, 2014). Attachment anxiety and/or avoidance is also related to heightened
cortisol responses during stress (Pietromonaco, DeBuse, & Powers, 2013). Cortisol is a hormone implicated in the body’s stress response. It has also been demonstrated that individuals high in attachment anxiety and/or avoidance exhibit elevated cortisol levels prior to discussing their romantic relationships, compared to securely attached individuals (Brooks, Robles, Schetter, & Dunkel, 2011; Powers, Pietromonaco, Gunlicks, & Sayer, 2006). Hyperactivation of the HPA axis and/or excess production of cortisol can lead to inefficient functioning of one’s bodily stress systems. This may lead to an enlargement of the adrenal glands and potential downstream immune and emotional issues (e.g., depression; Stokes, 1995). Due to those high in attachment anxiety and/or avoidance constantly preparing their bodies for stress, this may lead to bodily fatigue and inefficient responding when real stress does occur. Therefore, individuals high in attachment anxiety and/or avoidance are worn down and less equipped to handle stress when issues arise.

**Attachment, Sleep and Health**

I am interested in exploring mechanisms of the relationship between attachment orientations and health outcomes, specifically sleep quality. As noted above, sleep quality is a mediator of the relationship between romantic experiences and health outcomes (Flueckiger et al., 2015; Troxel et al., 2007). I predicted individuals high in attachment anxiety and/or avoidance who experienced poor quality sleep would have more deleterious health outcomes, especially after romantic conflict (compared with those low in attachment anxiety and/or avoidance, and those who had slept well).

A growing literature links attachment orientations and sleep disturbance (Robles & Kane, 2014). Recently, Adams and McWilliams (2015) examined the relationship between attachment insecurity and sleep while controlling for preexisting mental and physical health conditions, and
the relationship remained significant. In a diary study, women high in attachment anxiety reported decreased sleep efficiency (ratio of the time sleeping vs. the time spent in bed) and quality on nights following high disclosure of relationship issues relative to nights with low disclosure and relative to individuals low in attachment anxiety. Attachment anxiety has been consistently linked with sleep disturbances (Carmichael & Reis, 2005; Scharfe & Eldredge, 2001), throughout the lifespan (Adams, Stoops, & Skomro, 2014) and especially after relationship conflict (Hicks & Diamond, 2011). Neurologically, a specific physical difference in brain waves (alpha waves) was noted during the relaxed state prior to sleep in individuals high in attachment anxiety relative to those low in attachment anxiety (Sloan, Maunder, Hunter, & Moldofsky, 2007). Although the significance of this difference is not yet known, it still suggests physiological differences between those high and low in attachment anxiety during sleep.

Many studies cite the importance of sleep for the restoration of mental, emotional and physical health, especially during stress (e.g., Robles & Carroll, 2011), and associate lack of sleep with many unhealthy outcomes (e.g., increased cortisol levels and delays in recovery of the HPA axis after exposure to stress; Leproult, Copinschi, Buxton, & Van Cauter, 1997). Due to its restorative properties, sleep has been shown to be an important mediator in the relationship between stress and health outcomes (Hagger, 2010). Hagger notes that sleep can influence self-regulatory abilities, which can then influence health-related behaviours and health outcomes. Sleep is also shown to increase productivity throughout the day through greater feelings of vitality and self-efficacy, allowing one to achieve their independent and interpersonal goals (Schmitt, Belschak, & Den Hartog, 2016).

Therefore, to summarize the current literature, there are links between attachment anxiety and/or avoidance and poor health outcomes, attachment anxiety and/or avoidance and poor sleep...
quality, and poor sleep quality and poor health outcomes. However, there is little research directly testing sleep as a mediator of the relationship between attachment and health outcomes. As the literature on attachment anxiety, sleep and health outcomes is more consistent and robust than the literature on attachment avoidance, sleep and health (Stanton & Campbell, 2014), I chose to focus my analyses solely on attachment anxiety, rather than avoidance.

Support for Sleep as a Mediator Hypothesis

In 2002, a team of researchers examined the relationships among loneliness, sleep and health, providing a theoretical basis for my hypothesis (Cacioppo, Hawkley, Berntson, Ernst, Gibbs, Stickgold, & Hobson). The researchers reported that lonely individuals experience poorer sleep efficiency both in the laboratory and at home. The researchers suggested that sleep issues might mediate the relationship between loneliness and greater risk of disease and morbidity. Cacioppo et al. found that indeed, loneliness is associated with hypervigilance to social exclusion, which predicts poor sleep quality and can lead to health problems (Hawkley & Cacioppo, 2010). Poor sleep quality in lonely individuals predicted short-term (memory deficits) and long-term health issues (hypertension, increased risk of mortality).

Cacioppo et al.’s (2002) research on loneliness, sleep and health outcomes might reflect an underlying pattern predicting the relationship among personality differences, poor quality sleep, and health outcomes. Attachment anxiety, much like loneliness, is characterized by hypervigilance on social situations, negative emotional experience, and cognitive rumination (Simpson & Rholes, 2012). This hypervigilance and rumination (whether it be from feeling rejected by society or rejected by one’s partner) may lead to poorer quality sleep, thereby decreasing health over time. As discussed above, attachment anxiety predicts sleep deficits and health issues such as maladaptive immune and stress responses. I hypothesized that much like in Cacioppo et al.’s
research on loneliness, sleep quality would partially mediate the relationship between attachment anxiety and health outcomes (depicted in Figure 1).

Figure 1

*Sleep Mediation Hypothesis.*

One important point to note is that attachment-related behavior should be *more* pronounced during perceived threats to one’s relationship (Bowlby, 1969; Campbell & Marshall, 2011). Therefore, I expected a two-way interaction between attachment anxiety and perceived threat to one’s relationship predicting sleep quality. Specifically, I predicted that individuals high in attachment anxiety would have lower quality sleep than those low in attachment anxiety, but that this effect would be even *more* pronounced during romantic conflict (see graph in Figure 2). The poor quality sleep experienced by those high in attachment anxiety during romantic conflict (relative those low in attachment anxiety and those high in attachment anxiety with low romantic conflict) would then be associated with poor health outcomes the next day and potentially days afterwards. The health outcomes could be physical (e.g., contraction of illness), cognitive (e.g., difficulties concentrating), or emotional (e.g., anxiety).
I also tested time-lagged effects. I used a second mediator (sleep quality the two nights before the day of responding) to examine if sleep two nights before had a similar mediating effect to sleep one night before in predicting participants’ health responses. I predicted that both mediators would have similar effects.

**Initial Research Supporting the Sleep as a Mediator Hypothesis**

A few researchers have explored sleep as a mediator of the relationship between attachment anxiety and health, lending support to my hypothesis. Robles and Kane (2014) suggested that stress-related physiological changes mediate the relationship between attachment and health outcomes, and that the energy required to cope with stress can be restored through sleep. However, Robles and Kane did not directly test sleep as a mediator of the relationship between attachment orientations and health. Two research teams did test this hypothesis. The first team of researchers reported that poor sleep quality mediated the relationship between attachment anxiety and stress responses (measured by levels of inflammatory markers after stress), resulting in longer hospital stays for adult men post-cardiac surgery (Kidd, Poole, Leigh, Ronaldson, Jahangiri, & Steptoe, 2014; as described in Pietromonaco & Powers, 2015). The
second team of researchers noted that reports of global sleep quality partially mediated the relationship between attachment anxiety and self-reports of general health, symptoms, and number of sick days taken in female hospital-based healthcare employees (Maunder, Hunter, & Lancee, 2011). In this second study, depressive symptoms were a stronger mediator of this relationship than sleep quality. The above studies lend support my sleep mediational hypothesis, but are not specific to the context of romantic relationships. As stated above, Bowlby (1969) theorized that attachment-related behaviours are most salient during threats to one’s relationship. The two studies also used very specific samples of individuals and therefore cannot generalize much beyond adult men after heart surgery and female healthcare workers.

The Present Studies

In the following three studies, my goal was to examine if sleep did indeed mediate the relationship between attachment anxiety and health outcomes during romantic relational threat, using a sample of young adults from Queen’s University. I employed daily diary study methodology through nightly questionnaires asking about participants’ daily experiences, health, and interaction with their partners. I then used multi-level modeling to build a model examining trait-level attachment anxiety, daily partner interaction quality, night-before sleep quality, and both mental and physical health outcomes. In Studies 1 and 2 data were collected for seven consecutive nights to examine day-to-day mental and physical health, whereas in Study 3 data were collected longitudinally for two months to examine long-term contraction of illness over the winter season. I hypothesized that sleep quality would partially mediate the relationship between attachment anxiety and both mental and physical health outcomes, and that this relationship would be exacerbated during relationship stressors (e.g., negative daily interactions, relationship conflict), especially for those high in anxiety.
Chapter 2

Study 1

Study 1 was an initial test of my sleep mediation hypothesis. I conducted an online diary study examining attachment orientations, partner interaction quality, sleep quality and health behaviours. Participants answered nightly questionnaires about their sleep, health, and experience with their partner each evening for a week. I then used multi-level modeling (MLM) to examine if night-before sleep mediated the relationship between attachment anxiety and day-to-day health, controlling for partner interaction quality.

I hypothesized that attachment anxiety would be negatively associated with sleep quality, and health outcomes. Sleep quality would be positively associated with health outcomes. Further, I hypothesized a two-way interaction between attachment anxiety and perceived romantic threat (operationalized as participants reporting negative partner interaction quality over the day, or in a separate analysis, participants reporting high conflict intensity during a fight with their partner that day) to predict sleep quality. Sleep quality would then mediate the relationship between attachment anxiety and health outcomes. Specifically, when individuals high in attachment anxiety experience a potential threat to their relationship (e.g., negative interactions over the day or high conflict intensity), poor sleep quality would be associated with deleterious health outcomes to a much greater extent than on days with low threat to the relationship, and also compared with individuals low in attachment anxiety.

Method

Participants

Seventy-eight undergraduates at Queen’s University (9 men) participated in this study. Participants were recruited from Queen’s University community Facebook pages (e.g.,
“Incoming Class of 2019” and “Paid Psychology Research Studies,”). Individuals received ballots in a monetary draw as compensation for participation. To qualify to participate, individuals had to be in a romantic relationship and their partner must not have participated in this study. I did not want participants’ partners’ experience with the study materials to influence responding. Participants had a mean age of 20.3 years (range: 17-28 years) and had been in a relationship for an average of 20.8 months (range: 1-72 months). Not all participants provided data for the full seven days (71 participants started the night one survey, 60 participants started the night seven survey, 46.2% provided data on all seven nights).

**Measures and Procedures**

**Initial Survey**

I recruited participants from Queen’s University community Facebook pages by posting a link to the initial survey. This survey, as well as all other study materials, was presented on SurveyMonkey online software. The initial survey posted to Facebook had the letter of information and consent form (all ethics documentation are presented in Appendix A), and asked participants to create a participant identification code so that data could be aggregated over time. Participants then answered demographic questions (e.g., gender, age, relationship length; see questions in Appendix B). Finally, I measured attachment orientations using the Experiences in Close Relationships Scale Revised (ECR-R; Fraley, Waller, & Brennan, 2000). This 36-item scale measures attachment avoidance (e.g., “I get uncomfortable when a romantic partner wants to be very close”) and attachment anxiety (e.g., “I’m afraid that I will lose my partner’s love”) on a scale from 1 (strongly disagree) to 7 (strongly agree). Both scales had eighteen items, with scores on each scale demonstrating high reliability (attachment avoidance: Cronbach α = .92; attachment anxiety: Cronbach α = .93). After completing this initial survey, participants were
asked to provide their email address so that I could contact them with the seven nightly surveys. Email addresses were compiled on a secure electronic document to create a contact list, separated from participant codes and identifying information.

**Nightly Surveys**

On the closest Sunday one week after participants had completed the initial survey, I emailed a link to the nightly questionnaire for seven nights in a row. The night one questionnaire was always sent on Sunday, and emails were blind carbon copied to ensure participant privacy. Questionnaires were sent at 8 p.m. each night, and participants were asked to complete the questionnaires before going to sleep, reporting on their day and sleep from the night before. I allowed participants to access the survey from 8 p.m. that night until 11 a.m. the next morning to limit the time of responding (a bit of flexibility if participants had a busy night, but conservative to limit memory issues). The nightly surveys took approximately fifteen minutes to complete and were identical each night.

At the beginning of each survey, participants entered their identification code. Participants were then asked about their eating, exercise and sleep, as well as their general wellbeing, pain and discomfort over the day (see full survey in Appendix C). Sleep quality items were adapted from the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI measures sleep quality over the past month rather than the past night, so certain items were selected from the PSQI and adapted to fit the purpose of this study. I constructed additional items that seemed appropriate to assess night-before sleep as well.

Subsequently, participants were asked if they had interacted with their partner in the previous 24 hours. Participants who had interacted with their partner were then asked about the quality of the interaction, whether they experienced conflict, what that conflict was about and
whether it was resolved (see full questionnaire in Appendix C; partner conflict items adapted from Murphy’s {2012} dissertation). Items were measured on varying scales, but fit the general pattern from zero (much less than usual) to ten (much more than usual) with five (about the same as usual) in the middle.

Throughout the questionnaires, there was skip logic so that if participants did not have certain experiences (e.g., did not exercise, interact with their partner, or have a conflict with their partner) they did not have to answer questions about those experiences. If participants ended their romantic relationship, they could email the head researcher to be removed from the contact list. At the end of the seventh nightly survey, participants received a debriefing form (see form in Appendix A) and were thanked for their time. After all data were collected, I conducted the monetary draw to reward one of the participants for his/her time. This study was run from October 2014 until February 2015.

**Composite Variable**

Post-data collection, I created a composite variable of the sleep quality items using principal components analysis (see variable in Table 1). I used five survey items standardized with z-scores to construct the composite variable. My sleep quality composite had a moderate degree of reliability (Cronbach α = .63). Because participants were reporting on their night-before sleep, I created variables to account for sleep quality two nights before, one night before and the night of data collection so that I could examine time-lagged effects. Partner interaction quality was examined using a single item self-report rating (“how would you rate your interaction with your partner today overall?”). Health outcomes were also measured using individual items (e.g., “compared to an average day, how did you feel in general today?”) as there were not enough related variables to create composite health variables.
Table 1

Composite Variable for Study 1.

<table>
<thead>
<tr>
<th>Composite Variable</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Quality</td>
<td>Compared to a normal sleep, how was your sleep last night?</td>
</tr>
<tr>
<td></td>
<td>How many hours of sleep did you get last night?</td>
</tr>
<tr>
<td></td>
<td>How long did it take you to fall asleep last night?*</td>
</tr>
<tr>
<td></td>
<td>Did you wake up feeling rested this morning?</td>
</tr>
<tr>
<td></td>
<td>How many times did you wake up during the night?*</td>
</tr>
</tbody>
</table>

*=Reverse-scored

Data Analytic Strategy

All analyses were conducted on the Statistical Package for Social Sciences (SPSS), version 19.

Correlation Analyses

I first calculated descriptive statistics and the correlations among attachment anxiety, sleep quality, partner interaction variables and health variables.

Attachment Anxiety and Partner Interaction Quality Predicting Sleep Quality

Next, I examined if attachment anxiety, daily partner interaction quality, and the interaction of attachment anxiety and partner interaction quality could predict sleep quality the night of and night after data were collected. I used SPSS Mixed Models syntax to construct a multi-level conditional model. I entered attachment anxiety as a level two predictor, and daily partner interaction quality as a level one predictor to predict sleep quality the night of data collection, and then in a separate model to predict sleep quality the night after data collection. I also included the interaction between attachment anxiety and partner interaction quality as a predictor. Attachment anxiety was grand mean centered and partner interaction quality was group mean centered. I examined the unconditional model, and the conditional model with level one, two, and both one and two predictors. Any interactions were decomposed with simple
slopes analyses. This process was repeated with conflict intensity replacing partner interaction quality as the level one predictor as a separate set of analyses.

**Mediation Analyses**

I then tested whether sleep quality mediated the relationship between attachment anxiety and health outcomes, while controlling for partner interaction quality. Because multi-level modeling (MLM) was required in my analyses, I used Baron and Kenny’s (1986) recommendations to examine mediation within my MLM models. Current recommendations suggest using Preacher and Hayes’ (2008) bootstrapping mediation method rather than Baron and Kenny’s (1986) stepwise method (see Preacher & Selig, 2012). However, Preacher and Hayes’ (2008) bootstrap syntax is not suitable for nested data, which requires MLM. Preacher, Zyphur, and Zhang (2010) introduced resources to bootstrap multilevel structural equation modeling (MSEM) so that researchers could examine mediations using clustered data, and this method seems to have predictive and precision benefits over Baron and Kenny’s (1986) stepwise method (Preacher, Zhang, & Zyphur, 2011), however Preacher et al. have yet to develop MSEM syntax suitable for SPSS. Therefore, I used MLM analyses within Baron and Kenny’s framework of testing mediation.

Following Baron and Kenny’s (1986) stepwise mediation process, I first developed a multi-level model to examine if attachment anxiety predicted sleep quality, controlling for daily partner interaction quality. In the second step, I used MLM to examine if sleep quality could predict the health outcome variable, controlling for attachment anxiety and partner interaction quality. Third, I developed a multi-level model to test whether attachment anxiety predicted the health outcome variable, controlling for partner interaction quality. This is the direct path between the predictor and outcome variable. Fourth, I tested the multi-level model with
attachment anxiety predicting the health outcome, controlling for both partner interaction quality and sleep quality. This is the indirect path between the predictor and outcome variable, controlling for the mediator. I examined if attachment anxiety’s ability to predict the health outcome (simultaneously controlling for partner interaction quality) decreased by controlling for sleep quality (the mediator) in the model. Finally, I used Sobel’s test (1982) to examine if the mediation effects were significant. I used an online calculator developed by Preacher and Leonardelli (2016) to calculate the Sobel test, inputting regression weights and standard deviations from the path between the predictor and the mediator, and the path between the mediator and the outcome variable, controlling for the predictor. This Sobel test produces a z statistic and a p value, which indicate whether the indirect model of the predictor (attachment anxiety) predicting the outcome (health), via the mediator (sleep quality) is significantly different than the null hypothesis of no relationship. In all analyses used to test mediation, attachment anxiety was grand-mean centered and entered as a level two predictor, while partner interaction quality was group-mean centered and entered as a level one predictor. In the second step of testing mediation, sleep quality was group-mean centered and entered as a level one predictor. Conditional models with unstructured covariance structures were used in all models and any interactions were decomposed with simple slopes analyses.

This process to test for mediation was repeated controlling for conflict intensity rather than partner interaction quality (a different operational definition of romantic threat). The process was also repeated using sleep quality the two nights previously as the mediator to examine time-lagged effects. Various health outcome variables were tested including: how individuals felt in general, whether individuals were bothered by illness, whether individuals experienced pain, and whether physical symptoms interfered with their day.
Results

Correlation Analyses

As hypothesized, attachment anxiety was negatively correlated with sleep quality, $r(77) = -0.40$, $p < .001$. This is consistent with past research linking attachment anxiety to sleep issues (e.g., Robles & Kane, 2014). Sleep quality was correlated with negative partner interaction quality, $r(77) = -0.40$, $p < .001$, in that better sleep quality was associated with reporting better interactions with one’s partner. In contrast, attachment anxiety was not significantly correlated with negative partner interaction quality, $r(77) = -0.09$, $p = .436$. Neither sleep quality, $r(35) = -0.20$, $p = .239$, nor attachment anxiety, $r(35) = 0.11$, $p = .528$, were significantly associated with conflict intensity. Attachment anxiety was negatively correlated with healthy eating, $r(77) = -0.26$, $p = .024$, but not with any other measures of health. Sleep quality, however, was associated with more health outcomes. Sleep quality was correlated with healthy eating, $r(77) = 0.26$, $p = .024$, how individuals felt in general, $r(77) = 0.41$, $p < .001$, how in control individuals felt over their thoughts, $r(77) = 0.34$, $p = .002$, and whether individuals reported pain interfering with their day, $r(77) = -0.29$, $p = .010$. These correlations, as well as variable means and standard deviations, and are displayed in Table 2.
Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attachment Anxiety</td>
<td>2.87</td>
<td>1.15</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sleep Quality</td>
<td>0.00</td>
<td>0.63</td>
<td>-.40***</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Negative Partner Interaction Quality</td>
<td>7.25</td>
<td>1.52</td>
<td>.09</td>
<td>-.40***</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Conflict Intensity</td>
<td>2.89</td>
<td>1.98</td>
<td>.11</td>
<td>-.20</td>
<td>.23</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Healthy Eating</td>
<td>4.74</td>
<td>0.93</td>
<td>-.26*</td>
<td>.26*</td>
<td>-.10</td>
<td>-.57***</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Feelings in General</td>
<td>4.94</td>
<td>1.17</td>
<td>-.01</td>
<td>.41***</td>
<td>-.49***</td>
<td>-.44**</td>
<td>.20</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7. Control Over Thoughts</td>
<td>4.84</td>
<td>1.03</td>
<td>-.00</td>
<td>.34**</td>
<td>-.22</td>
<td>-.08</td>
<td>-.10</td>
<td>.65***</td>
<td>X</td>
</tr>
<tr>
<td>8. Pain Interference</td>
<td>1.12</td>
<td>1.39</td>
<td>.10</td>
<td>-.29**</td>
<td>.08</td>
<td>-.09</td>
<td>-.03</td>
<td>-.27*</td>
<td>-.09</td>
</tr>
</tbody>
</table>

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

Do attachment anxiety and partner interaction quality interact to predict sleep quality?

To further explore the relationship between attachment orientations and sleep quality I used multi-level modeling with attachment orientations (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment orientations and partner interaction quality entered to predict sleep quality. I used SPSS Mixed Models syntax to construct a multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. As expected, attachment anxiety (level two predictor) had a significant main effect predicting lower sleep quality, $B = -.14$, $SE = .04$, $t(58) = -3.47$, $p = .001$. However contrary to hypotheses, partner interaction quality (level one predictor) did not significantly predict sleep quality, $B = .02$, $SE = .02$, $t(41) = 0.73$, $p = .470$, and neither did the interaction between attachment anxiety and partner interaction quality, $B = .01$, $SE = .02$, $t(47) = 0.52$, $p = .607$. Therefore individuals high in...
attachment anxiety were more likely to endorse sleeping poorly, and this was consistent regardless of partner interaction quality.

Because there was a main effect of attachment anxiety predicting sleep quality, I decided to examine time-lagged effects of sleep by looking at the association between attachment anxiety and sleep the night after data collection. I created another multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. I entered attachment anxiety (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment anxiety and partner interaction quality to predict sleep quality the night following data collection. There was a trending main effect of attachment anxiety predicting lower sleep quality the night following data collection, \( B = -0.08, SE = 0.04, t(55) = -1.91, p = 0.061 \). Partner interaction quality did not significantly predict sleep quality on its own, \( B = -0.02, SE = 0.02, t(186) = -0.85, p = 0.399 \). Interestingly, there was a significant two-way interaction between attachment anxiety and partner interaction quality to predict sleep quality the night after data collection, \( B = -0.05, SE = 0.02, t(263) = -2.55, p = 0.011 \). This interaction is visually depicted in Figure 3. At low levels of relationship threat (participants reported a positive day interacting with their partner; depicted in the graph as one standard deviation below the mean), the association between attachment anxiety and sleep quality was non-significant. Participants reported the same quality sleep, regardless of their attachment anxiety. However, at high levels of relationship threat (participants reported negative interactions with their partner over the day; presented in the graph as one standard deviation above the mean), greater levels of attachment anxiety predicted lower quality sleep. This interaction is in concordance with my hypotheses in that when there is relationship threat,
attachment anxiety relates to sleep quality, whereas at low threat there is not a clear link between attachment anxiety and sleep quality (see hypothesis in Figure 2).

Figure 3

*Interaction Between Attachment Anxiety and Relationship Threat to Predict Sleep Quality the Night Following Data Collection.*

I then substituted conflict intensity into my models to replace partner interaction quality as a predictor. This allowed me to test the models with a different operationalization of romantic threat. I developed a multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. Conflict intensity (level one predictor) did not predict sleep quality the night of, $B = .01, SE = .05, t(11) = 0.16, p = .880$, or after data collection, $B = - .06, SE = .06, t(1) = -0.94, p = .485$. Further, conflict intensity did not interact with attachment anxiety (level two predictor) to predict sleep quality on the night of, $B = .00, SE = .05, t(10) = 0.08, p = .937$, or the night after data collection, $B = - .04, SE = .06, t(1) = -0.70, p = .591$. The lack of significant predictive models may be due to the very few conflicts reported by participants in Study 1. This may have
reduced the power for analyses. Therefore, I chose to use a more sensitive measure of conflict intensity as an operationalization of romantic threat in Study 2.

**Does sleep mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality?**

Although participants in Study 1 did not exhibit much variance in sleep measures and I only examined a few health outcome variables, I chose to run mediation analyses to examine if sleep mediated the relationship between attachment anxiety and health behaviours, controlling for partner interaction quality, and then in a separate analysis controlling for conflict intensity (two operational definitions of relational threat). These mediation analyses were designed to provide initial support to my central hypothesis, which could later be strengthened by the results of Study 2 using more valid and reliable measures. As stated in the data analysis strategy, I used multi-level modeling while simultaneously following Baron and Kenny’s (1986) recommendations for testing mediation. I used healthy eating, feelings in general, control over thoughts, and pain interference as four separate outcome variables.

First I examined if sleep quality mediated the relationship between attachment anxiety and healthy eating, controlling for partner interaction quality. To employ step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was negatively associated with sleep quality, $B = -.14, SE = .04, p = .001$, controlling for partner interaction quality. This significant result allows me to proceed to the
second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to healthy eating (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (healthy eating). Sleep quality was not significantly associated with healthy eating, $B = -.10, SE = .17, p = .541$, controlling for attachment anxiety and partner interaction quality. As the mediator (sleep quality) was not predictive of the outcome variable (healthy eating), controlling for the predictor (attachment anxiety) and covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality did not mediate the relationship between attachment anxiety and healthy eating, controlling for variance in partner interaction quality.

I then examined if sleep quality mediated the relationship between attachment anxiety and feelings in general, controlling for partner interaction quality. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). This is the same first step used in the mediation tested above. Attachment anxiety was negatively associated with sleep quality, $B = -.14, SE = .04, p = .001$, controlling for partner interaction quality. This significant result allows me to proceed to step two of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to feelings in general (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered
partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (healthy eating). Sleep quality was not significantly associated with feelings in general, $B = .37, SE = .20, p = .077$, controlling for attachment anxiety and partner interaction quality. As the mediator (sleep quality) was not predictive of the outcome variable (feelings in general), controlling for the predictor (attachment anxiety) and covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality did not mediate the relationship between attachment anxiety and feelings in general, controlling for variance in partner interaction quality.

Next, I examined if sleep quality mediated the relationship between attachment anxiety and participant-reported control over thoughts, controlling for partner interaction quality. For step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was negatively associated with sleep quality, $B = -.14, SE = .04, p = .001$, controlling for partner interaction quality. As attachment anxiety could predict sleep quality I was able to proceed to step two of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to control over thoughts (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to
predict the outcome variable (control over thoughts). Sleep quality was positively associated with control over thoughts, $B = .35$, $SE = .16$, $p = .029$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to step three of testing the mediation. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to control over thoughts (the outcome variable), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (control over thoughts). Attachment anxiety was not significantly associated with control over thoughts, $B = .05$, $SE = .10$, $p = .593$, controlling for partner interaction quality. As the predictor (attachment anxiety) was not predictive of the outcome variable (control over thoughts), controlling for the covariate (partner interaction quality), I terminated the mediation analysis. Sleep quality did not mediate the relationship between attachment anxiety and control over thoughts, controlling for variance in partner interaction quality.

Finally, I examined if sleep quality mediated the relationship between attachment anxiety and pain interference, controlling for partner interaction quality. To examine step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was negatively associated with sleep quality, $B = -.14$, $SE = .04$, $p = .001$, controlling for partner interaction quality. This significant result allowed me to proceed to step
two of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to pain interference (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (pain interference). Sleep quality was not significantly associated with pain interference, $B = -.18, SE = .19, p = .332$, controlling for attachment anxiety and partner interaction quality. As the mediator (sleep quality) was not predictive of the outcome variable (pain interference), controlling for the predictor (attachment anxiety) and covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality did not mediate the relationship between attachment anxiety and pain interference, controlling for variance in partner interaction quality.

In summary, sleep quality did not mediate the relationship between attachment anxiety and any of the four health outcome variables (healthy eating, feelings in general, control over thoughts, pain interference). Throughout testing the four mediational models, partner interaction quality did not interact with attachment anxiety to significantly predict outcomes. Further, in four separate analyses, I controlled for conflict intensity rather than negative partner interaction quality (a separate operationalization of romantic threat). Conflict intensity did not interact with attachment anxiety to predict outcomes either.

I then conducted time-lagged analyses to examine if sleep quality two nights before data collection could mediate the relationship between attachment anxiety and health outcomes. Sleep quality two nights beforehand was not a significant mediator of the relationship between attachment anxiety and any of the four health outcome variables (healthy eating, feelings in
Discussion

The results of Study 1 provide tentative initial evidence of the relationships among attachment orientations, partner interactions, sleep quality and health outcomes. Attachment anxiety was associated with sleep quality and healthy eating. Attachment anxiety was not, however, associated with other health outcomes, and was not significantly related to partner interaction quality or conflict intensity. Sleep quality was associated with all four health outcomes (healthy eating, general health, control over thoughts, pain interference). Partner interaction quality was also associated with participant reported general health, and conflict intensity was associated with healthy eating and general health. To summarize, most variables were related, but several important relationships were non-significant (e.g., attachment anxiety and partner interaction quality).

In concordance with my hypotheses, attachment anxiety interacted with partner interaction quality to predict sleep quality two nights following data collection. When partner interactions over the day were generally positive (low relationship threat), attachment anxiety was not associated with sleep quality. In comparison, when partner interactions were negative (high relationship threat), higher levels of attachment anxiety were associated with poorer sleep quality. This interaction supports my hypothesis, and past literature demonstrating that attachment behaviours are more pronounced during romantic threats (Bowlby’s working model, 1969; Hazan & Shaver, 1987). Although this result was promising, sleep quality did not then mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality.
interaction quality. Sleep quality two nights previously was also not a significant mediator of the relationship between attachment anxiety and health.

During data analysis I noticed that the measures used in Study 1 are quite general and did not allow me to parse apart the differences in participants’ daily experiences to the extent that I could accurately test my hypotheses. For instance, very few participants reported experiencing conflict with their partner (daily reports varied from 6.5% of participants reporting conflict on day three, to 20.0% of participants reporting conflict on day four). Especially with a sample size of 78 participants, and attrition throughout the weeklong study, having so few participants report conflict resulted in analyses with low power. Further, my sleep quality composite variable had a reliability of $\alpha = .63$, which is low-to-moderate, and has much room for improvement. Finally, I used single-item measures of partner interaction quality, conflict intensity, and various health behaviours, which may not have been very valid or reliable.

I used Study 2 to improve the limitations of Study 1. I refined my measures by adding more and more specific questions about health, partner interactions, and sleep. I could then create more composite variables and have more quality items to create more reliable scales. I also recruited larger sample sizes to increase the power of my analyses, anticipating the natural attrition associated with running a diary study. I anticipated a lack of power for my statistical tests, since attachment anxiety did not predict sleep quality the night following data analysis. I used G-Power software to calculate the observed power of the model with attachment anxiety predicting sleep quality the night following data collection. The observed power was low, $1-\beta = .58$. With the observed effect size of, $f^2 = .13$, and assuming significant power, $1-\beta = .80$, 87 participants would be required to find significant results if a true effect exists. Only 56 participants provided data for this portion of Study 1. Therefore, this study was likely
underpowered. I recruited more participants for Study 2 to further explore the relationships among attachment anxiety, partner interaction quality, sleep quality and health, and created measures with greater reliability and specificity.

Chapter 3

Study 2

My goal for Study 2 was to follow the same methodology as Study 1 with a larger sample and more reliable items. I aimed to construct more valid and reliable measures of sleep, partner interaction quality, and health outcomes. In Study 1, I focused on health-related behaviours such as diet and exercise, however in Study 2, I wanted to examine more health outcome variables. I asked questions pertaining to how much pain and discomfort individuals felt on a daily basis, how they were able to function in their daily routine and whether they experienced symptoms of illness. I also examined mental health outcomes such as anxious and depressive symptoms, which may also be influenced by attachment, relationship conflict and sleep quality. I asked a larger variety of sleep questions to get a more valid and reliable measure (e.g., experiencing nightmares, fatigue the following day). Additionally, I provided more questions pertaining to partner interactions to further differentiate partner experiences (e.g., feeling criticized, having minor disagreements). Finally, I recruited a larger sample of participants to increase the power of my analyses.

I predicted that with a larger number of more specific items to test my variables, I would find stronger relationships between variables and stronger support for my mediational hypothesis. Attachment anxiety would correlate with sleep difficulties, negative partner interactions, and negative mental and physical health outcomes. Poor sleep would also be associated with negative partner interactions and poor health outcomes. Most importantly, I
predicted that attachment anxiety would interact with partner interaction quality to predict sleep quality, and that sleep quality should then mediate the relationship between attachment anxiety and health outcomes, controlling for partner interactions. When romantic threat is perceived (participants reporting negative partner interactions), attachment anxiety would be much more associated with sleep quality (higher anxiety, lower sleep quality) than when threat is not perceived. Sleep would then mediate the relationship between attachment anxiety and health outcomes, especially for those high in attachment anxiety who perceive threats to their relationship. Conflict intensity would, again, be substituted in for partner interaction quality as a second operational definition of relationship threat in separate analyses.

**Method**

**Participants**

I recruited 299 undergraduate students (25 men) from Queen’s University to participate in Study 2. Participants were recruited from Queen’s University community Facebook pages (n = 252) as well as the Queen’s University Psychology Subject Pool (n = 47). As compensation, participants could choose to either receive course credit towards their introductory psychology course or could be given ballots in a monetary draw. To qualify to participate, individuals had to have been in a romantic relationship at the time of the study, they must not have participated in Study 1 of this project, and their partner must not participate in this study or have participated in the past. The sample had an average age of 20.5 years (range: 17-26 years). Participants were in romantic relationships for average length of 18.4 months (range: 1-96 months). Not all participants provided data for the full seven nights (186 participants started the night one survey, 141 participants started the night seven survey, 31.8% provided data on all seven nights).
Measures and Procedures

Initial Survey

I posted the link to my initial survey on Queen’s University community Facebook pages. Interested participants could follow the link to learn more about the study and participate. I also advertised the study on the university psychology subject pool website, and interested participants could email me to receive the link to participate for course credit. The initial survey had the letter of information and consent form (see forms in Appendix A), asked participants to create a participant identification code, collected demographic information (see questions in Appendix B), and measured attachment orientations. Attachment orientations were again examined with The Experiences in Close Relationships Scale Revised (ECR-R; Fraley, Waller, & Brennan, 2000). Scores on the two subscales had high reliability (attachment avoidance: Cronbach $\alpha = .94$ and attachment anxiety: Cronbach $\alpha = .92$). I also had three qualifying questions to ensure individuals were eligible to participate in my study (asking participants if they had completed Study 1 of this set of studies, asking participants if they were in a romantic relationship, and asking whether their partner had participated in this study). If participants did not qualify for the study, the questionnaire was programmed to close. At the end of the initial survey I asked for participants to provide their email addresses so I could contact them with the nightly surveys. I then compiled email addresses on a separate document.

Nightly Surveys

One week after participants completed the initial survey, I sent out the seven nightly questionnaires in the same method as in Study 1 (Sundays at 8 p.m.). The nightly surveys were a revised version of the surveys from Study 1 (see the Study 2 questionnaire in Appendix E). This nightly questionnaire went into greater detail about health (e.g., asking specific questions about
physical and psychological health), sleep quality (e.g., additional items adapted from the PSQI and additional items created; Buysse et al., 1989), partner interaction quality (e.g., asking about minor disagreements over the day), and partner conflict (e.g., asking about specific behaviours such as criticizing one another). I removed some questions that were not specific to my hypotheses (e.g., asking about conflicts with individuals other than one’s romantic partner), and added the brooding subscale of the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991). This subscale uses five items to measure ruminative thoughts after conflict (e.g., “since our conflict I’ve been thinking about what I did to deserve this”). Scores on this scale had a high degree of reliability (Cronbach α = .812). Almost all items on these nightly surveys were measured on a scale from one (strongly disagree) to five (strongly agree). The surveys took approximately fifteen minutes to complete and were identical each night.

At the end of the seventh nightly survey, individuals were asked if they wanted to participate in Study 3 of this project, an eight-week follow-up study. If individuals did not wish to participate in the follow-up, they received a debriefing form (see Appendix A) and were thanked for their time. If individuals did express interest in participating, I collected their email address and let them know that the follow-ups would commence at the beginning of January 2016. I conducted the monetary draw at the end of all Study 2 data collection. Course credit was awarded for the introductory psychology course as individuals finished the study. Study 2 was conducted from September 2015 until December 2015.

Composite Variables

To create the composite variables, I conducted a principal components analysis with direct oblimin rotation (see variables in Table 2). I created a sleep quality composite variable using 12 items standardized with z-scores. The sleep composite scores had a high degree of
reliability (Cronbach $\alpha = .80$). I created variables to account for sleep quality two nights before, the night before, and the night of data collection to examine time-lagged effects. Next, I created composite variables examining partner interactions. I developed a negative interaction composite from eight items (Cronbach $\alpha = .93$). I also created a variable measuring conflict intensity. This variable contained six items pertaining to a conflict that day (Cronbach $\alpha = .82$). Finally, I created a composite emotional experience variable from six items (Cronbach $\alpha = .89$), a cognitive experience variable from three items (Cronbach $\alpha = .66$), a physical symptoms variable from three items (Cronbach $\alpha = .81$), and an interference variable from four items (Cronbach $\alpha = .85$).
Table 3

*Composite Variables for Study 2.*

<table>
<thead>
<tr>
<th>Composite Variable</th>
<th>Items</th>
</tr>
</thead>
</table>
| **Sleep Quality**  | Approximately how many minutes did it take you to fall asleep?*  
|                   | Approximately how many hours of sleep did you get last night?  
|                   | Please rate the extent to which you agree or disagree with the following statements:  
|                   | I slept well last night.  
|                   | I woke up feeling rested this morning.  
|                   | I woke up a lot during the night.*  
|                   | It took me a long time to fall asleep.*  
|                   | I got more sleep than usual last night.  
|                   | I felt sluggish today.*  
|                   | I fell asleep during the day by accident.*  
|                   | I took a nap today.*  
|                   | It took me a long time to get up in the morning.*  
|                   | I had a lot of energy today. |
| **Negative Partner Interaction Quality**  | Please rate the extent to which you agree or disagree with the following statements concerning your interactions with your romantic partner today:  
|                   | I feel like my partner and I weren’t on the same page today.  
|                   | My partner criticized me today.  
|                   | I criticized my partner today.  
|                   | I had a minor disagreement with my partner today.  
|                   | I felt angry at my partner.  
|                   | I felt that my partner was angry at me.  
|                   | I felt hurt by my partner.  
|                   | I felt like my partner was hurt by me. |
| **Conflict Intensity**  | Please rate the extent to which you agree or disagree with the following statements concerning your conflict with your partner:  
|                   | The conflict was intense.  
|                   | We stopped talking for a while during the conflict.  
|                   | I was angry.  
|                   | My partner was angry.  
|                   | I was hurt.  
|                   | My partner was hurt. |
| **Emotional Experience**  | These statements refer to your emotions and health. Please rate the extent to which you agree or disagree with the following statements based on your experience today:  
|                   | I felt calm.  
|                   | I felt agitated or tense.*  
|                   | I felt upset.*  
|                   | I felt sad or down.*  
|                   | I felt angry.*  
|                   | I felt in control of my behaviours, thoughts, feelings, and emotions. |
| **Cognitive Experience**  | These statements refer to your emotions and health. Please rate the extent to which you agree or disagree with the following statements based on your experience today:  
|                   | I felt productive.  
|                   | I had a hard time concentrating.*  
|                   | I felt like I was on autopilot.* |
| **Physical Symptoms**  | These statements refer to your emotions and health. Please rate the extent to which you agree or disagree with the following statements based on your experience today:  
|                   | I felt sick. |
I was in pain.
I felt uncomfortable.

<table>
<thead>
<tr>
<th>Interference</th>
<th>These statements refer to your emotions and health. Please rate the extent to which you agree or disagree with the following statements based on your experience today:</th>
</tr>
</thead>
<tbody>
<tr>
<td>α = .85</td>
<td>My physical health interfered with my social life.</td>
</tr>
<tr>
<td></td>
<td>My physical health interfered with my academic/work life.</td>
</tr>
<tr>
<td></td>
<td>My mental and/or emotional health interfered with my social life.</td>
</tr>
<tr>
<td></td>
<td>My mental and/or emotional health interfered with my academic/work life.</td>
</tr>
</tbody>
</table>

*=Reverse-scored

**Data Analytic Strategy**

I followed the same data analytic strategy as in Study 1 (examining descriptive statistics, examining correlations, testing whether attachment anxiety predicted sleep quality while controlling for partner interaction quality, and testing whether sleep quality mediated the relationship between attachment anxiety and health outcomes while controlling for partner interaction quality). I used aggregate variables wherever possible instead of single-item variables, improving on Study 1. For example, instead of using single-item health outcomes, I used the emotional experience, cognitive experience, physical symptoms, and interference composites (see Table 2 for the items in each composite).

**Results**

**Correlation Analyses**

Replicating Study 1, I found that attachment anxiety was negatively correlated with the sleep quality composite measure, \( r(215) = -.23, p = .001 \). Attachment anxiety was also significantly correlated with both negative partner interaction quality, \( r(206) = .32, p < .001 \), and conflict intensity, \( r(87) = .26, p = .014 \). Sleep quality was trending towards a correlation with negative partner interaction quality, \( r(256) = -.11, p = .090 \), and was not significantly associated with conflict intensity, \( r(97) = .06, p = .575 \). Attachment anxiety was associated with many health-related outcomes, such as negative correlations with emotional experience, \( r(207) = -.37 \),
p < .001, and cognitive experience, r(207) = -.23, p = .001, and positive correlations with physical illness, r(207) = .21, p = .003, and life interference due to health, r(207) = .30, p < .001. There were many more relationships between attachment anxiety and health in Study 2, compared with Study 1, which may reflect the more valid and reliable composite health measures. Sleep quality was also associated with many health outcomes. Sleep quality positively correlated with emotional experience, r(271) = .42, p < .001, and cognitive experience, r(271) = .55, p < .001, and negatively correlated with physical illness, r(271) = -.36, p < .001, and life interference due to health, r(271) = -.35, p < .001. Means, standard deviations, and correlations between these variables are presented in Table 4.

Table 4

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attachment Anxiety</td>
<td>2.44</td>
<td>0.71</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sleep Quality</td>
<td>0.00</td>
<td>0.56</td>
<td>-.23***</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Negative Partner Interaction Quality</td>
<td>1.76</td>
<td>0.64</td>
<td>.32***</td>
<td>-.11</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Conflict Intensity</td>
<td>2.83</td>
<td>0.82</td>
<td>.26*</td>
<td>.06</td>
<td>.42***</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Positive Emotions</td>
<td>-0.36</td>
<td>0.69</td>
<td>-.37***</td>
<td>.42***</td>
<td>-.51***</td>
<td>-.31**</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cognitive Experience</td>
<td>-0.74</td>
<td>0.67</td>
<td>-.23***</td>
<td>.55***</td>
<td>-.22***</td>
<td>-.10</td>
<td>.53***</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7. Physical Symptoms of Illness</td>
<td>2.09</td>
<td>0.82</td>
<td>.21**</td>
<td>-.36***</td>
<td>.24***</td>
<td>.04</td>
<td>-.52***</td>
<td>-.40***</td>
<td>X</td>
</tr>
<tr>
<td>8. Health Interfering with Life</td>
<td>1.84</td>
<td>0.76</td>
<td>.30***</td>
<td>-.35***</td>
<td>.32***</td>
<td>.16</td>
<td>-.66***</td>
<td>-.53***</td>
<td>.66***</td>
</tr>
</tbody>
</table>

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

Do attachment anxiety and partner interaction quality interact to predict sleep quality?

Next, I used multi-level modeling with attachment orientations (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment
orientations and partner interaction quality entered to predict sleep quality. I used SPSS Mixed Models syntax to construct a multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. Replicating Study 1, attachment anxiety had a significant main effect predicting lower sleep quality, $B = -0.14$, $SE = .05$, $t(124) = -3.07$, $p = .003$. Contrary to hypotheses, but replicating Study 1, partner interaction quality did not significantly predict sleep quality, $B = .02$, $SE = .03$, $t(502) = 0.75$, $p = .452$, and neither did the interaction between attachment anxiety and partner interaction quality, $B = .01$, $SE = .05$, $t(511) = 0.25$, $p = .803$. Therefore, I found a main effect of higher attachment anxiety predicting lower quality sleep, and this was true regardless of partner interaction quality.

I then examined time lagged-effects, and entered attachment anxiety (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment anxiety and partner interaction quality to predict sleep quality the night following data collection. I created another multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. Attachment anxiety predicted time-lagged sleep quality (sleep the night following data analysis instead of the night of data analysis), $B = -0.15$, $SE = .05$, $t(138) = -3.23$, $p = .002$. The main effect of partner interaction quality, $B = .04$, $SE = .04$, $t(20) = 0.98$, $p = .337$, as well as the interaction between attachment anxiety and negative partner interaction quality, $B = -0.05$, $SE = .06$, $t(39) = -0.89$, $p = .377$, were both non-significant predictors of sleep quality the night following data collection. This deviates from the results of Study 1, where I found a significant interaction between attachment anxiety and partner interaction quality to predict time-lagged sleep effects (night after data analysis).
I then ran the same immediate and time-lagged tests replacing partner interaction quality with conflict intensity for a new operational definition of romantic threat. Replicating Study 1, conflict intensity did not have any main effects in predicting sleep quality the night of conflict, $B = .05, SE = .09, t(4) = 0.58, p = .589$, or night after conflict, $B = .16, SE = .10, t(23) = 1.58, p = .128$. Conflict intensity did not interact with attachment anxiety to predict sleep quality on the night of conflict, $B = .16, SE = .18, t(10) = 0.93, p = .376$, or the night after either, $B = -.07, SE = .20, t(31) = -0.33, p = .743$.

To summarize, attachment anxiety had a direct effect on sleep quality; more attachment anxiety was associated with lower quality sleep, but this was not influenced by perceived threats to one’s relationship (defined as partner interaction quality, and in a separate analysis defined as conflict intensity). There were also no time-lagged effects (affecting sleep a night later). This deviated from Study 1, where although there was also a main effect of anxiety, there was also a two-way interaction between attachment anxiety and partner interaction quality to predict sleep quality two days later.

**Does sleep mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality?**

I conducted mediation analyses using MLM while simultaneously following Baron and Kenny’s (1986) recommendations for testing mediation to examine my sleep quality mediation hypothesis. Perceived romantic threat was controlled for in all models, first in analyses using participant reported partner interaction quality as the definition of threat, and then in separate analyses using conflict intensity as the definition of threat.

I examined if sleep quality mediated the relationship between attachment anxiety and emotional responding, controlling for partner interaction quality. Recall higher scores on
emotional responding indicate more positive emotions (e.g., reporting feeling calm, not endorsing feeling angry or sad). To employ step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). I used an unstructured covariance structure. Attachment anxiety was negatively associated with sleep quality, $B = -.14$, $SE = .05$, $p = .003$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (emotional responding). Sleep quality was positively associated with emotional responding, $B = .16$, $SE = .05$, $p = .003$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, negative relationship between attachment anxiety and positive emotions, $B = -.32$, $SE = .06$, $p <$
.001, controlling for partner interaction quality, decreased when accounting for the sleep quality as well, $B = -0.27$, $SE = 0.07$, $p < .001$. This suggests that sleep quality explains a portion of the variance of attachment anxiety predicting emotional responses. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. The mediation model was significant, $z = -2.15$, $SE = 0.01$, $p = .031$ (model depicted in Figure 4). Therefore, sleep quality partially mediated the relationship between attachment anxiety and emotional responding, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported less positive emotions, and this was partially explained by having lower quality sleep.

Figure 4

*Sleep Quality Mediating the Relationship Between Attachment Anxiety and Emotional Responding, Controlling for Partner Interaction Quality.* The direct path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality. The indirect path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality and sleep quality (the mediator).

I then examined the same mediational model with cognitive experiences (e.g., ability to concentrate) as the dependent measure. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner
interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). I used an unstructured covariance structure. Attachment anxiety was negatively related to sleep quality, $B = -0.14, SE = 0.05, p = .003$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (cognitive responding). Sleep quality was positively associated with cognitive experience, $B = 0.18, SE = 0.06, p = .002$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, negative relationship between attachment anxiety and cognitive experience, $B = -0.26, SE = 0.07, p < .001$, controlling for partner interaction quality, decreased when accounting for the sleep quality, $B = -0.23, SE = 0.07, p = .002$. This suggests that sleep quality explains part of the variance of attachment anxiety predicting cognitive responses. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was significant, $z$
= -2.21, \(SE = .01, p = .027\) (see model in Figure 5). Sleep quality partially mediated the relationship between attachment anxiety and cognitive experience, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more cognitive difficulties, and this was partially explained by having lower quality sleep.

Figure 5

Sleep Quality Mediating the Relationship Between Attachment Anxiety and Cognitive Experience, Controlling for Partner Interaction Quality. The direct path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality. The indirect path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality and sleep quality (the mediator).

Next I examined the mediation model’s ability to predict physical symptoms of illness. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was negatively related to sleep quality, \(B = -.14, SE = .05, p = .003\), controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to
symptoms of illness (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (physical symptoms of illness). Sleep quality was not significantly associated with physical illness, $B = -.06, SE = .07, p = .410$, controlling for attachment anxiety and partner interaction quality. As this relationship was non-significant, I stopped the process of testing for mediation. Sleep quality did not mediate the relationship between attachment anxiety and participant reports of illness, controlling for partner interaction quality.

Finally, I used health interfering with life as the outcome variable to test my mediation hypothesis. I first created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was negatively related to sleep quality, $B = -.14, SE = .05, p = .003$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to participant reports of health interfering with life (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (life interference). Sleep quality was negatively associated with health
interfering with life, $B = -.18$, $SE = .05$, $p = .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, positive relationship between attachment anxiety and interference, $B = .26$, $SE = .08$, $p = .001$, controlling for partner interaction quality, became weaker when accounting for sleep quality, $B = .23$, $SE = .08$, $p = .005$. This suggests that sleep quality explains part of the variance of attachment anxiety predicting life interference. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was significant, $z = 2.24$, $SE = .01$, $p = .025$ (mediation depicted in Figure 6). Sleep quality partially mediated the relationship between attachment anxiety and health interference in life, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more life interference due to health, and this was partially explained by having lower quality sleep.
In summary, sleep quality mediated the relationship between attachment anxiety and three of the four health outcomes (emotions, cognitive experiences, and health interfering with life). Sleep did not mediate the relationship between attachment anxiety and symptoms of physical illness. Throughout testing the four mediational analyses, partner interaction quality did not interact with attachment anxiety to significantly predict outcomes. There were simply main effects of attachment anxiety, regardless of partner interaction quality. Further, in four separate analyses, I controlled for conflict intensity rather than negative partner interaction quality (a separate operationalization of romantic threat). Conflict intensity did not interact with attachment anxiety to predict outcomes either.

Finally, I examined sleep quality two nights before data collection to see if there were time-lagged effects on health outcomes. Sleep quality two nights beforehand was a significant mediator of the relationship between attachment anxiety and all four health outcome variables, controlling for partner interaction quality. The time-lagged sleep mediation models followed the same patterns as the above sleep mediations. However, sleep also mediated the relationship
between attachment anxiety and physical symptoms of illness, controlling for partner interaction quality. Individuals high in attachment anxiety reported more physical symptoms of illness, and this was partially mediated by lower sleep quality. As the results of the time-lagged models were similar to the results of the sleep mediation models presented above, the time-lagged models are not presented here, but can be referred to in Appendix F.

**Discussion**

The correlations among variables in Study 2 were much more consistent with hypotheses than they were in Study 1. Attachment anxiety was significantly associated with sleep quality, partner interaction quality, conflict intensity, and all four health outcomes (emotional and cognitive experiences, physical symptoms of illness and life interference due to health). Sleep quality was also significantly associated with the four health outcomes, showed a trend towards an association with partner interaction quality ($p = .09$), but was not related to conflict intensity. Partner interaction quality was associated with all four health outcomes. In contrast, conflict intensity was associated with emotional experiences, but not cognitive experience, physical illness or life interference due to health. Therefore, most of the variables were significantly related and coincide with my hypotheses. However, conflict intensity was not significantly related to many of the variables. This may be because conflict intensity does not predict the health outcomes I chose to study, whereas other partner-relevant variables are better predictors (e.g., experiencing negative interactions throughout the day with one’s partner). Or, perhaps my measure of conflict intensity reflects participants’ biased memories of the conflict rather than the actual intensity of the incident; if so, the measure may not be accurately assessing the intensity of the conflict. Further research is needed with more objective measures of conflict intensity to
answer this question (e.g., both partners’ accounts of the conflict, volume of voices, valence of words used).

In Study 2, there was a main effect of attachment anxiety predicting sleep quality, in that higher attachment anxiety predicts lower quality sleep. However, partner interaction quality, and the interaction between attachment anxiety and partner interaction quality did not predict sleep quality. The lack of an interaction between attachment anxiety and partner interaction quality deviates from my hypotheses and the results of Study 1. Regardless of how positive or negative participants reported their days were with their partner, those higher in anxiety reported lower quality sleep. As explained in my hypotheses, I predicted that on low-stress days (participants reporting mostly positive interactions with their partner) attachment anxiety would not be associated with sleep quality as there is little to ruminate about and individuals may feel more secure in their relationship, thereby not affecting sleep. On high-stress days (many negative partner interactions), attachment anxiety would predict lower sleep quality, as individuals high in attachment anxiety may experience strong negative emotions and ruminate about the conflict, reducing sleep quality. Because the sample size of Study 2 (299) was three times larger than that of Study 1 (78), there was much greater statistical power for these tests. Therefore, the lack of interaction is not likely an issue of statistical power. I used Study 3 to further explore the interaction between attachment anxiety and partner interactions to help reconcile the discrepant results of Studies 1 and 2.

In Study 2, sleep quality did indeed partially mediate the relationship between attachment anxiety and many health outcomes (emotional and cognitive experiences, life interference due to health). This was true when examining immediate and time-lagged (an extra day) effects. In Study 1, my sleep mediation models were non-significant. Using reliable composite variables in
my analyses may have been a reason for the improvement from Studies 1 to 2. For example, the reliability of scores on my sleep quality composite variable in Study 1 was $\alpha = .63$, whereas it improved to $\alpha = .80$ in Study 2.

I employed Study 3 to further examine my hypotheses. I used the same composite variables as in Study 2 to further explore the attachment anxiety by partner interaction quality interaction, and to aim to replicate the mediational models. Study 3 was also conducted over two months rather than one week, to explore more long-term health outcomes.

Chapter 4

Study 3

Study 3 was conducted as a long-term follow-up to Study 2. The first two studies collected data over one week of participants’ lives. This provided a greater understanding of day-to-day health, however many participants did not experience sickness in this short a time period. I wanted to examine if attachment anxiety, partner interaction quality, and sleep quality could predict long-term health outcomes, such as how likely participants were to develop illnesses over two months during the winter season. I asked participants at the end of Study 2 if they wanted to participate in a follow up study (Study 3). Individuals who consented to participate were contacted at the beginning of January and then subsequently surveyed once a week for two months. The eight weekly questionnaires had almost identical items to the nightly questionnaires used in Study 2. The only differences were that wording was slightly altered to encompass experiences over a week rather than a day, and a few items were dropped to shorten the length of the survey (an attempt to reduce attrition). Using a similar procedure and data analytic strategy as the first two studies, I examined the relationship among attachment anxiety, romantic conflict, and sleep quality, predicting more long-term health outcomes.
Method

Participants

Seventy-seven undergraduate students (5 men) from Queen’s University participated in Study 3. Participants were recruited from the Study 2 sample. As compensation, participants received ballots in a monetary draw. The sample had an average age of 20.6 years (range: 17-26 years). Participants were in romantic relationships with an average length of 17.9 months (range: 1-56 months). Not all participants provided data for the eight time points (64 participants started the night one survey, 43 participants started the night seven survey, 23.4% provided data on all eight weeks).

Measures and Procedures

Initial Survey

I emailed the list of individuals from Study 2 that had expressed interest in participating in Study 3 on the first Sunday that students were back at university in January 2016. I sent participants an electronic link to the first of the eight follow-up surveys. Survey one had a letter of information and consent form (see forms in Appendix A), asked for individuals’ participant identification codes (the same codes as the ones created in Study 2), and then had the health and partner interaction questions. The weekly questionnaires used for this study were modeled from the Study 2 nightly questionnaires, containing many of the same questions but shortened for ease of responding. I removed some items that were not necessary for the follow-up tests (e.g., the rumination items; see the full survey in Appendix G). Participants were asked to reflect on their experiences over the entire week to answer the questions (Monday to Sunday). If participants experienced more than one conflict with their partner, they were asked to report on the most
intense conflict of the week. Almost all items were again measured on a scale from one (*strongly disagree*) to five (*strongly agree*).

**Nightly Surveys**

After this first survey, I proceeded to e-mail participants at 8 p.m. for the following seven Sundays with the follow-up questionnaires. At the beginning of each weekly questionnaire, participants were asked for their participant identification code so that I could match data across weeks. Each survey was closed at 11 a.m. the morning after it was sent to limit the time of responding. The surveys took approximately ten minutes to complete and were identical each week. On the final Sunday, participants received a debriefing form (see form in Appendix A). At the end of the eight weeks, I conducted the monetary draw. Study 3 was conducted from January 2016 until March 2016 with all participants completing the surveys during the same eight weeks.

Attachment orientations (ECR-R; Fraley, Waller, & Brennan, 2000) and demographic data were matched from the Study 2 initial survey using participant identification codes. Scores on the two subscales of the ECR-R had high reliability (attachment avoidance: Cronbach $\alpha = .95$ and attachment anxiety: Cronbach $\alpha = .91$).

**Composite Variables**

I conducted principal components analyses with direct oblimin rotation to create the composite variables. Most of these composite variables can be referenced in Table 2, because they had the same items as in Study 2, however the Study 3 sleep quality variable is presented in Table 3. I created a sleep quality composite variable using 10 items (Cronbach $\alpha = .79$). Following the process used in the other two analyses, I standardized the 10 sleep items using $z$-scores when creating the composite variable (see Table 3; all other composite variables can be examined by referring back to Table 2). The sleep quality composite differed between Studies 2
and 3 because some items measuring sleep were removed to shorten my Study 3 questionnaire (e.g., “I took a nap today”). Because participants were reporting on their sleep over the past week, I created variables to account for sleep quality the week-before and week-after that week of data collection so that I could examine time-lagged effects. I then created the partner interaction composites. I developed a negative interaction composite using the same eight items as in Study 2 (Cronbach α = .94), and the conflict intensity composite using the six items in the Study 2 composite (Cronbach α = .82). Finally, I created the health outcome variables. The composite emotional experience (Cronbach α = .87), cognitive experience (Cronbach α = .62), physical symptoms (Cronbach α = .85), and interference variables (Cronbach α = .80) contained the same items as in Study 2.

Table 5

<table>
<thead>
<tr>
<th>Composite Variable</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Quality</td>
<td>On average, how many hours of sleep did you get each night this week?</td>
</tr>
<tr>
<td>α = .79</td>
<td>Please rate the extent to which you agree or disagree with the following statements.</td>
</tr>
<tr>
<td></td>
<td>Over the last week:</td>
</tr>
<tr>
<td></td>
<td>I slept well.</td>
</tr>
<tr>
<td></td>
<td>I woke up feeling rested.</td>
</tr>
<tr>
<td></td>
<td>I woke up a lot during the nights.*</td>
</tr>
<tr>
<td></td>
<td>It took me a long time to fall asleep each night.*</td>
</tr>
<tr>
<td></td>
<td>I got more sleep than usual.</td>
</tr>
<tr>
<td></td>
<td>I felt sluggish.*</td>
</tr>
<tr>
<td></td>
<td>I fell asleep during the day by accident.*</td>
</tr>
<tr>
<td></td>
<td>It took me a long time to get out of bed in the mornings.*</td>
</tr>
<tr>
<td></td>
<td>I had a lot of energy.</td>
</tr>
</tbody>
</table>

*=Reverse-scored

Data Analytic Strategy

I followed the same data analytic procedure in Study 3 as I did in Studies 1 and 2. First I calculated descriptive statistics and examined the correlations among relevant variables. Then I tested whether attachment anxiety interacted with partner interaction quality to predict sleep
quality. Finally, I tested whether sleep quality mediated the relationship between attachment anxiety and health outcomes, while controlling for partner interaction quality. In separate analyses, conflict intensity was substituted in for partner interaction quality to allow for a second operationalization of romantic threat. I examined time-lagged sleep effects as well, following the same procedures as in Studies 1 and 2.

**Results**

**Correlation Analyses**

The majority of the correlations found in Study 3 resemble those found in Study 2. However, surprisingly, attachment anxiety was not significantly associated with sleep quality, $r(65) = -0.12, p = 0.324$. This may be due to data being collected over two months in Study 3 rather than one week. Specific weekly sleep effects may have averaged out when combining data over the two months. Fortunately, MLM analyses allow for sleep to vary each week, which aided in understanding weekly differences and helped to parse apart variance across the two months.

Attachment anxiety was significantly correlated with both negative partner interaction quality, $r(61) = 0.46, p < .001$, and conflict intensity, $r(61) = 0.37, p = 0.003$. Conversely, sleep quality was not significantly associated with negative partner interaction quality, $r(70) = -0.19, p = 0.117$, nor conflict intensity, $r(70) = -0.13, p = 0.267$. This may be, again, due to lack of variance in the sleep composite used in the correlation, which was parsed apart through MLM. Attachment anxiety was associated with many health-related outcomes, replicating Study 2. Specifically, attachment anxiety was negatively correlated with emotional experience, $r(65) = -0.26, p = 0.034$, and cognitive experience, $r(65) = -0.26, p = 0.036$, and was positively correlated with physical illness, $r(65) = 0.39, p = 0.001$. Attachment anxiety was not, however, related to life interference due to health, $r(65) = 0.20, p = 0.115$. Sleep quality was also associated with many health outcomes. Sleep
quality positively correlated with emotional experience, $r(76) = .45, p < .001$, and cognitive experience, $r(76) = .39, p < .001$, and negatively correlated with physical illness, $r(76) = -.24, p = .035$, and life interference due to health, $r(76) = -.42, p < .001$. These correlations can be examined in Table 6.

Table 6

<table>
<thead>
<tr>
<th>Study 3 Descriptive Statistics and Correlations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>1. Attachment Anxiety</td>
</tr>
<tr>
<td>2. Sleep Quality</td>
</tr>
<tr>
<td>3. Negative Partner Interaction Quality</td>
</tr>
<tr>
<td>4. Conflict Intensity</td>
</tr>
<tr>
<td>5. Positive Emotions</td>
</tr>
<tr>
<td>6. Cognitive Experience</td>
</tr>
<tr>
<td>7. Physical Symptoms of Illness</td>
</tr>
<tr>
<td>8. Health Interfering with Life</td>
</tr>
</tbody>
</table>

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

Do attachment anxiety and partner interaction quality interact to predict sleep quality?

I then used multi-level modeling with attachment orientations (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment orientations and partner interaction quality entered to predict sleep quality. I used SPSS Mixed Models syntax to construct a multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. Attachment anxiety was trending towards predicting sleep quality, $B = -.14, SE = .08, t(58) = -1.73, p = .089$. Although the $p$ value did not reach the level of significance, this
relationship is in the same direction as the significant relationships between attachment anxiety and sleep quality demonstrated in Studies 1 and 2. This trend suggests higher attachment anxiety is related to lower quality sleep, but cannot be interpreted with conviction as the $p$ value is non-significant. Negative partner interaction quality also trended towards predicting sleep quality, $B = -.08, SE = .04, t(256) = -1.85, p = .065$. The direction of this trend was that better interactions with one’s partner predicts better sleep quality. Replicating Studies 1 and 2, attachment anxiety did not interact with partner interaction quality to predict sleep quality, $B = .01, SE = .06, t(244) = 0.24, p = .814$.

I then examined time lagged-effects, and entered attachment anxiety (level two predictor), partner interaction quality (level one predictor), and the interaction between attachment anxiety and partner interaction quality to predict sleep quality one week after data collection. I created another multi-level conditional model with both level one predictors (group mean centered) and level two predictors (grand mean centered), and an unstructured covariance structure. Main effects of attachment anxiety, $B = -.16, SE = .10, t(53) = -1.60, p = .115$, and partner interaction quality, $B = -.00, SE = .05, t(185) = -0.01, p = .995$, as well as the interaction between anxiety and interaction quality, $B = -.07, SE = .08, t(183) = -0.97, p = .331$, were all non-significant.

I then ran the same immediate and time-lagged tests replacing partner interaction quality with conflict intensity for a new operational definition of romantic threat. The results replicated both previous studies in that conflict intensity did not predict sleep quality the week of conflict, $B = .05, SE = .13, t(22) = 0.35, p = .727$, or week after, $B = -.09, SE = .16, t(24) = -0.60, p = .557$. Conflict intensity did not interact with attachment anxiety to predict sleep quality during
the week of conflict, $B = .26$, $SE = .17$, $t(17) = 1.55$, $p = .140$, or the week after either, $B = .02$, $SE = .20$, $t(53) = 0.08$, $p = .938$.

To summarize, attachment anxiety was trending towards predicting sleep quality; more attachment anxiety was somewhat associated with lower sleep quality, but this relationship was not influenced by partner interaction quality. There were no time-lagged effects (affecting sleep the following week).

**Does sleep mediate the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality?**

I then conducted mediation analyses using MLM while simultaneously following Baron and Kenny’s (1986) recommendations for testing mediation to examine my sleep quality mediation hypothesis. I examined whether sleep quality mediated the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality. All four mediation models (sleep mediating the relationship between attachment anxiety and the four health outcomes) had Sobel’s test (1982) significance values between .09 and .11. Although none of these models reached the .05 level of significance, the relationships between variables in each model were in the expected directions, replicating Study 2 and supporting my hypotheses. As all models were in the expected directions and trending towards significance, I chose to report the meditational models, although I take caution with interpretation as they are merely trends and could indeed be spurious.

I examined if sleep quality mediated the relationship between attachment anxiety and emotional responding, controlling for partner interaction quality. Recall higher scores on emotional responding indicate more positive emotions (e.g., reporting feeling calm, endorsing low levels of anger and sadness). For the first step of Baron and Kenny’s (1986)
recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was trending towards a negative association with sleep quality, $B = -.14$, $SE = .08$, $p = .089$, controlling for partner interaction quality. Although this model was only trending towards significance I proceeded to the second step of testing mediation as an exploratory analysis. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (emotional responding). Sleep quality was positively associated with emotional responding, $B = .43$, $SE = .06$, $p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, negative relationship between attachment anxiety and positive emotions, $B = -.33$, $SE = .11$, $p = .003$, controlling for partner interaction quality, decreased when accounting for the sleep quality, $B = -.27$, $SE = .10$, $p = .009$. I then conducted
Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was trending towards significance, \( z = -1.70, SE = .04, p = .089 \) (see model in Figure 7). Therefore, there is a weak trend such that sleep quality partially mediates the relationship between attachment anxiety and emotional responding, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported less positive emotions, and this may be partially explained by having lower quality sleep, although the results of Study 3 are not strong enough to make definitive conclusions. It is important to note that all relationships in this model were in the same direction as in Study 2.

Figure 7

*Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Emotional Responding, Controlling for Partner Interaction Quality. The direct path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality. The indirect path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality and sleep quality (the mediator).*

I then examined the same mediational model with cognitive experiences (e.g., ability to concentrate) as the dependent measure. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to
see if they could predict variance in the mediator (sleep quality). Attachment anxiety was trending towards a negative association with sleep quality, $B = -.14$, $SE = .08$, $p = .089$, controlling for partner interaction quality. As this model was trending towards significance, I employed the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (cognitive responding). Sleep quality was positively associated with cognitive experience, $B = .51$, $SE = .12$, $p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The trending, negative relationship between attachment anxiety and cognitive experience, $B = -.19$, $SE = .12$, $p = .119$, controlling for partner interaction quality, decreased when accounting for the sleep quality, $B = -.10$, $SE = .09$, $p = .303$. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was, again, trending towards significance, $z = -1.62$, $SE = .04$, $p = .106$ (see a visual depiction of this mediation in Figure 8). Therefore, I found a non-significant pattern suggesting that sleep quality may partially mediate the relationship between attachment anxiety and cognitive experience, controlling for variance in partner
interaction quality. There was a hint of a negative association between attachment anxiety and cognitive experience, and this may be partially explained by having lower quality sleep. Note that this mediation was also marginal and did not reach the .05 level, however the relationships between variables are in same directions as in Study 2.

Figure 8

Trend of Sleep Quality Mediating the Relationship Between Attachment Anxiety and Cognitive Experiences, Controlling for Partner Interaction Quality. The direct path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality. The indirect path represents the relationship between attachment anxiety and positive emotions, controlling for partner interaction quality and sleep quality (the mediator).

Next, I examined the ability to predict physical symptoms of illnes. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was trending towards a negative association with sleep quality, $B = -.14, SE = .08, p = .089$, controlling for partner interaction quality. As this model was trending towards significance, I employed the second step of testing mediation. For the second step I created a
multi-level conditional model examining if sleep quality (the mediator) was significantly related to symptoms of illness (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (symptoms of illness). Sleep quality was inversely associated with physical illness, $B = .62, SE = .08, p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to illness (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to illness (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, positive relationship between attachment anxiety and symptoms of illness, $B = .42, SE = .12, p = .001$, controlling for partner interaction quality, became weaker when accounting for the composite sleep quality measure, $B = .34, SE = .11, p = .004$. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was, again, trending towards significance, $z = 1.71, SE = .05, p = .088$ (see model in Figure 9). Therefore, there is a marginal trend towards sleep partially mediating the relationship between attachment anxiety and physical symptoms of illness, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more symptoms of illness, and this may be partially explained by having lower quality sleep, although the results were not significant at the .05 level. All relationships were in the same direction as the effects observed in Study 2.
I then used health interfering with life as the outcome. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was trending towards a negative association with sleep quality, $B = -.14$, $SE = .08$, $p = .089$, controlling for partner interaction quality. As this model was trending towards significance, I employed the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality (the mediator) was significantly related to health interference with life (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (life interference). Sleep quality was
negatively associated with health interfering with life $B = -.53, SE = .07, p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality and sleep quality (the mediator). The significant, positive relationship between attachment anxiety and interference, $B = .30, SE = .12, p = .012$, controlling for partner interaction quality, became weaker when accounting for sleep quality, $B = .23, SE = .11, p = .037$. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was again trending, $z = 1.71, SE = .04, p = .088$ (see visual in Figure 10). There is a marginal trend of sleep quality partially mediating the relationship between attachment anxiety and health interference in life, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more life interference due to health, and this was somewhat accounted for by having lower quality sleep, however not at a level of significance. Again, all variables in this model were related in the expected directions predicted by my hypotheses and by Study 2.
Partner interaction quality did not interact with attachment anxiety in any of the above analyses. Further, in four separate analyses I controlled for conflict intensity rather than negative partner interaction quality (a different measure of romantic threat). Conflict intensity did not interact with attachment anxiety to predict outcomes either.

To summarize, all four sleep mediational models were trending towards significance with $p$ values between .09 and .11. All relationships between predictors, mediators and outcomes replicated the directions of the relationships observed in the mediational models of Study 2. Therefore, although the results of Study 3 on their own cannot be interpreted as anything more than trends, the concordance between Studies 2 and 3 strengthens my confidence in this sleep mediational models that were observed in Study 2.

Lastly, I conducted time-lagged analyses to examine if sleep quality the week before data collection could mediate the relationship between attachment anxiety and health. For the first step of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality (the
mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality). Attachment anxiety was not significantly associated with sleep quality the week beforehand, $B = -.06, SE = .10, p = .560$, controlling for partner interaction quality. As the predictor (attachment anxiety) was not significantly associated with the mediator (sleep quality one week beforehand), I stopped Baron and Kenny’s (1986) process of testing mediation models to predict health outcomes. Attachment anxiety must be significantly associated with sleep quality for any of the time-lagged mediation models to reach step two of testing, therefore none of the models were significant. Sleep quality the week beforehand was not a significant mediator of the relationship between attachment anxiety and any of the four health outcome variables, controlling for partner interaction quality.

**Discussion**

Many correlations from Study 2 were replicated in Study 3, however there were some key differences. Attachment anxiety was not significantly related to sleep quality. Further, overall sleep quality was not associated with overall negative partner interaction quality or conflict intensity. Because my correlations average data over the two months, this may cloud specific sleep effects week-to-week. These effects were examined using MLM analyses where sleep is permitted to vary by week. Attachment anxiety was correlated with negative partner interaction quality and conflict intensity, in that higher anxiety was associated with more negative interactions and more intense conflicts (replicating the patterns of Study 2). Attachment anxiety also predicted less healthy emotional and cognitive experiences (more negative emotions, more distractions), and more symptoms of physical illness. Attachment anxiety was
not significantly related to life interference due to health in this sample. Good sleep quality predicted healthy emotional and cognitive experiences, less symptoms of physical illness, and less life interference due to health.

I next examined the ability of attachment anxiety, partner interaction quality, and the interaction of these variables to predict sleep quality. Attachment anxiety was trending towards predicting sleep quality, but this did not reach significance ($p = .089$). This trend suggests higher attachment anxiety is somewhat related to lower quality sleep, replicating the results of Studies 1 and 2. Negative partner interaction quality also trended towards predicting sleep quality ($p = .065$), which is a trend that I did not find in Studies 1 and 2. Positive partner interactions were somewhat associated with better quality sleep. This new correlation may be the result of collecting more data over a longer period of time in Study 3, and analyzing negative interactions over weeks rather than days. Potentially the small day-to-day negative interactions of Studies 1 and 2 were not enough to predict sleep quality on their own. Whereas, examining partner interactions over an entire week allows for a better predictor of sleep quality. Alternatively, this correlation may be simply spurious, as it did not reach the .05 level of significance.

It is important to note that the sample size of Study 3 (77) is less than one third of that collected in Study 2 (299). This is in part due to the nature of the longitudinal design. More attrition can be expected over two months than over one week. Therefore the above trending relationships could potentially be indicative of significant relationships, however due to the underpowered tests the $p$ values did not reach significance. This may be especially true for attachment anxiety predicting sleep, which was significant in Studies 1 and 2, and then marginal in Study 3. I used G-Power software to calculate the observed power of the model with attachment anxiety predicting sleep quality. The observed power was extremely low, $1-\beta = .30$. 
With the observed effect size of, \( f^2 = .06 \), and assuming significant power, \( 1-\beta = .80 \), 180 participants would be required to find significant results if a true effect exists. As only 59 participants provided enough data to explore this model my study was quite underpowered.

Attachment anxiety did not interact with partner interaction quality to predict sleep quality, replicating Study 2. Therefore there is simply a main effect of more attachment anxiety relating to lower quality sleep, regardless of the valence of partner interactions.

Main effects of attachment anxiety and partner interaction quality, as well as the interaction between these variables were non-significant in predicting *time-lagged* sleep effects. This could be due to the low power of analyses. I used G-Power to calculate the observed power of the model with attachment anxiety predicting sleep quality the week after. The observed power was low, \( 1-\beta = .27 \). With the observed effect size of, \( f^2 = .06 \), and assuming significant power, \( 1-\beta = .80 \), 187 participants would be required to find significant results if a true effect exists. This model was likely underpowered, as only 54 participants provided enough data to test the model. Further, perhaps other variables are influencing sleep quality as well over the two weeks. In two weeks there is plenty of time for other variables (e.g., work stress or activity levels) to influence sleep. This hypothesis is discussed further in the general discussion.

All four models examining sleep quality mediating the relationships between attachment anxiety and health outcomes (emotions, cognitions, physical symptoms of illness, life interference due to health), controlling for partner interaction quality, were trending towards significance (.09 < \( p < .11 \)). Although I am careful not to interpret these mediation models as one would if they were significant, the mediations mirror the models in Study 2. The relationships among attachment anxiety, sleep quality, partner interaction quality, and the health outcomes are all in the directions expected from Study 2. Therefore, although the sleep mediational results of
Study 3 on their own are not very convincing, examining these results in association with the results of Study 2 creates a much more convincing picture. As all four $p$ values of the mediation models were less than .11, I anticipate that the lack of significance in Study 3 is due to a lack of power as well. All mediation models examining time-lagged effects were non-significant in Study 3. In Study 2, these models were significant. The lack of significance in Study 3 could be due to a power issue, or as stated above the time lag of two weeks may allow ample time for outside variables to influence health outcomes.

Chapter 5

General Discussion

Summary of Findings

The purpose of this program of research was to examine whether sleep quality mediated the relationship between attachment anxiety and various indicators of health, while controlling for relationship threat (daily partner interaction quality and conflict intensity, using a separate model for each).

Because many of the same variables were examined across studies, I meta-analyzed the correlations between variables used in Studies 1 to 3 to create a more complete and reliable picture of the relationships among these variables. As Studies 2 and 3 used the same group of participants, this violates the assumption of independent data. Therefore, the meta-analysis must be interpreted with caution. I thought it was useful to include this meta-analysis because although the data violate assumptions of the test, the results can inform future research. The meta-analyzed correlations are presented in Table 9 in Appendix H. Correlation coefficients were averaged across the three studies, each weighted by their respective sample size. I
calculated these weighted averages using Hedges and Olkin’s (1985) $r$-to-$z$ method, assuming random effects, and then calculated confidence intervals using Fisher’s $r$-to-$z$ method.

Across studies, and as seen in Table 9, attachment anxiety was significantly correlated with sleep quality, partner interaction quality, conflict intensity, as well as the four measures of health when averaging across the three studies. As predicted, attachment anxiety generally predicted lower quality sleep, more negative partner interactions, more intense partner conflicts, and less salutatory health outcomes. Sleep quality was correlated with partner interaction quality and the four health outcomes, however sleep was not significantly correlated with conflict intensity. In other words, better sleep quality predicted better partner interactions and better health. Partner interaction quality was uncorrelated with conflict intensity, however partner interaction quality correlated with the four health measures. More positive partner interactions were associated with better health. Conflict intensity correlated with emotional experience and health interference with life, however not with cognitive experience and physical symptoms of illness. Therefore, more intense conflicts predicted more negative emotions and more health interference with life. The four health variables are significantly correlated with each other. This pattern of correlations meta-analyzed across the three studies is very consistent with the individual studies, and provides a more accurate approximation of the true correlation values.

After examining correlations between the variables of interest, I used MLM to determine whether attachment anxiety, partner interaction quality, and the interaction between attachment anxiety and partner interaction quality predicted sleep quality. I expected attachment anxiety to interact with partner interaction quality, predicting sleep quality. When low threat to the relationship is perceived, I hypothesized that attachment anxiety would not predict sleep quality (individuals sleep the same regardless of their attachment anxiety). In contrast, I predicted that
when high threat to the relationship is perceived, attachment anxiety would predict sleep quality (individuals higher in attachment anxiety should have more sleep difficulties than those low in anxiety, due to ruminating about losing their partner). The results of these MLMs are presented across the three studies in Table 7. I have included both immediate and time-lagged effects for each study in this table and noted trending effects that had p values under .10. Columns in this table represent the predictors used to explain variance in sleep quality. A response of “yes” indicates that the item significantly predicted sleep quality.

Table 7

<table>
<thead>
<tr>
<th>Study</th>
<th>Main Effect Attachment Anxiety</th>
<th>Main Effect Partner Interaction Quality</th>
<th>Interaction Attachment Anxiety and Partner Interaction Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Immediate Effects</td>
<td>Yes Trend (p = .06)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1 – Time-Lagged Effects</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>2 – Immediate Effects</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2 – Time-Lagged Effects</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3 – Immediate Effects</td>
<td>Trend (p = .09)</td>
<td>Trend (p = .07)</td>
<td>No</td>
</tr>
<tr>
<td>3 – Time-Lagged Effects</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

As seen in Table 7, attachment anxiety predicted sleep quality across most tests in Studies 1 to 3, although a few main effects were simply trends. This was true whether attachment anxiety was predicting immediate sleep effects or time-lagged (two days later) sleep effects. The only case in which attachment anxiety had no predictive power over sleep quality was in time-lagged effects in Study 3 (one week later). I will discuss the lack of time-lagged effects in Study 3 when addressing the mediation models.

Overall, there was a general pattern that greater attachment anxiety predicted lower quality sleep, across all analyses. This is consistent with past research linking sleep difficulties to individuals high in attachment anxiety (Robles & Kane, 2014). Due to the excessive rumination characteristic of individuals high in attachment anxiety, they are likely to have issues falling
asleep, and potentially staying asleep throughout the night. This theory also compliments Hawkley and Cacioppo’s (2010) sleep and loneliness research cited in the introduction. Lonely individuals are more likely to ruminate, which is associated with lower quality sleep and later health issues. I’ll discuss this connection further when examining sleep mediating the relationship between attachment anxiety and health.

Partner interaction quality did not significantly predict sleep quality, besides one trend in Study 3. Although the variables were significantly correlated, this correlation was quite small ($r = -0.22$). Other factors that related to both partner interaction quality and sleep quality may have greater predictive power in explaining variance in sleep. For example, although someone may have had negative interactions with their partner, depending on how these issues were addressed, how the individual coped with their negative feelings, and what else happened in the day, sleep may not be correlated with these negative partner interactions.

The expected two-way interaction between attachment anxiety and partner interaction quality to predict sleep quality was only observed in Study 1 time-lagged analyses (see Figure 3). In this instance, at low levels of threat (more positive interactions), attachment anxiety did not predict sleep quality, however at high levels of threat (more negative interactions), greater attachment anxiety predicted lower sleep quality. This is consistent with hypotheses (Figure 2). Interestingly, this interaction was not replicated with a larger sample and more reliable measures (Studies 2 and 3). The attachment anxiety by partner interaction quality interaction in Study 1 could then be considered spurious, however it is in the direction that would be predicted by past literature examining attachment anxiety and threat (Bowlby, 1969; Campbell & Marshall, 2011).

One theory as to why attachment anxiety did not interact with partner interaction quality to predict sleep quality in Studies 2 and 3 is that sleep quality may be generally poor for those
high in attachment anxiety (relative to low) due to other influences that are stronger than partner interaction quality. For example, rumination about other aspects of one’s life (e.g., relationships with one’s parents or friends, academics, work), as well as elevated stress reactivity in the body may inhibit sleep for those high in attachment anxiety, relative to low, creating a main effect regardless of interactions with one’s partner. Events following negative interactions (e.g., resolving conflicts, partner reassurances, positive experiences later on) may also protect those high in attachment anxiety from sleep issues post-conflict. Therefore, regardless of partner interaction quality, attachment anxiety may be uniformly related to sleep quality, and may interact with other pertinent variables instead. As Studies 2 and 3 had more reliable measures, these studies may provide a more accurate picture of the relationship between attachment anxiety, partner interaction quality and sleep quality than Study 1. Therefore, although demonstrated in Study 1, the interaction between attachment anxiety and partner interaction quality may not be a significant factor to consider in predicting sleep quality.

In separate analyses, I examined whether conflict intensity on its own, or in an interaction with attachment anxiety, predicted sleep quality. Conflict intensity did not predict sleep quality on its own, nor did it interact with attachment anxiety. Similar to my reasoning about the predictive deficits of negative partner interaction quality, I reason that other factors pertinent to couple conflicts and the rest of individuals’ experience over the day better predict sleep quality.

The final, and most important analyses that I computed were examining whether sleep quality mediated the relationship between attachment anxiety and health outcomes. Here, I was aiming to replicate Hawkley and Cacioppo’s (2010) research on sleep quality mediating the relationship between loneliness and health, as individuals high in attachment anxiety and loneliness share a characterization of experiencing extreme emotions and are prone to cognitive
rumination. Therefore, I predicted that those individuals high in anxiety who experience threat would sleep more poorly, and this would be associated with worse health outcomes (e.g., more negative emotions such as anxiety and sadness, more cognitive distraction, more symptoms of illness, more health interference with life). In comparison, I predicted that individuals with low attachment anxiety, and those high in anxiety but not currently perceiving threats to their relationship would have better sleep quality and less health issues.

The results of my mediation models are presented in Table 8, across Studies 2 and 3, and in terms of immediate and time-lagged effects. Recall that in Study 1, none of the mediation models were significant. This is may be due to using single items in the models rather than composite variables, and lack of reliability in the sleep composite that was used. Studies 2 and 3 improved on the reliability and validity of the variables used, and this improvement may have contributed to the significant sleep mediation models that I found.

Table 8

<table>
<thead>
<tr>
<th>Study</th>
<th>Emotional Experience Outcome</th>
<th>Cognitive Experience Outcome</th>
<th>Physical Symptoms of Illness Outcome</th>
<th>Health Interference with Life Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 – Immediate Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2 – Time-Lagged Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3 – Immediate Effects</td>
<td>Trend (p = .09)</td>
<td>Trend (p = .11)</td>
<td>Trend (p = .09)</td>
<td>Trend (p = .09)</td>
</tr>
<tr>
<td>3 – Time-Lagged Effects</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

In Study 2, almost all sleep mediation models were significant, with both immediate and time-lagged effects. The only exception was that sleep quality did not mediate the relationship between attachment anxiety and physical symptoms of illness in Study 2, controlling for partner interaction quality. As a time-lagged effect was significant, maybe sleep quality is related to health deficits for those high in attachment anxiety, but those health deficits take time to have an
observable effect. A lot of the research on attachment anxiety and health outcomes examines health on the biological and cellular level, looking at changes in hormones such as cortisol, and biomarkers of inflammation and sickness (e.g., Pietromonaco et al., 2013; Stanton & Campbell, 2014). Perhaps these physiological changes are more immediate, whereas overt bodily responses to illness take a few more days.

In Study 3, all four sleep mediation models examining immediate effects were trending towards significance. As discussed above, I expect that these trends would be significant if Study 3 had greater power. I recruited for Study 3 through my Study 2 sample, limiting the sample size, and this number further decreased through attrition across the two months. The four mediation models in Study 3 resembled those found in Study 2, however the $p$ values were between .09 and .11.

Interestingly, none of the mediation models examining time-lagged health effects were significant in Study 3. I speculate that the span of two weeks allows too much time for confounds to influence health outcomes, because these effects are not occurring in a vacuum. For example, someone high in attachment anxiety who sleeps poorly may have the biomarkers for illness (e.g., research done by Stanton & Campbell, 2014), increasing his or her propensity to become ill, and that person may even experience emotional and cognitive deficits the next day (as seen in the week-long studies), however depending on his or her actions over the next few days that person may or may not experience fully developed illness. If someone gets a good night of sleep for the few nights after, eats healthily, and regulates his or her stress levels, that person may not become ill over the two weeks. Conversely, if someone continues to sleep poorly, engages in unhealthy behaviours, and is extremely stressed, he or she may become sick in the two weeks following this initial night of poor sleep. This would follow the general theory of a diathesis-stress model
that is prevalent in psychology (originally theorized by Gottesman & Shields, 1967). Individuals high in attachment anxiety who sleep poorly are predisposed to develop an illness, but without stressors in the following weeks they may not actually become ill. In the span of two days fewer outside variables can impact health, and more immediate effects are observed. This may be why, in Study 2, I saw time-lagged effects (two days), whereas in Study 3 I did not see time-lagged effects (two weeks). This would also explain why in Study 3 attachment anxiety did not predict sleep quality, whereas in Study 2 it did.

Partner interaction quality and conflict intensity both did not interact with attachment anxiety in the sleep mediational models. Sleep may be generally disrupted for those high in attachment anxiety, and may interact with other factors that have yet to be explored (e.g., whether couples resolve conflict prior to sleep).

It is also important to note that sleep quality only partially mediated the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality. Much of the variance in predicting health outcomes remains unexplained. Other potential mediators of the relationship between attachment anxiety and health outcomes, controlling for partner interaction quality, may be: level of cognitive rumination, degree of HPA axis hyperactivation, and susceptibility to illness. For example, individuals high in attachment anxiety likely ruminate to a greater degree (Simpson & Rholes, 2012), which may explain variance in cognitive and emotional health outcomes, unique to the variance explained by sleep quality. Individuals high in attachment anxiety are also more likely to have greater HPA axis hyperactivation (Stanton & Campbell, 2014), which may partially mediate the relationship between attachment anxiety and developing illness. Lastly, individuals high in attachment anxiety are more susceptible to illness (Stanton & Campbell, 2014), and this heightened
susceptibility may mediate the relationship between attachment anxiety and the actual contraction of illness. These potential mediators, among others, could be explored in future studies.

**Implications**

Theoretically, I have provided evidence for a new mediator of the relationship between attachment anxiety and poor health outcomes: sleep quality. This provides information on a mechanism related to the greater incidence of illness in those high in attachment anxiety other than the stress response or inflammation (Stanton & Campbell, 2014). Further, it is important to consider not only the theoretical implications of this research, but also the practical implications (Hagger-Johnson & Whiteman, 2008). Sleep quality is much easier to conceptualize and change than cortisol levels and inflammation in bodily tissues. Small alterations of habits can greatly benefit sleep quality, such as avoiding electronics a half hour before going to sleep. With this knowledge, individuals high in attachment anxiety could put greater focus on improving sleep quality, which may be associated with a reduction of the incidence and extremity of illness. Of course sleep only partially mediates the relationship between attachment anxiety and health outcomes, but with this knowledge we may have a bit greater of a chance to prevent illness in those high in attachment anxiety.

Another point to note is that altering sleep habits may be more realistic than altering attachment anxiety to improve health outcomes. Attachment orientations are relatively stable over time (Bowlby, 1988). In a meta-analysis, Baldwin and Fehr (1995) noted that approximately 30% of individuals report changes in attachment orientations over time. Changes in attachment orientations were associated with significant life events and interpersonal experiences, which altered participants' frameworks used to understand interpersonal relationships. As it is not very
common to transfer attachment orientations, and it requires significant shifts in interpersonal relationships, I do not think it is practical to attempt to alter attachment orientations to improve health. Besides the issues of time, effort, and feasibility, there could also be ethical issues. Altering one's social schemas could have lasting effects on interpersonal relationships. It would be much more practical, and less invasive, to focus on sleep quality. There is a large literature supporting the ability to change sleep patterns and the associated benefits for health and wellbeing (e.g., Balliett, Davis, & Miller, 2015; Liu, Lee, Yu, & Chen, 2016; Mairs & Mullan, 2015; Paavonen, Huurre, Tilli, Kiviruusu, & Partonen, 2016). Many of these studies focus on sleep hygiene, defined as engaging in behaviours that prepare one for a restful sleep (e.g., going to bed at the same time each night, having a dark, quiet place to sleep, turning off electronic devices, avoiding caffeine too close to bedtime, and engaging in relaxing, de-stressing activities at night; Mairs & Mullan, 2015). Many researchers are recognizing the importance of improving sleep hygiene and are working to inform public health policies across North America (e.g., Barnes & Drake, 2015). My research supports the findings that attachment anxiety and sleep quality are implicated in poor health outcomes. Sleep quality seems to be a promising factor to target for interventions to improve the health of those high in attachment anxiety.

This set of research studies adds to the growing literature on attachment and health as I have examined a sleep mediation model, incorporating romantic threat, and using a new population that has yet to be studied (university students in romantic relationships). Other research on attachment anxiety, sleep and health outcomes has been focused on very specific populations (Kidd et al., 2014; Maunder et al., 2011). I have generalized this research to a younger population without preexisting health problems, which may be helpful in understanding the generality of sleep mediating the relationship between attachment anxiety and health.
Further, in this series of studies I have also attempted to incorporate romantic threat into this model of attachment and health, which prior researchers had yet to do. I found little evidence of attachment anxiety interacting with romantic threat to be associated with sleep and health, unlike what would be expected in the literature (Bowlby, 1969; Campbell & Marshall, 2011). This is puzzling and I believe worthy of future research to explore factors that interact with attachment anxiety to predict sleep quality.

One final area of discussion is that the results of my sleep mediation models mirror the results reported by Hawkley and Cacioppo (2010). This would suggest an underlying mechanism (sleep) linking the relationship between personality (loneliness; attachment anxiety) and poor health outcomes. There may therefore be a tie between attachment anxiety and loneliness in this context, which have already been correlated in the literature (Wei, Shaffer, Young, & Zakalik, 2005). If rumination is indeed the trait underlying both attachment anxiety and loneliness, and is implicated in sleep difficulties and further health problems, rumination could be another target for health intervention. By helping individuals reduce ruminative thoughts before bed (e.g., by distraction, relaxation) this may be associated with better sleep quality and potentially better health outcomes for individuals high in loneliness and/or attachment anxiety. This parallel may also help researchers to build a more comprehensive theory to understand personality and health.

Limitations and Future Directions

The main limitation of my study is the diary design. Although nightly diaries allow for a more naturalistic conceptualization of romantic relationships and daily health, there is very little control over these variables, as well as extraneous variables. In the future, I would like retain the diary design for its naturalistic benefits, but to collect more data on potential confounds (e.g.,
stress reduction/amplifying events, coming in contact with others who are sick) so that these variables could be controlled for. This may help in predicting long-term health outcomes.

Another limitation of my study design is that I used self-report measures, which can be biased by socially desirable responding (e.g., participants wanting to seem healthy; wanting to report a “perfect” romantic relationship), as well as inaccurate information (e.g., participants may be unaware of their objective sleep quality). I would like to include more objective and physiological measures of my variables, along with the subjective measures, in future examination of these variables. For example, I would like to have participants into the lab overnight to examine EEG sleep waves, breathing and restlessness, for an objective measure of sleep. Gaining data from participants’ partners about the quality of interactions may create less biased estimates of conflict as well.

Studies 1 and 3 were quite underpowered (the model with attachment anxiety predicting sleep quality the night following data collection in Study 1 had low power, $1-\beta = .58$; the model with attachment anxiety predicting sleep quality in Study 3 had extremely low power, $1-\beta = .30$; the time-lagged model with attachment anxiety predicting sleep quality was also underpowered, $1-\beta = .27$), which is another limitation of the study design. Study 2 aimed to replicate Study 1 with more power, helping in the understanding of my hypotheses. However, in the future I would like a chance to replicate the long-term tests of Study 3 with a larger sample to examine if the effects hold with greater power as well.

Another future direction would be to test if variables interact with attachment anxiety to predict sleep quality to a greater extent than partner interaction quality did in Studies 2 and 3. Potential variables to test are: conflict with individuals other than one’s partner (e.g., friends, family), bodily stress reactivity, and whether individuals resolve conflict with their romantic
partner prior to sleep. These variables may be more likely to interact with attachment anxiety to predict sleep quality, compared with the non-significant attachment anxiety by partner interaction quality interaction in this study. A more detailed diary study may be needed to understand the lack of attachment anxiety by romantic threat interaction and to uncover other variables that interact with attachment anxiety.

Another hypothesis I generated in the discussion was that individuals high in attachment anxiety who have poor sleep may be predisposed to illness (e.g., displaying biomarkers of inflammation {Stanton & Campbell, 2014}, experiencing small day-to-day health deficits), but the events in the days following the initiation of this predisposition will influence whether or not individuals will actually contract the illness. In the future this hypothesis could be tested through employing both objective (measures of inflammation) and subjective (self-reports of symptoms) measures to examine illness in another diary study. Information could be collected pertaining to precursors of illness as well as direct symptoms of illness. These measures could be taken daily, along with records of daily life events (e.g., stressors, interpersonal interactions) to examine if attachment orientations and sleep quality predict a predisposition for illness. One could subsequently examine what life events are required for this predisposition to evolve into full-blown sickness. The trajectory of the illness could be tracked to examine its length and severity. This would allow us to test whether attachment anxiety, compounded by deficits in sleep quality, would predict a predisposition to illness, which could then lead to becoming sick depending on specific life circumstances. It would also help reconcile why I could demonstrate time-lagged effects over two days in predicting health deficits, but that I could not demonstrate time-lagged effects over two weeks. The moderator may be life events, which could be the catalyst causing a predisposition to illness to transform into overt physical symptoms of sickness.
One last direction for future research would be to test other mediators of the relationship between attachment anxiety and health outcomes. As discussed above, level of cognitive rumination, degree of HPA axis hyperactivation, and susceptibility to illness may be interesting factors to explore, and may account for unique variance that sleep quality could not explain.

Conclusions

Attachment orientations predict not only how individuals will behave towards their romantic partners, but also how they will personally interact in the world and both short- and long-term health outcomes. I have demonstrated that sleep quality is an important factor in understanding why individuals high in attachment anxiety are more likely to experience symptoms of illness. This research draws interesting ties between attachment anxiety and loneliness (Hawkley & Cacioppo, 2010), and recognizes a factor influencing health that is capable of change. Sleep quality can be improved by small lifestyle changes, and this information may be especially helpful for those high in attachment anxiety who wish to reduce their chances of illness.
References


interactionist perspective. *Journal of Personality, 79*(6), 917-947. doi: 10.1111/j.1467-6494.2011.00723.x


Ratliff-CRAIN, J., & Baum, A. (1990). Individual differences and health: Gender, coping, and


Schmitt, A., Belschak, F. D., & Den Hartog, D. N. (2016). Feeling vital after a good night’s
sleep: The interplay of energetic resources and self-efficacy for daily proactivity. *Journal of Occupational Health Psychology*. Advance online publication. doi: 10.1037/ocp0000041


Appendix A

Ethics Documents

Study 1 Letter of Information

This research is being conducted by Rachael Quickert, who is a Master’s student working with Dr. Tara Macdonald, Associate Professor, of the Department of Psychology at Queen’s University in Kingston, Ontario.

**What is the study about?** The purpose of this research is to explore the relationship between individual health and events occurring within romantic relationships. Participants will be asked to complete a questionnaire taking approximately ten minutes. One week after this questionnaire is completed, participants will be e-mailed each evening for ten consecutive nights with a link to complete a short questionnaire about events occurring that day. Each questionnaire should take about ten minutes. The questions will focus on individual health behaviours and interactions with one’s romantic partner. As this study examines romantic relationships the questions are by definition personal and could be potentially sensitive. In the event that you would like to see a counselor after completing this study, please contact Queen’s University Health, Counseling and Disabilities Services at 613-533-2506. They are located at 146 Stuart Street in the St. LaSalle Building (across the street from Adelaide Hall).

**Is my participation voluntary?** Yes. Although your participation is greatly appreciated, you have full rights to withdraw from this study at any time or to not complete a portion of this study. No explanation is needed for leaving. You may withdraw from the study by no longer completing the nightly questionnaires and e-mailing the head researcher at 9req@queensu.ca. If you send the head researcher your participant code all information with this code number will be deleted and not included in data analysis.

**What will happen to my data?** We will keep all data confidential. All questionnaires will be matched with an anonymous participant number. No identifying information will be kept with any of the data. We will store the data on a password-protected account and will delete the data at the end of the study. Only authorized researchers have access to this area. Results will be analyzed and communicated based on group trends of all participants. The data may be presented in professional psychological journals or at scientific conferences, but any such presentations will be of general findings and never breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings.

**Will I be compensated for my participation?** There will be a draw at the end of the study for $100. Each night that you participate in the study entitles you to one ticket in the draw. By participating in all 11 questionnaires (the initial questionnaire plus the 10 nightly questionnaires) you will have 11 tickets in the draw.

Any questions about study participation may be directed to Dr. Tara Macdonald at tmacdon@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Boar at 613-533-6081 or Chair.GREB@queensu.ca

*This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.*

Again, thank you. Your interest in participating in this research study is greatly appreciated.

Dr. Tara Macdonald, Associate Professor
Rachael Quickert, Master’s Student
Study 1 Consent Form

Name (please type): ___________________________________________

1. I have read the Letter of Information and have had any questions answered to my satisfaction by e-mailing Rachael at 9req@queensu.ca.

2. I understand that I will be participating in the study called “Health and Romantic Relationships”. I understand that this means that I will be asked to complete a ten-minute questionnaire, and then one week later I will be asked to complete a ten-minute questionnaire each night for ten consecutive nights.

3. I understand that my participation in this study is voluntary and that I may withdraw at any time. I can withdraw from this study by no longer answering the nightly questionnaires and e-mailing 9req@queensu.ca. By e-mailing the head experimenter my participant identification code she will delete any questionnaires with this code and they will no longer be included in the data analysis.

4. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. I understand that the data will be stored on a password-protected account, and that only authorized researchers will have access. I understand data will be published based on group trends and that no individual identifying information will be used. If data is published in a psychological journal, it will be reported based on group trends as well.

Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca or Rachael Quickert at 9req@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca

I have read the above statements and freely consent to participate in this research: Check box: [ ]

Electronic signature (type name): ________________________ Date:_________________
Study 1 Debriefing

Thank you for your participation in this study, it is greatly appreciated. There has been a lot of recent research relating romantic relationships to individual health. I am interested in the possibility that conflict with one’s relationship partner will lead to worse health behaviours in the form of more unhealthy eating, worse quality and amount of sleep, and less exercise. I used nightly questionnaires to examine if conflict will lead to more unhealthy behaviour on the days of conflict, and also on the days after conflict. The initial questionnaire was used to examine how people view romantic relationships in terms of their value, and impact on their life. I believe that how individuals view their romantic relationships will be an important factor in how conflict influences their health behaviours.

Your participation in this study will allow us to examine the relationship among individual theories of relationships, events within relationships, and individual health. All data will be associated with your participant number, and no identifying information will be matched with any of your data. Data will be communicated based on group trends of all participants in this study, not on an individual basis. If you are uncomfortable with any of this information you are welcome to e-mail the researchers at 9req@queensu.ca and we can remove your data from our sample. There is no penalty for this. We will do everything we can to ensure your confidentiality and are very grateful for your participation.

In the event that you would like to see a counselor after completing this study, please contact Queen’s University Health, Counseling and Disabilities Services at 613-533-2506. They are located at 146 Stuart Street in the St. LaSalle Building (across the street from Adelaide Hall). Also, please feel free to e-mail the experimenter for more information on the study you just participated in. If you would like a copy of the results of this study please e-mail 9req@queensu.ca and we will keep your e-mail to send you the report once it is finished.

If you would like further information on this area of research, these are some related references that may be of interest to you.


Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca or Rachael Quickert at 9req@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca. Again, thank you for your help with our study.

Dr. Tara MacDonald, Associate Professor
Rachael Quickert, Master’s Student
**Study 2 Letter of Information**

This research is being conducted by Rachael Quickert, who is a Master’s student working with Dr. Tara Macdonald, Associate Professor, of the Department of Psychology at Queen’s University in Kingston, Ontario.

**What is the study about?** The purpose of this research is to explore the relationship between individual health and events occurring within romantic relationships. Participants will be asked to complete a survey taking approximately five minutes. One week after this survey is completed, participants will be e-mailed each evening for ten consecutive nights with a link to complete a short survey about events occurring that day. Each survey should take about fifteen minutes. The questions will focus on individual health behaviours and interactions with one’s romantic partner. After the seventh night you will be given the opportunity to participate in part two of this study, however this is optional. As this study examines romantic relationships the questions are by definition personal and could be potentially sensitive. In the event that you would like to see a counselor after completing this study, please contact Queen’s University Health, Counseling and Disabilities Services at 613-533-2506. They are located at 146 Stuart Street in the St. LaSalle Building (across the street from Adelaide Hall.

**Is my participation voluntary?** Yes. Although your participation is greatly appreciated, you have full rights to withdraw from this study at any time or to not complete a portion of this study. You may withdraw from the study by no longer completing the nightly surveys and e-mailing 9req@queensu.ca. If you send the head researcher your participant code all information with this code number will be deleted and not included in data analysis.

**What will happen to my data?** We will keep all data confidential. All surveys will be matched with an anonymous participant code. No identifying information will be kept with any of the data. We will store the data on a password-protected account that only authorized researchers have access to. Results will be analyzed and communicated based on group trends of all participants. The data may be presented in professional psychological journals or at scientific conferences, but any such presentations will be of general findings and never breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings.

**Will I be compensated for my participation?** There will be a draw at the end of the study for $100. Each night that you participate in the study entitles you to one ticket in the draw. By participating in all eight surveys (the initial survey plus the seven nightly surveys) you will have eight tickets in the draw. Choosing to participate in part two of this study (at the end of part one) gives you the opportunity for additional compensation.

Any questions about study participation may be directed to Dr. Tara Macdonald at tmacdon@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Boar at 613-533-6081 or Chair.GREB@queensu.ca

*This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.*

Again, thank you. Your interest in participating in this research study is greatly appreciated.

Dr. Tara Macdonald, Associate Professor  
Rachael Quickert, Master’s Student
Study 2 Consent Form

Name (please type): ___________________________________________

1. I have read the Letter of Information and have had any questions answered to my satisfaction by e-mailing Rachael Quickert at 9req@queensu.ca.

2. I understand that I will be participating in the study called “Health and Romantic Relationships”. I understand that this means that I will be asked to complete a five-minute survey and then one week later I will be asked to complete a fifteen-minute survey each night for seven consecutive nights.

3. I understand that my participation in this study is voluntary and that I may withdraw at any time. I can leave questions blank that I do not want to answer. I can withdraw from this study by no longer answering the nightly surveys and e-mailing 9req@queensu.ca. By e-mailing the head experimenter my participant identification code she will delete all surveys with this code.

4. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. I understand that the data will be stored on a password-protected account, and that only authorized researchers will have access. I understand data will be published based on group trends and that no identifying information will be used. If data is published in a psychological journal, it will be reported based on group trends as well.

Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca or Rachael Quickert at 9req@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca

I have read the above statements and freely consent to participate in this research:
Check box: [ ]

Electronic signature (type name): ________________________ Date:________________
Study 3 Letter of Information

This research is being conducted by Rachael Quickert, who is an Master’s student working with Dr. Tara Macdonald, Associate Professor, of the Department of Psychology at Queen’s University in Kingston, Ontario.

**What is the study about?** This is a continuation of the study you just completed. We are interested in following up with you on your interactions with your partner and your health for two months. We will send you a ten-minute survey, once a week, for eight consecutive weeks. The surveys will be sent on Sunday, and we ask that you complete them on Sunday night, reflecting on the past week. These weekly surveys will have similar questions to the nightly surveys you just completed however they will be much shorter.

**Is my participation voluntary?** Yes. Although your participation is greatly appreciated, you have full rights to withdraw from this study at any time or to not complete a portion of this study. You may withdraw from the study by no longer completing the nightly surveys and e-mailing 9req@queensu.ca. If you send the head researcher your participant code all information with this code number will be deleted and not included in data analysis.

**What will happen to my data?** We will keep all data confidential. All surveys will be matched with an anonymous participant code. No identifying information will be kept with any of the data. We will store the data on a password-protected account that only authorized researchers have access to. Results will be analyzed and communicated based on group trends of all participants. The data may be presented in professional psychological journals or at scientific conferences, but any such presentations will be of general findings and never breach individual confidentiality. Should you be interested, you are entitled to a copy of the findings.

**Will I be compensated for my participation?** There will be a draw at the end of the study for $100 (separate from the draw for the first part of the study). Each night that you participate in the study entitles you to one ticket in the draw. By participating in all eight surveys (once weekly for eight consecutive weeks) you will have eight tickets in the draw.

Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Boar at 613-533-6081 or Chair.GREB@queensu.ca

*This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.*

Again, thank you. Your interest in participating in this research study is greatly appreciated.

Dr. Tara MacDonald, Associate Professor
Rachael Quickert, Master’s Student
Study 3 Consent Form

Name (please type): ___________________________________________

1. I have read the Letter of Information and have had any questions answered to my satisfaction by e-mailing Rachael Quickert at 9req@queensu.ca.

2. I understand that I will be participating in Part Two of the study called “Health and Romantic Relationships”. I understand that this means that I will be asked to complete a ten-minute survey each Sunday for eight consecutive weeks.

3. I understand that my participation in this study is voluntary and that I may withdraw at any time. I can leave questions blank that I do not want to answer. I can withdraw from this study by no longer answering the nightly surveys and e-mailing 9req@queensu.ca. By e-mailing the head experimenter my participant identification code she will delete all surveys with this code.

4. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. I understand that the data will be stored on a password-protected account, and that only authorized researchers will have access. I understand data will be published based on group trends and that no identifying information will be used. If data is published in a psychological journal, it will be reported based on group trends as well.

Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca or Rachael Quickert at 9req@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca.

I have read the above statements and freely consent to participate in this research:
Check box: [ ]

Electronic signature (type name): ________________________ Date:_______________
Studies 2 and 3 Debriefing Form

At the end of Study 2 participants were asked if they wanted to participate in Study 3. If participants did not want to participate in Study 3 they received this debriefing form after Study 2. If participants did want to participate in Study 3 they did not receive the debriefing form right away, but instead received the debriefing form after completing Study 3.

Thank you for your participation in this study, it is greatly appreciated. There has been a lot of recent research relating romantic relationships to individual health. I am interested in the possibility that conflict with one’s relationship partner will lead to health issues in both day-to-day life (problems concentrating, sleep issues) and long-term outcomes (developing colds and the flu). I am using nightly surveys to examine if conflict will lead to more unhealthy behaviour on the days of conflict, and also on the days after conflict. The initial survey was used to examine how people view romantic relationships in terms of their value, and impact on their life. I believe that how individuals view their romantic relationships will be an important factor in how conflict influences their health behaviours.

Your participation in this study will allow us to examine the relationship among individual theories of relationships, events within relationships, and individual health. All data will be associated with your participant number, and no identifying information will be matched with any of your data. Data will be communicated based on group trends of all participants in this study, not on an individual basis. If you are uncomfortable with any of this information you are welcome to e-mail the researchers at 9req@queensu.ca and we can remove your data from our sample. You will still be entered in the draw. We will do everything we can to ensure your confidentiality and are very grateful for your participation.

In the event that you would like to see a counselor after completing this study, please contact Queen’s University Health, Counseling and Disabilities Services at 613-533-2506. They are located at 146 Stuart Street in the St. LaSalle Building (across the street from Adelaide Hall). Also, please feel free to e-mail the experimenter for more information on the study you just participated in. If you would like a copy of the results of this study please e-mail 9req@queensu.ca and we will keep your e-mail to send you the report once it is finished.

If you would like further information on this area of research, these are some related references that may be of interest to you.


Any questions about study participation may be directed to Dr. Tara MacDonald at tmacdon@queensu.ca or Rachael Quickert at 9req@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or Chair.GREB@queensu.ca. Again, thank you for your help with our study.

Dr. Tara MacDonald, Associate Professor
Rachael Quickert, Master’s Student
Appendix B

Demographics Questions

What is your gender? male, female, other

What is your age? ___ years

How long have you been in a romantic relationship with your partner? ____ months

On average, how many hours of sleep do you get each night? ____ hours
Appendix C

Study 1 Nightly Conflict and Health Questionnaire

The following questions ask about your exercise and health behaviours for today:
Compared to an average day, how much did you exercise today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

What type of exercise did you do?
Biking, running, walking, yoga, team sport, individual sport, other _______
What time did you exercise at? _______

Did you exercise more than once today? 0=No 1=Yes

How intense was this exercise?
0 = not at all intense 5 = moderately intense 10 = extremely intense

Compared to an average workout, how did you feel during your exercise today?
0 = much worse than usual 5 = about the same as usual 10 = much better than usual

Compared to an average day, how would you rate your eating habits today?
0 = much unhealthier than usual 5 = about the same as usual 10 = much healthier than usual

Relative to a normal day, how much “junk food” or unhealthy food did you eat?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

Relative to a normal day, how much healthy food did you eat?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

Did you skip any meals today? 0=No 1=Yes

Compared to a normal sleep, how was your sleep last night?
0 = much worse than usual 5 = about the same as usual 10 = much better than usual

How many hours of sleep did you get last night? 5 hours or fewer, 6, 7, 8, 9, 10 hours or more

How long did it take you to fall asleep? Less than 15 min, 30 min, 45 min, 1 hour or more

How many times did you wake up during the night? 0, 1, 2, 3, 4, 5 or more times

Did you wake up feeling rested this morning? 0=No 1=Somewhat 2=Yes

Relative to a normal day, how much did you smoke today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual
N/A = I don’t smoke

Relative to a normal day, how many alcoholic drinks did you consume today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual
N/A = I don’t drink alcohol
Relative to a normal day, how much caffeine did you consume today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual
N/A = I don’t drink caffeine

Compared to an average day, how did you feel in general today?
0 = much worse than usual 5 = about the same as usual 10 = much better than usual

Compared to an average day, how much control did you feel over your behaviour, thoughts, feelings and emotions?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

Relative to an average day, how much did your physical and/or emotional health interfere with your normal social activities?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

Relative to an average day, how much were you bothered by illness, bodily disorder, aches or pains today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

Compared to a normal day, how much bodily pain did you have today?
0 = much less than usual 5 = about the same as usual 10 = much more than usual

How much did this pain interfere with normal work?
0 = not at all 5 = quite a bit 10 = extremely

The following questions ask about your experience with your partner today:
Approximately how many hours did you spend with your partner today?
Less than an hour, 1-3 hours, 3-5 hours, 5-7 hours, 7 or more hours, I didn’t see my partner today

How would you rate your interaction with your partner today overall?
0 = very negative 5 = neutral 10 = very positive

Did you experience conflict with your partner today? 0=No 1=Yes

Please rate the intensity of the conflict.
0 = not at all intense 5 = moderately intense 10 = extremely intense

What was the main issue of conflict?
Household chores, personal habits, money, beliefs, school/work, family/friends, other
If you feel comfortable please indicate the nature of the conflict in 1-3 words _______

Who started the conflict? ___% partner, ___% you
Who did the arguing/talking? ___% partner, ___% you

How angry were you during this conflict? (Anger is defined as a feeling of irritation or annoyance)
0 = not at all angry 5 = moderately angry 10 = extremely angry

How angry was your partner during this conflict?
0 = not at all angry 5 = moderately angry 10 = extremely angry
How hurt were you during this conflict? (Hurt is defined as mental pain, similar to sadness)
0 = not at all hurt 5 = moderately hurt 10 = extremely hurt

How hurt was your partner during this conflict?
0 = not at all hurt 5 = moderately hurt 10 = extremely hurt

Was the issue resolved? 0=No 1=Somewhat 2=Yes

Was the conflict more important to you or your partner? 0=You 1=Both 2=Your partner

Did you experience conflict with anyone else today? 0=No 1=Yes

Who did you experience conflict with?
Housemate, sibling, parent, friend, coworker, peer, other

Please rate the intensity of the conflict.
0 = not at all intense 5 = moderately intense 10 = extremely intense

What was the main issue of conflict?
Household chores, personal habits, money, beliefs, school/work, family/friends, other

If you feel comfortable please indicate the nature of the conflict in 1-3 words _______

How angry were you during this conflict?
0 = not at all angry 5 = moderately angry 10 = extremely angry

How angry was the other individual during this conflict?
0 = not at all angry 5 = moderately angry 10 = extremely angry

How hurt were you during this conflict?
0 = not at all hurt 5 = moderately hurt 10 = extremely hurt

How hurt was the other individual during this conflict?
0 = not at all hurt 5 = moderately hurt 10 = extremely hurt

Was the issue resolved? 0=No 1=Somewhat 2=Yes
Appendix D

Study 1 Time-Lagged Sleep Mediation Analyses

I first tested whether sleep two nights before mediated the relationship between attachment anxiety and healthy eating, controlling for partner interaction quality. To employ step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights before (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively associated with sleep quality two nights previously, $B = -.14, SE = .04, p < .001$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights previously (the mediator) was significantly related to healthy eating (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights previously as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (healthy eating). Sleep quality two nights previously was not significantly associated with healthy eating, $B = .10, SE = .14, p = .462$, controlling for attachment anxiety and partner interaction quality. As the mediator (sleep quality two nights previously) was not predictive of the outcome variable (healthy eating), controlling for the predictor (attachment anxiety) and covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality two nights previously did not mediate the
relationship between attachment anxiety and healthy eating, controlling for variance in partner interaction quality.

I then tested whether sleep two nights before mediated the relationship between attachment anxiety and feelings in general, controlling for partner interaction quality. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights before (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively associated with sleep quality two nights previously, $B = -.14, SE = .04, p < .001$, controlling for partner interaction quality. This significant result allows me to proceed to step two of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to feelings in general (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights before as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (feelings in general). Sleep quality two nights previously was positively significantly associated with feelings in general, $B = .85, SE = .17, p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to step three of testing the mediation. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to feelings in general (the outcome variable), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction
between the level one and two predictors to predict the outcome variable (feelings in general). Attachment anxiety was not significantly associated with feelings in general, $B = .02$, $SE = .11$, $p = .836$, controlling for partner interaction quality. As the predictor (attachment anxiety) was not predictive of the outcome variable (feelings in general), controlling for the covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality two nights before did not mediate the relationship between attachment anxiety and feelings in general, controlling for variance in partner interaction quality.

Next, I tested whether sleep two nights before mediated the relationship between attachment anxiety and control over thoughts, controlling for partner interaction quality. For step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previously (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights previously). Attachment anxiety was negatively associated with sleep quality two nights previously, $B = -.14$, $SE = .04$, $p < .001$, controlling for partner interaction quality. As attachment anxiety could predict sleep quality two nights before I was able to proceed to step two of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights previously (the mediator) was significantly related to control over thoughts (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights before as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (control
over thoughts). Sleep quality two nights previously was positively associated with control over thoughts, $B = .63$, $SE = .16$, $p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to step three of testing the mediation. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to control over thoughts (the outcome variable), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (control over thoughts). Attachment anxiety was not significantly associated with control over thoughts, $B = .05$, $SE = .10$, $p = .593$, controlling for partner interaction quality. As the predictor (attachment anxiety) was not predictive of the outcome variable (control over thoughts), controlling for the covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality did not mediate the relationship between attachment anxiety and control over thoughts, controlling for variance in partner interaction quality.

Finally, I tested whether sleep two nights before mediated the relationship between attachment anxiety and pain interference, controlling for partner interaction quality. To examine step one of Baron and Kenny’s (1986) recommendations I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previously (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively associated with sleep quality two nights previously, $B = -.14$, $SE = .04$, $p < .001$, controlling for partner interaction quality. This significant result allowed me to proceed to step two of testing mediation.
For the second step I created a multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to pain interference (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights before as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (pain interference). Sleep quality two nights previously was negatively associated with pain interference, $B = -.45, SE = .18, p = .015$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to step three of testing the mediation. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to pain interference (the outcome variable), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (pain interference). Attachment anxiety was not significantly associated with pain interference, $B = .11, SE = .14, p = .425$, controlling for partner interaction quality. As the predictor (attachment anxiety) was not predictive of the outcome variable (pain interference), controlling for the covariate (partner interaction quality), I terminated the mediation analysis. Therefore, sleep quality two nights before did not mediate the relationship between attachment anxiety and pain interference, controlling for variance in partner interaction quality. Overall, sleep quality two nights before did not mediate the relationship between attachment anxiety and any of the outcome variables.
Appendix E

Study 2 Nightly Conflict and Health Questionnaire

Please rate the extent to which you agree or disagree with the following statements concerning your health today.
I ate healthy food today.
I ate junk food today.
I ate healthier than usual today.
I ate unhealthier than usual today.
I felt strong today.
I felt healthy today.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

How many meals did you skip today? 0, 1, 2, 3
Did you exercise today? 0=no 1=yes
How intense was your exercise today?
0 = not at all intense 5 = moderately intense 10 = extremely intense
How long did you exercise for? _______minutes
How many times did you exercise today? 1, 2, 3, 4, more than 4

Please indicate whether you consumed any of these substances today.
Caffeine 0=no 1=yes
Alcohol 0=no 1=yes
Tobacco 0=no 1=yes
Please rate the extent to which you agree or disagree with the following statements.
I consumed too much caffeine today.
I consumed too much alcohol today.
I smoked too much today.

Approximately how many minutes did it take you to fall asleep? _______minutes
Approximately how many hours of sleep did you get last night? _______hours

Please rate the extent to which you agree or disagree with the following statements.
I slept well last night.
I woke up feeling rested this morning.
I woke up a lot during the night.
It took me a long time to fall asleep.
I got more sleep than usual last night.
I had a nightmare (or more than one) last night.
I felt sluggish today.
I fell asleep during the day by accident.
I took a nap today.
It took me a long time to get up in the morning.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree
These statements refer to your emotions and health. Please rate the extent to which you agree or disagree with the following statements based on your experience today.
I had a lot of energy.
I had a hard time concentrating.
I felt productive.
I felt calm.
I felt agitated or tense.
I felt upset.
I felt sad or down.
I felt angry.
I felt in control of my behaviour, thoughts, feelings and emotions.
I felt like I was on autopilot.
I felt sick.
I was in pain.
I felt uncomfortable.
My physical health interfered with my social life.
My mental and/or emotional health interfered with my social life.
My physical health interfered with my academic/work life.
My mental and/or emotional health interfered with my academic/work life.
I spent time taking care of myself today.
I did something special for myself today.
I spent time taking care of someone else today.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

Were you physically unwell today? (cold, flu, headache, stomach ache) 0=no 1=yes
Please briefly describe your symptoms ______
Please rate the severity of your symptoms.
0 = minimal 5 = moderate 10 = extreme
Did you cancel or reschedule any social or academic/work obligations due to your physical health today?
0=no 1=yes

Were you psychologically unwell today? (experiencing symptoms of anxiety, depression, eating disorders) 0=no 1=yes
Please briefly describe your symptoms ______
Please rate the severity of your symptoms.
0 = minimal 5 = moderate 10 = extreme
Did you cancel or reschedule any social or academic/work obligations due to your psychological health today? 0=no 1=yes

Approximately how many hours did you spend with your partner today (in person, online, text, phone)?
I didn’t interact with my partner today, less than an hour, 1-3 hours, 3-5 hours, 5-7 hours, 7 or more hours

Please rate the extent to which you agree or disagree with the following statements concerning your interactions with your romantic partner today.

I had a positive day with my partner today (regardless if long distance or in person).
I felt emotionally close to my partner today.
I felt physically close to my partner today.
I felt intimately (and/or sexually) close to my partner today.
I felt like my partner and I weren’t on the same page today.
I criticized my partner today.
My partner criticized me today.
I complimented my partner today.
My partner complimented me today.
I felt important to my partner today.
I helped my partner today.
My partner helped me today.
I had a minor disagreement with my partner today.
I felt angry at my partner.
I felt that my partner was angry at me.
I felt hurt by my partner.
I felt like my partner was hurt by me.
I felt loved by my partner.
I felt like my partner loved me.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

Did you experience conflict with your partner today? 0=no 1=yes

Please rate the extent to which you agree or disagree with the following statements concerning this conflict.
The conflict was intense.
We stopped talking for a while during the conflict.
I was angry.
My partner was angry.
I was hurt.
My partner was hurt.
I swore at my partner.
My partner swore at me.
I criticized my partner.
My partner criticized me.
I did more of the arguing.
My partner did more of the arguing.
I started the conflict.
My partner started the conflict.
We resolved the conflict.
I felt better after the conflict.
I feel closer to my partner after the conflict.
The issue of the conflict was more important to me.
The issue of the conflict was more important to my partner.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

What was the main issue of the conflict?
Household chores, personal habits, money, beliefs, school/work, family/friends, other
If you feel comfortable please indicate the nature of the conflict in 1-3 words _______

Approximately how long did the conflict last (from the time it started to the time it was resolved)? Please indicate whether your report is in minutes, hours or days. _______

Since our conflict I’ve been thinking about…
My relationship.
How to improve my relationship.
Whether my partner was mad.
What I did to deserve this.
Why I always act this way.
Why my partner always acts this way.
Why the situation hadn’t gone better.
Why I have problems other people don’t have.
Why I can’t handle things better.
Why my partner can’t handle things better.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree
Appendix F

Study 2 Time-Lagged Sleep Mediation Analyses

I examined if sleep quality two nights before mediated the relationship between attachment anxiety and emotional responding, controlling for partner interaction quality. Higher scores on emotional responding indicate more positive emotions. First I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previous to the night of data collection (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively related to sleep quality two nights before, $B = -.10$, $SE = .04$, $p = .015$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights previously as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (emotional responding). The composite sleep quality measure for two nights before was positively associated with positive emotions $B = .36$, $SE = .05$, $p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality. I then created
another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to emotional responding (the outcome variable), controlling for partner interaction quality and sleep quality two nights before (the mediator). The significant, negative relationship between attachment anxiety and positive emotions, $B = -0.32, SE = 0.06, p < .001$, controlling for partner interaction quality, decreased when accounting sleep quality two nights previous to data collection, $B = -0.28, SE = 0.06, p < .001$. This suggests that sleep quality two nights before explains part of the variance of attachment anxiety predicting emotional responses.

I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. The mediation model was significant, $z = -2.37, SE = 0.02, p = .018$. Therefore, sleep quality two nights before partially mediated the relationship between attachment anxiety and emotional responding, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported less positive emotions, and this was partially explained by having lower quality sleep two nights previously.

I examined if sleep quality two nights before mediated the relationship between attachment anxiety and cognitive responding, controlling for partner interaction quality. First I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previous to the night of data collection (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively related to sleep quality two nights before, $B = -0.10, SE = 0.04, p = .015$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a
multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights previously as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (cognitive responding). The composite sleep quality measure was positively associated with cognitive experience $B = .51, SE = .05, p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to cognitive responding (the outcome variable), controlling for partner interaction quality and sleep quality two nights before (the mediator). The significant, negative relationship between attachment anxiety and cognitive experience, $B = -.26, SE = .07, p < .001$, controlling for partner interaction quality, decreased when accounting for sleep quality two nights previously, $B = -.21, SE = .06, p = .001$. This suggests that sleep quality two nights before explains part of the variance of attachment anxiety predicting cognitive responses. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was significant, $z = -2.42, SE = .02, p = .015$. Sleep quality two nights previously partially mediated the relationship between attachment anxiety and cognitive experience, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more cognitive difficulties, and this was partially explained by having lower quality sleep two nights before that day.
I examined if sleep quality two nights before mediated the relationship between attachment anxiety and symptoms of physical illness, controlling for partner interaction quality. First I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previous to the night of data collection (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively related to sleep quality two nights before, $B = -0.10$, $SE = 0.04$, $p = 0.015$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to symptoms of illness (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights previously as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (symptoms of illness). The composite sleep quality measure was negatively associated with symptoms of illness $B = -0.34$, $SE = 0.06$, $p < 0.001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to illness (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to illness (the outcome variable), controlling for partner interaction quality and sleep quality two nights before (the mediator). The significant, positive relationship between attachment anxiety
and symptoms of illness, $B = .19, SE = .09, p = .028$, controlling for partner interaction quality, decreased when accounting for the sleep quality two nights previously, $B = .16, SE = .09, p = .067$. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was significant, $z = -2.26, SE = .02, p = .024$. Sleep quality two nights previously partially mediated the relationship between attachment anxiety and symptoms of physical illness, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more symptoms of physical illness, and this was partially explained by having lower quality sleep two nights before that day.

I examined if sleep quality two nights before mediated the relationship between attachment anxiety and health interfering with life, controlling for partner interaction quality. First I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to sleep quality two nights previous to the night of data collection (the mediator), controlling for partner interaction quality. I entered partner interaction quality as a level one predictor, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to see if they could predict variance in the mediator (sleep quality two nights before). Attachment anxiety was negatively related to sleep quality two nights before, $B = -.10, SE = .04, p = .015$, controlling for partner interaction quality. This significant result allows me to proceed to the second step of testing mediation. For the second step I created a multi-level conditional model examining if sleep quality two nights before (the mediator) was significantly related to life interference (the outcome variable), controlling for partner interaction quality and attachment anxiety. I entered partner interaction quality and sleep quality two nights previously as level one predictors, attachment anxiety as a level two predictor, and the interaction between the level one and two predictors to predict the outcome variable (life
interference). Sleep quality two nights previously was negatively associated with health interfering with life, $B = -.21, SE = .05, p < .001$, controlling for attachment anxiety and partner interaction quality. I was then able to proceed to the final two steps. I created a multi-level conditional model examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality. I then created another multi-level conditional model, examining if attachment anxiety (the predictor) was significantly related to life interference (the outcome variable), controlling for partner interaction quality and sleep quality two nights before (the mediator). The significant, positive relationship between attachment anxiety and life interference, $B = .26, SE = .08, p = .001$, controlling for partner interaction quality, decreased when accounting for the composite sleep quality measure, $B = .24, SE = .07, p = .001$. I then conducted Sobel’s test (1982) to examine if the mediation effect was significantly different from a null effect of zero. Sobel’s test (1982) was significant, $z = 2.17, SE = .01, p = .030$. Sleep quality two nights previously partially mediated the relationship between attachment anxiety and health interfering with life, controlling for variance in partner interaction quality. Individuals high in attachment anxiety reported more life interference due to health, and this was partially explained by having lower quality sleep two nights before that day.

Partner interaction quality did not interact with attachment anxiety to significantly predict outcomes throughout the four mediational analyses. Conflict intensity did not interact with attachment anxiety to predict outcomes either, when it was controlled for in separate analyses.
Appendix G

Study 3 Weekly Check-In Questionnaire

The following questions ask about your health this week. Please reflect on your entire week and rate the extent to which you agree or disagree with the following statements.
Over the last week…
I ate healthier than usual.
I ate unhealthier than usual.
I felt strong.
I felt healthy.
I had a lot of energy.
I had a hard time concentrating.
I felt productive.
I slept well.
I woke up feeling rested.
I woke up a lot during the nights.
It took me a long time to fall asleep each night.
I got more sleep than usual.
I had a nightmare (or more than one).
It took me a long time to get out of bed in the mornings.
I felt sluggish.
I fell asleep in the day by accident.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

On average, how many hours of sleep did you get each night this week? _______ hours
How many days did you exercise this week? _______ days

The following questions ask about your health this week. Please reflect on your entire week and rate the extent to which you agree or disagree with the following statements.
Over the last week…
I felt calm.
I felt upset.
I felt agitated or tense.
I felt sad or down.
I felt angry.
I felt like I was on autopilot.
I felt in control of my behaviour, thoughts, feelings and emotions.
I felt sick.
I was in pain.
I felt uncomfortable.
I spent time taking care of myself this week.
I spent time taking care of others this week.
My physical health interfered with my social life.
My mental and/or emotional health interfered with my social life.
My physical health interfered with my academic/work life.
My mental and/or emotional health interfered with my academic/work life.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

Were you physically unwell this week? (cold, flu, headache, stomach ache) 0=no 1=yes
Please briefly describe your symptoms _______
Please rate the severity of your symptoms.
0 = minimal 5 = moderate 10 = extreme
How long have you been experiencing these symptoms? _______days
Have you sought medical assistance (gone to the clinic or a doctor, taken medicine etc.)? 0=no 1=yes
Please briefly describe the assistance you received _______

Were you psychologically unwell this week? (experiencing symptoms of anxiety, depression, eating disorders) 0=no 1=yes
Please briefly describe your symptoms _______
Please rate the severity of your symptoms.
0 = minimal 5 = moderate 10 = extreme
How long have you been experiencing these symptoms? _______days
Have you sought assistance (gone to see a doctor or counselor, taken medicine etc.)? 0=no 1=yes
Please briefly describe the assistance you received _______

Have you experienced any significant events in the past week that would affect your mood or wellbeing? 0=no 1=yes
Please briefly describe the event if you feel comfortable doing so _______

Are you still with the same romantic partner as you were in part one of this study? 0=no 1=yes
If not, do you have a new romantic partner? 0=no 1=yes

The following statements ask about your romantic relationship this week. Please reflect on your entire week and rate the extent to which you agree or disagree with the following statements.
I had a positive week with my partner (regardless if long distance or in person).
I felt emotionally close to my partner.
I felt physically close to my partner.
I felt intimately (and/or sexually) close to my partner.
I felt like my partner and I weren’t on the same page.
I criticized my partner.
My partner criticized me.
I complimented my partner.
My partner complimented me.
I helped my partner.
My partner helped me.
I felt important to my partner.
I had a minor disagreement with my partner (or more than one).
I felt angry at my partner.
I felt that my partner was angry at me.
I felt hurt by my partner.
I felt loved by my partner.
I felt like my partner loved me.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

Did you experience conflict with your romantic partner? 0=no 1=yes

Please rate the extent to which you agree or disagree with the following statements concerning this conflict. If you had more than one conflict please consider the most intense conflict of the week.
The conflict was intense.
We stopped talking for a while during the conflict.
I was angry.
My partner was angry.
I was hurt.
My partner was hurt.
I swore at my partner.
My partner swore at me.
I criticized my partner.
My partner criticized me.
I did more of the arguing.
My partner did more of the arguing.
I started the conflict.
My partner started the conflict.
We resolved the conflict.
I felt better after the conflict.
I feel closer to my partner after the conflict.
The issue of the conflict was more important to me.
The issue of the conflict was more important to my partner.
1 = strongly disagree 3 = neither agree nor disagree 5 = strongly agree

What was the main issue of the conflict?
Household chores, personal habits, money, beliefs, school/work, family/friends, other
If you feel comfortable please indicate the nature of the conflict in 1-3 words ______

Approximately how long did the conflict last (from the time it started to the time it was resolved)? Please indicate whether your report is in minutes, hours or days. ______
Appendix H

Meta-Analyzed Correlations Among Variables Averaged Across Studies 1 to 3

Table 9

*Combined Correlation Coefficients Meta-Analyzed Across Studies 1 to 3. Above the diagonal, the first value represents the sample size (N) summed across k studies; the number in parentheses represents the number of studies (k). Below the diagonal, the number represents the weighted average correlation (r) across k studies; parenthetical numbers are the 95% confidence intervals calculated using Fisher’s r-to-z method. Bolded correlation coefficients are significant at the p = .05 level.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attachment Anxiety</td>
<td>X</td>
<td>360 (3)</td>
<td>347 (3)</td>
<td>186 (3)</td>
<td>274 (2)</td>
<td>274 (2)</td>
<td>274 (2)</td>
<td>274 (2)</td>
</tr>
<tr>
<td>2. Sleep Quality</td>
<td>-.25</td>
<td>-.39</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>406 (3)</td>
<td>205 (3)</td>
<td>349 (2)</td>
<td>349 (2)</td>
<td>349 (2)</td>
<td>349 (2)</td>
<td>349 (2)</td>
</tr>
<tr>
<td>3. Negative Partner Interaction Quality</td>
<td>.29</td>
<td>-.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10, .47)</td>
<td>(-.39, -.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Conflict Intensity</td>
<td>.27</td>
<td>-.06</td>
<td>.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.13, .40)</td>
<td>(-.21, .10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Positive Emotions</td>
<td>-.34</td>
<td>-.52</td>
<td>-.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-.44, -.23)</td>
<td>(-.60, -.44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cognitive Experience</td>
<td>-.23</td>
<td>.49</td>
<td>-.30</td>
<td>-.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-.34, -.12)</td>
<td>(.32, .63)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Physical Symptoms of Illness</td>
<td>.28</td>
<td>-.33</td>
<td>.34</td>
<td>-.52</td>
<td>-.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.09, .44)</td>
<td>(-.42, -.24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Health Interfering with Life</td>
<td>.27</td>
<td>.34</td>
<td>.28</td>
<td>-.65</td>
<td>-.47</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.16, .38)</td>
<td>(.24, .44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

121
Appendix I

Ethics Clearance Form

July 17, 2014

Ms. Rachael Quickert
Master’s Student
Department of Psychology
Queen’s University
Kingston, ON, K7L 3N6

GREB Ref #: GPSYC-662-14; Romeo # 6013142
Title: "GPSYC-662-14 Attachment Orientations, Relationship Conflict and Health Behaviour"

Dear Ms. Quickert:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled "GPSYC-662-14 Attachment Orientations, Relationship Conflict and Health Behaviour" for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen’s ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

Joan Stevenson, Ph.D.
Chair
General Research Ethics Board

c: Dr. Tara MacDonald, Faculty Supervisor
   Dr. Stanka Fitneva, Chair, Unit REB
   Ms. Marie Tooley, Dept. Admin.