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GOOD NIGHT, SLEEP TIGHT: EXPLORING THE IMPACT OF SLEEP QUALITY ON INTERPERSONAL EMOTION REGULATION AND RELATIONSHIP SATISFACTION

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I examined how people's sleep quality is associated with how they regulate their partner's emotions, and how sleep quality and interpersonal emotion regulation are linked to relationship satisfaction. Using samples from two studies and data from intake measures, I found evidence of an association between sleep quality over the past month and relationship satisfaction. I also found evidence of an association between sleep quality and concealing emotions, inauthentic displays of emotion, and mood worsening strategies. Further, there was a link between the use of interpersonal emotion regulation strategies and how satisfied people are with their relationships. These results demonstrate that sleep quality is implicated in how partners interact with each other and may have downstream effects for relationship quality.

Keywords: dyadic analyses, interpersonal emotion regulation, relationship satisfaction, romantic relationships, sleep

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Introduction

Have you ever woken up after a bad night's sleep and knew you were going to have a bad day? Maybe you were tired and the lack of sleep put you in a bad mood or made it difficult for you to get along well with the people around you. If you have had this experience, you are not alone. According to the National Sleep Foundation (NSF), most people do not get adequate sleep regularly (2014) and lack of sleep impacts how people interact with those around them (Gordon et al., 2017). People are even less satisfied with their romantic relationships if either partner sleeps poorly (Hasler & Troxel, 2010). Although previous research has examined the impact of poor sleep on relational outcomes, there is not a good understanding of the processes that translate poor sleep into poor relationship quality and satisfaction. I sought to fill this gap by examining interpersonal emotion regulation as a mechanism through which poor sleep impacts relationship satisfaction.

Sleep and Relationships

Sleep is a necessary health behavior that plays an important role in the life of every individual. Everyone needs sleep. However, getting the right quantity and quality of sleep can be difficult. In fact, sleep problems have become a public health epidemic. More than 69% of U.S. adults do not get the recommended amount of sleep (NSF, 2014). In addition to not getting enough sleep, the sleep people are getting is poor quality (NSF, 2013). Subjective ratings of sleep quality and satisfaction, such as reports of how "good" or "poor" one found their sleep to be, are highly correlated with physiological sleep outcomes (Buysse, 2014), thus making self-

reported sleep quality a useful proxy for quantifying a person's sleep. It is important for people to get both an adequate amount of sleep and good quality sleep because poor sleep has been implicated in many health outcomes including morbidity and mortality (Cappuccio et al., 2010), as well as detrimental cognitive, affective, and relational outcomes (Gordon et al., 2017). Although most sleep research focuses on factors that impact an individual's own sleep, sleep has been identified as a dyadic process. In fact, most adults share a bed with their significant other (NSF, 2011), which has prompted some researchers to start investigating sleep in the context of romantic relationships (Chen, 2018; Elsey et al., 2019; Gordon et al., 2017, 2021; Troxel, 2010).

Sleep impacts how people interact with their partners outside of the bedroom and therefore it is important to thoroughly understand the influence of sleep on relational outcomes. In general, people are less satisfied with their relationships and relationship quality suffers if either partner sleeps poorly (Cartwright & Knight, 1987; Hasler & Troxel, 2010; Maranges & McNulty, 2016; Strawbridge et al., 2004; Troxel et al., 2009). This may be due to how sleep affects partner interactions, including their communication, and how they respond to conflict. For example, following nights of longer sleep duration or better sleep quality, people report more positive interactions with their spouse, fewer negative interactions, and higher relationship satisfaction (Yorgason et al., 2018). Conversely, poor sleep is associated with increased daily conflict between partners, more hostility during conflict, as well as decreased empathic accuracy (how accurately one partner can identify and rate the other partner's emotions) between partners, and decreased conflict resolution (Fillo et al., 2017; Gordon et al., 2017; Gordon & Chen, 2014). The relationship characteristics that are negatively impacted by sleep (e.g., negative affect, negative interactions, conflictual communication, and poor listening skills) are hallmarks of distressed relationships (Kiecolt-Glaser & Newton, 2001). Thus, there is evidence that sleep is

important for relationship functioning and maintenance. Although there is a clear link between sleep and relationship outcomes, the mechanisms through which poor sleep translates to poor relationship outcomes is not entirely understood. Some researchers have suggested emotion regulation may be one mechanism (Gordon et al., 2021). I propose that another process through which they are linked is interpersonal emotion regulation. Researchers have established the associations between sleep and interpersonal processes (e.g., conflict resolution, empathic accuracy, etc.), therefore the goal of this project was to explore the under-researched association between sleep and interpersonal emotion regulation.

Sleep and Intrapersonal Emotion Regulation

Sleep impacts the emotions people experience and how they regulate their own emotions. For example, people who do not get enough sleep experience less positive emotions than those who get eight hours or more, and people who do not get good quality sleep experience more negative emotions than those who get adequate sleep (Shen et al., 2018). Indeed, sleep loss is associated with increases in self-reported depressed mood, anger, and frustration (Kahn-Greene et al., 2006). Poor sleep also increases reactivity to negative emotional stimuli (Beattie et al., 2015).

In addition to altering emotional experiences, sleep impacts emotion regulation—intrapersonal emotion regulation (how people regulate their own emotions) and interpersonal emotion regulation (how people regulate the emotions of others). Emotion regulation requires people to monitor, evaluate, and change their emotional behavior through the use of a variety of strategies (which can be adaptive or maladaptive) and entails the regulator to be emotionally and behaviorally flexible (i.e., it requires energy, attention, and flexibility; Gross, 2014). When someone does not get the proper quality and quantity of sleep, their ability to effectively regulate

their emotions is impaired. For example, sleep loss increases people's perceptions of stress and limits their skills to cope with that stress (Killgore et al., 2008), including their abilities to self-regulate (Durmer & Dinges, 2005) and override impulses (Killgore et al., 2008). These findings indicate that poor sleep may lead to a person doing and saying things they otherwise would not via increasing their perceived stress and decreasing their ability to regulate their emotions and actions to cope with that stress. Additionally, sleep loss can make it difficult for people to delay gratification and in return more likely to pursue rewards and rewarding experiences (Killgore et al., 2008) in lieu of working towards their goals.

In addition to decreasing how effective people are at regulating their emotions, sleep modifies the emotion regulation strategies people use, which have consequences for wellbeing and romantic relationships. In cases of extreme sleep loss, people with insomnia who experience low quality sleep, report using maladaptive emotion regulation strategies (e.g., thought suppression: attempting to inhibit emotionally laden thoughts from one's mind; and emotional suppression: attempting to hide emotional experiences from others) more frequently than healthy sleepers, who report using more effective strategies (Harvey, 2001). Use of maladaptive emotional regulation strategies may be due to how poor sleep quality impacts people's ability to use adaptive coping strategies (e.g., cognitive reappraisal) following stressful situations (Mauss et al., 2013). Poor sleep quality is also associated with depressive symptoms, and the association between sleep and depressive symptoms is mediated by maladaptive emotion regulation strategies, which indicates that people who get poor quality sleep have a difficult time choosing appropriate emotion regulation strategies which leads them to experience depressive symptoms (O'Leary et al., 2017). When sleep impairs people's ability to regulate their emotions in times of stress, it affects their well-being as well as their relationships (Gross & John, 2003).

Intrapersonal Emotion Regulation and Relationship Processes

Emotion regulation strategies serve many functions for interpersonal interactions. People must regulate their emotions to be successful in romantic relationships (English et al., 2013; Rusbult & Van Lange, 2003). The emotion regulation strategies people use in their relationships impact their relationship quality and satisfaction—for example, when people are more emotionally expressive during daily interactions they experience more positive emotions (Brans et al., 2013), more intimacy within their relationships (Laurenceau et al., 1998), more acceptance from others, greater relatedness and are more satisfied with their relationships (Cameron & Overall, 2018). For relationships to function well, one must use intrapersonal emotion regulation to express their own emotions and respond to their partner's emotional needs (Gosnell & Gable, 2017).

If someone cannot regulate their emotions adequately it can result in poor relationship functioning. For instance, difficulties with emotion regulation impacts a person's ability to respond to their partner's needs effectively and leads to decreased intimacy (Tani et al., 2015), a protective factor for duration of, satisfaction with, and well-being in a relationship (Raffagnino et al., 2012). Emotion regulation is also associated with a person's ability to enact self-control (Paschke et al., 2016) which is associated with numerous relationship benefits, such as increased levels of perspective-taking, responsiveness, constructive communication, accommodation, sacrifice, forgiveness, reductions in aggressiveness, refraining from the temptation of attractive alternatives, and relationship satisfaction (Karremans et al., 2015; Zuo et al., 2020). To fully understand the factors that influence relationship satisfaction and quality (e.g., closeness, disclosure, responsiveness, etc.), researchers must understand how both partner's emotion regulation impacts those factors and subsequent relational outcomes.

Sleep impacts emotion regulation, including how people identify and respond to their partner's emotions. For instance, poor sleep quality makes people less accurate at identifying their partner's emotions (Killgore et al., 2017; van der Helm et al., 2010), less able to empathize with their emotions (Guadagni et al., 2014, 2018), and less capable of using emotion regulation strategies during stressful times in the relationship (Mauss et al., 2013). Without these abilities and appropriate strategies, people might respond poorly to their partner and make stressful situations worse. As sleep is essential to perspective-taking and the ability to cooperate to solve problems (Guadagni et al., 2018), it will impact how people respond to conflicts within the relationship. In other words, poor sleep may modulate a person's ability to regulate their emotions and this difficulty may have consequences for their relationships.

It is common for romantic partners to have conflicting interests or desire different things in a relationship (Rusbult & Van Lange, 2003). When these situations occur, people must use complex processes to consider both partners' needs before making decisions that affect the relationship. Interdependence theory explains how these considerations impact interactions between partners, and that relational interdependence sometimes results in transformation of motivation, or a shift from self-interest to partner and relationship interest, and may result in partners using accommodation or being willing to sacrifice (Etcheverry & Le, 2005; Rusbult & Van Lange, 2003). Both accommodation and sacrifice require using emotion regulation strategies to cooperate, solve problems, and maintain the relationship. Accommodation—responding constructively to a partner's destructive relationship behaviors—requires a partner to pause and regulate their emotions to prevent engaging in retaliation (Rusbult et al., 1991), and relationship functioning is enhanced when partners can inhibit impulses to react destructively during times of relationship distress (Rusbult & Buunk, 1993). Sacrifice—forgoing self-interest

to promote the well-being of a partner or a relationship—is important for relationship satisfaction and personal well-being (Van Lange et al., 1997). Emotion regulation is necessary to put one's partner ahead of one's own needs and is important for relationship satisfaction and quality, but it is negatively impacted by sleep.

On top of impeding these protective relationships processes, poor sleep also increases destructive processes. For example, poor sleep leads to poor self-regulation which impacts a person's ability to suppress their emotions and can result in them being mean to their partner (Baumeister & Vohs, 2016). Sleep loss can also lead to lower frustration tolerance, an increase in blaming others for problems (Kahn-Greene et al., 2006), and greater likelihood to react impulsively during conflict (Killgore et al., 2008). If partners are unable to self-regulate, they will not be able to respond to their partner's needs and intimacy suffers. Three hallmarks of distressed marriages are high levels of negative affect, conflictual communication, and poor listening skills (Kiecolt-Glaser & Newton, 2001), which are all impacted by poor sleep (Daniela et al., 2010; El-Sheikh et al., 2013; Lim & Dinges, 2010).

Interpersonal Emotion Regulation

In relationships people not only regulate their own emotions, but also their partner's emotions (Austin & O'Donnell, 2013; Niven et al., 2011; Nozaki & Mikolajczak, 2020; Zaki & Williams, 2013). When someone tries to regulate another person's emotions, it is referred to as interpersonal emotion regulation or extrinsic emotion regulation, and it can be accomplished in many ways. Some of the ways people attempt to regulate their partner's emotions, and the strategies that I will focus on in this project are: mood enhancing, diverting attention, concealing emotions, inauthentic displays of emotion, and mood worsening.

Mood enhancing. People try to regulate others' emotions through empathic, supportive,

and prosocial behaviors (Batson, 2011) as an effort to enhance the mood of the other person (Austin & O'Donnell, 2013; Niven et al., 2011; Nozaki & Mikolajczak, 2020; Zaki & Williams, 2013). This is done as an attempt to boost the target's mood to make them feel better. Mood enhancement attempts can also be made through offering reassurance, showing understanding, and allowing the other person to express their feelings (Austin & O'Donnell, 2013). It is important for partners to allow each other to express their feelings because processes such as social sharing can soften the impact of negative experiences when others respond supportively (Nils & Rimé, 2012), which can be done via situation-specific emotional support (Lepore, 1992) and comforting messages (Burleson, 1985).

Another way people can attempt to enhance their partner's mood is through capitalization—responding to positive events by celebrating or sharing good news with others and thereby deriving additional benefit from the positive experience—which increases positive affect surrounding positive events (Gable & Reis, 2010; Langston, 1994). How a person's partner responds to capitalization attempts are important (Gable et al., 2004) and successful capitalization is associated with greater feelings of well-being as well as satisfaction and intimacy in the relationship (Gable & Reis, 2010). People may also need to downregulate their partner's negative emotions via providing social support. Humans often regulate their own emotions by reaching out to others for support during times of distress (Kennedy-Moore & Watson, 2001; Zaki & Williams, 2013) and using others' support to dampen that stress (Uchino et al., 1996). This drives the provision of social support to others when they are experiencing stress as well, which can buffer stress and negative emotions for the receiver (Heinrichs et al., 2003; Uchino & Garvey, 1997) and help to downregulate their negative emotions.

A person might try to enhance their partner's mood during times of distress as a way to

regulate the partner's emotions and improve the partner's mood, but their ability to do so may be impacted by poor sleep. In order to effectively regulate someone else's emotions, the regulator must choose a tailored regulation strategy that fits the needs of the target, which requires effective self-other distinction, perspective taking, and a correct assessment of the other person's needs (Nozaki & Mikolajczak, 2020; Steinbeis, 2016). I posit that mood enhancing attempts are negatively impacted by poor sleep (i.e., poor sleep quality will be associated with less attempts to enhance the mood of the partner) given that poor sleep decreases a person's ability to pay attention to others (Lim & Dinges, 2010), identify their emotions (van der Helm et al., 2010), take their perspective, and empathize with them (Guadagni et al., 2018). Predictions regarding use of mood enhancing strategies are solely for actor effects (how one person's own sleep is associated with their own use of mood enhancing tactics on their partner) as I have no predictions about partner effects (how one's sleep is associated with how the partner uses mood enhancing strategies on oneself) and analyses investigating partner effects will be exploratory. Further, because mood enhancing strategies are used to help the partner manage their distress and to improve their mood, and dyadic coping is associated with relationship satisfaction for both members of a couple (Bodenmann et al., 2006), mood enhancing may be associated with relationship satisfaction for both people in the relationship. Mood enhancing also allows the receiver to express their emotions—which is associated with relationship satisfaction (Cameron & Overall, 2018)—so more mood enhancing attempts should lead to being more satisfied with the relationship (i.e., there should be a positive association between actor use of mood enhancing strategies and relationship satisfaction for both actors and partners).

Diverting attention. Another way people can regulate their partner's emotions is through diverting their partner's attention to enhance their mood (Austin & O'Donnell, 2013; Niven et

al., 2011). When someone is distressed, others can try to distract them or divert their attention by being positive, using humor, or arranging an enjoyable activity (Austin & O'Donnell, 2013; Francis et al., 1999). These strategies require a person to not only recognize their partner's distress but also to choose to try to improve it by distracting them. Poor sleep could easily impact effective use of this strategy by limiting the regulator's ability to pay attention to their partner's needs (Lim & Dinges, 2010) and their executive functions (Durmer & Dinges, 2005). This strategy may be especially difficult if the partner is not being open about their distress and only sharing subtle emotional cues, as this would require the regulator to be able to focus their attention on their partner to notice the cues and also redirect their attention when necessary (Whitney et al., 2017) which are impaired by poor sleep (Lim & Dinges, 2010). This may be why people are less accurate at identifying the emotions of others when they do not get good sleep (van der Helm et al., 2010) and makes them less able to take others' perspectives (Guadagni et al., 2018).

Choosing to actively support a partner and maintain a relationship requires a person to employ appropriate self-regulation and initiate behaviors related to long-term or abstract goals (Karremans et al., 2015). However, poor sleep affects a person's ability to initiate these behaviors and may decrease their motivation to work towards these goals (Chattu et al., 2018) which may affect how they choose to regulate their partner's emotions. I posit that attempts to divert a partner's attention are negatively impacted by poor sleep (i.e., poor sleep quality will be associated with less efforts to divert the partner's attention). Predictions regarding use of attention diverting strategies are solely for actor effects (how one's own sleep is associated with their own use of attention diverting tactics on their partner) as I have no predictions about partner effects (how one's sleep is associated with how their partner uses attention diverting strategies on

oneself) and analyses investigating partner effects will be exploratory. Further, similarly to mood enhancing, attention diverting attempts by one person may be associated with relationship satisfaction for both people in the relationship. Diverting a partner's attention involves using tactics such as humor, which is associated with relationship satisfaction when shared between partners (Hall, 2017). Because attention diverting strategies are used to improve the other person's mood, they should be associated with relationship satisfaction for both individuals (i.e., there should be a positive association between actor use of attention diverting strategies and relationship satisfaction for both partners).

Concealing emotions. In addition to trying to improve a partner's mood, people may also use more neutral strategies such as concealing their own emotions from their partner as a way to regulate the partner's emotions (Austin & O'Donnell, 2013). If someone is in a bad mood or experiencing stress, they can conceal their own emotions in an attempt to regulate their partner's mood and to prevent their partner from also feeling bad as a result of emotional mimicry (Hess & Fischer, 2013) or emotional contagion (Hatfield et al., 2014). Emotions between romantic partners can become linked across time (Sels et al., 2020) and negative emotions and stress can spill over into relationships (Larson & Almeida, 1999). Although someone may conceal their emotions from their partner for pro-social reasons, such as trying to prevent this spillover, concealing emotions from one's partner may be detrimental to the relationship. People share their emotions with others to feel better; receive comfort, validation, or other forms of emotional support, and promote closeness in their relationships (Rimé, 2007, 2009). Self-disclosure and responsiveness are imperative for intimacy in relationships (Reis & Shaver, 1988). So, if partners are not sharing their emotions with each other, the relationship might suffer. However, how emotions are shared may be impacted by sleep. Sleep loss leads to

social withdrawal (Simon & Walker, 2018), and higher use of maladaptive emotion regulation strategies, such as suppression (Harvey, 2001), which can be employed to avoid conflicts with others (English et al., 2017), but also result in less acceptance from others, more distancing, and less relationship satisfaction (Cameron & Overall, 2018). Poor sleep quality may have similar effects and lead to withdrawing from partners and concealing emotions.

I posit that mood concealing attempts are positively associated with poor sleep (i.e., poor sleep quality will lead to more mood concealing attempts). Predictions regarding use of mood concealing strategies are solely for actor effects (how one's own sleep is associated with their own use of mood concealing tactics on their partner) as I have no predictions about partner effects (how one's sleep is associated with how their partner uses mood concealing strategies on oneself) and analyses investigating partner effects will be exploratory. Further, given the association between emotional suppression and relationship satisfaction (Cameron & Overall, 2018), as well as the importance of authenticity and self-disclosure in relationships (Gross & Levenson, 1997), more mood concealing attempts should lead to both people being less satisfied with their relationship (i.e., there should be a negative association between actor use of mood concealing strategies and relationship satisfaction for both partners).

Inauthentic displays of emotion. People can also try to regulate their partner's mood by being inauthentic in how they display their emotions to their partner. This is done for self-serving purposes and can include using niceness or flattery, sulking, or trying to induce guilt, sympathy, or jealousy on another person (Austin & O'Donnell, 2013). People may manage the emotions of others by purposely manipulating them (Andrade et al., 2009) and making them feel guilty for their own personal gains (Vangelisti et al., 1991). Because poor sleep decreases the ability to take the perspective of others and cooperate (Guadagni et al., 2018) and to be empathetic

towards others (Killgore et al., 2008), poor sleep may lead to using inauthentic displays of emotion in order to get what they want rather than using more appropriate emotion regulation strategies when communicating with the partner. Poor sleep also decreases self-regulation and self-control (Hisler & Križan, 2019), which may lead to resorting to more manipulative strategies to achieve their goals with the partner rather than doing what is in the best interest of the relationship (e.g., sacrificing or accommodating their partner). People often fail at effectively regulating their own emotions (Gross, 2014), and this difficulty only increases when they aren't getting good quality sleep (Goldschmied, 2019; Harvey, 2001). This coupled with the finding that one experiences more negative emotions when not getting sufficient sleep (Daniela et al., 2010; Franzen & Buysse, 2008; Kahn-Greene et al., 2007; Shen et al., 2018) highlights why people might have difficulty regulating the emotions of their partner or choose to use negative interpersonal emotion regulation strategies when they are not getting good quality sleep. The use of inauthentic displays of emotion may have negative consequences for the relationship, but research also supports this notion—behaviors such as sulking for one's own benefit during a conflict with one's partner are linked with lower relationship satisfaction for both the actor and the partner (Knobloch & Basinger, 2021).

I posit that inauthentic displays of emotion are positively linked with poor sleep (i.e., poor sleep quality will be associated with more inauthentic displays of emotion). Predictions regarding inauthentic displays of emotion are solely for actor effects (how one person's own sleep is associated with their own use of inauthentic emotional tactics on their partner) as I have no predictions about partner effects (how one's sleep is associated with how their partner uses displays of inauthentic emotions on oneself) and analyses investigating partner effects will be exploratory. Further, more inauthentic displays of emotion should lead to both partners being

less satisfied with their relationship (i.e., there should be a positive association between actors inauthentically displaying emotion to their partner and relationship satisfaction for both individuals).

Mood worsening. Finally, people use mood worsening tactics such as the use of criticism and negative comments, undermining their confidence, and displaying anger to regulate their partner's emotions (Austin & O'Donnell, 2013; Niven et al., 2011). People also manipulate their partner's emotions to promote their own objectives (Andrade et al., 2009). Sleep may impact these mood worsening tactics. Sleep loss can lead to increases in negative emotions (Daniela et al., 2010; Franzen & Buysse, 2008; Kahn-Greene et al., 2007; Shen et al., 2018), lower frustration tolerance, increase in blaming others for problems, and reduced willingness to accept blame during conflict (Kahn-Greene et al., 2006). Poor sleep quality is also associated with disinhibition of aggressive behavior (Denis & Poerio, 2017) and leads to more conflict in relationships (Gordon & Chen, 2014). If people cannot effectively inhibit their aggression during conflicts, they may lash out at their partner and criticize them or make negative comments that they otherwise would not make. Sleep loss and poor sleep quality may also increase use of mood worsening tactics by making people less able to empathize with their partner (Guadagni et al., 2018) and more likely to react impulsively during conflict (Killgore et al., 2008). These behaviors and consequences of poor sleep have implications for the relationship, as negative affect, negative interactions, and conflictual communication are indicative of distressed relationships (Kiecolt-Glaser & Newton, 2001).

I posit that that mood worsening attempts are positively linked with poor sleep (i.e., poor sleep quality will be associated with more mood worsening attempts). Predictions regarding use of mood worsening strategies are solely for actor effects (how one person's own sleep is

associated with their own use of mood worsening tactics on their partner) as I have no predictions about partner effects (how one's sleep is associated with how their partner uses mood worsening strategies on oneself) and analyses investigating partner effects are exploratory. Further, because mood worsening tactics are meant to negatively impact another's mood, more mood worsening attempts by either partner should lead to less satisfaction in the relationship (i.e., there should be a negative association between actor use of mood worsening strategies and both partners' relationship satisfaction).

People who get poor sleep might have trouble regulating their partner's emotions effectively. In reviewing the literature, I have demonstrated that intrapersonal emotion regulation is impaired by sleep. It is reasonable to assume that interpersonal emotion regulation is impaired by sleep as well, but to my knowledge, there is no research that investigates this relationship. I aimed to examine the link between sleep and interpersonal emotion regulation.

The Current Study

I used dyadic data in two studies to investigate the associations between sleep quality, interpersonal emotion regulation strategies (mood enhancing, diverting partner attention, concealing emotions, inauthentic displays of emotion, and mood worsening), and relationship satisfaction. In the current studies, I used intake data from both partners within couples to measure actor and partner effects of sleep quality on interpersonal emotion regulation strategies, and actor and partner effects of these strategies on both people's relationship satisfaction. A figure of the conceptual model can be found on page 91. Given the importance of replication, analyses were conducted using data from two community samples, one sample recruited online and one sample recruited in-person, to assess if the findings would replicate across multiple samples.

I expected that when people experience poorer quality sleep they would use less mood enhancing and attention diverting strategies, more emotion concealing, inauthentic displays of emotion, and mood worsening strategies to regulate their partner's mood, and these effects would result in themselves and their partner being less satisfied with the relationship. I only had predictions for actor effects in the first part of my model, I did not have any predictions for how sleep quality would affect partner use of interpersonal emotion regulation strategies.

Study 1

Method

Participants and procedures

As a part of a larger study on romantic relationships, a community sample of 56 cohabitating mixed-gender couples (N = 112 people) were recruited through online advertisements, local newspapers, in-person recruitment at local gyms, and on online university advertisements for faculty and staff. In order to participate, participants had to be in a mixed-gender relationship and cohabitating with their partner, both partners had to agree to participate, partners had to be at least 18 years old, speak fluent English, have daily access to the internet and be comfortable using computers. This study had a physical exercise component as well, thus, at least one partner had to have engaged in exercise twice per week for 30 minutes or more in the two weeks prior to participating, and have intentions to engage in physical exercise three times per week for at least 30 minutes during the two weeks they were involved in the study.

There were three phases of the study. In the first phase of the study, both members of each couple came into the lab together for a 2.5-hour intake session, consisting of completing questionnaires, cognitive tasks, and discussions. Each partner received $25 for completing this phase. The second phase of the study lasted two weeks, during which participants completed short questionnaires and cognitive tasks four times per day, completed nightly surveys, wore actigraph activity monitors during the first week, and provided saliva samples three times per day during the first week. Participants received $70 for completing this phase of the study and were eligible for an additional $40 if they completed at least 80% of the assessments in this

phase. In the third phase of the study participants came back into the lab for a 30-minute exit session, during which they completed further questionnaires and cognitive measures. They received $5 for this session.

In the current study, I used data from the in-lab intake session only. Half (50%) of the participants were female (50% male), 79.5% were White (8.9% Black; 3.6% Native American or Native Alaskan; 7.2% "other"), and on average were 43.64 years old (*SD* = 14.53, range = 20-74). Most (82%) participants were employed (17% retired). Personal income varied: Less than $20,000 (14.3%), $20,000-59,999 (21.4%), $60,000-79,999 (17.9%), $80,000-99,999 (19.6%), $100,000-149,999 (19.6%), and $150,000 or more (7.1%). Participants had 2.23 children on average (*SD* = 1.05. range = 1-4), and an average relationship length of 14.2 years (*SD* = 13.00 years, range = 1-50 years).

Measures

Managing Emotions of Others. Participants responded to items regarding how they tried to manage their partner's emotions using the Managing Emotions of Others Scale (Austin & O'Donnell, 2013), which was modified to be specific to the participant's romantic partner (see Appendix A). The measure consists of 25 items in total, which assess five subscales using five items per subscale. Items for each subscale were averaged together to create composite scores. All items were rated on 7-point scales (1 = *strongly disagree* to 7 = *strongly agree*). The mood-enhancing subscale assessed participants' efforts to enhance their partner's mood (e.g., "If my partner is anxious, I try to reassure him/her"), the diverting partner attention subscale assessed participants diverting their partner's attention when the partner is experiencing negative emotions (e.g., "When my partner is in a bad mood, I try to divert him/her by telling jokes or funny stories"), the concealing emotions subscale assessed participants concealing their own

emotions from their partner (e.g., "I hide my feelings so my partner won't worry about me"), the inauthentic displays of emotions subscale assessed participants' display of inauthentic emotions in order to modify their partner's behaviors (e.g., "I sometimes sulk to get my partner to change his/her behavior"), and the mood-worsening subscale assessed participants' efforts to worsen their partner's mood (e.g., "I can make my partner feel anxious so that he/she will act in a particular way"). Descriptive statistics for subscales can be found in the Study 1 column of Table 1.

Sleep. Sleep quality was assessed with 12 items from the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). Difficulty participants had sleeping over the past month was assessed with 11 items (e.g., "how often have you had trouble sleeping because you woke up in the middle of the night or early morning?"). Items were rated on 4-point scales (1 = *not during the past month* to 4 = *three or more times a week*). Overall sleep quality was assessed with one item, "During the last month would you rate your sleep quality overall as…", which was rated on a 4-point scale (1 = *very bad* to 4 = *very good*). The item assessing overall sleep quality was reverse scored then all items were averaged together to create a composite global sleep score for each participant (M = 1.81, SD = .43, α = .71), with higher scores reflecting poorer sleep. See Appendix B for items.

Relationship Satisfaction. Participants responded to two items (see Appendix C) regarding how satisfied they are in their relationship, using items adapted from the Investment Model Scale (Rusbult et al., 1998). The two items, " I feel satisfied with my partner" and "I feel close to my partner" were rated on 7-point scales (1 = *strongly disagree* to 7 = *strongly agree*) and were averaged together to create a composite satisfaction score (M = 6.52, SD = .98, α = .91).

Results

Analysis Strategy

I analyzed the data using path models in MPlus 7 (Muthén & Muthén, 1998). I conducted dyadic analyses to examine both actor and partner effects and the similarity between the partners on each construct. In the first model, I examined the associations between actor and partner sleep and their effects on actor and partner relationship satisfaction, allowing actor and partner sleep to covary and actor and partner satisfaction to covary. In the second set of models (see Figure 1 for the conceptual model and Appendix D for sample syntax), I examined management of emotions as potential mediators between sleep and relationship satisfaction. In each of the models, actor and partner sleep each predicted both actor and partner management of emotions, which in turn predicted both actor and partner relationship satisfaction. I also included a direct effect between actor's own sleep and their own relationship satisfaction. Thus, the model is an indirect effects model, where I examine the associations between sleep and relationship satisfaction directly and through management of emotions, with a dyadic setup that includes both actor and partner effects. I allowed covariances between actor and partner sleep, management of emotions, and relationship satisfaction. All paths were examined for gender differences, and none were found, so paths for men and women were constrained to be equal in all models to increase power for the analyses.

I ran separate models for each management of emotions subscale. Model fit for each model was evaluated based on chi-square (nonsignificant value indicates good fit), root mean square error of approximation (RMSEA; values below .05 indicate good fit), comparative fit index (CFI; values above .95 indicate good fit), and standardized root mean square residual (SRMR; values below .08 indicate good fit; Kline, 2011). For each model, I present standardized

estimates with their 95% confidence intervals, standard errors of estimate, and p-values. Standardized estimates for men and women differ even when they are constrained to be equal, due to standardization (constraints are imposed on the unstandardized estimates).

Results for Basic Sleep and Satisfaction Model

In the first analysis, I ran a model where actor and partner sleep both predicted both actor and partner relationship satisfaction. I also allowed actor and partner sleep to covary and actor and partner satisfaction to covary. Results showed a direct association between sleep and relationship satisfaction, such that poorer quality actor sleep predicted lower actor relationship satisfaction (women: β = -.26, SE = .09, p = .005, 95% CI [-.45, -.08]; men: β = -.20, SE = .07, p = .006, 95% CI [-0.34, -.06]). Actor sleep quality did not predict partner relationship satisfaction (women: β = -.13, SE = .08, p = .101, 95% CI [-.29, .03]; men: β = -.15, SE = .09, p = .096, 95% CI [-.32, .03]). There was a marginal association between actor and partner sleep quality (β = .23, SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction did covary significantly (β = .62, SE = .09, p < .001, 95% CI [.45, .78]). The model fit the data well: $\chi 2$ (2) = .699, p = .705; RMSEA = .000, p = .738 [90% CI: 0.000, 0.194]; CFI = 1.000; SRMR = .042. Given that there were no direct effects between actor sleep and partner relationship satisfaction I did not estimate these paths in the indirect effects models.

Results for Indirect Effects Models

Mood-Enhancing. Next, I ran a model where actor and partner sleep both predicted both actor and partner use of mood-enhancing tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. Results showed evidence of a direct association between sleep and relationship satisfaction, such that poorer quality actor sleep predicted lower actor relationship satisfaction (women: β = -.24, SE =

.09, p = .010, 95% CI [-.42, -.06]; men: β = -.18, SE = .07, p = .009, 95% CI [-.32, -.05]). Neither actor sleep quality (women: β = .15, SE = .11, p = .150, 95% CI [-.05, .36]; men: β = .11, SE = .08, p = .157, 95% CI [-.04, .27]) nor partner sleep quality (women: β = .05, SE = .09, p = .562, 95% CI [-.12, .23]; men: β = .06, SE = .10, p = .568, 95% CI [-.14, .26]) predicted actor use of mood enhancing tactics on their partner. Actor use of mood enhancing tactics predicted higher actor relationship satisfaction (women: β = .33, SE = .08, p < .001, 95% CI [.17, .49]; men: β = .34, SE = .09, p < .001, 95% CI [.18, .51]), such that the more actors tried to enhance their partner's mood, the more satisfied actors were with their relationship. Partner use of mood enhancing tactics did not predict actor relationship satisfaction (women: β = .10, SE = .10, p = .294, 95% CI [-.09, .29]; men: β = .07, SE = .07, p = .293, 95% CI [-.06, .20]). Actor and partner sleep covaried marginally (β = .23, SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction did significantly covary (β = .60, SE = .09, p < .001, 95% CI [.43, .78]). Actor and partner use of mood enhancing tactics also covaried significantly (β = .29, SE = .12, p = .017, 95% CI [.05, .54]). Given that actor and partner sleep were not associated with actor and partner mood enhancing, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (7) = 9.104, p = .245; RMSEA = .073, p = .334 [90% CI: 0.000, 0.190]; CFI = .959; SRMR = .090. A model with the significant paths highlighted can be found in the top part of Figure 2.

Diverting Partner Attention. Next, I ran a model where actor and partner sleep both predicted both actor and partner use of attention diverting tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. The direct association between sleep and relationship satisfaction was significant, such that poorer quality actor sleep predicted lower actor relationship satisfaction (women: β = -.20, SE =

.09, p = .027, 95% CI [-.39, -.02]; men: β = -.16, SE = .07, p = .025, 95% CI [-.29, -.02]). Neither actor sleep quality (women: β = .09, SE = .09, p = .352, 95% CI [-.10, .27]; men: β = .09, SE = .10, p = .354, 95% CI [-.10, .29]) nor partner sleep quality (women: β = -.02, SE = .08, p = .859, 95% CI [-.18, .15]; men: β = -.02, SE = .11, p = .860, 95% CI [-.23, .20]) predicted actors diverting their partner's attention. Neither actor (women: β = .09, SE = .10, p = .374, 95% CI [-.11, .29]; men: β = .07, SE = .07, p = .379, 95% CI [-.08, .21]) nor partner (women: β = -.09, SE = .09, p = .328, 95% CI [-.27, .09]; men: β = -.09, SE = .09, p = .327, 95% CI [-.26, .09]) diverting of their partner's attention predicted actor relationship satisfaction. Actor and partner sleep covaried marginally (β = .23, SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction covaried significantly (β = .64, SE = .08, p < .001, 95% CI [.48, .80]). Actor and partner diverting their partner's attention did not covary significantly (β = .14, SE = .08, p < .291, 95% CI [-.12, .40]). Given that actor and partner sleep were not associated with actor and partner attention diverting tactics, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (7) = 4.405, p = .732; RMSEA = .000, p = .797 [90% CI: 0.000, 0.120]; CFI = 1.000; SRMR = .066. A model with the significant paths highlighted can be found in the top part of Figure 3.

Concealing Emotions. Next, I ran a model where actor and partner sleep both predicted both actor and partner concealing of their own emotions which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. The direct association between sleep and relationship satisfaction was significant, such that poorer quality actor sleep predicted lower actor relationship satisfaction (women: β = -.18, SE = .09, p = .038, 95% CI [-.36, -.01]; men: β = -.14, SE = .07, p = .035, 95% CI [-.27, -.01]). Neither actor sleep quality (women: β = .07, SE = .10, p = .465, 95% CI [-.12, .27]; men: β = .06, SE = .09, p =

.466, 95% CI [-.11, .23]) nor partner sleep quality (women: β = .10, SE = .09, p = .304, 95% CI [-.09, .28]; men: β = .10, SE = .10, p = .292, 95% CI [-.09, .29]) predicted actors trying to conceal their emotions from their partner. Actor use of mood concealing tactics predicted lower actor relationship satisfaction (women: β = -.29, SE = .08, p = .001, 95% CI [-.46, -.13]; men: β = -.26, SE = .08, p = .001, 95% CI [-.41, -.10]), such that the more actors tried to hide their emotions from their partner the less satisfied they were in their relationship. Partner use of mood concealing tactics did not predict actor relationship satisfaction (women: β = -.08, SE = .09, p = .395, 95% CI [-.26, .10]; men: β = -.06, SE = .07, p = .390, 95% CI [-.21, .08]). Actor and partner sleep covaried marginally (β = .23, SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction covaried significantly (β = .62, SE = .08, p < .001, 95% CI [.46, .79]). Actor and partner use of emotion-concealing tactics also covaried significantly (β = .33, SE = .12, p = .005, 95% CI [.09, .57]), such that partners were similar in the degree to which they tried to conceal their emotions from each other. Given that actor and partner sleep were not associated with actor and partner mood concealing, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (7) = 8.595, p = .283; RMSEA = .064, p = .376 [90% CI: 0.000, 0.184]; CFI = .966; SRMR = .069. A model with the significant paths highlighted can be found in the top part of Figure 4.

Inauthentic Displays of Emotion. Next, I ran a model where actor and partner sleep both predicted both actor and partner inauthentic displays of emotions which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. In this model, the direct association between actor sleep and actor relationship satisfaction was not significant (women: β = -.17, SE = .09, p = .067, 95% CI [-.35, .01]; men: β = -.13, SE = .07, p = .062, 95% CI [-.27, .01]). Actor sleep quality predicted higher actor

inauthentic displays of emotions to their partner (women: β = .23, SE = .10, p = .017, 95% CI [.04, .42]; men: β = .19, SE = .08, p = .022, 95% CI [.03, .36]) such that the poorer quality sleep people experienced, the more likely they were to display inauthentic emotions to their partner. Partner sleep quality did not predict actor inauthentic displays of emotion to their partner (women: β = .17, SE = .09, p = .066, 95% CI [-.01, .35]; men: β = .17, SE = .09, p = .056, 95% CI [-.05, .35]). Actor inauthentic displays of emotion did not predict actor relationship satisfaction (women: β = -.10, SE = .09, p = .241, 95% CI [-.28, .07]; men: β = -.10, SE = .08, p = .245, 95% CI [-.26, .07]), but partner inauthentic displays of emotions did predict lower actor relationship satisfaction (women: β = -.20, SE = .09, p = .032, 95% CI [-.38, -.02]; men: β = -.16, SE = .08, p = .041, 95% CI [-.31, -.01.08]), such that the more inauthentic people's partners were in the way the expressed their emotions, the less satisfied people were with their relationship. Actor and partner sleep covaried marginally (β = .23, SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction covaried significantly (β = .60, SE = .09, p < .001, 95% CI [.43, .77]). Actor and partner use of inauthentic displays of emotion did not covary significantly (β = .21, SE = .13, p = .106, 95% CI [-.04, .46]). There were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (7) = 5.578, p = .590; RMSEA = .000, p = .675 [90% CI: 0.000, 0.143]; CFI = 1.000; SRMR = .057. A model with the significant paths highlighted can be found in the top part of Figure 5.

Mood-Worsening. Next, I ran a model where actor and partner sleep both predicted both actor and partner use of mood-worsening tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. In this model, the direct association between actor sleep and actor relationship satisfaction was not significant (women: β = -.08, SE = .08, p = .311, 95% CI [-.24, -.08]; men: β = -.06, SE = .06, p = .305, 95%

CI [-.19, .06]). Actor sleep quality predicted higher actor use of mood worsening tactics on their partner (women: β = .27, SE = .10, p = .004, 95% CI [.09, .46]; men: β = .25, SE = .09, p = .004, 95% CI [.08, .42]), such that actors who experienced poorer sleep quality were more likely to try to worsen their partner's mood in order to modify their partner's behavior. Partner sleep quality did not predict actor use of mood worsening tactics on their partner (women: β = .06, SE = .09, p = .549, 95% CI [-.11, .23]; men: β = .07, SE = .10, p = .493, 95% CI [-.21, .25]). Both actor use of mood worsening tactics (women: β = -.52, SE = .07, p < .001, 95% CI [-.65, -.39]; men: β = -.47, SE = .07, p < .001, 95% CI [-.61, -.32]) and partner use of mood worsening tactics (women: β = -.26, SE = .07, p < .001, 95% CI [-.40, -.12]; men: β = -.23, SE = .07, p <.001, 95% CI [-.35, -.10]) predicted lower actor relationship satisfaction, such that the more actors and partners tried to worsen each other's mood, the less satisfied they both were with their relationship. Actor and partner sleep covaried marginally (β = .23, -.26-SE = .13, p = .073, 95% CI [-.02, .48]), but actor and partner relationship satisfaction significantly covaried (β = .48, SE = .10, p < .001, 95% CI [.28, .69]). Actor and partner use of mood worsening tactics covaried marginally (β = .24, SE = .13, p = .061, 95% CI [-.01, .49]). A model with the significant paths highlighted can be found in the top part of Figure 6.

In testing the indirect effects, I found a significant indirect effect between actor sleep quality and actor relationship satisfaction through actor use of mood worsening tactics (women: β = -.14, SE = .05, p = .006, 95% CI [-.24, -.04]; men: β = -.12, SE = .04, p = .008, 95% CI [-.20, -.03]), such that when people had poorer sleep quality they were more likely to try to worsen their partner's mood, and trying to worsen their partner's mood was associated with themselves being less satisfied with their relationship. No other indirect pathways were significant. The model fit the data well: $\chi 2$ (7) = 5.369, p = .615; RMSEA = .000, p = .697 [90% CI: 0.000,

0.139]; CFI = 1.000; SRMR = .066.

Study 2

Method

Participants and procedures

As a part of a larger study on romantic relationships, a community sample of cohabitating couples (N = 233 people) were recruited through online advertisements posted on sites for major cities across the United States (e.g., Craigslist) and online university advertisements for faculty and staff at Kent State University. In order to participate, participants had to be at least 18 years old, speak fluent English, have daily access to the internet, be cohabitating with their partner, and both partners had to participate.

Couples who met the eligibility criteria were sent a link to an online consent form and an intake questionnaire, then when both partners have completed the intake questionnaire, they completed a nightly online questionnaire prior to going to bed each day for a period of two weeks. Participants were each compensated $15 for the intake survey and $30 for the daily diaries if they completed at least 80% of the surveys (those who completed less than 80% received $2 per survey) via an online gift card of their choice (Amazon, Walmart, or Target). In the current study, I used data from the intake session only. I intended to use the full sample in the analyses, but due to finding some gender differences in the initial analyses, I was only able to use data from 104 mixed-gender couples (N = 208), as testing gender effects required restricting the sample to couples who were in mixed-gender relationships. Of the participants retained in the final analyses, 50% were female (50% male), mostly (86.3%) White (7.5% Hispanic, 6.6% Black, 7.6% "Other"), and on average, 32.29 years old (SD = 7.67, range = 19-68). Participants

were mostly (82.1%) employed (16.5% unemployed, .9% retired). Personal incomes varied: less than $20,000 (26.4%), $20,000-39,999 (33.0%), $40,000-59,999 (22.2%), $60,000-79,999 (9.0%), over $80,000 (8.9%). Participants had an average relationship length of 7.66 years (*SD* = 5.91 years, range = 7 months–29.67 years); lived with their partner for an average of 5.51 years (*SD* = 3.47 years, range = 0 months–12.75 years); and had 2.29 children on average (*SD* = 1.35, range = 0-8).

Measures

Managing Emotions of Others. The same adapted version of The Managing Emotions of Others Scale (Austin & O'Donnell, 2013) that was used in Study 1 was also used in Study 2 (see Appendix A). Descriptive statistics for subscales can be found in the Study 2 column of Table 1.

Sleep. Sleep quality was assessed via three items (see Appendix B). Two items were part of a health behavior measure developed for the study. Participants responded to the items "during the past month, tell me how many days you slept 8 hours" and "during the past month, tell me how many days you felt rested after sleeping", which were both rated on 5-point scales (1 = *not at all* to 5 = *every day*). The third item from the Hopkins Symptom Checklist (Derogatis et al., 1974) assessed difficulty sleeping (i.e., "Please indicate how often you've experienced the following over the past month: difficulty in falling or staying asleep"), and was rated on a 5-point scale (1 = *none at all* to 5 = *very much*). The item assessing difficulty sleeping was reverse scored and averaged with the other two items to create a composite global sleep score for each participant (*M* = 3.22, *SD* = .89, α = .64), with higher scores reflecting better sleep.

Relationship Satisfaction. Participants responded to three items (see Appendix C) regarding how satisfied they were in their relationship using an adapted version of the

Investment Model Scale (Rusbult et al., 1998). The items (i.e., “my relationship is close to ideal”, “ I feel satisfied with my relationship”, and “I feel close to my partner”) were rated on 7-point scales (1 = *strongly disagree* to 7 = *strongly agree*) and were averaged together to create a composite satisfaction score (M = 6.18, SD = 1.23, α = .93).

Results

Analysis Strategy

The data were analyzed as described above in Study 1, beginning with analysis of the basic model using only sleep and relationship satisfaction, followed by indirect effects models for each emotion management subscale. In order to test for any potential gender differences, I started the analyses freely estimating all paths. Where the effects for men and women were not significantly different (i.e., confidence intervals overlapped), I constrained the effects to be equal across men and women (doubling the sample size for the estimations of those paths) to increase power. Where the estimates for men and women were not similar, I conducted the chi-square difference test at 1 degree of freedom with a critical value of 3.841 to see if constraining the paths across men and women would result in a significant drop in model fit. If the constraint did not result in a significant decrease in model fit, I retained the constraint for the paths to increase power, but if the chi-square difference test indicated a significant difference between the effects for men and women, I did not constrain those paths to be equal and I report where such gender differences were found.

Results for Basic Sleep and Satisfaction Model

In the first analysis, I ran a model where actor and partner sleep both predicted both actor and partner relationship satisfaction. I also allowed actor and partner sleep to covary and actor and partner satisfaction to covary. The estimates for men and women for the direct association

between actor sleep and actor relationship satisfaction were not similar, therefore I conducted a chi-square difference test. Constraining the paths across men and women resulted in a significant drop in model fit, $\chi 2$ (1) = 5.531, indicating that the actor effects for men and women were statistically significantly different from one another, thus, these paths were not constrained in the final model. In the final model, results showed evidence of a direct association between actor sleep and actor relationship satisfaction for women (β= .21, SE = .08, p = .011, 95% CI [.05, .38]) but not men (β = -.04, SE = .08, p = .601, 95% CI [-0.20, .11]), such that for women, better quality sleep predicted higher relationship satisfaction. Actor sleep quality did not predict partner relationship satisfaction (women: β = .02, SE = .08, p = .771, 95% CI [-.14, .18]; men: β = .12, SE = .05, p = .771, 95% CI [-.08, .11]). There was a marginal association between actor and partner sleep (β = .18, SE = .10, p = .059, 95% CI [-.01, .37]), but actor and partner relationship satisfaction did covary significantly (β = .65, SE = .06, p < .001, 95% CI [.54, .76]). The model fit the data well: $\chi 2$ (1) = .670, p = .413; RMSEA = .000, p = .471 [90% CI: 0.000, 0.241]; CFI = 1.000; SRMR = .025. Given that there were no direct effects between actor sleep and partner relationship satisfaction I did not estimate this path in the indirect effects models.

Results for Indirect Effects Models

Mood-Enhancing. Next, I ran a model where actor and partner sleep both predicted both actor and partner use of mood-enhancing tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. In this model, the direct association between actor sleep and actor relationship satisfaction differed for men and women, such that the effect was significant for women (β = .18, SE = .07, p = .012, 95% CI [.04, .31]) but not men (β = -.05, SE = .08, p = .541, 95% CI [-.20, .10]), thus, for women, better quality sleep predicted higher relationship satisfaction. Neither actor sleep quality (women: β =

.06, SE = .08, p = .464, 95% CI [-.09, .20]; men: β = .04, SE = .06, p = .463, 95% CI [-.07, .16]) nor partner sleep quality (women: β = .07, SE = .06, p = .183, 95% CI [-.04, .18]; men: β = .11, SE = .08, p = .174, 95% CI [-.05, .27]) predicted actor use of mood enhancing tactics on their partner. Actor use of mood enhancing tactics predicted actor relationship satisfaction for both men (β = .22, SE = .08, p = .004, 95% CI [.07, .37]) and women (β = .38, SE = .07, p < .001, 95% CI [.25, .52]), but the effect was significantly stronger for women as these paths could not be constrained to be equal. Partner use of mood enhancing tactics also predicted higher actor relationship satisfaction (women: β = .16, SE = .05, p = .002, 95% CI [.06, .26]; men: β = .20, SE = .07, p = .003, 95% CI [.07, .33]). These actor and partner effects together suggest that the more either partner tried to enhance the other partner's mood, the more satisfied they both were with their relationship. Actor and partner sleep covaried marginally (β = .18, SE = .10, p = .058, 95% CI [-.01, .37]), but actor and partner relationship satisfaction covaried significantly (β = .60, SE = .06, p < .001, 95% CI [.47, .72]). Actor and partner use of mood enhancing tactics also covaried significantly (β = .25, SE = .09, p = .007, 95% CI [.07, .43]), indicating that partners were similar in their use of mood enhancing strategies. Given that actor and partner sleep were not associated with actor and partner mood enhancing, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (5) = 3.648, p = .601; RMSEA = .000, p = .722 [90% CI: 0.000, 0.116]; CFI = 1.000; SRMR = .042. A model with the significant paths highlighted can be found in the bottom part of Figure 2.

Diverting Partner Attention. I ran a model where actor and partner sleep both predicted both actor and partner use of attention diverting tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. In this model, the direct association between sleep and relationship satisfaction was significant for

women (β = .20, SE = .07, p = .008, 95% CI [.05, .34]) but not for men (β = -.05, SE = .08, p = .512, 95% CI [-.20, .10]) such that better quality sleep for women predicted higher relationship satisfaction for them. Neither actor sleep quality (women: β = -.04, SE = .08, p = .596, 95% CI [-.20, .12]; men: β = -.03, SE = .06, p = .595, 95% CI [-.14, .08]) nor partner sleep quality (women: β = .04, SE = .06, p = .553, 95% CI [-.08, .16]; men: β = .05, SE = .08, p = .554, 95% CI [-.11, .20]) predicted actors diverting their partner's attention. Neither actor (women: β = .06, SE = .06, p = .334, 95% CI [-.06, .17]; men: β = .07, SE = .07, p = .333, 95% CI [-.07, .21]) nor partner (women: β = .09, SE = .06, p = .177, 95% CI [-.04, .21]; men: β = .09, SE = .07, p = .176, 95% CI [-.04, .23]) diverting of their partner's attention predicted actor relationship satisfaction. Actor and partner sleep covaried marginally (β = .18, SE = .10, p = .059, 95% CI [-.01, .37]), but actor and partner relationship satisfaction covaried significantly (β = .65, SE = .06, p < .001, 95% CI [.54, .76]). Actor and partner use of diverting their partner's attention did not covary significantly (β = .15, SE = .10, p = .133, 95% CI [-.04, .34]). Given that actor and partner sleep were not associated with actor and partner attention diverting tactics, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (6) = 2.021, p = .918; RMSEA = .000, p = .955 [90% CI: 0.000, 0.046]; CFI = 1.000; SRMR = .029. A model with the significant paths highlighted can be found in the bottom part of Figure 3.

Concealing Emotions. Next, I ran a model where actor and partner sleep both predicted both actor and partner concealing of their own emotions which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. The direct association between actor sleep and actor relationship satisfaction was significant for women (β = .17, SE = .07, p = .025, 95% CI [.02, .31]) but not for men (β = -.09, SE = .07, p = .236, 95% CI [-.23, .06]) such that better quality sleep for women predicted higher relationship

satisfaction for them. Actor sleep quality predicted higher actor concealing of emotions from their partner (women: β = -.23, SE = .08, p = .003, 95% CI [-.38, -.08]; men: β = -.17, SE = .06, p = .004, 95% CI [-.28, -.06]) such that those who experienced poorer sleep quality were more likely to conceal their emotions from their partner. Partner sleep quality did not predict actor concealing of emotions from their partner (women: β = .03, SE = .06, p = .631, 95% CI [-.09, .14]; men: β = .04, SE = .08, p = .633, 95% CI [-.12, .19]). Both actor emotion concealing (women: β = -.29, SE = .06, p < .001, 95% CI [-.40, -.18]; men: β = -.34, SE = .06, p < .001, 95% CI [-.47, -.22]) and partner emotion concealing (women: β = -.23, SE = .06, p < .001, 95% CI [-.33, -.12]; men: β = -.27, SE = .06, p < .001, 95% CI [-.39, -.15]) predicted lower actor relationship satisfaction such that the more actors and partners concealed their emotions from one another, the less satisfied they both were with their relationship. Actor and partner sleep covaried marginally (β = .18, SE = .10, p = .059, 95% CI [-.01, .37]), but actor and partner relationship satisfaction covaried significantly (β = .58, SE = .07, p < .001, 95% CI [.45, .71]). Actor and partner concealing of emotions did not covary significantly (β = .10, SE = .10, p = .322, 95% CI [-.09, .28]). A model with the significant paths highlighted can be found in the bottom part of Figure 4

In testing of the indirect effects, I found that there was a significant indirect effect between actor sleep quality and actor relationship satisfaction through actor emotion concealing (women: β = .07, SE = .03, p = .010, 95% CI [.02, .12]; men: β = .06, SE = .02, p = .010, 95% CI [.01, .10]), such that when people had poorer sleep quality they were more likely to conceal their emotions from their partner, and concealing one's emotions from the partner was associated with being less satisfied with the relationship. There was also a significant indirect effect between actor sleep quality and partner relationship satisfaction through actor emotion concealing

(women: β = .06, SE = .03, p = .015, 95% CI [-.01, .11]; men: β = .04, SE = .02, p = .016, 95% CI [.01, .07]), such that when people had poorer sleep quality they were more likely to conceal their emotions from their partner, and concealing one's emotions from their partner was associated with the partner being less satisfied with the relationship. No other indirect pathways were significant. The model fit the data well: $\chi 2$ (6) = 3.698, p = .717; RMSEA = .000, p = .823 [90% CI: 0.000, 0.095]; CFI = 1.000; SRMR = .041.

Inauthentic Displays of Emotion. Next, I ran a model where actor and partner sleep both predicted both actor and partner inauthentic displaying of their emotions which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction. The direct association between actor sleep and actor relationship satisfaction was significant for women (β = .21, SE = .07, p = .004, 95% CI [.07, .36]) but not for men (β = -.06, SE = .08, p = .395, 95% CI [-.21, .08]) such that better quality sleep for women predicted higher relationship satisfaction for them. Neither actor sleep quality (women: β = .08, SE = .10, p = .416, 95% CI [-.11, .26]; men: β = -.13, SE = .09, p = .165, 95% CI [-.32, .05]) nor partner sleep quality (women: β = .04, SE = .05, p = .455, 95% CI [-.06, .13]; men: β = .06, SE = .09, p = .459, 95% CI [-.11, .23]) predicted actor inauthentic displays of emotions. The paths between actor sleep quality and actor inauthentic displays of emotions were significantly different for men and women (i.e., could not be constrained to be equal), but neither path was statistically significant. Actor inauthentic displays of emotion predicted actor relationship satisfaction (women: β = -.20, SE = .07, p = .005, 95% CI [-.33, -.06]; men: β = -.17, SE = .06, p = .004, 95% CI [-.28, -.05]) such that the more inauthentic people were in displaying their emotions to their partner, the less satisfied they themselves were in their relationship. Partner inauthentic displays of emotions did not predict actor relationship satisfaction (women: β = -.06,

SE = .05, p = .237, 95% CI [-.15, .04]; men: β = -.09, SE = .08, p = .231, 95% CI [-.24, .06]). Actor and partner sleep covaried marginally (β = .18, SE = .10, p = .058, 95% CI [-.01, .37]), but actor and partner relationship satisfaction covaried significantly (β = .64, SE = .06, p < .001, 95% CI [.52, .75]). Actor and partner use of inauthentic displays of emotion covaried significantly (β = .29, SE = .09, p = .002, 95% CI [.11, .47]) such that partners were inauthentic in displaying their emotions to one another to similar degrees. There were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (5) = 4.154, p = .528; RMSEA = .000, p = .661 [90% CI: 0.000, 0.124]; CFI = 1.000; SRMR = .041. A model with the significant paths highlighted can be found in the bottom part of Figure 5.

Mood-Worsening. Next, I ran a model where actor and partner sleep both predicted both actor and partner use of mood-worsening tactics which both predicted both actor and partner relationship satisfaction. Actor sleep also predicted actor relationship satisfaction There was a direct association between actor sleep and actor relationship satisfaction for women (β= .21, SE = .07, p = .003, 95% CI [.07, .34]) but not men (β= -.03, SE = .08, p = .662, 95% CI [-.18, .12]) such that better quality sleep for women predicted higher relationship satisfaction for them. Neither actor sleep quality (women: β = .05, SE = .07, p = .454, 95% CI [-.08, .19]; men: β = .05, SE = .07, p = .455, 95% CI [-.09, .19]) nor partner sleep quality (women: β = -.07, SE = .05, p = .119, 95% CI [-.16, .20]; men: β = -.14, SE = .09, p = .108, 95% CI [-.31, .03]) predicted actor use of mood worsening tactics on their partner. Actor use of mood worsening tactics predicted relationship satisfaction for both men (β = -.29, SE = .05, p < .001, 95% CI [-.38, -.18] and women (β = -.37, SE = .07, p < .001, 95% CI [-.50, -.23]), but the effect was significantly stronger for women. Partner use of mood worsening tactics (women: β = -.12, SE = .05, p = .008, 95% CI [-.22, -.03]; men: β = -.19, SE = .07, p = .008, 95% CI [-.32, -.05]) also predicted actor

relationship satisfaction. Thus, these actor and partner effects suggest that the more either person tried to worsen their partner's mood, the less satisfied both partners were in the relationship. Actor and partner sleep covaried marginally (β = .18, SE = .10, p = .059, 95% CI [-.01, .37]), but actor and partner relationship satisfaction covaried significantly (β = .60, SE = .06, p < .001, 95% CI [.48, .72]). Actor and partner use of mood worsening tactics covaried significantly (β = .20, SE = .09, p = .031, 95% CI [.02, .39]) such that partners tried to worsen each other's moods to similar degrees. Given that actor and partner sleep were not associated with actor and partner mood worsening, there were no significant indirect effects between sleep and relationship satisfaction. The model fit the data well: $\chi 2$ (5) = 3.861, p = .570; RMSEA = .000, p = .696 [90% CI: 0.000, 0.119]; CFI = 1.000; SRMR = .040. A model with the significant paths highlighted can be found in the bottom part of Figure 6.

Discussion

The present studies investigated the associations between sleep quality, interpersonal emotion regulation, and relationship satisfaction. Direct effects between the three constructs were assessed as well as indirect effects between sleep and relationship satisfaction. There was evidence of significant associations between the constructs of interest, but the findings were mixed across the two samples. The basic model assessed the association between sleep quality and relationship satisfaction for both partners. There was a significant association between sleep quality and relationship satisfaction for men and women in study one, but only for women in study two. The association between actor sleep and partner relationship satisfaction was not significant, regardless of gender, in either study.

For the five models that included interpersonal emotion regulation strategies, there was evidence of a significant association between sleep quality and use of interpersonal emotion regulation strategies such as concealing emotions, inauthentic displays of emotions, and mood worsening tactics, but these effects were inconsistent across the two samples. There was no evidence of a significant association between sleep quality and the use of mood enhancing tactics or diverting a partner's attention in either sample. Furthermore, there was evidence of a significant association between a person's own use of interpersonal emotion regulation strategies on their partner such as mood enhancing, concealing emotions, inauthentic displays of emotions, and mood worsening tactics and their own relationship satisfaction as well as their partner's relationship satisfaction, but once again these findings were not consistent across the two samples. There was no evidence of an association between a person's attempts to divert their

partner's attention and their own or their partner's relationship satisfaction in either sample.

Finally, there was evidence of significant indirect effects between sleep and relationship satisfaction via use of interpersonal emotion regulation strategies. People who had poor quality sleep concealed their emotions more from their partner and were more likely to try to worsen their partner's mood and use of these interpersonal emotion regulation strategies were both associated with lower relationship satisfaction. These effects were not consistent across the two samples. Furthermore, people who got poor quality sleep were more likely to conceal their emotions from their partner which was also associated with their partner being less satisfied with their relationship. Once again, these findings were not consistent across the two samples. These findings provide novel information about how sleep is associated with the use of interpersonal emotion regulation strategies within romantic relationships and how these strategies may be associated with the relationship itself.

Basic Model: Sleep and Relationship Satisfaction

In study one, men and women were both more satisfied with their relationship when they had higher quality sleep. However, in study two only women were more satisfied with their relationship when they got higher quality sleep. The association between sleep quality and relationship satisfaction was not significant for men in this sample. The significant link I found between sleep and relationship satisfaction is in line with prior research. For example, spouses are more satisfied with their romantic relationship on days they sleep for longer periods of time (Maranges & McNulty, 2016), and when people have poor sleep—measured by how often they report experiencing difficulty falling asleep, waking up in the middle of the night, and waking up very early in the morning over the past month—they report being less satisfied with their marriages, friendships, and various relationships with others (Strawbridge et al., 2004). These

findings are important because relationship satisfaction is implicated in many other life domains. For example, those who are satisfied with their long-term romantic relationships have happier and healthier lives, and live longer than those who are dissatisfied with their romantic relationships (Diamond et al., 2010; Robles et al., 2014). Thus, it is important to understand how daily behaviors such as sleep impact how satisfied people are with their relationships. It is understood that there is a bidirectional link between sleep and relationship functioning, but some evidence suggests that sleep may have a stronger effect on relationship quality than relationship quality has on sleep (Yang et al., 2013). The current study provides further evidence of the link between sleep and relationship satisfaction.

In both studies, the association between a person's own sleep quality and their partner's relationship satisfaction was not significant. This is not in line with prior research that found that one spouse's poor sleep quality (assessed via difficulty sleeping over the past month) is associated with the other spouse being less satisfied with their romantic relationship (Strawbridge et al., 2004). The discrepancies between these findings may reflect differences in the age of the samples being studied. The study by Strawbridge and colleagues (2004) included a sample of older adults between the ages of 51 and 94 (with the mean age being over 65). The two samples in the current study had mean ages of about 32 and 44, so the samples reflected people of different ages in different periods of their lives. The link between sleep and relationship quality may change throughout the lifespan (Yang et al., 2013) due to the effects of aging on sleep (e.g., there are changes in sleep architecture and increased levels of insomnia in older adults; Ancoli-Israel, 2009). These differing aspects of the study samples could explain the mixed findings.

Actor sleep quality was not significantly correlated with partner sleep quality in either

study. This association, or lack thereof, is in line with previous research linking sleep duration between romantic partners, but not sleep quality. Difficulty sleeping does not covary between husbands and wives (Strawbridge et al., 2004; Yang et al., 2013), yet husbands and wives get about the same amount of sleep on average (McNulty & Maranges, 2017). The vast majority of cohabitating couples in the United States share a bed, and women tend to be impacted more by their partner's sleep than men are (Andre et al., 2021), which may be one reason why partners' sleep was not correlated. Similarities in couples' sleep may depend on the length of time being assessed, as partners are similar on their recent sleep, but partner sleep differs over the past month (Wilson et al., 2017). In the current study, I assessed sleep quality over the past month. One future direction in this area could be to assess partners' quality and quantity of sleep using a daily diary study to investigate whether they are similar on a day-to-day basis. Health behaviors in couples tend to be similar and converge over time (Homish & Leonard, 2008; Leong et al., 2014), so couples' sleep behaviors may become more similar the longer they are in a relationship which may result in them having more similar sleep quality and quantity over time. This is another potential avenue for future research, to assess whether couples in longer relationships have more similar sleep than couples in newer relationships.

Actor relationship satisfaction was significantly correlated with partner relationship satisfaction in both samples. These findings are in line with previous research showing that romantic partners experience similar relationship satisfaction (Gunn et al., 2015), and tend to be similar on many life and relationship domains (Schul & Vinokur, 2000). Partners are similar in their emotional experiences and these experiences predict relationship quality (Gonzaga et al., 2007). I did not find associations between partners' sleep quality, found associations between partners' relationship satisfaction, and found mixed associations between partners' sleep quality

and relationship satisfaction.

Gender differences. In the current studies, I tested for gender differences for each of the pathways. In study one, I did not find any differences between men and women for the association between one partner's sleep quality and their own or their partner's relationship satisfaction. In study two, I found differences between men and women such that the better sleep quality women had, the more satisfied they were with their relationship, but I did not find this effect for men. This finding is in line with research indicating that the link between sleep and relationship processes and outcomes may differ for men and women (Troxel et al., 2007; Yang et al., 2013; Yorgason et al., 2018). In a daily diary study, sleep duration buffered men's marital satisfaction evaluations from the effects of negative daily interactions, but this buffering effect was not present for women (Maranges & McNulty, 2016). Men were better able to remain more globally satisfied with their relationship despite negative evaluations of specific aspects of the relationship on days following more sleep, but women were not (Maranges & McNulty, 2016). Indeed, women's physiology (e.g., cortisol levels, bp, heart rate) seems to be more sensitive to relationship interactions than men's physiology (Kiecolt-Glaser & Newton, 2001), indicating women may also be more sensitive to associations between sleep and relationship outcomes, potentially the reason I found gender differences in one of the samples. The current studies provide further evidence that health behaviors and relationship experiences may differentially impact men and women.

However, the gender differences I found were not consistent across the samples. In fact, gender differences are not consistently found across the studies in which they are assessed. Other researchers have noted that many studies have looked at gender differences when investigating the link between sleep and specific aspects of relationship functioning, and some evidence

suggests that there are stronger effects for women than men, but overall a clear pattern has not yet emerged (Gordon et al., 2021). Furthermore, to my knowledge, none of these effects have been studied outside of the traditional gender binary (i.e., in people who identify as gender non-binary). Future research should further investigate the role gender identity plays in the link between sleep and relationship functioning and the mechanisms involved.

Sleep and Interpersonal Emotion Regulation Strategies

Mood enhancing and diverting partner attention. In both studies, sleep quality was not associated with attempts to either enhance a partner's mood or divert a partner's attention during times of distress. There is no prior research on this precisely, but the finding that sleep quality was not associated with attempts to enhance the partner's mood is contrary to my hypothesis. Sleep does impact people's ability to regulate their emotions effectively but there is not a lot of evidence about which aspects of emotion regulation are affected and the precise circumstances that impact these difficulties (Goldschmied, 2019). Poor sleep negatively impacts the ability to identify (van der Helm et al., 2010) and empathize (Guadagni et al., 2018) with the emotions of others, so I expected that poor sleep would be associated with lower capability of using strategies to enhance the partner's mood given that these strategies would involve accurately identifying and empathizing with the partner's feelings. However, given that there was no link between sleep quality and positive interpersonal emotion regulation (use of mood enhancing strategies and attempts to divert the partner's attention), it appears as though people are still able to identify and select appropriate emotion regulation strategies (Gross, 2015), indicating that the issue is happening somewhere else in the interpersonal emotion regulation process.

In addition to attempts to enhance the partner's mood during stressful times, I expected

that poor sleep would be associated with less attempts to divert the partner's attention during times of distress. Attentional processes (Lim & Dinges, 2010), as well as attentional control and adaptation (Whitney et al., 2017), are impacted by insufficient sleep. If someone cannot pay attention to their partner, identify their emotions, and is less capable of redirecting their own and their partner's attention during times of distress, this interpersonal emotion regulation strategy should suffer when getting inadequate sleep. However, the findings were not in line with this hypothesis.

Furthermore, positive interpersonal emotion regulation strategies can be viewed as a form of social support. In a recent meta-analysis investigating the link between social support and sleep, the authors defined social support as an individual's perception or experience of affection, care, value, belonging, or assistance in connection with other people and is often measured in terms of various functions people serve (e.g., as sources of informational, instrumental, or emotional support; Kent de Grey et al., 2018; Taylor, 2011). Since positive interpersonal emotion regulation strategies involve providing emotional support to another person and helping to alter or regulate their emotions and experiences, it falls into this categorization. The meta-analysis found that poor sleep quality and quantity are both associated with less social support (Kent de Grey et al., 2018). Given this finding, when people are not getting sufficient sleep, they should be less likely to try to enhance their partner's mood and use strategies to divert their partner's attention during stressful situations. This was not the case in the present studies—it seems that people are still motivated to reduce their partner's negative emotions during stressful times (Uchino et al., 1996) regardless of their sleep quality. In fact, mood enhancing was the highest reported interpersonal emotion regulation strategy between partners (mean scores above 6 out of 7 in both samples).

These findings suggest that although sleep impacts the ability to regulate one's own emotions (Durmer & Dinges, 2005), sleep quality may not be associated with the ability to regulate the partner's emotions, at least using positive interpersonal emotion regulation tactics. One explanation for this discrepancy may be that there is greater emotion regulation during negative emotional support provision than positive emotional support provision, indicating that it may be easier to provide a partners with positive support (Gosnell & Gable, 2017) than negative support. This may explain why there were no significant effects between sleep quality and positive interpersonal emotion regulation strategies (i.e., mood enhancing and diverting partner attention) but there were effects between sleep quality and negative emotion regulation strategies (i.e., inauthentic displays of emotion and mood worsening). It is important to understand how sleep impacts attempts to boost the partner's mood during good times and bad times. Mood enhancing tactics such as allowing a partner to express their feelings, and responding positively to good news, can soften the impact of negative experiences (Nils & Rimé, 2012) and increase personal well-being as well as intimacy and satisfaction with the relationship (Cameron & Overall, 2018; Gable et al., 2004), so it has implications for individuals and their romantic relationship.

Concealing emotions. In study one, sleep quality was not associated with trying to conceal emotions from the partner. In study two, people who had poorer sleep quality tried to conceal their emotions more from their partner than their well-rested counterparts. Choosing to conceal emotions from a partner during times of poor sleep quality is in line with research indicating that poor sleep leads to higher use of emotional suppression (Harvey, 2001), more distancing from others (Cameron & Overall, 2018), and social withdrawal (Simon & Walker, 2018). Poor sleep quality may be associated with mood concealing as an intrapersonal and

interpersonal emotion regulation strategy to down-regulate one's own emotions and prevent the partner from worrying about one's own negative emotions. Poor sleep and sleep loss are associated with experiencing more negative emotions (Daniela et al., 2010; Franzen & Buysse, 2008; Kahn-Greene et al., 2007), which may lead to the perception of increased need for suppression/concealing of emotions as a regulation strategy. Negative emotions are linked with avoidance behaviors (whereas positive emotions are linked with approach behaviors; Campos et al., 2015). This may, at least in part, be one reason someone conceals their emotions more when they are getting poor sleep: they may be experiencing more negative emotions and are avoiding sharing those negative emotions with the partner.

People may be more likely to conceal their emotions from their partners during times of poor sleep, but that does not necessarily mean it is an adaptive and successful emotion regulation strategy. Indeed, there is conflicting evidence on whether withdrawing and concealing emotions from others is adaptive or maladaptive, and it may be both, or even depend on the situation. Withdrawing from a partner at the end of a workday allows for more rapid recovery from stress than sharing with a partner (Repetti, 1989), and also reduces the likelihood that negative affect will be reciprocated (Roberts & Levenson, 2001) if shared with a partner. Thus, withdrawing may be an adaptive way to regulate one's own emotions and in turn regulate a partner's emotions by protecting them from mimicking and reciprocating negative feelings. On the contrary, research also shows that trying to suppress one's own emotions and conceal them from others is often an ineffective strategy for decreasing negative emotions (Gross, 2015) and has been shown to induce a variety of negative reactions such as sustained negative emotions and dampened positive emotions (Gross & Levenson, 1997; Stepper & Strack, 1993).

Resorting to using neutral or negative interpersonal emotion regulation techniques

following poor sleep may result from not having the necessary resources available to try to bolster a partner's mood or respond to situations in a constructive way. Gordon and colleagues (2021) demonstrate that sleep is associated with positive and negative relationship processes (e.g., interpersonal emotion regulation strategies) differently, so they should be assessed as different constructs. This may be why I found effects between sleep quality and some interpersonal emotion regulation strategies but not others. Certain intrapersonal and interpersonal emotion regulation strategies may require more resources to employ than others. When someone becomes depleted of the resources necessary to self-regulate (e.g., when they are not getting adequate sleep) their defenses to negative emotions, and their ability to regulate these emotions effectively, are weakened (Baumeister & Vohs, 2016). Poor sleep was associated with each of the negative interpersonal emotion regulation strategies, but was not associated with the positive strategies—this may be a result of poor sleep leading to an increase in negative emotions, decreasing the ability to self-regulate, and leading to an increase in the use of strategies that would worsen a partner's mood as well. Positive and negative emotions might be driven by different processes (Watson, Wiese, Vaidya, & Tellegen, 1999), and the presence of negatively valanced emotions does not necessarily mean the absence of positively valanced emotions and vice versa. Sleep may only be impacting the processes that drive negative emotions or may impact them to a further degree than the processes that drive positive emotions which could account for the differences in how sleep impacted positive versus negative interpersonal emotion regulation strategies.

It is worth noting again that the findings between sleep quality and use of mood concealing was not consistent across the samples. This may be evidence that this effect is small, there is something specific about the sample in which the effect was found that lead to this

association, or this association needs to be investigated from a different perspective to understand the full picture. Given that the associations between sleep and negative interpersonal emotion regulation strategies might be linked to self-regulation, future research should investigate how sleep, self-control/self-regulation, and relationship processes are interconnected. Self-regulatory abilities are linked to relationship processes and outcomes such as accommodation, appropriate conflict management, inhibition of violence, forgiveness, and derogation of alternative partners (Gosnell & Gable, 2017) so it is important to better understand these connections to help inform interventions that can give people the best chance at happy and successful relationships.

Inauthentic displays of emotions. In study one, people who had poorer sleep quality were more inauthentic in displaying emotions to their partner than their well-rested counterparts. In study two, sleep quality was not associated with inauthentic displays of emotions. To my knowledge there is no prior research that investigates how people try to manipulate their partner's emotions when they are getting poor sleep. Given these inconsistent findings, further research should be conducted to better understand this association. Poor sleep decreases the ability to take the perspective of others (Guadagni et al., 2018) as well as the ability to self-regulate and employ self-control (Hisler & Križan, 2019). This may be one explanation for sleep quality's association with negative interpersonal emotion regulation strategies such as being inauthentic in displaying emotions to a partner and trying to worsen a partner's mood.

Furthermore, sleep increases emotional reactivity (Beattie et al., 2015) which may be a reason that negative interpersonal emotion regulation strategies are used more with poor sleep. It is worth noting that participants did not endorse using this strategy a lot, but they did use it. This strategy involves misrepresenting emotions to a partner to manipulate the partner's emotions and

behaviors—this includes sulking to make the partner feel guilty, sulking if the partner does something the actor does not like, sulking for the intention of behavior change by the partner, being especially nice to get what they want, and making the partner feel guilty (in ways other than through sulking) if they want the partner to do something for them. Rather than simply being impulsive reactions to the partner's behavior, these strategies seem to be deliberate reactions to the partner's behavior (when the partner's behavior has caused distress) and deliberate attempts to manipulate the partner's emotions and behavior.

Inauthentic displays of emotions to manipulate the partner into doing what they want seems to be used more when getting poor sleep quality, but this strategy may not be effective. Sleep loss impacts the ability to be empathetic towards others (Killgore et al., 2008) including the ability to use cognitive empathy (i.e., the ability to understand another person's perspective, feelings and state of mind; Baron-Cohen, 2009) which informs the ability to predict others' behaviors, to manipulate or deceive others to their own advantage, and to understand when others are lying or holding a false belief (Guadagni et al., 2014). So, although these strategies are used in an attempt to manipulate the partner, poor sleep may prevent them from being used effectively, rendering this a poor strategy to use and possibly damaging the relationship in the process.

These findings only tell us that people are, at least sometimes, more likely to respond with negative interpersonal emotion regulation strategies when they have poor sleep quality, but they do not tell us anything about the contexts in which they respond with negative interpersonal emotion regulation strategies following poor sleep. That is, the use of these strategies was measured in a general way, but it would be interesting to investigate when people decide to use these negative interpersonal emotion regulation strategies and the situations that precede their

use. Future research could investigate when poor sleep leads to inauthentic displays of emotion and mood worsening. This information is necessary to design appropriate intervention strategies to protect relationships from the effects of these negative interpersonal emotion regulation strategies. For example, if the use of these negative strategies is occurring after disagreements perhaps an intervention that focuses on conflict reappraisal would be useful as they have shown success in preserving martial quality (see Finkel et al., 2013 for an example of this type of intervention).

The strategies discussed thus far have been positive (mood enhancing and diverting partner attention) or somewhat neutral (concealing emotions), but this is the first negative strategy I have discussed. It appears that sleep is associated with interpersonal emotion regulation strategies differently depending on their valence/orientation (i.e., there was no significant association between sleep quality and use of positive strategies, but there was a significant association between sleep quality and the use of neutral and negative strategies, albeit the findings were inconsistent). This is evidence that interpersonal emotion regulation should be considered separately for positive and negative strategies. Barret and colleagues (2001) explain that positive and negative emotions should also be considered separately because they are experienced and regulated differently (e.g., negative emotions are more heavily regulated in our current cultural context).

Mood worsening. In study one, people who had poorer sleep quality were more likely to try to worsen their partner's mood than their well-rested counterparts. In study two, sleep quality was not associated with trying to worsen a partner's mood. This strategy involves putting the partner down in public, using criticism, making the partner anxious, undermining their confidence, and making negative comments. These strategies could be deliberate, like

inauthentic displays of emotion, or they could be impulsive reactions to the situation where someone is unable to appropriately regulate their emotions. These findings are in line with research that indicates poor sleep can lead to becoming frustrated more easily, more willing to blame others during disputes, and less willing to accept blame during conflicts (Kahn-Greene et al., 2007). Sleep also decreases the ability to self-regulate and use self-control (Hisler & Križan, 2019). Furthermore, getting low quality sleep is linked to reports of feeling sleepy are more frustrated (Balter et al., 2021). If someone is experiencing increased frustration and decreased ability to regulate this frustration when they are getting poor sleep, they might be more willing to criticize their partner and display anger towards them. Indeed, following poor sleep, people can be frustrated to the point that they barely respond to further frustration inductions (Balter et al., 2021). If a person is going through their life already frustrated, their threshold for conflict will be lower and they may respond negatively to any provocation from their partner. However, I do not know if this strategy was used in a deliberate or reactive manner as I did not measure this, but that could be an avenue for future research.

These findings are also in line with research linking sleep with aggression and relationship conflict (El-Sheikh et al., 2013). If poor quality sleep is associated with being more willing to make negative comments and criticize a partner, it will likely lead to relationship conflict. I did not assess whether the use of this interpersonal emotion regulation strategy leads to relationship conflict, but it is an area open for future research. Although people are motivated to view their relationship in a positive light (see Murray, 1999), romantic partners often behave in unpleasant ways towards each other (Hicks et al., 2021). Indeed, when asked to spontaneously think about their partner, people experience both positive and negative feelings about their partner, yet when asked to evaluate their partner, they engage in numerous cognitive processes

that bias their judgments toward positive feelings and away from negative feelings (Hicks et al., 2021). In other words, most individuals automatically experience at least some negative feelings toward their partner (McNulty et al., 2019; Zayas et al., 2017; Zayas & Shoda, 2015) but their motivations to view the relationship positively seem to minimize the likelihood that they use these negative implicit feelings when deliberately evaluating the quality of their relationship. However, during times of poor sleep, they have less capacity to perform these cognitive processes, and they rely more on implicit attitudes and stereotypes regarding others (Bodenhausen, 1990; Ghumman & Barnes, 2013). They may be using these mental shortcuts in their romantic relationship as well which leads to reliance on negative implicit attitudes rather than the global positive attitudes they are typically motivated to use for their partner.

If this strategy is indeed being used in a reactive manner, these findings are in line with research that shows that sleep deprived people respond more quickly and have more incorrect responses to emotional stimuli and have a difficult time inhibiting emotional responses when performing a go/no go task (Anderson & Platten, 2011). Responding positively to a partner may not involve any inhibition so it is easier for those who are not getting good quality sleep, but preventing negative responses involves inhibiting an emotional reaction which may explain the association between sleep quality and negative interpersonal emotion regulation strategies.

Emotion regulation, and therefore interpersonal emotion regulation, can also be motivated and executed to accomplish a goal (Tamir, 2016; Tamir et al., 2019). Poor sleep may be associated with more use of negative interpersonal emotion regulation strategies if experiencing more negative emotions and thus motivation to make the partner feel negative emotions too. A future study could assess emotions prior to and after using interpersonal emotion regulation strategies to see if people are more likely to use negative interpersonal emotion

regulation strategies when they are already experiencing negative emotions and how the use of these strategies impact their mood. If they are indeed experiencing negative emotions and it is leading them to use negative interpersonal emotion regulation strategies to worsen their partner's mood, interventions could focus on helping people regulate their own negative emotions before trying to impact their partner's emotions to match theirs.

It is worth noting that participants did not endorse using this strategy very much, but the association between sleep quality and interpersonal emotion regulation was the strongest for this tactic in study one, yet this association was not significant in study two. It is important to understand how sleep impacts the way people communicate with their partner, show their emotions to their partner, and try to regulate their partner's emotions during times of distress. Sleep loss increases perceptions of stress and limits a person's ability to cope with it (Killgore et al., 2008). If people are responding negatively to their partners when they are feeling stressed, this may help explain why poor sleep is associated with an increase in conflict between partners and decreased conflict resolution (Gordon et al., 2017; Gordon & Chen, 2014) and perhaps why poor sleep is linked to more use of negative interpersonal emotion regulation strategies.

Actor sleep and partner use of interpersonal emotion regulation strategies. The paths between actor sleep and partner use of interpersonal emotion regulation strategies were exploratory. To my knowledge, there is no literature indicating that someone's sleep quality is linked to how their romantic partner attempts to manage the individual's own emotions. Although it would have been interesting if there were effects, for example, if people decided to try to enhance their partner's mood more often if they knew their partner slept poorly, those were not the findings. There were no associations between one person's sleep quality and their partner's use of interpersonal emotion regulation strategies across all strategy types in either

sample. Future research could investigate further links between one partner's sleep and the other partner's use of interpersonal emotion regulation strategies. For example, perhaps a link exists but it requires one partner to be aware of the other partner's sleep quality or quantity on the previous night for it to inform their use of specific interpersonal emotion regulation strategies.

Correlations between actor and partner use of interpersonal emotion regulation strategies. The association between partners' interpersonal emotion regulation was not consistent across the five different emotion regulation strategies. There were also inconsistent findings between the two samples studied. Actor and partner interpersonal emotion regulation was significantly correlated for mood enhancing, but was not significantly correlated for diverting attention, and there were inconsistent findings between the two samples for concealing emotions, inauthentic displays of emotions, and mood worsening. Although there is no research specifically looking at the similarities between how partners regulate their own and each other's emotions, there is research showing that romantic partners tend to be similar in their emotional experiences (Gonzaga et al., 2007) and other life domains (Schul & Vinokur, 2000) indicating they may be similar in their use of emotion regulation strategies as well. Indeed, emotional convergence hypothesis suggests that people in a close relationship become more emotionally similar over time because this enhances coordination, understanding, and closeness between them (Anderson & Keltner, 2004)—it is plausible that partners may also become more similar in intrapersonal and interpersonal emotion regulation strategies over time.

On the contrary, although there was evidence that people used all these strategies, there may be individual differences in people's abilities to use varying interpersonal emotion regulation strategies when they are not getting adequate sleep. For example, people differ on traits such as emotional intelligence and their perception of available emotion regulation

strategies (Barrett et al., 2001). Individuals with high emotional intelligence (i.e., emotional competence, or the ability to perceive one's own emotions and the emotions of others) are more sensitive to others' emotional expressions (Petrides & Furnham, 2003) and more competent in inferring others' emotional states from situational cues (Nozaki, 2015). Therefore, even if someone with high emotional intelligence has a reduced ability to recognize their partner's emotions following poor sleep, they still may be competent enough to recognize when their partner is struggling and needs them to employ a positive interpersonal emotion regulation strategy. Emotional intelligence may not be impacted by sleep to the same extent that emotions and emotion regulation are. Furthermore, people also differ on their perceptions of available emotion regulation options (Gross, 2015). If sleep decreases the options one perceives they have available, those who view themselves as having more options available may not be impacted by poor sleep to the same extent as those who feel they have limited options available to begin with. These individual factors could help explain why partners are often choosing different interpersonal emotion regulation strategies. These are potential avenues for future research.

Interpersonal Emotion Regulation Strategies and Relationship Satisfaction

In this section I will be discussing the results for the second half of the models linking interpersonal emotion regulation strategies to relationship satisfaction. Where effects were found, I will also discuss indirect effects that link sleep to relationship satisfaction via interpersonal emotion regulation strategies. If indirect effects are not discussed for a particular interpersonal emotion regulation strategy that means there were no significant indirect effects to discuss.

Mood enhancing. In both studies, people who tried to enhance their partner's mood more were more satisfied with their relationship. In study two, this effect was stronger for women than for men. These findings are in line with my hypothesis that when someone tries to

enhance their partner's mood, it would be associated with higher relationship satisfaction for both partners. Mood enhancing can be considered supportive dyadic coping as it involves one partner helping the other to manage a stressful event (Levesque et al., 2014). These findings are in line with research indicating that dyadic coping enhances relationship satisfaction for both members of the couple (Bodenmann et al., 2006). Furthermore, the link between dyadic coping and relationship outcomes seems to be stronger for women than for men (Bodenmann et al., 2006).

In study one, a person's own attempts to try to enhance their partner's mood was not associated with their partner's relationship satisfaction. In study two, the more a person tried to enhance their partner's mood, the more satisfied their partner was with the relationship. Considering the link found between actor mood enhancing and partner relationship satisfaction, there is evidence that empathic tendencies (i.e., things partners do to enhance each other's mood) of one partner may lead to increased relationship satisfaction for the other partner, particularly when female partners are the ones being empathic (Davis & Oathout, 1987; Franzoi et al., 1985). In the current studies, participants were specifically asked about mood enhancing strategies when their partner is stressed or anxious, and the findings provide evidence that they may be beneficial to the relationship in these situations. One avenue for future research is to investigate the use of mood enhancing tactics in response to positive events (e.g., capitalization support). Capitalization by romantic partners has been linked to increased recipient well-being and positive affect (Gable et al., 2004; Reis et al., 2010) as well as the promotion of intimacy and closeness within the relationship (Laurenceau et al., 1998). The current findings give us a better understanding of how positive interpersonal emotion regulation strategies (e.g., being empathic and supportive to boost a partner's mood) are connected to relationship satisfaction. It is

important to understand factors that promote relationship satisfaction given all the benefits that stem from satisfying relationships (Diamond et al., 2010; Fincham et al., 2018; Robles et al., 2014).

Diverting partner attention. In both studies, diverting a partner's attention when the partner is distressed was not associated with either actor or partner relationship satisfaction. I hypothesized that when people use more attention diverting strategies it would lead to higher relationship satisfaction for both partners. In the current studies, I only measured when participants tried to divert their partner's attention to boost the partner's mood, so I expected to find the same pattern of results for mood enhancing and diverting attention strategies, but that was not the case. This indicates that there may be something about mood enhancing strategies that are more beneficial to the relationship than simply trying to distract a partner when they are having a difficult time. Humor is one of the strategies a person can use to distract their partner when they are in a bad mood. People are more satisfied with their relationships when they share more humor with their partner (Hall, 2017). Furthermore, higher levels of positive humor use during conflict is associated with higher relationship satisfaction for couples (Butzer & Kuiper, 2008), but the association varies with use of different types of humor. The item in the current studies that asked about use of humor was in response to the partner being in a bad mood, rather than being in the midst of a conflict discussion, so perhaps partner use of humor in these situations is less effective because the bad mood is one-sided and not shared between the partners. However, this is only one strategy used in this category of interpersonal emotion regulation.

Other tactics included in this strategy are distracting a partner by being cheerful, talking about something positive, or arranging an enjoyable activity. Sharing positive news with a

romantic partner promotes intimacy, closeness, and relationship satisfaction within the relationship (Laurenceau et al., 1998; Logan & Cobb, 2013) but to my knowledge, no studies have assessed the impact of sharing positive information with the intention of distracting a partner while they are distressed. Furthermore, people may not be aware that their partner is diverting their attention with the intention to boost their mood, which may have implications for relationship satisfaction. For example, if Kyle and Toni are partners and Toni comes home from work upset because her boss is being mean and Kyle tries to divert her attention by telling a joke, she may feel that Kyle is not being responsive to her concerns and get upset about the interaction. Even if Kyle was using humor with the intention of boosting her mood, it could negatively impact the relationship if his attempts are mistaken as being unresponsive or unsupportive. However, if Toni realizes that Kyle is trying to distract her by telling a joke with the intention of making her feel better, it could positively impact her mood and the relationship. Future research could investigate if people's ability to accurately perceive when their partner is trying to improve their mood impacts the efficacy of the strategy and relationship outcomes such as relationship satisfaction.

Concealing emotions. In both studies, the more people concealed their emotions from their partner the less satisfied they themselves were with the relationship. In study two, but not study one, when people concealed their emotions from their partner, their partner was also less satisfied with the relationship. These findings are in line with research that shows that emotional suppression is associated with lower relationship satisfaction (Cameron & Overall, 2018) and that people share their emotions with others in order to feel better; receive comforting, validation, or other forms of emotional support; and promote closeness in their relationships (Rimé, 2007, 2009). It is unsurprising that concealing emotions from a partner results in both

partners being less satisfied.

Prior research indicates that people who conceal their emotions from others are less satisfied with themselves and their relationships (Gross & John, 2003). This strategy might be used if experiencing negative emotions to try to prevent the partner from also experiencing negative emotions via emotional contagion (Hatfield et al., 2014), even though this may not be an effective strategy to regulate one's own emotions or the partner's emotions. Concealing emotions from others influences physical, psychological, and social well-being (e.g., Gross & John, 2003; Nils & Rimé, 2012), so it might influence relationship well-being as well via relationship satisfaction. Furthermore, concealing emotions may negatively influence relationship satisfaction because it creates a feeling of mismatch between inner experiences and outer expression, and this feeling of inauthenticity (Sheldon et al., 1997) may lead to feeling alienated from one's partner (Gross & John, 2003). Indeed, in one study when participants were asked to conceal their emotions during a conversation, they reported feeling nongenuine and inauthentic themselves, but they also reported the other person was being inauthentic as well (Butler et al., 2003), suggesting that concealing emotions from others may make people feel alienated from themselves and their social partners.

The emotions being concealed may also be important. Suppressing negative emotions leaves those negative emotions intact, while suppressing positive emotions decreases the experience of these emotions (Gross & Levenson, 1997; Stepper & Strack, 1993). In the current project, only concealing of negative emotions was assessed, but if someone is also feeling less positive emotions due to concealing them, they will not be able to capitalize on them with their partner and may miss out on the benefits of doing so (Gable & Reis, 2010; Laurenceau et al., 1998; Logan & Cobb, 2013; Reis et al., 2010). Future research could investigate the impacts of

concealing different emotions on relationship outcomes.

In study two, but not study one, concealed emotions from the partner was associated with lower partner relationship satisfaction as well. One explanation for this finding is that concealing emotions from a partner may undermine social functioning. Interacting with a partner who is concealing or suppressing their emotions is more stressful than interacting with someone who uses other emotion regulation strategies when they are experiencing negative emotions (Butler et al., 2003). If interactions are stressful because the partner is concealing their emotions, it may lead to lower relationship satisfaction. Additionally, concealing emotions from others they may still result in "leaking" signs of the emotion, but the signs may be ambiguous or confusing and may indicate the wrong emotion, or even be distracting to others (Gross & Levenson, 1997). People are highly attuned to signals of negative emotions in others (Campos et al., 2015) so even if someone is trying to conceal their negative emotions from their interaction partners, their efforts may not be effective. This confusion or ambiguity may be difficult for romantic partners and impact relationship satisfaction. Given that authenticity and self-disclosure are important for the development and maintenance of intimacy in relationships (Laurenceau et al., 1998; Sheldon et al., 1997), if it is obvious that the partner is being inauthentic and concealing their emotions, it might have implications for relationship satisfaction and other relationship outcomes (Gross & Levenson, 1997). I did not ask participants whether they could accurately perceive when their partner was using this interpersonal emotion regulation strategy, but this is an interesting area for future research.

Indirect effects. It is important to understand how sleep impacts the way people interact and express their emotions to their partner, and how those interactions impact the relationship, or in other words, how sleep directly and indirectly affects relationship outcomes. The way of

disclosing positive and negative events to the partner, and the partner's response to the information, has implications for the relationship (Reis & Shaver, 1988). In study one there were no indirect effects between sleep quality and either partner's relationship satisfaction. However, in study two, there were indirect effects between one person's sleep quality and both partners' relationship satisfaction. There was a significant indirect effect between actor sleep quality and actor relationship satisfaction through actor use of emotion concealing tactics—when people had poorer quality sleep, they were more likely to conceal their emotions from their partner, and concealing one's emotions from their partner was associated with being less satisfied with their relationship. There was also a significant indirect effect between actor sleep quality and partner relationship satisfaction through actor use of emotion concealing—when people had poorer sleep quality, they were more likely to conceal their emotions from their partner, and concealing one's emotions from their partner was associated with the partner being less satisfied with the relationship. These findings provide preliminary evidence that one mechanism through which sleep quality is associated with relationship satisfaction is the interpersonal emotion regulation strategies someone uses.

Inauthentic displays of emotions. In both studies, there was an association between inauthentic displays of emotions and relationship satisfaction. In study one, inauthentic displays of emotions did not impact own relationship satisfaction, but they were linked to the partner being less satisfied with the relationship. In study two, the opposite pattern was found. Inauthentic displays of emotion were linked with lower satisfaction with the relationship for the self, but the partner's relationship satisfaction was not significantly impacted. Each study only partially supports my hypothesis that use of inauthentic displays of emotion would be linked with lower relationship satisfaction for both partners. Prior research shows that using "destructive

conflict strategies," such as sulking, for their own benefit, are linked with lower relationship satisfaction for both the actor and the partner (Knobloch & Basinger, 2021).

Sometimes inauthentic displays of emotions are expressed to make one's partner feel guilty. Guilt is often accompanied by other negative emotions (Jones & Kugler, 1993), particularly when guilt has been induced by others (Baumeister et al., 1994; Overall et al., 2014). These negative emotions could impact relationship satisfaction, especially if the partner is successful in inducing these negative emotions. Once again, inauthentic emotional displays may result in lower satisfaction with the relationship because they create feelings of inauthenticity (Sheldon et al., 1997) which may lead to feelings of alienation from the partner (Gross & John, 2003). Indeed, feelings of closeness within a relationship are linked to relationship satisfaction, and those who are satisfied with their relationship are less likely to try to make their partner feel guilt to get what they want (Alexander, 2008). The inconsistent findings between the two studies indicate that more research needs to be conducted to better understand the link between inauthentic displays of emotion and relationship satisfaction. This research could focus on specific strategies (e.g., flattery vs sulking vs inducing guilt) to identify if any of the strategies may be more impactful than others for either actors, partners, or both.

Mood worsening. In both studies, worsening the partner's mood was linked with lower relationship satisfaction for both partners. In study two, the association between mood worsening and one's own relationship satisfaction was stronger for women than for men. Negative interpersonal emotion regulation strategies such as trying to worsen a partner's mood via criticism, undermining their confidence, and purposely inducing anxiety in them is likely to be viewed by the receiver as being unresponsive to their needs. These findings are in line with research that demonstrates that lower perceived responsiveness is associated with less

satisfaction with the romantic relationship (Gregory et al., 2020). Someone may choose to worsen their partner's mood because of their own negative emotions. Indeed, negative emotions and stress can spill over into relationships (Larson & Almeida, 1999; Sels et al., 2020; Westman, 2001) and impact relationship satisfaction. When one or both partners are experiencing stress (e.g., when they are not sleeping well) they may be more inclined to use mood worsening tactics on their partner and the relationship suffers because of it. Indeed, in the current studies, poor sleep quality was associated with worsening the partner's mood.

Once again, the situation that precedes the use of this strategy may be important. For example, if someone was reprimanded at work for being late too many times, and their partner is unhappy about it and makes a negative comment to make them feel bad (i.e., uses a mood worsening interpersonal emotion regulation tactic), it can lead to decreased satisfaction with the relationship. Indeed, prior research shows that negative reciprocity when providing partner support following a negative event is associated with more distress and lower happiness in the relationship (Gosnell & Gable, 2017). Furthermore, distressed couples are more likely to respond negatively to each other during a conflict discussion than couples who are more satisfied—negativity becomes an absorbing state for people who are dissatisfied with their relationship and it is difficult to exit that state once entered (Gottman et al., 1998). Distressed couples may be more likely to use negative interpersonal emotion regulation strategies to begin with and this feeds back into the relationship and they become even less satisfied.

Negative interpersonal emotion regulation may simply be the result/continuation of conflict between partners which could explain its association with relationship satisfaction. Although, conflict can result in being dissatisfied with the relationship, not all conflicts harm the relationship. Sometimes discussing negative events and issues in the relationship are necessary to

motivate people to make changes to improve and maintain the relationship (Lavner et al., 2014). Although the presence of conflicts in the relationship may not be harmful in general, how people respond to conflicts does have implications for the relationship and trying to worsen a partner's mood appears to have negative consequences for both partners. One positive thing to note is that although participants did endorse trying to worsen their partner's mood, this strategy was used the least out of the five interpersonal emotion regulation strategies investigated.

Indirect effects. In study one there were indirect effects between a person's own sleep quality and their relationship satisfaction through their own use of mood worsening tactics. People who had poorer quality sleep were more likely to try to worsen their partner's mood and were less satisfied with their relationship. However, in study two, there were no indirect effects of a person's sleep quality on either partner's relationship satisfaction. The indirect effects were not consistent across studies, but there is evidence that poor sleep quality impacts relationship satisfaction via use of interpersonal emotion regulation strategies, particularly negative strategies such as concealing emotions and mood worsening.

Limitations and Future Directions

Although the findings of these studies are interesting, it is important to note that sample characteristics may limit their generalizability. First, the samples collected for this project were predominantly White. Research shows that there are racial/ethnic disparities in sleep and its effects (Kingsbury et al., 2013). For example, Black people tend to sleep for shorter durations of time than White people (Krueger & Friedman, 2009; Stamatakis et al., 2007) and are at risk for more severe consequences of sleep problems than White people (i.e., diabetes; Zizi et al., 2012). The effects I found regarding poor sleep may differ in a more diverse population, or a population of primarily non-White individuals. Additionally, the average ages in both samples fall into early

adulthood (ages 22-34) and middle age (ages 35-44; Medley, 1980), and there is a stronger link between sleep disturbance and relationship quality in older adults, particularly in late adulthood (ages 65 and older; Medley, 1980; Yang et al., 2013). Older adults also notice and process emotional stimuli differently than younger adults (Reed et al., 2014), and this has implications for how they try to manage the emotions of others (Jarman & Windsor, 2021). Further research would need to be conducted with samples of varying characteristics to understand if these findings are generalizable.

In the current project I only assessed one aspect of sleep: self-report sleep quality. Although subjective ratings of sleep quality are highly correlated with physiological sleep outcomes (Buysse, 2014) there is a disconnect between objective sleep quality (as measured with polysomnography or actigraphy) and perceived sleep quality (as measured through subjective measurements, such as self-report questionnaires; Andre et al., 2021). Researchers who study dyadic sleep in romantic couples suggest that future research should use both objective and subjective sleep measures for both partners (Andre et al., 2021). It may also be useful to investigate different aspects of sleep quality and quantity and whether they have different associations with relationship processes and relationship outcomes. Most studies look at either sleep quality or sleep quantity (e.g., utilizing sleep deprivation paradigms) but do not consider both. The literature reviewed in this paper incorporate both investigations of sleep quality and sleep quantity but if they are not assessed in the same studies the effects cannot be compared. I assessed sleep quality in the current project, but there may be a different pattern of results, or different effect sizes for the links between sleep and interpersonal emotion regulation strategies if sleep quantity was assessed as well. Additionally, people may experience poor quality sleep on top of getting limited quantities of sleep and the combination of these sleep issues is not well

understood. Do they compound? Is one more important than the other? Future research should try to answer these questions.

In the current study all data were self-report. However, people are not necessarily good at reporting on their emotion regulation and interpersonal emotion regulation. Research shows there is a mismatch between subjective and behavioral emotion regulation data (Zhang et al., 2019), so future studies should consider collecting both subjective self-report and behavioral emotion regulation data. One future direction in this area of research would be to investigate individual differences in interpersonal emotion regulation tendencies and strategies used, particularly in romantic relationships. People with higher tendencies to try to regulate the emotions of others experience more positive emotions, share their emotions more openly, are more prosocial and have greater connectedness to others (Williams et al., 2018). Those who have positive experiences with interpersonal emotion regulation strategies may be more likely to use those strategies again in the future (Williams et al., 2018), but this has only been studied in young adults who were establishing new friendships in college. Given the differences in interpersonal emotion regulation across age groups, this research should be extended to other samples and other contexts (e.g., romantic relationships). Furthermore, using multiple intrapersonal and interpersonal emotion regulation strategies and switching between them is linked to higher wellbeing (Gloria et al, 2020). It would be interesting to understand what strategies people are using, how often they are using them, and their flexibility in switching between strategies to meet their interpersonal emotion regulation goals, and whether these abilities are impacted by their sleep.

This project assessed sleep quality and use of interpersonal emotion regulation strategies at one time and asked about the previous month. Future research should investigate whether

daily fluctuations in sleep impact daily relationship experiences, use of different interpersonal emotion regulation strategies, and relationship outcomes. This would give researchers a better understanding of whether someone's sleep on a particular night has implications for their interpersonal emotion regulation, and ultimately their relationship, or whether they have to experience a more prolonged disturbance to their sleep to see the effects. Further studies would help researchers fully understand this phenomenon and consider possible interventions to protect the relationship. Daily fluctuations in sleep properties can be accessed via self-report sleep diaries and more objective measures such as phone sleep applications or wearable technology that monitors sleep (Fitbit, Apple Watch, etc.). In addition to daily fluctuations in sleep, chronic sleep restriction should be considered as well. People adjust to chronic sleep restriction and rate themselves as being less "sleepy" than cognitive measures indicate (Banks & Dinges, 2007), suggesting self-report sleep quality and sleepiness may not be a great indicator of the cognitive effects of poor sleep. People may not feel sleepy or think they are getting poor sleep but still may be experiencing effects from inadequate sleep (quality or quantity).

Finally, another potential future direction could be to assess whether the interpersonal emotion regulation strategies used are effective at altering the partner's mood, as intended. This could be assessed with an ecological momentary assessment or daily diary paradigm to measure how often these strategies are used throughout the day, if they accomplish their intended goals, and whether people can pick up on their partner's attempts to regulate their emotions using these strategies.

Conclusion

Overall, the results of the studies suggest that sleep is linked with interpersonal emotion regulation, and interpersonal emotion regulation has implications for relationship outcomes.

However, the link between sleep and regulation strategies is inconsistent and needs further exploration. Furthermore, there were associations between almost every type of interpersonal emotion regulation strategy and relationship satisfaction, which indicates that how people try to regulate their partner's emotions matters for their own experiences, their partner's experiences, and the relationship itself.

To my knowledge, this is the first study that has assessed the complex associations between sleep, the way people try to manage their partner's emotions, and their relationship satisfaction. Given the ample evidence about how sleep is implicated in physical health (Cappuccio et al., 2010), mental health (Zochil & Thorsteinsson, 2018), and relationship outcomes (Gordon et al., 2021), in addition to the understanding that most people are not getting adequate quality and quantities of sleep (NSF, 2014), this area is full of opportunities for future research that has real-world consequences.

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Figure 1.

Conceptual model for Managing Emotions of Others subscales

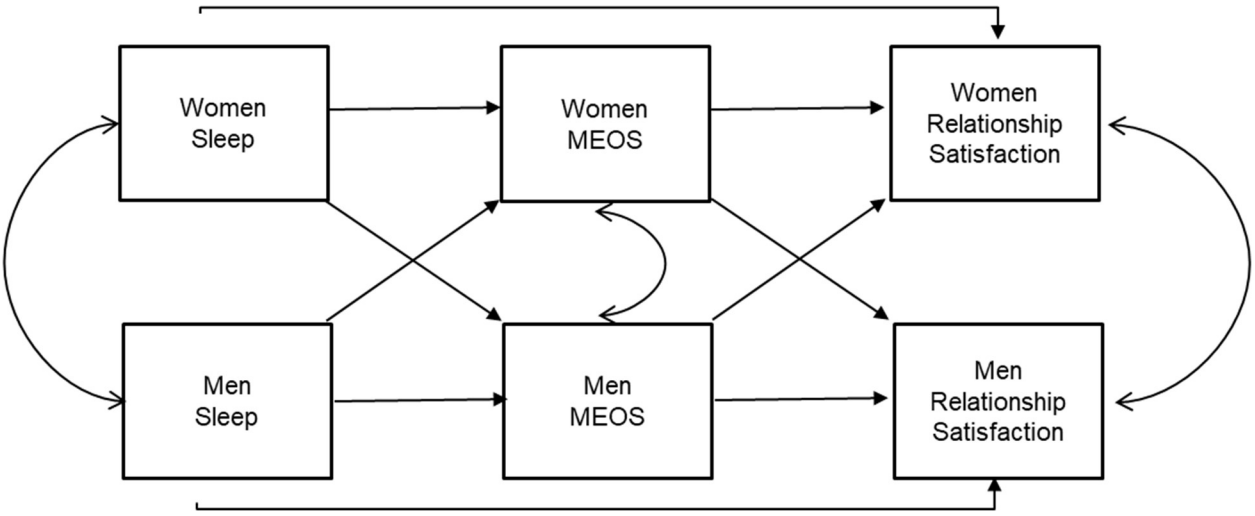
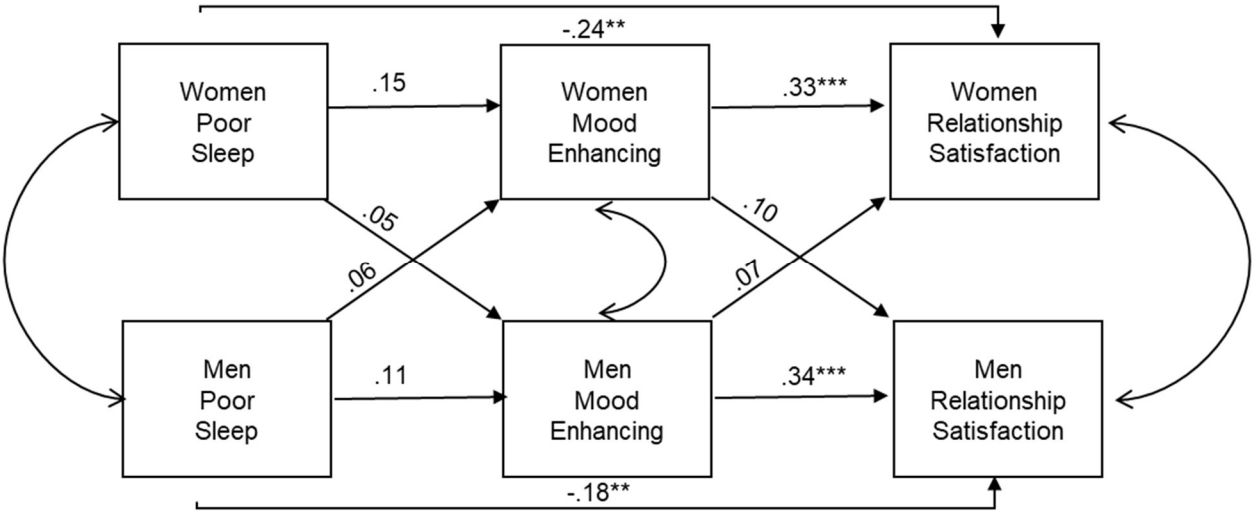


Figure 2.

Mood enhancing models

Study 1



Study 2

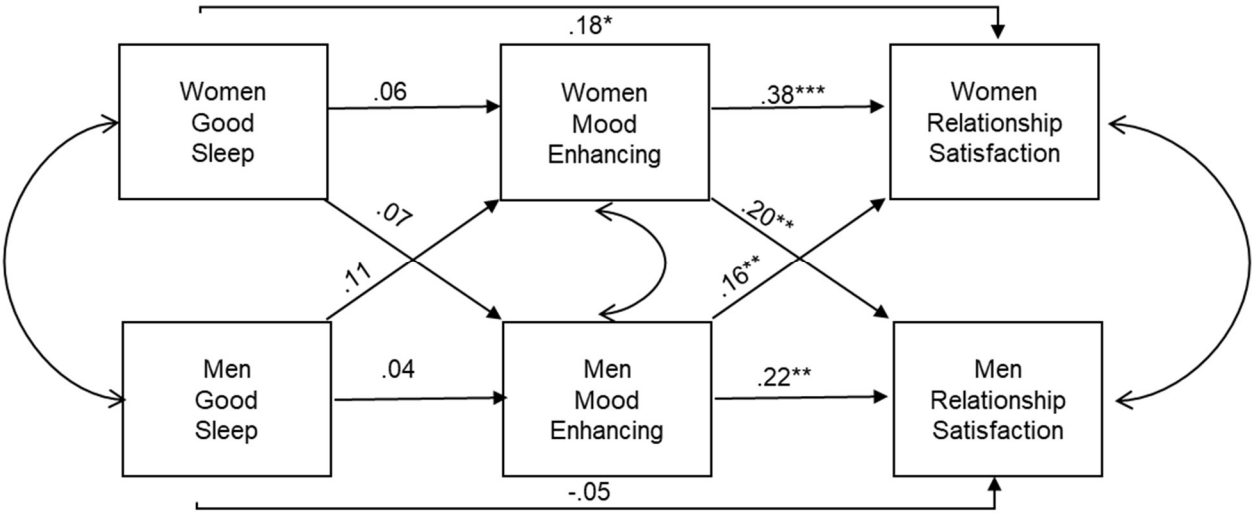
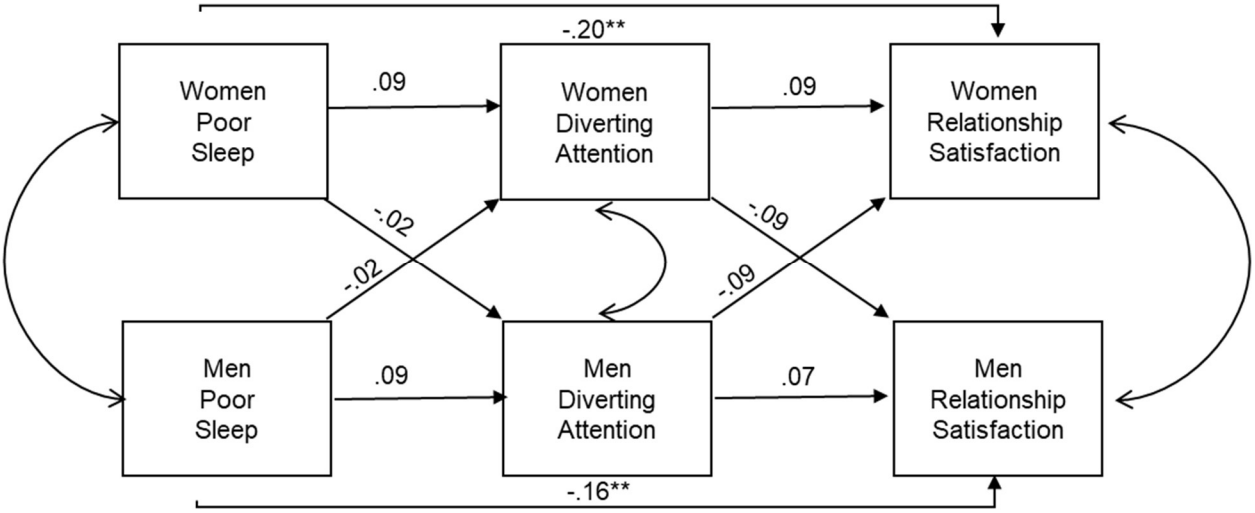


Figure 3.

Diverting attention models

Study 1



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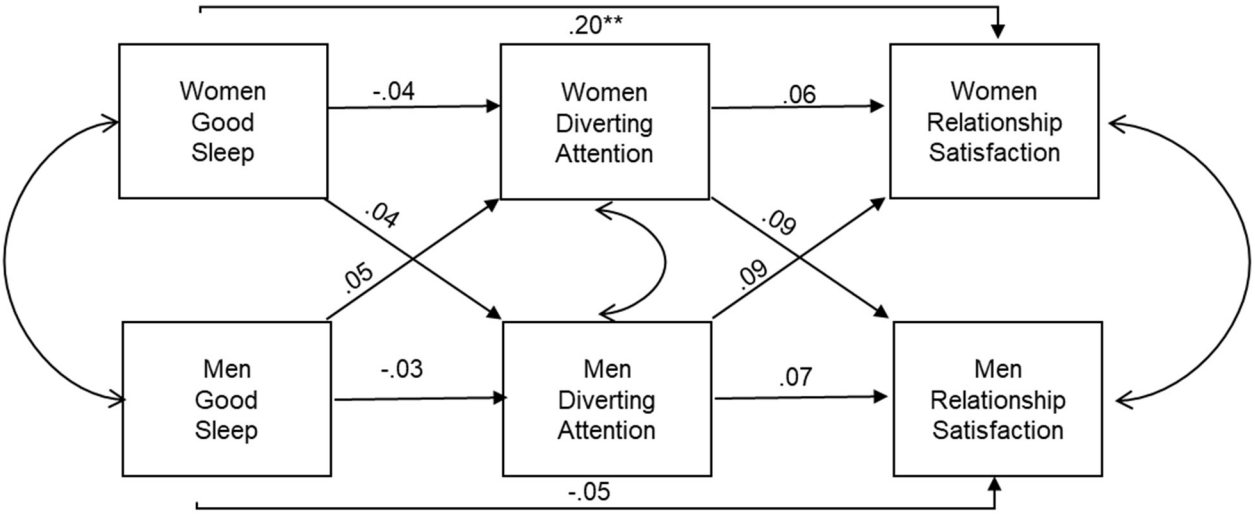
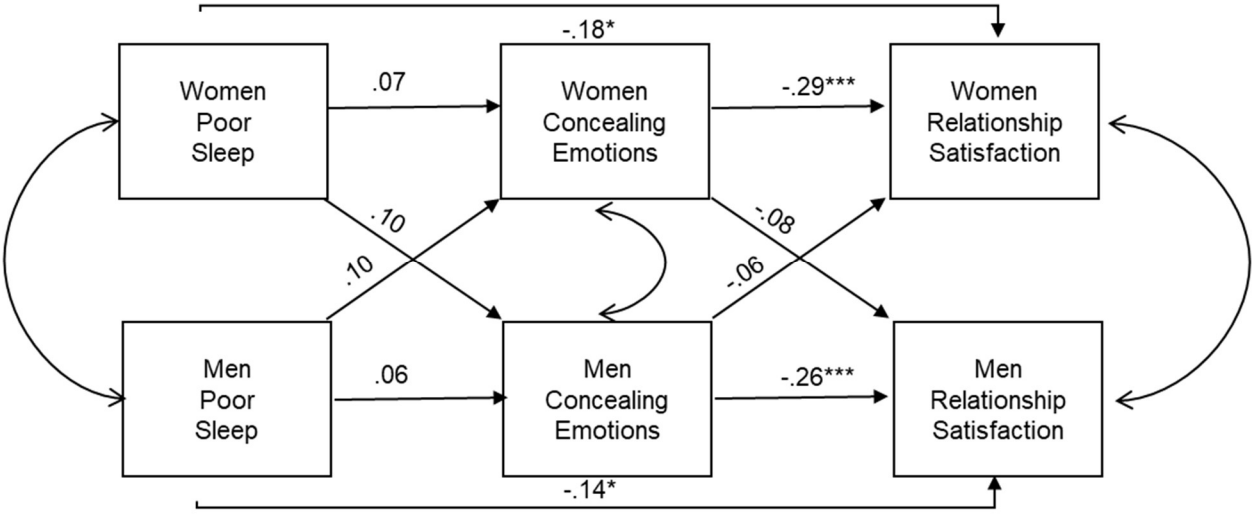


Figure 4.

Concealing emotions models

Study 1



Study 2

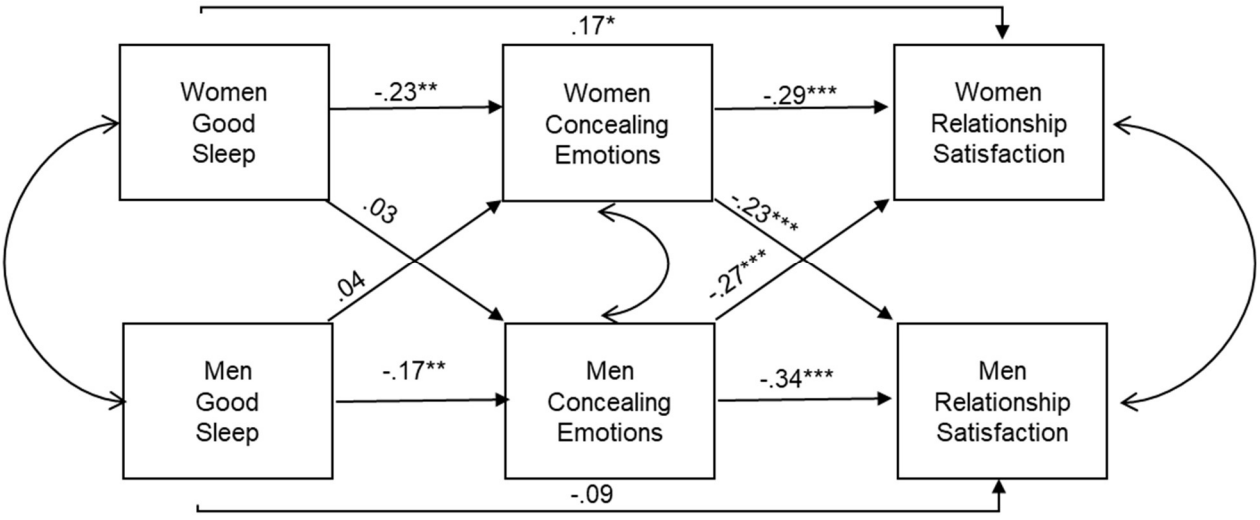
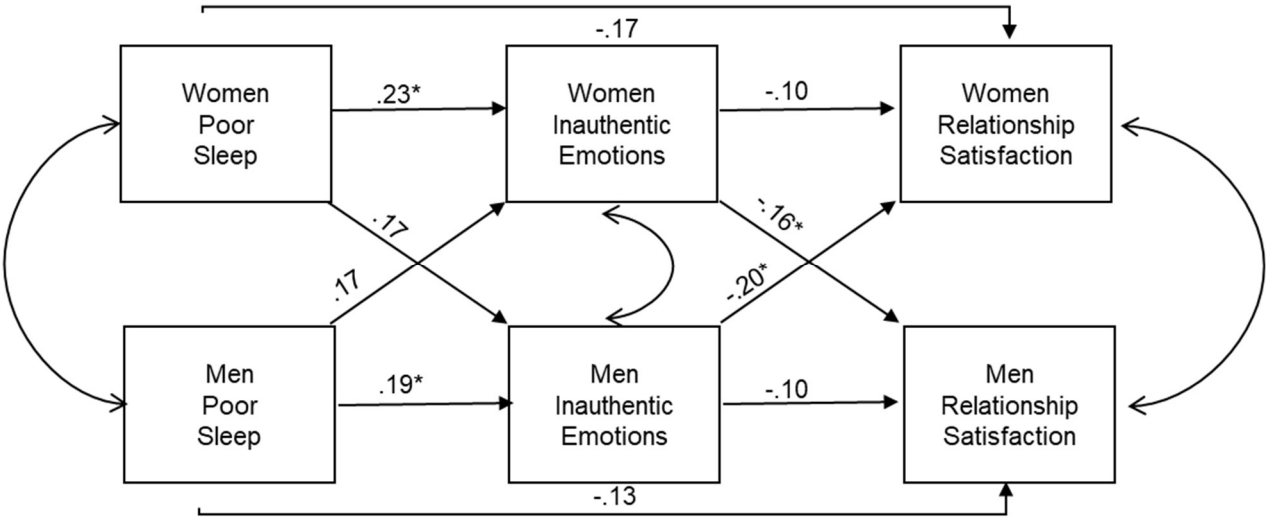


Figure 5.

Inauthentic displays of emotion models

Study 1



Study 2

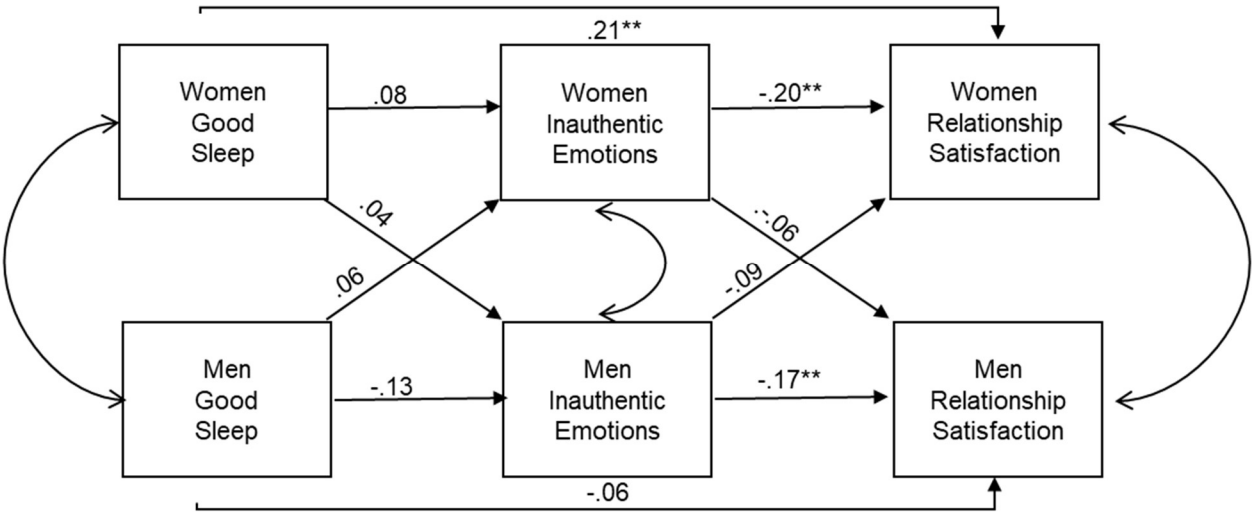
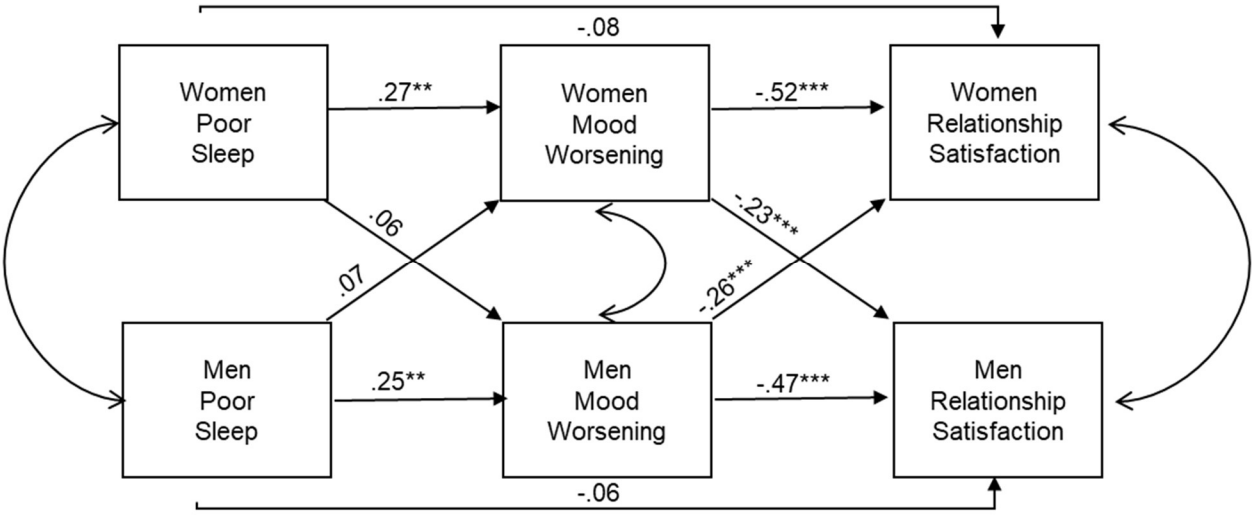


Figure 6.

Mood worsening models

Study 1



Study 2

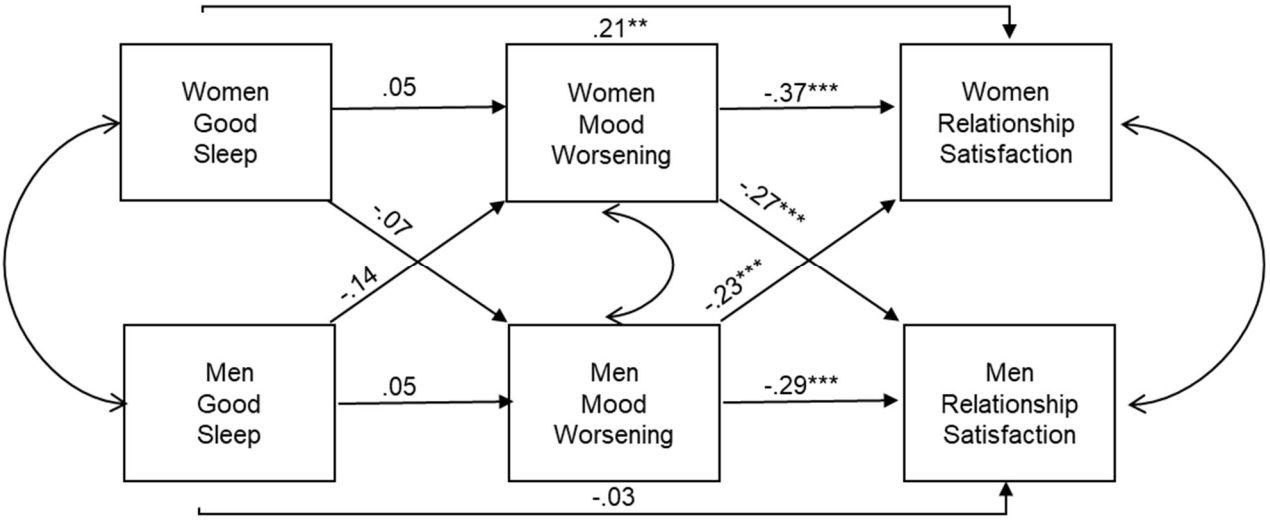


Table 1.

Descriptive Statistics for Managing Emotions of Others Scale

	Study 1			Study 2		
Subscales	Mean	SD	α	Mean	SD	α
1. Mood Enhancing	6.30	.72	.93	6.18	.70	.93
2. Diverting Attention	4.95	1.17	.85	5.15	1.06	.82
3. Concealing Emotions	3.22	1.44	.87	3.55	1.52	.88
4. Inauthentic Emotions	2.68	1.42	.88	3.05	1.39	.84
5. Mood Worsening	1.67	0.98	.84	1.93	1.21	.87

Note. All items were rated on 7-point scales.

Table 2.

Correlations for Study 1 Variables

Variable	Female							Male						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Women														
1. Sleep	1.00													
2. Mood Enhancing	.13	1.00												
3. Diverting Attention	.06	.39	1.00											
4. Concealing Emotions	.08	.02	.04	1.00										
5. Inauthentic Emotions	.23	-.07	.02	.14	1.00									
6. Mood Worsening	.30	-.34	-.09	.01	.55	1.00								
7. Relationship Satisfaction	-.35	.25	.00	-.26	-.25	-.54	1.00							
Men														
8. Sleep	.23	.24	.08	.24	.33	.17	-.17	1.00						
9. Mood Enhancing	-.09	.30	.15	.04	.11	-.02	.27	.15	1.00					
10. Diverting Attention	-.06	.23	.14	.06	.14	.04	-.02	.11	.33	1.00				
11. Concealing Emotions	-.01	-.14	-.09	.34	.14	.04	-.30	.10	-.09	.03	1.00			
12. Inauthentic Emotions	.11	-.12	-.14	.30	.28	.12	-.17	.28	-.12	-.14	.26	1.00		
13. Mood Worsening	.07	.11	.10	.03	.27	.27	-.47	.25	-.18	.10	.28	.49	1.00	
14. Relationship Satisfaction	-.20	.05	-.11	.00	-.33	-.31	.64	-.15	.39	.13	-.33	-.14	-.63	1.00

Table 3.

Correlations for Study 2 Variables

	Female							Male					
Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Women														
1. Sleep	1.00													
2. Mood Enhancing	.08	1.00												
3. Diverting Attention	-.09	.26	1.00											
4. Concealing Emotions	-.25	-.16	.27	1.00										
5. Inauthentic Emotions	.10	-.29	.06	.24	1.00									
6. Mood Worsening	.02	-.41	.05	.25	.68	1.00								
7. Relationship Satisfaction	.19	.48	.06	-.29	-.23	-.47	1.00							
Men														
8. Sleep	.18	.18	-.02	-.12	-.08	-.19	.11	1.00						
9. Mood Enhancing	.05	.26	.08	-.11	-.19	0.10	.19	.05	1.00					
10. Diverting Attention	.08	.21	.15	-.22	-.04	.05	.09	.06	.39	1.00				
11. Concealing Emotions	.09	-.24	-.01	.09	.04	.19	-.31	-.13	-.14	-.15	1.00			
12. Inauthentic Emotions	.11	-.25	-.10	.03	.31	.19	-.16	-.15	-.33	-.16	.28	1.00		
13. Mood Worsening	-.07	-.28	-.10	.00	.19	.19	-.15	.03	-.19	-.18	.06	.37	1.00	
14. Relationship Satisfaction	-.03	.31	.13	-.22	-.11	-.31	.63	.00	.22	.07	-.41	-.16	-.18	1.00

APPENDICES

Appendix A. Managing Emotions of Others Scale

Please indicate your agreement with the following items.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree

Mood Enhancing

1. When my partner is anxious about a problem, I try to help him/her work out a solution.
2. If my partner is feeling anxious, I try to calm him/her down by talking with him/her.
3. If my partner is anxious, I try to reassure him/her.
4. When my partner is under stress, I try to boost his/her confidence in his/her ability to cope.
5. When my partner is unhappy, I show that I understand how he/she is feeling.

Mood Worsening

6. I sometimes put my partner down in public to make him/her feel bad.
7. I use criticism to make my partner feel that he/she should work harder.
8. I can make my partner feel anxious so that he/she will act in a particular way.
9. I sometimes try to undermine my partner's confidence.
10. If I don't like my partner's behavior, I make negative comments in order to make him/her feel bad.

Conceal Emotions

11. I often conceal feelings of anger and distress from my partner.
12. When my partner has made me upset or angry, I often conceal my feelings.
13. I hide my feelings so my partner won't worry about me.
14. When my partner has made me upset or angry, I tend to downplay my feelings.
15. I don't believe in telling my partner about my problems, I keep them to myself.

Inauthentic Displays of Emotion

16. I sometimes sulk to make my partner feel guilty.
17. If my partner says or does something I don't like, I sometimes sulk.
18. I sometimes sulk to get my partner to change his/her behavior.
19. If I want my partner to do something for me, I am especially nice to him/her before asking.
20. If my partner's behavior has caused me distress, I try to make him/her feel guilty about it.

Divert Partner Attention

21. If my partner is angry, I try to divert his/her mood by being cheerful.
22. When my partner is in a low mood, I behave in a happy and cheerful way to make him/her feel better.
23. When my partner is in a bad mood, I try to divert him/her by telling jokes or funny stories.
24. When my partner is unhappy, I try to cheer him/her by talking about something positive.
25. When my partner is unhappy, I try to cheer him/her by arranging an enjoyable activity.

Appendix B. Sleep Measures

Study 1: Pittsburgh Sleep Quality Index

During the past month, how often have you had trouble sleeping because you . . .

1	2	3	4
Not during the past month	Less than once a week	Once or twice a week	Three or more times a week

1. Cannot get to sleep within 30 minutes
2. Wake up in the middle of the night or early morning
3. Have to get up to use the bathroom
4. Cannot breathe comfortably
5. Cough or snore loudly
6. Feel too cold
7. Feel too hot
8. Had bad dreams
9. Have pain
10. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?
11. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
12. During the past month, would you rate your sleep quality overall as:
    a. ( ) Very bad
    b. ( ) Fairly bad
    c. ( ) Fairly good
    d. ( ) Very good

Study 2:

During the past month, tell me how many days you…

	4	3	2	1	0
	Every day	Several Times Per Week	About once per week (3-4 Times in past month)	Once or Twice	Not at all
Slept 8 hours					
Felt rested after sleeping					

Please indicate how often you've experienced the following over the past month…

	1	2	3	4	5
	None at all	A little	A moderate amount	A lot	Very much
Difficulty in falling asleep or staying asleep					

Appendix C. Investment Model Scale

Study 1:

Please answer the following questions about your relationship.

1	2	3	4	5	6	7
Strongly disagree	Moderately Disagree	Slightly disagree	Neutral	Slightly agree	Moderately Agree	Strongly agree

1	I feel satisfied with my relationship.	1	2	3	4	5	6	7
2	I feel close to my partner.	1	2	3	4	5	6	7

Study 2:

Please answer the following questions about your relationship.

1	2	3	4	5	6	7
Strongly disagree	Moderately Disagree	Slightly disagree	Neutral	Slightly agree	Moderately Agree	Strongly agree

1	I feel satisfied with my relationship.	1	2	3	4	5	6	7
2	I feel close to my partner.	1	2	3	4	5	6	7
3	My relationship is close to ideal	1	2	3	4	5	6	7

Appendix D. MPlus Syntax for Fully Constrained Model

```
ANALYSIS:
  Model = NOCOV;

MODEL:
  sleep_f WITH sleep_m;
  meosme_f ON sleep_f (1);
  meosme_m ON sleep_m (1);
  meosme_m ON sleep_f (2);
  meosme_f ON sleep_m (2);

  meosme_f WITH meosme_m;
  sat_f ON meosme_f (3);
  sat_m ON meosme_m (3);
  sat_f ON meosme_m (4);
  sat_m ON meosme_f (4);

  sat_f WITH sat_m;
  sat_f ON sleep_f (5);
  sat_m ON sleep_m (5);


OUTPUT: MOD(1) SAMP STANDARDIZED TECH1 TECH3 TECH4 CINT;
```