

**Exploring Dyadic and Longitudinal Associations between Couple Relationship Skills,
Perceived stress, and Sleep Quality among Couple Relationship Education Participants**

by

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Abstract

Couple relationship education (CRE) has been used as one of the primary prevention methods targeting couples' relationship functioning. Considerable evidence suggests that CRE programs are effective in improving couples' relationship satisfaction, family harmony, relationship stability, and mental health outcomes. However, only a few studies have considered the implications of CRE programs on indicators of physical health. To build upon and extend recent findings that CRE positively impacted participants' sleep quality as well as elements of couple functioning immediately post-program, with effects sustained over 1 year, this study investigated the dyadic links between specific behaviors emphasized in CRE (i.e., conflict management skills, caring for partner skills, and self-care skills), perceived stress, and sleep concurrently, as well as between the specific CRE behaviors and sleep prospectively and within dyad. We used assumptions from interdependence theory, social support, and social control theory to frame the empirical models. The sample for this study was 308 different-sex couples randomly assigned to receive a CRE curriculum. The sample was racially and economically diverse. Overall, couples' conflict management skills and self-care skills were both associated with individuals' sleep quality. Further, women but not men's conflict management skills were associated with their partners' sleep quality; whereas men but not women's self-care skills were related to their partner's sleep quality concurrently. Further, men and women's conflict management skills were both indirectly related to their own and their partner's sleep quality through their perceived stress level. Similarly, perceived stress also served as an indirect link between men and women's self-care skills and their own sleep quality. Results from a series of actor-partner interdependence structural equation models (SEM) revealed the dyadic cross-lagged effects over a 1-year period between couple relationship skills and sleep functioning.

Over time, we found that positive changes in men and women's sleep quality from baseline to immediately post-program predicted improvements in their own conflict management skills 1 year later. Enhancements in women's conflict management skills predicted better sleep quality for themselves. We also found that improvements in men's self-care behaviors predicted better sleep quality for themselves and their partners. These findings provide some evidence of both directional and bidirectional influences between relationship functioning and sleep and adds to knowledge of change processes following CRE participation. The study also further validates the benefits of current practices in CRE to emphasize improvements in these couple relationship skills and may suggest an additional emphasis on and discussion of the links between sleep and couple functioning.

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CHAPTER I: Introduction

The relationship between couple functioning and health is a complicated and nuanced one. Generally speaking, healthy individuals are more likely to select themselves into relationships, and they are likely to choose partners who are similar in health conditions and health behaviors. Those who are in healthy couple relationships, tend to benefit from such relationships, as demonstrated by their increased individual well-being (e.g., Braithwaite & Holt-Lunstad, 2017; Lillard & Panis, 1996; Kiecolt-Glaser & Wilson, 2017; Waldron et al., 1996). The reverse is also found for those in unhealthy relationships. The association between couple relationship quality and individual's physical well-being, overall, has been well-documented in past literature. The highly influential systematic review by Kiecolt-Glaser and Newton revealed that relationship functioning has a direct impact on people's physiological well-being including functioning of immune, cardiovascular, endocrine, and neurosensory systems (2001). A more recent review suggested that health behavior might be one of the mechanisms connecting relationship quality and health outcomes. Additionally, romantic partners have critical influence on each other's physical health and well-being through dyadic processes that likely also affect each other's perceptions of relationship quality and satisfaction. Specifically, some of the important health behaviors linking relationship quality and health outcomes, such as sleep, diet, and exercise, have dyadic elements (e.g., co-sleeping, sharing meals); thus, romantic partners likely influence each other's individual health behaviors and affect each other's individual and relational health because of their close proximity (e.g., Barr & Simons, 2014; Meyler et al., 2007; Robles, 2014; Wilson & Novak, 2021).

Understanding the value of high-quality couple relationships, practitioners and policymakers have emphasized practical efforts to help couples build healthy and stable

relationships (e.g., Halford & Snyder, 2012; Halford & van Acker, 2012; Markman et al., 2004). One of the tools used as a primary prevention method targeting couples' relationship functioning is couple relationship education (CRE) (Halford et al., 2004); however, there has been limited attention given to assessing the implications of CRE for individual health. A large body of literature spanning several decades has assessed whether and how CRE programs are effective in promoting healthy relationships and have primarily focused on investigating participant improvements in critical relational outcomes such as couple relationship satisfaction, communication skills, conflict management skills, positive couple behaviors, and coparenting agreements (e.g., Adler-Baeder et al., 2010, 2018; Markman & Rhodes, 2012; Rauer et al., 2014). Meta-analytic studies (including a range of 38 to 143 studies) documented that these areas were likely to improve immediately after participation in CRE programs, and a few of the studies that followed the participants long-term detected that some of the effects were sustained up until 2 years after program participation (Arnold & Beelmann, 2019; Blanchard et al., 2009; Hawkins et al., 2008; Hawkins & Erikson, 2015). Other recent CRE studies examined the spillover of program effects to enhancements in coparenting and improvements in child outcomes as well (e.g., Adler-Baeder et al., 2013; Adler-Baeder et al., 2018; Lavner et al., 2020; Sterrett-Hong et al., 2018).

In addition to couple and family functioning outcomes, individual mental health and well-being indicators were also assessed in some CRE studies; findings indicate that CRE participants report enhanced individual empowerment and reduced depressive symptoms (e.g., Adler-Baeder, et al., 2022; 2010). Other studies explored the links between changes in couple functioning and mental health among CRE participants and found bidirectional influences (e.g., Bradford et al., 2014; Roddy et al., 2021).

Although basic science studies clearly link relational and physical health and early policy papers supporting funding for CRE emphasized the value for physical health and well-being (e.g., Staton, 2009; Staton & Ooms 2011; Wood et al., 2007), surprisingly few studies of CRE emphasize and assess indicators of physical health. Specifically, sleep, a critical indicator and predictor of psychological and physical health (Cappuccio et al., 2010; Kent de Grey et al., 2018), has been considered in only a few recent CRE studies (Adler-Baeder, et al., 2022; Barton et al., 2021; Roddy et al., 2021; Roddy & Doss, 2021). Findings indicated that CRE participants showed positive changes in their sleep quality immediately post-program (Barton et al., 2020) and the program effects were sustained for as long as 1 year (Adler-Baeder, et al., 2022).

The current study was built upon and extended the investigations of CRE and sleep by investigating the link between specific behaviors emphasized in CRE (i.e., self-care skills, caring behaviors, and conflict management skills), perceived stress, and sleep quality at CRE program start and over time. The inclusion of a stress measure in our study is based on consistent findings that stress from multiple sources influences sleep quality (e.g., Eliasson et al., 2010; Kashani et al., 2012). This improves the understanding of what aspects of the CRE experience influence reports of stress and sleep quality. Further, the current study was the first to consider the dyadic influences of the specific behaviors of self-care, caring, and conflict management on partners' reports of sleep quality among CRE participants. This study contributes to the small, but growing literature on CRE programs and physical health outcomes and offers more nuanced information on potential processes and mechanisms of influence. Findings of the current study inform the research base as well as practice.

Couple Relationships and Health

Healthy couple relationships can provide several protective effects for an individual's health. Previous literature demonstrates that married couples have a variety of better health outcomes and overall lower mortality rates than unmarried individuals (Rendall et al., 2011; Robles et al., 2014; Waite, 1995), with some scholars asserting a causal link between marriage and health outcomes (Wood et al., 2007). Others point out that several factors may be at play to explain this link. Research shows that, on average, married individuals have greater access to financial resources (Lerman, 2002); they are less likely to engage in health compromising behaviors (e.g., drinking and smoking) (Cho et al., 2008; Kendler et al., 2016); they are more likely to eat healthier and less likely to be obese or overweight (Braithwaite et al., 2010; Mata et al., 2015); they reported experiencing less mental health problems (Braithwaite et al., 2010); they reported greater life satisfaction (Holt-Lunstad et al., 2008); and better blood pressure outcomes (Holt-Lunstad et al., 2008) compared to people who are unmarried or are not in committed couple relationships.

However, not all couple relationships are equal. Importantly, it is the quality of a couple relationship that appears to be more predictive of the individual health outcomes than simply marital status. Being in an unhappy marriage or couple relationship not only is less likely to provide any health benefits, but it also can have harmful effects on people's long-term health. Negative interactions and ineffective conflict management can lead to poorer health through the negative effects on cardiovascular, endocrine, and immune systems (Robles & Kiecolt-Glaser 2003; Smith et al., 2013; Wright & Loving, 2011). Other longitudinal studies also indicate that the sustained negative effects of relationship strains have on couples are cumulative and can have even stronger negative effects as the couples age (Umberson et al., 2006).

Other research emphasizes the deleterious effects of poor relationship quality on couples' mental health outcomes, and these issues are linked with physical health issues. For example, lower partner support was significantly associated with women's depressive symptoms (Choi & Ha, 2010), and negative couple interactions were indirectly related to men and women's health outcomes through their depressive symptoms (Sandberg et al., 2013). Fortunately, the opposite is true when relationship quality is high. Receiving emotional support from a partner has positive effects on one's emotional and mental health outcomes and may in turn lower the chance of them engaging in risky behaviors and having compromised physical health outcomes (Kiecolt-Glaser et al., 2010; Umberson & Montez, 2010).

Couple Relationships and Sleep

Sleep is an important health behavior that plays a vital role in people's overall health and well-being (Cappuccio et al., 2010; Gallicchio & Kalesan, 2009; Lo et al., 2018). Lack of quality sleep is associated with an increased risk of chronic conditions including, type 2 diabetes, cardiovascular disease, obesity, and depression (CDC, 2019). Sleep researchers emphasize that stress from various sources such as financial well-being, work experience, interpersonal interactions, and societal events can all negatively affect sleep quality (e.g., Fortunado & Harsh, 2006; Garefelt et al., 2020; Zhao et al., 2020). Some of the research on sleep during adulthood treats sleep quality as an individual process instead of a dyadic process. Some studies, however, point out that it is very common for adults to share the experience of sleep with a partner, particularly in western cultures, validating the inclusion of sleep measures in studies of couples (e.g., Richter et al., 2016; Troxel et al., 2007). A number of recent studies document a robust association between relationship quality and sleep quality. Studies find that greater relationship satisfaction is related to better sleep quality and less chance of having sleep disorders like

insomnia (e.g., Madsen et al., 2021; Troxel et al., 2017). In studies using objective sleep measures (i.e., sleep actigraphy), respondents who reported more positive couple relationship characteristics showed better sleep actigraphy outcomes (Chen et al., 2015).

While high relationship quality and positive interactions benefit couple's sleep quality, the opposite is true as well – sleep quality can be compromised when there are relationship strains and conflicts. For example, a recent study found that lower relationship satisfaction was associated with more sleep disturbance over a 6-month period (Brown et al., 2019). Further, a large body of research finds that couples experiencing moderate to high conflict are more likely to experience sleep disruptions and lower quality sleep, and also disrupt their children's sleep patterns (e.g., Kelly & El-Sheikh, 2011; Schlarb et al., 2015; Troxel et al., 2009). Notably, some studies test indirect effects models and found that relational distress and conflicts are often closely connected with emotional distress, anxiety, and depressive symptoms explaining lower quality sleep (e.g., El-Sheikh et al., 2013; 2015; Hall et al., 2000; Selcuk et al., 2017). In addition, the associations between relationship quality and sleep quality were found to be bidirectional – meaning not only can relationship quality impact couples' sleep quality, but the couples' sleep quality has an influence on their relationship quality as well (e.g., Hasler & Troxel, 2010; Medina et al., 2009). Specifically, research using daily diaries shows that couples have more conflicts and negative interactions following poor nights of sleep (Gordon & Chen, 2014; Hasler & Troxel, 2010), but have more positive couple interactions following a night of high couple sleep concordance (Hasler & Troxel, 2010). In a longitudinal study, participants who reported lower relationship quality at baseline were more likely to report lower sleep quality 4 years later, while sleep quality also significantly predicted couple relationship quality 4 years later (Yang et al., 2013). Thus, we can consider that reports of stress, sleep quality, and couple

quality are linked for individuals and within dyads and that improvements in one area may manifest as improvements in other areas.

Core Couple Skills That Influence Sleep

Decades of research point to several key couple relationship skills that are predictive of relationship quality and are essential to healthy relationship functioning (Futris & Adler-Baeder, 2013). The National Extension Relationship and Marriage Education Model is an empirically-derived framework that consists of 7 core elements of couple relationships shown to be robust predictors of high quality couple relationships and recommended as targeted skills in CRE programs (NERMEM; Futris & Adler-Baeder, 2013). The seven core concepts are *Self-Care* (*practices that maintain health and well-being*), *Choose* (*intentional behaviors that prioritize the relationship*), *Know* (*efforts to gain, maintain, and enhance intimate knowledge about each other*), *Care* (*attending to each other with affection and compassion*), *Manage* (*constructive skills for managing conflicts and stress*), *Share* (*efforts to connect and establish and maintain a couple identity*), and *Connect* (*mutually engaging in contextual supportive networks*). The current study included assessments of three of the core relationship skills that have been shown to be closely connected with reports of stress and sleep quality – *Self-Care*, *Care*, and *Manage*.

Each of these three skillsets is well-documented in the literature to have robust direct connections with both healthy individual and couple outcomes, specifically with stress and sleep (Goddard et al., 2013; Greeff & Bruyne, 2000; Rizkalla et al., 2008; Wiley et al., 2013).

Research shows that efforts to care for one's mental and physical self (*Self-Care*) is highly associated with healthy couple functioning (e.g., Booth & Johnson, 1994; Wiley et al., 2013). Further, self-care behaviors are linked with lower stress and better sleep quality (e.g., Virtue et al., 2012; Shahandashti et al., 2021; Shapiro et al., 2007; Werner et al., 2020). In addition,

expression of affection, positive emotions, and efforts to care for the partner (*Care*) are also strongly related to healthy couple relationships (e.g., Goddard et al., 2013), as well as lower stress and better sleep (e.g., Ditzen et al., 2007; O'Neill et al. 2020; Selcuk et al., 2017). Finally, it is well-documented in the literature that constructive conflict management (*Manage*) contribute considerably to couple well-being (e.g., Marshall et al., 2013), as well as lower stress and higher quality of sleep (e.g., El-Sheikh et al., 2015). Recent summaries of CRE work note that these three are core content areas of CRE programs and are consistently and heavily emphasized across CRE curricula (Hawkins et al., 2020; Stanley et al., 2020). No studies of CRE, however, have tested their relative influence on indicators of individual mental and physical health outcomes.

Couple Relationship Education

As indicated, numerous studies provided evidence that CRE programs are effective in helping couples (Stanley et al., 2020). While it is well-established that some CRE programs are effective in improving couple and individual functioning as indicated by assessments of relationship quality (Adler-Baeder et al., 2010, 2022; Hawkins & Fackrell, 2010), positive couple behaviors (Adler-Baeder et al., 2010), commitment (Rauer et al., 2014), communication skills (Markman & Rhoades, 2012), individual empowerment (Harcout et al., 2017), depressive symptoms and mental health (Adler-Baeder et al., 2010, 2022; McGill et al., 2016), and coparenting agreement (Adler-Baeder et al., 2018), comparatively little is known about improvements in indicators of individual physical health following CRE participation.

In the few studies of CRE programs and physical health, promising findings suggest CRE participation leads to enhancements in physical health. For example, a study of 61 couples assessed the same conflict-like conversations pre and post CRE participation and detected a

lower cortisol level for couples during the conversation post CRE participation (Ditzen et al., 2011). Four recent CRE studies examined the relationship between CRE participation and physical health rigorously by implementing randomized control trials (RCT) (Adler-Baeder et al., 2022; Barton et al., 2021; Roddy et al., 2020; Roddy & Doss, 2020). In a sample of 748 couples, Roddy and colleagues (2020) found CRE program participants reported significantly greater improvements in individual mental health and several physical health behaviors (e.g., alcohol use, insomnia, and exercise) immediately post-program and over a 4-month follow-up period compared to those who did not receive the CRE program. Further, they found that CRE participation had indirect positive effects on couples' perceived health through psychological distress and insomnia and these effects were sustained over a 4-month period (Roddy & Doss, 2020). In a sample of 297 couples, Barton and colleagues (2021) found positive programs effects on sleep problems through increased couple functioning post CRE participation. In addition to the short-term program effects, Adler-Baeder and colleagues (2022) also found in a sample of 929 couples positive program effects on CRE participants' sleep quality over a 1-year period compared to a no-program control group who did not show improvements in sleep quality over time. These studies represent an important starting point for establishing evidence that suggests that CRE participation promotes physical health. An important next step is understanding better and in more practical terms how these two areas are linked both concurrently and over time and whether and how couples influence each other. These efforts enhance our understanding of mechanisms of change resulting from CRE participation.

Theoretical framework

The current study was guided by assumptions in interdependence theory (Kelley & Thibaut, 1978), social support theory (House, 1987), and social control theory (Umberson, 1987,

1992). These theories provide foundational backgrounds that inform the understanding of the dyadic effects of romantic relationship and health outcomes. One of the primary assumptions of interdependence theory is, one partner's behaviors and functioning can impact both partners (Kelley & Thibaut, 1978). Interdependence theory also has a strong emphasis on understanding the outcomes of interactions by focusing on the actor component (each person's actions and their own outcomes), partner component (each person's actions and their partner's outcomes), and relational component (to what degree are the partners' outcomes related; Kelley et al., 2003; Rusbult & Van Lange, 2008). Interdependence theory provides us the most fundamental reasons to explore the effects that specific behaviors of couple interactions have on couple relationships (Arriaga, 2013; Holmes, 2002).

In addition, social support theory proposes social support, social regulation, and social conflict as three of the main processes of social relationships; each of the aspects has direct and indirect associations with physical and mental health. When studying romantic relationships incorporating these three processes, both the positive and negative effects of romantic relationships are being considered. On one hand, social support encompasses emotional caring, instrumental aids, and information (House et al., 1988). Supportive couple relationships directly provide resources that people need to stay healthy. On the other hand, relationship conflicts reflect the negative and conflictual aspects of the relationship and may be detrimental to health (House et al., 1988). Perhaps more importantly, social support theory also suggests that social support promotes health through buffering emotional distress and stress, which establishes a pathway that can be tested in empirical studies (House, 1987).

As one of the aspects of the three social processes that were distinguished by social support theory, social control theory (Umberson, 1992) suggests that close social relationships

can positively or negatively influence people's health depending on the social influence strategy they use. Based upon social control theory, self-care behaviors can be identified as an indirect social control strategy because modeling a health behavior oneself can significantly predict one's partner's engagement in that corresponding health behavior (Homish & Leonard, 2008). On the other hand, caring behaviors toward one's partner, such as expression of affection, sharing emotions, and making connections, are all channels to demonstrate social support. Further, expression of positive emotions, according to social control theory, is one of the positive social control tactics and an effective tactic for encouraging health behavior engagement, which in this case, is to get more quality sleep at night (Lewis & Butterfield, 2007; Young et al., 2019). Finally, conflict management skills promote constructive and effective ways to handle conflicts, and therefore may buffer the stress that is caused by the conflict itself, and in turn, promote more quality sleep and less sleep disruptions (Brown et al., 2019). All of these skills, in the context of interpersonal interactions, and how one of the partners or both partners utilize them, would have impact on their own and their relational outcomes.

Building upon the concepts proposed by these theories that romantic partners influence each other's health within the context of interpersonal interactions, this study investigated the association between three distinct couple relationship skills and reports of sleep quality. Further, the conceptual framework includes the consideration that these areas are linked for self and partner through perceived stress.

Current Study

As noted, a recent study established the program effect of a CRE program (i.e., the ELEVATE curriculum) on sleep quality for a large, diverse sample of couples (Adler-Baeder et al., 2022). In the current study and using the same sample, we sought to better understand this

effect and tested the links among specific practices addressed in CRE, perceived stress, and sleep quality for individuals and their partners.

Based upon the current literature and this study's theoretical framework, we expected that there are direct inverse links between self-care behaviors, caring behaviors, and conflict management skills and sleep dysfunction for both individuals (actors) and their partners (partners) at baseline (H1). Based on previous evidence linking relationship functioning, emotional distress/stress, and sleep quality, we further hypothesized that there are indirect links at baseline between caring behaviors, self-care behaviors, conflict management skills and sleep quality through perceived stress level for both self and partner. Higher relationship skills are associated with lower perceived stress levels for self and partner, and lower stress are in turn related to one's own and one's partner's lower sleep dysfunction (H2). Finally, to assess the process of change in CRE, we explored the bidirectional relationship between sleep quality and couple relationship functioning and test a cross-lagged model of change among couple relationship skills and sleep quality over a 1-year period (RQ1).

Chapter II: Literature Review

Overview

Sleep is a vital health behavior that has been studied extensively in the literature with numerous studies pointing out its connection with various psychological and physiological outcomes. Insufficient sleep, poor sleep quality, and sleep disturbance are all related to increased risk of serious individual health concerns including hypertension, diabetes, cardiovascular disease, depression, and anxiety (e.g., Bin, 2016; Cappuccio et al., 2010; Kent de Grey et al., 2018). Interestingly, sleep is often considered as a shared behavior with significant others during adulthood, and it has received increasing attention in studies of couples (Hislop, 2007). A recent systematic review describes sleep as an important expression of intimacy, attachment, and a way to strengthen couple relationships (Richter et al., 2016). Further, a considerable amount of evidence suggests a bidirectional and reciprocal relationship between couple relationship quality and sleep quality (e.g., Hasler & Troxel, 2010; Troxel et al., 2007; Yang et al., 2013). This encourages more research and studying to further explore associations between specific aspects of couple relationships and sleep.

In effort to help couples build healthy relationships, CRE programs have demonstrated effectiveness in improving couple relationship quality, communication skills, individual empowerment, mental health outcomes, and other critical family outcomes (e.g., Adler-Baeder et al., 2022; 2010; Markman & Rhoades, 2012; Williamson et al., 2016; Stanley et al., 2020). A few recent studies explored the program effects of CRE on indicators of physical health (e.g., Adler-Baeder et al., 2022; Barton et al., 2021; Roddy et al., 2020), representing the initial steps in understanding more about the potential value of CRE and links between social and physiological functioning for individuals and couples.

In the following section, I provide further details in a review of existing literature relevant to the current study. First, a review is provided of the relevant research background on the connections between couple relationship functioning, individual health, and sleep, as well as core couple relationship skills related to health. The impact and role of CRE in promoting individual and relational health are further discussed as well, followed by the theoretical assumptions that provide the conceptual frameworks for empirically testing links between couple relationship skills targeted in CRE programs and sleep quality. Finally, the research questions and hypotheses of the current study are presented at the end of this section.

Couple Relationships and Health

Among so many of the social relationships that one may have across their lifespans, scholars suggest that couple relationships are one of the most influential social relationships in adulthood (e.g., Balfour et al., 2008; Smock, 2004), and couple relationships can have significant impact on an individual's health and well-being (e.g., Coleman et al., 2013; Ditzen et al., 2007). Romantic partners share critical elements of each other's lives, from regular daily interactions and communication to major life events of getting married and becoming parents. There is a significant amount of research accumulated over the past several decades investigating the relationship between couple relationship and individual health and well-being. Primarily, being involved in a couple relationship itself may provide some protective effects for people. Extant literature documents a long list of benefits that having a partner provides including improved psychological well-being (Musick & Bumpass, 2012), greater financial resources (Schwartz, 2005; Waite, 1995), lower overall mortality rate (Jaffe et al., 2006; Rendall et al., 2011), and more health-promoting behaviors (Guner et al., 2014). However, the quality of couple relationships vary greatly resulting in mixed impacts on health. Research emphasizes that

relationship quality and functioning have a stronger connection to health than the relationship status itself (e.g., Carr & Springer, 2010).

In addition, another body of couple relationship and health research draws our attention to couples' health concordance. In Meyler and colleagues' (2007) systemic review consisted of 103 health concordance articles, they identified remarkable evidence suggesting the highly concordant patterns between couples' mental health, physical health, and health behaviors. Since that review, a large amount of empirical research further supported the highly concordant relationship between partners within couple relationships. For example, from the health condition perspective, a recent study of concordance of diabetes paired over 5,000 couples with non-couples using 1:1 dual propensity score matching and found that couples demonstrate a significantly higher risk to both have diabetes than non-couples, which indicated the relevance of the shared health behaviors and living environment to health outcomes (Wang et al., 2017). Others also found similar findings in concordance of cardiovascular disease risk factors in couple relationships (Shiffman et al., 2020).

From a health behavior perspective, there are also numerous studies pointing out that one partner's health behaviors are highly relevant to the other partner's health behaviors. Cross-sectionally, Pauly and colleagues' (2020) recent study found that couples' physical activity level and sedentary behaviors are significantly correlated, that is, when one of the partners engages in more physical activity or spends more hours being inactive, the other partner is more likely to demonstrate the corresponding behaviors. Researchers also found similar patterns in married couples using longitudinal data. Through their dyadic latent class growth analysis using data from 5,074 couples with 4 timepoints over 6 years, researchers revealed that husbands' trajectories of physical activity level predicted wives' trajectories of physical activity level, and

vice versa (Li et al., 2013). This research validates the need to study couples' health conditions and health behaviors dyadically, and to keep exploring the relational factors associated with couples' health.

Kiecolt-Glaser and Newton (2001)'s seminal review investigated the impact that relationship functioning (relationship quality and relational interactions) had on psychological and physiological health. Reviewing a total of 64 published marital studies with physical or psychological health measures, the authors found that relationship functioning had a direct impact on cardiovascular, endocrine, and immune functioning. For example, negative couple functioning, such as conflicts or disagreements, were associated with heightened blood pressure and heart rates. Further, relational distress was also strongly related to mental health concerns, which in turn indirectly influenced physiological health too. They also found, as did others (e.g., Wanic & Kulik, 2011), that women's health was more negatively affected by conflicts and negative interactions than men's. Further, a later longitudinal study collecting data from 1,049 adults over an eight-year period provided empirical evidence that relational distress or low relationship quality was not only related to worse self-reported health concurrently, but also accelerated the decline in self-reported health over time (Umberson et al., 2006).

More recently, Kiecolt-Glaser and Newton (2017)'s review focused even more on the reciprocal effects that the partners have on one another. They proposed the conceptual framework for similar couple-level health conditions and health behaviors, and possible convergence of their health and health behaviors over time through their communications, emotional connections, and common experiences together. Relevant to the current study, this review also had an emphasis on couples' social support, positive interactions, and stress response

where they underlined the facts that exchanging supports and demonstrating positive feelings can help reduce partner's stress responses.

In recent years, as our understanding of the dyadic relationships between couple relationship functioning and self-reported health develops and deepens, empirical studies are investigating these relationships in more nuanced ways. For example, with longitudinal, nationally representative data ($N = 1,981$ couples), Chopik and O'Brien (2017) found that one's own happiness and their partner's happiness each predicted one's self-reported health 6 years later. Notably, those who were with happy partners were significantly more likely to report better self-reported health, less physical impairment, and more physical activities regardless of one's own initial happiness. This finding furthered the understanding of dyadic influences on health and made the novel point that one's partner's happiness may have as much impact on one's health as one's own happiness, validating future efforts to assess relational and physical health through a dyadic lens.

Other recent research on health and relationship functioning includes advancements in research design such as larger and more diverse sample size, and more advanced analytic strategies allowing a deeper understanding of relationship and health. For example, Miller and colleagues (2013) followed two cohorts of respondents ($N = 1,681$ married individuals) for twenty years and collected 6 waves of data in an effort to investigate the trajectories of relationship quality and health. Results from latent growth curve analyses suggested that improved relationship happiness over the two decades significantly predicted increased physical health for the younger cohort, and marginally significantly predicted increased physical health for the mid-life cohort. These longitudinal findings shed a light on the importance of healthy relationships and the benefit of developing and maintaining couple relationship skills. A

biomarker study conducted by Ditzen and colleagues (2007) also provided robust evidence for the health effects of positive couple interactions on individual health. Sixty-seven women who received positive physical contact from their partner showed significantly lower salivary cortisol level and heart rate when exposed to a stressor compared to those who did not receive positive partner interaction. This finding suggests that positive couple interactions may buffer stressful events through the neurological systems. Related to couple positive interactions, Stanton and colleagues (2019) found that, perceived partner responsiveness, a similar construct to “*Care*” as defined previously, predicted mortality rate over a twenty-year period using a sample of 1,208 individuals. Decreased level of perceived partner responsiveness predicted negative affect reactivity later, which in turn predicted mortality rate 10 years later.

Couple Relationships and Sleep

Research on couple relationships and health clearly documents the effects that relationship functioning has on individual’s health outcomes, however, the associations between couple relationships and sleep behavior are less studied than individual sleep health. Some foundational studies on couple relationship and sleep highlighted that although most adults sleep with a partner, sleep has usually been viewed as an individual experience (Troxel et al., 2007; Troxel, 2009). In Troxel’s systematic review (2009) on sleep and health, she proposed a conceptual model explaining the relationship between relationship functioning, psychological pathways, sleep, physical, and mental health. Relationship functioning (positive and negative), and sleep were hypothesized to have a reciprocal relationship through psychological, behavioral, and neurobiological paths. In the past decade since this theoretical model was proposed, researchers have tested it empirically and found support for the proposed association between

relationship functioning, psychological functioning, and sleep health (e.g., El-Sheikh et al., 2013).

A recent longitudinal study on relationship satisfaction and multiple aspects of sleep quality conducted by Brown and colleagues (2019) found that higher relationship satisfaction at baseline predicted better overall sleep quality and a shorter time needed to fall asleep at 6-month follow-up. From T1 to T2, for those who reported decreases in relationship satisfaction, they also reported more sleep disturbances at T2. Although these important findings contributed to the understanding of relationship satisfaction and sleep, this study had limitations including a relatively small sample size ($N = 88$), data that were not dyadic, and almost all participants (97.7%) identified as White or Caucasian. In another 2-wave longitudinal study with a slightly larger and more diverse sample ($N = 216$ couples; 80% = Caucasian), Troxel and the team (2017) discovered that higher relationship satisfaction was significantly associated with lower odds of experiencing insomnia for men over a 3-month period. Specifically, for each standard deviation enhancements in relationship satisfaction, there was a 36% decrease in the odds of having insomnia for men.

Beyond relationship quality or satisfaction, Selcuk et al. (2017) added individual mental health outcomes to the investigation of relationship functioning and sleep quality. Specifically, using a sample of 698 married or cohabiting individuals, they investigated a mediating relationship between perceived partner responsiveness, anxiety and depressive symptoms, and sleep quality. The concept of perceived partner responsiveness resonates well with the caring for partner relationship skill (*Care*), as they both capture the extent to which individuals feel cared, attended to, and appreciated. One of the major strengths of this study was that they measured both subjective sleep quality (measured by Pittsburgh Sleep Quality Index; PSQI) and objective

sleep quality (measured by sleep actigraphy). The results indicated that participants who reported having a more responsive partner reported less sleep problems. Partner responsiveness was also significantly associated with less sleep problems via lower anxiety and depressive symptoms. Sleep actigraphy results revealed similar but slightly different results – partner responsiveness was not directly related to sleep efficiency or duration, but was indirectly related sleep efficiency through lower anxiety.

The conceptual pathway between relationship functioning, emotional or mental outcomes, and sleep quality proposed by Troxel (2009) not only emphasized the positive couple functioning's association with sleep, but also provided a conceptual model for studying the relationship between negative couple functioning (e.g., conflicts and negative interactions) and sleep. In El-Sheikh and colleagues' (2013) work on interpersonal psychological conflicts (IPC), mental health, and sleep with a sample of 135 married or cohabiting couples, an Actor-Partner Interdependence Model (APIM) was conducted to examine if anxiety and depression mediated the association between partner conflicts and sleep problems identified by sleep actigraphy. Results revealed that anxiety and depression each served as mediating factors for men and women's sleep problems after engaging in IPC with their partner. Specifically, women who experienced higher level of IPC showed higher level of anxiety symptoms, and this in turn predicted their shorter sleep duration and poorer sleep efficiency. A similar pathway was detected for men in which experiencing higher level IPC was associated with more depressive symptoms, which in turn impacted their sleep efficiency and sleep onset latency.

With the same study sample, El-Sheikh and colleagues (2015) expanded this study even further to investigate the influence that constructive versus destructive conflicts have on couples' mental health and sleep outcomes. This study has important implications for the current study as

it indicated the importance of constructive conflict management. Both direct and indirect effects were detected, but there were mixed findings regarding men's and women's experiences and the status as the aggression receiver or perpetrator. Receivers of psychological or physical aggression, regardless of gender, showed worse sleep outcomes. Women who perpetrated psychological aggression had shorter sleep duration 1 year later; however, men who perpetrated psychological aggression displayed increased sleep efficiency at T2. On the other hand, men's use of more constructive conflict management tactics at T1 predicted better sleep outcomes one year later for both themselves and their partners. Depressive and anxiety symptoms at T1 were added to the models as mediating variables. At T1, aggression from women was associated with both women's own and their partners' depressive and anxiety symptoms, which in turn predicted poorer sleep outcomes for men and women at T2. It is important to point out that in both studies, mental health outcomes were T1 variables, meaning the relationship between conflict management and mental health outcomes was not specifically tested.

On the other hand, just like couple functioning has an impact on couples' sleep quality, couples' sleep quality influences their relationship functioning as well. With a small sample of 29 co-sleeping couples, Hasler and Troxel (2010) found higher sleep-efficiency the night before significantly predicted less negative couple interactions the following day for men. For women, lower couple sleep concordance predicted more negative interactions and less positive interactions the following day. Similar to Hasler and Troxel (2010)'s study, Gordon and Chen (2014) also investigated the associations between couple interactions and their sleep quality dyadically and found that one of the partner's poor sleep was related to less positive and more negative couple interactions later. Specific to couple conflicts, they also found that one partner's poor sleep was associated with both partners' lower empathic accuracy during a conflict

conversation (measured by one of the partners' ratings on levels of different emotions that they believed their significant other felt during the conflict versus their significant other's own ratings). This bidirectional relationship between couple functioning and sleep quality was also studied longitudinally. Following 1,081 married individuals for over 4 years, Yang and colleagues (2013) found that for middle-aged adults (ages 55-71 at baseline), lower relationship quality at baseline predicted worse sleep disturbances 4 years later. In parallel, more sleep disturbances at baseline also predicted worse relationship quality 4 years later regardless of age.

Core Couple Relationship Skills

Couple relationship skills are critical to couple functioning and relationship quality, thus are often the focus in CRE programs (Adler-Baeder et al., 2022). The couple relationship skills being investigated in the current study are rooted in a 7-dimension relationship education framework, the National Extension Relationship and Marriage Education Model (NERMEM; Futris & Adler-Baeder, 2013). Each of the couple relationship skill corresponds with a core concept centered in the educational model, representing an important aspect of healthy relationship functioning. The 7 core skills are *Self-Care (self-care behaviors that maintain individual well-being)*, *Choose (intentional commitment to the relationship and decisions that promote it)*, *Care (expression of affection and compassion)*, *Manage (constructive conflict management tactics)*, *Know (deepening the intimate knowledge of partner)*, *Connect (engaging with the supportive networks)*, *Share (connecting through rituals and routines specific to the couples)*. In the current study, the skills being focused on are self-care skills (*Self-Care*), caring for partner skills (*Care*), and conflict management skills (*Management*) because these three skills in particular have been shown to be related to the outcomes of interest in the current study – stress and sleep quality (e.g., El-Sheikh et al., 2015; O'Neill et al. 2020; Wiley et al., 2013).

As identified previously, couple relationships and health are studied through a dyadic lens, and one's own functioning can impact both their own and their partner's well-being (Chopik & O'Brien, 2017). Although self-care behaviors cover emotional regulation, stress management, and health behaviors engagement, which are all closely connected with individual health, they are also closely related to couple relationship functioning. Further, through the lens of behavioral modeling, we know from empirical research that one's own health self-regulation has spillover effects to partner's health-regulation (Berli et al., 2018), and when one partner partakes a health behavior, it increases the chance for the other partner to participate in such behavior as well (Gellert et al., 2011). Therefore, although centered in individual empowerment, self-care skill should still be recognized as a couple relationship skill because of the spillover effects it demonstrates (Wiley et al., 2013). *Care* encompasses behaviors and attitudes including caring for the partners, showing affection, and sharing intimacy. Another way to interpret *Care* is it promotes more positive interactions between couples, and it encourages more attentiveness and responsiveness between partners. Caring for partner is identified as a core couple relationship skill because affections, intimacy, and positive interactions all contribute to relationship quality and stability (e.g., Costa-Ramalho et al., 2014; Dainton et al., 1994). In addition, in empirical studies, social support is sometimes measured in a similar way as how *Care* is being measured. For example, in a recent study investigating the associations between spousal support and self-reported health, they measured spousal support as the level of being *cared for* by their partners, or to what degree they can share their thoughts and feelings, which maps on well to how we identify the concept of *Care* in the current study (Ryan et al., 2014). Finally, conflict management is a crucial couple relationship skill as it emphasizes the ability to manage conflicts and stress healthily and constructively. A great deal of research has documented the profound

effects conflicts and conflict management have on couple relationships. High levels of negative conflict in couple relationships are highly predictive of relationship dissatisfaction and instability (Fincham & Beach, 1999; Kluwer & Johnson, 2007). The ratio of the positive and negative effects is also critical to relationship outcomes, which suggests the importance of conflict and stress management (Gottman, 1994; Gottman et al, 1998). In an observational study, individuals' negative responses to conflicts during a conflict task significantly predicted decreased relationship quality, whereas couples' positive responses to the conflicts were related to improvement in relationship quality after the same conflict task (Julien et al, 2003). These findings illustrated the idea that conflict itself may not be detrimental to the relationship, but it is about the way that people respond to it.

CRE and Physical Health

With the purpose to help couples build healthy relationships, CRE programs often provide participants with a list of “tools” such as knowledge, skills, behaviors, and beliefs that are essential to relationship functioning (Hawkins et al., 2008; Wilson & Halford, 2008). CRE programs have demonstrated effectiveness in many couple outcomes such as relationship distress (Quirk et al., 2014), relationship satisfaction (Halford & Bodenmann, 2013), communication (Halford et al., 2010), and couple interactions (Bradford et al., 2017; Harcourt et al., 2017). Interestingly, CRE also has shown significant positive effects in areas that are not often tested as indicators of CRE programs' efficacy such as individual mental health outcomes (e.g., Adler-Baeder et al., 2010; McGill et al, 2016). Aligning with the large body of research linking couple relationship functioning and health outcomes (Robles et al., 2014; Smith et al., 2013; Troxel et al., 2007), it is reasonable to expect that positive changes also occur in health outcomes as a

product of the increased relationship functioning post CRE participation (Staton, 2008; Staton & Ooms 2011; Wood et al., 2007).

However, because health outcomes, especially physical health outcomes, are not usually tested as an indicator for CRE programs' efficacy when evaluating CRE programs, the research on physical health in the context of a CRE experience remains scarce. Although limited, the few studies investigating physical health as an outcome of CRE exhibited promising results. In a biomarker study with a relatively small sample ($N = 61$ couples), couples were asked to have a conflictual discussion before and approximately 4 weeks after CRE program participation, and their salivary cortisol was taken at both occasions. Results showed that couples' cortisol levels were significantly decreased after CRE participation compared to the pre-program levels. More importantly, the reduced cortisol levels were mediated by increased self-reported relationship quality post program (Ditzen et al., 2010). In addition, another biomarker study tested the effectiveness of an intervention using a rigorous randomized control trial design. During the 4 weeks of the intervention, couples in the treatment group participated in educational sessions and watched online videos focused on positive physical touch and were instructed to practice the affection skills during the intervention period. Despite the small sample size ($N = 34$ couples), the researchers found significant treatment effects such that couples in the intervention group showed enhanced salivary oxytocin, and men in the intervention group showed reduced 24-hour blood pressure after the intervention compared to the control group (Holt-Lunstad et al., 2008). These results again emphasize the importance of positive couple interactions and affections, which is a concept that can be captured by the caring for partner relationship skill.

A recent randomized controlled CRE study with a community-based and racial minority sample investigated program effects of CRE on participants' health outcomes (general health,

depressive symptoms, and problematic sleep; Barton et al., 2020). Three hundred and forty-four African American couples were randomly assigned to either a CRE program group or a no program control group. The program group received 6 weeks of a CRE program that was tailored specifically for African American parents. Study participants were followed up to over 2 years post baseline and 4 waves of data were collected. Results suggested that CRE program participants demonstrated significantly more positive changes in self-reported health, depressive symptoms, substance use, and sleep problems up to 2 years post-program compared to the control group, through the mediating effects of enhanced couple relationship functioning at 9 month and a year and half later (Barton et al., 2020). This study had major strengths in the study design and methods, the rigorous approach of randomized control trial (RCT) and multi-wave follow-up data greatly advanced the understanding of the CRE and health effects and set the stage for future research studying CRE and health.

Similarly, other recent RCT studies also reveal significant positive effects of CRE programs on health outcomes. Notably, Roddy and colleagues (2020) implemented a rigorous study design by randomly assigning a large sample ($N = 742$ couples) to one of two different online CRE programs or a waitlist control group that did not initially receive CRE. Participants were diverse in race/ethnicity and employment status and were all considered low-income. Data were collected at pre-, mid-, and post-intervention, as well as at 2 months and 4 months after intervention, CRE participants reported significantly more improvements in mental health (e.g., emotional distress, anger, perceived stress) and physical health and health behaviors (e.g., perceived health, insomnia, exercise) than participants in the waitlist control group.

Similarly, Adler-Baeder and colleagues' (2022) recent RCT study also found positive program effects for sleep quality over a 1-year period. In this RCT study, 929 economically and

racially diverse couples were randomly assigned to one of two CRE program groups or to the no-program control group. To test program efficacy, data were collected at baseline, immediate after program participation (about 2-month after baseline), 6-month, and 1-year after baseline.

Participants who were in the *ELEVATE: Taking Your Relationships to the Next Level* (Futris et al., 2014) program group demonstrated a significantly different growth trajectory than the control sample in sleep quality improvements over one year. Those in ELEVATE improved .039 points more in sleep quality (measured by PSQI) each month compared to the control group participants who experienced no change in sleep quality.

With the same study sample previously noted, Roddy and Doss (2020) conducted another study investigating the mechanisms of change in CRE participants' health outcomes. Among the mediators tested, improved partner support showed a full indirect effect on perceived health. Further, decreases in conflicts, decrease in psychological distress, and insomnia all showed significant partial indirect effects. Together, these results suggest that CRE program participation impacted participants' perceived health through improved couple and psychological functioning. This study serves as a crucial basis for further explorations of the relationship between CRE participation and health outcomes and the consideration of mediators. The results of this study underscored that healthy relationships can in fact lead to healthy individuals, and that being in a healthy relationship is beneficial for people's health, which further emphasizes the importance of effective CRE programs.

Additionally, these studies provide evidence that low-income couples can greatly benefit from CRE programs, and this is an especially important population to target for programs that promote health, because of their vulnerability to poor health outcomes based on their socioeconomic status (e.g., Pampel et al., 2010; Turner, 2013). It is also important to note for the

current study, that the CRE programs studied in Roddy and colleagues (2020) as well as Adler-Baeder and colleagues' (2022) studies are both skills-based programs that teach couples critical skills targeting positive relationship functioning including communication skills, conflict management skills, skills for building trusting and caring relationship, as well as self-care skills. Such programs align with the core principles that NERMEM prescribed for CRE programs. Overall, these studies initially established connections between CRE programs and health outcomes and set the stage for evaluations of more complex models of CRE programs' effects on health outcomes.

Theoretical Framework

Previous studies clearly demonstrate the relationship between couple relationships and health outcomes, which raises the interesting question of *how* do couple relationships influence health. Assumptions of interdependence theory provide us the some of the foundational support to explore couples' health behaviors dyadically. Social support and social control theories, on the other hand, both serve to explain the benefits that positive couple relationships provide for physical health. Interdependence theory introduces the concept that one partner's behaviors and functioning, have an influence on their own outcomes, and also have an influence on their partners' outcomes (Kelly & Thibaut, 1978). Social support theory proposes that social support buffers the effects of stress and adverse experiences and in turn protects health (House, 1987). Social control theory, on the other hand, provides another explanation for the elevated health of those who are partnered or married, suggesting that individuals who are involved in positive couple relationships are more likely to engage in more healthy behaviors and less health-compromising behaviors. In the current study, interdependence theory, social support theory, and

social control theory are applied to support the suggested associations between each of the couple relationship skills and sleep quality.

“A prominent feature of a relationship is that events associated with one person are causally connected to those associated with the other person” (Kelley et al., 1983, p.124). As one of the overarching theories for studying relationships, interdependence theory has an strong emphasis on understanding couples’ behaviors dyadically. An individual’s outcomes are interdependent with their partners, because their emotions, cognition, and behaviors, are not isolated to their own experiences (Rodriguez et al., 2014). There are considerable amount of interdependence in couples’ emotions, common experiences, and health given the nature of couple relationships (Kiecolt-Glaser & Wilson, 2017). Thus, we aim to understand the effects that each of the couple relationship skills have on ones’ own outcomes, and their partners’ outcomes.

First, one of the aspects of the self-care skill is the ability to manage one’s individual health including engaging in adequate sleep, regular exercise, and opting for healthy food choices. According to social control theory, self-care consists of social control behaviors and shows a sense of responsibility for the partner (Umberson, 1997). Empirical findings suggest that when one of the partners models healthy behaviors, their behavior predicts their partner’s health behaviors over time (Gellert et al., 2011; Homish & Leonard, 2008). In other words, when one of the partners demonstrates health self-regulation, their behaviors have spillover effects to their partners health behaviors, which serves as a mechanism of change in partner’s health (Berli et al., 2018). In qualitative studies, couples also consider setting a good example themselves and modeling healthy behaviors in front of the partner as an effective social control strategy to encourage their partners to participate in healthy behaviors (Tucker & Mueller, 2000).

Further, the promotion of positive couple interactions and expression of affection (*Care*) resonates well with social support theory. Indicated by the caring for partner skill, verbal affection and encouragement, physical affection, and emotion sharing all fall under the definition of social support and have underlying effects for health promotion (Reblin & Uchino, 2008). The associations between caring behaviors and health are well-documented in the literature. In a sample of 1,923 older couples, researchers found the level of one is cared for by their partners also has direct associations with their individual self-reported health (Ryan et al., 2014).

Conflict is often considered as a stressful event. By implementing the conflict management and emotion regulation skills that encourage positive and constructive interaction, forgiveness and mutual understanding, couples may experience less stress during conflicts. Applying the pathway proposed by social support theory, social support, which is positive and constructive interactions in this case, may buffer the stress related to conflict (House, 1987). This suggested pathway was also well-studied in the couple literature. Whitson and El-Sheikh (2003) conducted a thorough systematic review on the relationship of couple conflict and health and discovered that conflicts that resulted in arousal of sympathetic nervous system (SNS) may have harmful effects for immune functioning. Emotional regulation and positive communication may provide protective effects against the detrimental effects of chronic, repeated SNS arousal. Highly relevant to this finding, a biomarker study with 90 couples found that supportive behaviors during couple conflicts contributed to declines in cortisol for women (Robles et al., 2006). Expanding the work on couple conflict and health outcomes, a large scale dyadic longitudinal study ($N = 371$ couples) revealed that constructive conflict management during middle age predicted both partners' lower level of depressive symptoms over a decade later in late adulthood (Lee et al., 2020).

Current Study

A clear association between relationship skills and health outcomes was established in the couple literature. However, there is more left to explore in the context of CRE programs given the emphasis that CRE programs influence couple relationship skills, and the existing gap in the CRE literature for considering physical health indicators. Typically, participation in CRE is the predictor of outcomes. More work needs to be done assessing specific areas of CRE program focus (e.g., couple relationship skills) and their effects on health. The current study addressed this research gap by investigating the associations among specific skills targeted in CRE programs (self-care skills, caring for partner skills, and conflict management skills) and a health outcome (sleep quality) dyadically. Based on the current literature and theoretical framework, we hypothesized that self-care behaviors, caring for partner behaviors, and conflict manage skills are negatively associated with couples' sleep dysfunction at baseline for both partners and actors (H1). Specifically, if one's own couple relationship skill levels are high, they would have lower sleep dysfunction themselves (actor effect), and their partner would have lower sleep dysfunction as well (partner effect). Based on the important role that emotional distress plays in couple relationship and sleep quality indicated by the literature, we further hypothesized that higher levels of each of couple relationship skills are related to lower sleep dysfunction for both partners and actors through lower perceived stress levels at baseline (H2). Finally, to assess the process of change in CRE in more exploratory fashion, we conducted three auto-regressive cross-lagged models of changes among couple relationship skills and sleep dysfunction over a 1-year period post CRE program participation to explore the direction of effects between change in couple relationship functioning and sleep dysfunction and vice versa (RQ1).

Chapter III: Methods

Procedures

Participants in the current study were couples enrolled in an efficacy study of Couple Relationship Education (CRE) programs and who were assigned to receive the ELEVATE curriculum. Participants needed to be at least 18 years old and were currently involved in a couple relationship to be able to participate in the programs. The study utilized a randomized control method. After completing the baseline survey, the participants were randomly assigned to one of three groups to either receive one of the two CRE courses or to the control group that did not receive CRE programs. The two CRE programs that participants could possibly be assigned to were *ELEVATE: Taking Your Relationship to the Next Level* or *Couples Connecting Mindfully (CCM)*. The present study specifically considered participants who were assigned to the ELEVATE program. ELEVATE is a research-informed, skill-based curriculum developed from the National Extension Relationship and Marriage Education Model (NERMEM; Futris & Adler-Baeder, 2013). The ELEVATE program was the primary focus of the present study because the ELEVATE curriculum has an emphasis on the practical skills (e.g., self-care skills, caring for partner skills, and conflict management skills) that are the focus of the current study. Further, an efficacy study on the ELEVATE curriculum found that ELEVATE curriculum receivers demonstrated positive program effects on measures of sleep quality (measured by Pittsburg Sleep Quality Index; PSQI) up to 1 year after baseline, while those in the CCM program did not (Adler-Baeder et al., 2022). Therefore, the current study sought to build upon the positive program effects that ELEVATE program demonstrated on sleep quality, and to explore the association between specific couple skills and sleep quality.

CRE curriculum were presented in 10 local communities across the states of Alabama. Informed consents were collected before data collection. Program participants attended weekly sessions that met for about 2 hours for 6 weeks. A pair of trained facilitators delivered the curriculum at each site. The average attendance rate of the ELEVATE program was 58.15% (i.e., 7 hours). These classes were held from the year of 2015-2019, all of the classes were delivered in-person. Seventy-five percent of the participants attended one or more session, 65.2% of the participants attended half or more sessions, and 26.8% of the participants attended all of the sessions. Approximately 8 weeks following baseline survey completion, study participants (program group and control group) were given a follow-up survey to assess immediate post-program changes. Later, participants were invited to finish 2 more follow-up surveys containing the same survey content at 6-month and 1-year post program participation. Each of the participant received \$50 as compensation for each survey they completed.

Participants

The final analytic sample included 616 participants assigned to the *ELEVATE* curriculum at the study baseline. Of the 308 participants (308 different-sex couples), participants' mean age was 37.25 years ($SD = 11.74$). Seventy-three percent of the participants were married, 20% reported to be in a committed relationship, and 7% were engaged. Relationship length ranged from 1 to 37 years. The sample is ethnically diverse, 61% reported being European American, 33% reported African American, and 6% reported Asian American, Pacific Islander, American Indian, and another racial/ethnic category. The sample is diverse in education level as well. Nineteen percent reported of having an advanced degree, 22% reported of having a bachelor's degree, 20% had completed some college but no degree completion, 11% hold a vocational or technical certificate or an associate's degree, 22% hold a high school diploma or GED, 6% had

no degree or diploma. Employment status and household income also varied. Twenty-one percent of the participants were not currently employed, 18% were part time and temporarily employed, 61% were full time employed. Thirty percent reported a household income lower than \$25,000, 43% reported between \$25,000 and \$75,000, 27% reported \$75,000 or higher (See Table 1 for sample demographics descriptives).

Measures

The three measures of skills were taken from the Couple Relationship Skills Inventory (CRSI). The CRSI is a comprehensive measure of core relationship skills shown to be essential to healthy couple relationships (Adler-Baeder et al., 2022). This inventory was derived from the foundational framework of the National Extension Relationship and Marriage Education Model that consists of 7 core principles of couple relationships predictive of relationship quality (NERMEM; Futris & Adler-Baeder, 2013). Each of the subscales in the CRSI is a measure of one of seven the concepts (*Self-Care, Choose, Know, Care, Share, Connect, and Manage*) in the NERMEM. As noted, *Self-Care, Care, and Management* were the targeted couple relationship skills. Therefore, those subscales from the CRSI were to assess those three skills.

Self-care. The seven items of the *Self-Care* subscale in the CRSI were used to assess participants' self-care behaviors. Self-care encompasses several dimensions of self-care practices and attitudes including health management and self-empowerment. Response options ranged from 1 (*very strongly disagree*) to 7 (*very strongly agree*). Two example items are, "I have the power to manage the challenges in my life," and "I have quiet time for myself every day." The original scale has an item asking about respondents' self-care behaviors regarding sleep; this item was dropped in our analyses. Cronbach's alpha demonstrated good internal consistency of

the subscale (range: $\alpha = .816 - .827$ for men across timepoints; $\alpha = .792 - .834$ for women across timepoints).

Care. The four items of the *Care* subscale from the CRSI were used to measure positive caring behaviors toward a partner in the past month. This subscale assesses both the general positive feelings one has toward their relationship, and the positive behaviors used in maintaining a stable relationship. All items are on a 7-point Likert-scale ranged from 1 (*never*) to 7 (*more often than once a day*). Example items include, “Say ‘I love you’ to your partner,” and “Initiate physical affection with your partner (e.g., kiss, hug).” Higher scores suggest higher level of care toward one’s partner. The Cronbach’s alpha coefficient for internal consistency were $\alpha = .826 - .869$ for men across timepoints and $\alpha = .843 - .886$ for women across timepoints suggesting great reliability.

Conflict management. Conflict management was measured by the five items of the *Manage* subscale in CRSI assessing positive and negative conflict management. Conflict management skills and communication are closely connected with the concepts taught in CRE programs. Item responses ranged from 1 (*very strongly disagree*) to 7 (*very strongly agree*). Sum score was used with high score indicating healthier interactions when dealing with disagreements and conflict. An example item is “When things ‘get heated’ I suggest we take a break to calm down.” The scale has acceptable reliability (Cronbach’s alpha: $.709 - .749$ for women across timepoints; $.66 - .72$ for men across timepoints).

Perceived stress. Perceived stress level was measured by the Perceived Stress Scale (PSS; Cohen, 1994). Ten items were included in the scale to measure how often do the respondents experience certain feelings and thoughts that were related to stress during the past month. The items were on a 5-point Likert scale with 0 indicates “never” and 4 indicates “very

often”. Sample items are “In the last month, how often have you found that you could not cope with all the things that you had to do?” and “In the last month, how often you felt confident about your ability to handle your personal problems?” The PSS demonstrated good internal consistency for the study respondents (range: $\alpha = .873$ - $.885$ for men across timepoints; $\alpha = .88$ - $.894$ for women across timepoints).

Sleep Dysfunction. Subjective sleep quality over the past month was assessed by the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). PSQI is a widely used self-rated measure that assesses various dimensions of sleep quality including sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. PSQI consists of 18 items that can be combined into 7 component scores. The 7 component scores yield a global score ranging from 0-21 with higher scores indicating more sleep dysfunction. Example items include, “When have you usually gone to bed?” and “How often have you taken medicine (prescribed or over the counter) to help you sleep?” The PQSI has acceptable reliability based on the Cronbach’s alpha coefficient (range: $\alpha = .76$ - $.771$ for men across timepoints; $\alpha = .742$ - $.785$ for women across timepoints).

Analytical Plan

Before data analyses, multiple imputation were performed to address missing data. This approach of imputation predicts multiple values for each of the missing values based on existing data resulting in multiple datasets (Azur et al., 2011). The multiple imputation procedures were conducted using the “mice” package in R (van Buuren et al., 2015; RStudio Team, 2019). Regarding the amount of missing data, there were 6% of missingness at baseline at the item level, 14% at immediate follow-up, 23% at 6-month follow-up, and 22% at 1-year follow-up. The following analyses were completed using a data set consisting of pooled values from the

multiple imputed datasets. Before conducting primary analyses, preliminary analyses were conducted to assess normal distribution, skewness, kurtosis, homoscedasticity of the variables to ensure the assumptions for a linear model are met.

Dosage of the CRE classes received, ethnicity, education, and income were included in the primary analyses as covariates. Women's education was a significant covariate in all of the models. To test Hypothesis 1 which assumes that higher level of both partners' relationship skills (caring behaviors, self-care skills, and conflict management skills) were associated with better sleep quality for both men and women, three separate actor-partner interdependence model (APIM; Kashy & Kenny, 1999; Kenny, 1996) were fit in R Studio (RStudio Team, 2019). This procedure addresses the nonindependence of the observations in the couple dyads. In an APIM model, the actor effects are referred as the effects one's own behaviors have on their own outcomes in a relationship, where partner effects are referred as one's behaviors' effects on the other dyad member's outcomes and vice versa (i.e., partner's effects on one's outcomes). In this case, the models consisted of each of the relationship skills for both partners, and their sleep dysfunction at baseline.

To test Hypothesis 2 that there are indirect links between each of the relationship skills and sleep dysfunction through perceived stress for both men and women at baseline, where higher levels of caring behaviors, self-care skills, and conflict management skills are associated with lower level of stress, and are in turn related to lower sleep dysfunction, three separate actor-partner interdependence mediation models (APIMeM; Ledermann et al., 2011) each featured one of the couple relationship skills were conducted by adding perceived stress as an indirect link as an extension of the previous APIM models. In APIMeM models, there are two types of indirect effects, indirect actor effects and indirect partner effects. For each of the couple relationship

skills, there are four pathways between the predictor and outcome variables that have potentially indirect links: men partner effects, men actor effects, women actor effects, and women partner effects. If the direct paths were statistically significant in the APIM models in the first set of analyses, they were carried to and contained in the APIMeM models, if not, the direct paths were not included in the indirect effects models.

To investigate Research Question 1 that explores the relationships among changes in couple relationship skills and sleep dysfunction over the one-year period, three separate autoregressive cross-lagged models each featuring one of the three couple relationship skills were conducted. Autoregressive models allow the variables to regress on one another in both directions. Couple relationship skills and sleep dysfunction at baseline were accounted for in each of the models (Singer & Willett, 2003), thus the post-program and one-year follow up measures of these variables represented residual change. These models allow us to investigate the effects that immediate changes in couple relationship skills have on sleep dysfunction one year later, and effects that earlier changes in sleep functioning have on couple relationship skills later. We also included dyadic paths exploring the influences that changes in one's couple relationship skills from program start to immediate post-program have on later changes in their partner's sleep dysfunction.

Goodness of fit indices were utilized to evaluate how well the data fit each of the structural equation models illustrated above. Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA) were used to assess the fit of each model. Good model fit was indicated by a significant chi-square value ($p < 0.05$), CFI and TLI larger than .95, RMSEA smaller than .06, and SRMR smaller than .08 per recommendation by Hu and Bentler (1999).

Chapter IV: Results

Preliminary Analyses

Preliminary analyses were conducted to assess normal distribution, skewness, kurtosis, and homoscedasticity of the variables before conducting primary analyses. The variables in the current sample are normally distributed; kurtosis and skewness statistics were between -2 and +2 (George & Malley, 2019). Assumptions for a linear model were met. In the analytical sample, significant correlations ranged from -.13 to .59. All correlations were in expected directions and all but two were significant. Men's caring skills were not significantly correlated to women's sleep dysfunction, and women's conflict management skills were not significantly correlated to men's sleep dysfunction at baseline. The measure was retained in the model since we were also examining prospective links. Descriptive statistics and bivariate correlations of the key variables are displayed in Table 2 and 3 respectively.

Primary Analyses

Hypothesis 1: Concurrent associations among couple skills and sleep.

After controlling for income and education at baseline, for *conflict management skills*, both of the actor paths were significant (See Figure 1). For men, higher level of conflict management skills was significantly associated with their own lower sleep dysfunction ($\beta = -.177, p = .005, b = .044$). Similarly, for women, their practice of conflict management skills is inversely related to their own sleep dysfunction ($\beta = -.167, p = .006, b = .042$). For the partner paths, only women to partner's path was significant indicating women's higher level of conflict management skills was related to their partner's lower sleep dysfunction ($\beta = -.167, p = .006, b = .043$). Goodness of fit indices suggested excellent model fit (CFI = .988; TLI = .972; RMSEA = .055, $p = .371$; $\chi^2 = 22.151, df = 12, p = .036$).

The results of the APIM model featuring *caring for partner* skills indicated no associations with sleep dysfunction. Specifically, at baseline, men's practice of caring for partner was not associated with their own or their partner's sleep dysfunction ($\beta = -.044, p = .554, b = .048$ actor; $\beta = -.103, p = .164, b = .050$ partner). In addition, women's use of caring for partner skills did not have any significant associations with their own or their partner's sleep dysfunction either ($\beta = -.009, p = .905, b = .049$ actor; $\beta = -.060, p = .423, b = .047$ partner; See Figure 2). The model revealed good fit to the data: CFI = 1.00; TLI = 1.00; RMSEA = .000, $p = .881$; $\chi^2 = 11.971, df = 12, p = .448$).

The results of the APIM model testing baseline *self-care* skills and sleep links indicated that both men and women's self-care skills were associated with their own sleep dysfunction (See Figure 3). A higher level of self-care behaviors was significantly related to both men and women's lower levels of sleep dysfunction ($\beta = -.424, p < 0.001, b = .029$ men; $\beta = -.314, p < 0.001, b = .027$ women). Further, the results also indicated that higher levels of men's self-care skills were significantly associated with lower levels of sleep dysfunction for women ($\beta = -.167, p = 0.006, b = .029$). However, women's use of self-care skills was not related to men's sleep dysfunction at baseline ($\beta = .042, p = 0.487, b = .027$). This model demonstrated good fit with the data based on model fit indices (CFI = .989; TLI = .975; RMSEA = .055, $p = .371$; $\chi^2 = 22.157, df = 12, p = .036$).

Hypothesis 2: Concurrent associations among couple skills, stress, and sleep. Three separate actor-partner interdependence mediation models (APIMeM; Ledermann et al., 2011) each consisting of one of the couple relationship skills, perceived stress, and sleep dysfunction were conducted to test Hypothesis 2 that assumed indirect associations between each of the couple relationship skills and sleep dysfunction through perceived stress as an indirect link for

both partners at baseline. Direct paths from couple relationship skills to sleep dysfunction were retained in the models if they were significant based on the results of models for Hypothesis 1. Non-significant direct paths were not included in the APIMeM models.

The results of the APIMeM model with *conflict management skills* indicated that there were indirect associations between conflict management skills and sleep dysfunction through perceived stress for both men and women at baseline (See Figure 4). Specifically, men's conflict management skills were inversely related to their own perceived stress suggesting higher levels of conflict management skills were related to lower levels of perceived stress for men at baseline ($\beta = -.436, p < 0.001, b = .075$). Further, lower levels of men's perceived stress were significantly and positively associated with their own lower levels of sleep dysfunction ($\beta = .381, p < 0.001, b = .035$). Using the bootstrapping tests method of testing indirect effects, results indicated this indirect actor effect for men ($\beta = -.170$) was statistically significant (lower CI = -0.175, upper CI = -0.067). Similarly for women, at baseline, high levels of conflict management skills were negatively related to their own levels of perceived stress ($\beta = -.460, p < 0.001, b = .077$). Their lower levels of perceived stress were in turn related to their own lower levels of sleep dysfunction ($\beta = .343, p < 0.001, b = .033$). After conducting bootstrapping tests for indirect effects, results suggested this indirect actor effect for women ($\beta = -.137$) was statistically significant (lower CI = -0.145, upper CI = -0.048). In addition to the significant actor effects, men and women's higher conflict management skills were also directly significantly associated with each other's lower levels of perceived stress. For men, higher levels of their partner's conflict management skills were directly significantly associated with their own lower levels of perceived stress ($\beta = -.123, p = 0.024, b = .078$) which was, in turn related to lower sleep dysfunction for themselves but not for their partners ($\beta = -.095, p = .116, b = .031$). Results

of the bootstrapping test for this indirect partner path indicated that the indirect partner effects from women's conflict management skills to men's lower sleep dysfunction through perceived stress were not significant (lower CI = -.021, upper CI = .062). A similar pattern was found for women. Higher levels of men's conflict management skills were directly significantly associated with women's lower perceived stress ($\beta = -.118, p = 0.033, b = .074$); women's lower levels perceived stress, was directly related to women's lower sleep dysfunction ($\beta = .343, p < 0.001, b = .033$). Results of the bootstrapping test for this indirect partner path indicated that the indirect partner effects from men's conflict management skills to women's lower sleep dysfunction through perceived stress were not significant (lower CI = -.063, upper CI = .018). Women's lower levels of perceived stress were not related men's sleep dysfunction at baseline ($\beta = -.063, p = .362, b = .034$). This model fit the data well (CFI = .973; TLI = .942; RMSEA = .072, $p = .071$; $\chi^2 = 51.433, df = 21, p < .001$).

The results of the APIMeM model featuring *caring for partner* skills, perceived stress, and sleep dysfunction indicated that there were indirect associations between women's caring for partner skills and their own sleep dysfunction through perceived stress (See Figure 5). For women, at baseline, higher levels of caring for their partners were negatively associated with their own perceived stress ($\beta = -.147, p = 0.041, b = .098$), and lower levels of their perceived stress were linked to their own better sleep outcomes ($\beta = .356, p < 0.001, b = .029$). This indirect actor path was not statistically significant based on the bootstrapping test results ($\beta = -.055$; lower CI = -.072, upper CI = .002). However, for men, there was no significant relationship between caring for partner skill and their own perceived stress ($\beta = -.112, p = 0.122, b = .089$). Although for men, lower perceived stress was associated with their own better sleep outcomes ($\beta = .381, p < 0.001, b = .089$). Neither men nor women's caring for partner skills

were related to their partners' levels of perceived stress ($\beta = -.132, p = .066, b = .094$ men; $\beta = -.131, p = .071, b = .093$ women). Model fit indices suggested good fit to the data (CFI = .982; TLI = .967; RMSEA = .053, $p = .394$; $\chi^2 = 42.984, df = 24, p = .010$).

The results of the APIMeM model featuring the *self-care skills* suggested indirect links between men and women's self-care skills and their own sleep outcomes and men's self-care skills and their partner's through perceived stress (See Figure 6). At baseline, for men, higher levels of self-care were significantly associated with their own lower levels of perceived stress ($\beta = -.501, p < 0.001, b = .051$); their lower levels of perceived stress, in turn, were related to their own lower levels of sleep dysfunction ($\beta = .231, p = 0.001, b = .035$). This indirect actor path was significant based on bootstrapping indirect effects test ($\beta = -.125$; lower CI = $-.100$, upper CI = $-.023$). Similarly, for women, at baseline, more frequent practices of self-care skills were significantly associated with their own lower perceived stress ($\beta = -.545, p < 0.001, b = .048$); lower levels of their perceived stress, then in turn contributed to the lower levels of their own sleep dysfunction ($\beta = .230, p = 0.001, b = .034$). This indirect actor path was significant as well ($\beta = -.124$; lower CI = $-.096$, upper CI = $-.019$). Dyadically, higher levels of men's self-care skills at baseline were associated with their partners' lower levels of perceived stress ($\beta = -.116, p = 0.029, b = .051$). Women's lower level of perceived stress was directly related to their own lower sleep dysfunction as well ($\beta = .231, p = 0.001, b = .035$). The bootstrapping test results indicated that this indirect partner path from men's self-care to women's lower sleep dysfunction through perceived stress was not significant ($\beta = -.012$; lower CI = $-.027$, upper CI = $.002$). However, women's self-care skills were not related to men's perceived stress at baseline ($\beta = -.088, p = 0.115, b = .048$). Noticeably, both of the direct actor paths between men and women's self-care skills and their own sleep dysfunction that were retained in the model remained

significant ($\beta = -.318, p < 0.001, b = .031$ men; $\beta = -.188, p = 0.006, b = .030$ women) suggesting partial indirect effects. The data fit the current model well (CFI = .981; TLI = .959; RMSEA = .063, $p = .193$; $\chi^2 = 44.230, df = 21, p = .002$).

Research Question 1. Longitudinal bidirectional associations among couple relationship skills and sleep outcomes. Three cross-lagged autoregressive models each consisting of one of the couple relationship skills (conflict management, caring for partner, or self-care) were conducted exploring bidirectional relationships for the individual between couple relationship skills and sleep outcomes over time. Men and women were included in one model for the analyses to account for dependency. Dyadic paths from couple relationship skills at immediate post-program (T2) to sleep outcomes at one-year post program (T3) were also included in the models.

To test the comparative associations between couples' *conflict management skills* and their sleep outcomes immediately post CRE participation and at one-year follow-up, a cross-lagged model featuring the *conflict management skill* was conducted, and the model demonstrated good fit (CFI = .966; TLI = .935; RMSEA = .060, $p = .103$; $\chi^2 = 161.642, df = 80, p < 0.001$; See Figure 7). The results suggested that for men participating in CRE, declines in their sleep dysfunction from baseline to immediately post-program predicted later increase in their levels of conflict management skills over the course of one year ($\beta = -.176, p = 0.001, b = .077$). But the changes in their conflict management skills from baseline to immediately post-program follow-up did not predict changes in their own sleep outcomes at one-year post-program follow-up ($\beta = -.053, p = 0.347, b = .042$). For women participating in CRE programs, decreases in their sleep dysfunction from baseline to immediate post program predicted later increases in their conflict management skills ($\beta = -.121, p = 0.024, b = .071$). Further, improvements in

women's conflict management skills also predicted later decreases in women's sleep dysfunction one year after program participation ($\beta = -.099, p = 0.05, b = .033$). According to the beta coefficients values, women's sleep outcomes at T2 predicting conflict management skills at T3 appeared to be a more robust path than their conflict management skills at T2 predicting their sleep outcomes at T3. For dyadic effects, changes in men or women's conflict management skills from baseline to immediate post-program did not predict later changes in their partners' sleep outcomes ($\beta = -.081, p = 0.108, b = .064$ men; $\beta = .041, p = 0.377, b = .075$ women).

The cross-lagged model featuring *caring for partner skills* was conducted to explore the potential bidirectional relationships between couples' *caring for partner skills* and their sleep outcomes from program baseline to one-year follow-up. The model demonstrated adequate fit to the data: CFI = .964; TLI = .929; RMSEA = .065, $p = .032$; $\chi^2 = 158.865, df = 77, p < 0.001$ (See Figure 8). The cross-lagged model results suggested that for men and women participating in CRE, changes in their *caring for partner skills* from baseline to immediately post-program did not predict changes in their own sleep outcomes one year later ($\beta = -.067, p = 0.289, b = .038$ men; $\beta = -.026, p = 0.590, b = .030$ women). In addition, changes in men and women's sleep outcomes from baseline to immediately post-program did not predict their own caring for partner skills one year later either ($\beta = 0.025, p = 0.610, b = .071$ men; $\beta = -.035, p = 0.456, b = .067$ women). Interestingly, for partner paths, immediate increases in women's caring for partner skills immediately post program participation predicted increases in their partner's sleep dysfunction, suggesting the path was not in the expected direction ($\beta = 0.126, p = 0.016, b = .089$). On the other hand, changes in men's caring for partner skills from baseline to immediately post-program did not predict changes in women's sleep outcomes one year post program participation ($\beta = 0.026, p = 0.554, b = .068$).

To investigate the relationships between changes in couples' *self-care skills* and changes in their sleep outcomes from program baseline to one-year post-program follow-up, a cross-lagged model featuring *self-care skills* was conducted; the model fit the data well (CFI = .985; TLI = .971; RMSEA = .042, $p = .803$; $\chi^2 = 114.686$, $df = 77$, $p = 0.003$; See Figure 9). For men participating in CRE programs, enhancements in their own self-care skills from baseline to immediately post-program significantly predicted decreases in their own sleep dysfunctions ($\beta = -0.122$, $p = 0.041$, $b = .025$). On the other hand, immediate changes in their sleep outcomes did not predict changes in their self-care skills one year later ($\beta = -0.070$, $p = 0.303$, $b = .158$). For women participating in CRE, immediate improvements in their self-care skills post program participation predicted declines in their own sleep dysfunction ($\beta = -0.193$, $p = 0.001$, $b = .026$). In addition, decreases in women's sleep dysfunction from baseline to immediately post-program predicted improvements in women's self-care skills a year later ($\beta = -0.228$, $p < 0.001$, $b = .110$). Based on the beta coefficients, the association between women's sleep improvements at T2 and later improvements in self-care skills at T3 was the more robust path compared to the associations between women's improvements in self-care skills at T2 and later improvements in sleep outcomes at T3. Dyadically, improvements in men's self-care skills immediately post-program predicted declines in women's sleep dysfunctions a year later ($\beta = -0.103$, $p = 0.037$, $b = .110$); changes in women's self-care skills immediately post-program, however, did not predict changes in men's sleep functioning over time ($\beta = 0.031$, $p = 0.508$, $b = .112$).

CHAPTER V: Discussion

Although there is an abundance of knowledge on the effectiveness of couple relationship education (CRE) (e.g., Markman et al., 2021; Stanley et al., 2020), the exploration of CRE and couples' physical health outcomes remains scarce, with only four studies to date investigating the links between CRE participation and physical health indicators (Adler-Baeder et al., 2022; Barton et al., 2021; Roddy et al., 2020; Roddy & Doss, 2020). The current study investigated the links among specific skills (conflict management skills, caring for partner skills, and self-care skills) that are emphasized in CRE programs, emotional distress, and a physical health indicator (i.e., sleep functioning) longitudinally and dyadically. Notably, a recent published CRE study by Adler-Baeder and colleagues (2022) showed that a specific CRE curriculum, *ELEVATE: Taking Your Relationship to the Next Level*, demonstrated efficacy in enhancements of couples' sleep quality over the course of one year post CRE program participation. The current study represented an important next step, which is to understand better and in more practical terms how CRE participation and physical health are linked both concurrently and over time and whether and how couples influence each other for CRE participants. We found that men and women's conflict management skills and self-care skills were inversely related to their own sleep dysfunction at baseline. In addition, women's higher conflict management skills and men's self-care skills also were linked to their partner's lower sleep dysfunction. Caring behaviors were not related to sleep dysfunction for self or partner at baseline. We also found that concurrent links between both men and women's conflict management skills and their sleep dysfunction were through their own perceived stress, such that lower stress levels associated with higher conflict management skills were in turn associated with their own lower sleep dysfunction. Finally, in the bidirectional cross-lagged models, we found that for women, improvements in their conflict

management skills from baseline to immediate post-program predicted later decreases in their sleep dysfunction, and vice versa. We also found evidence of parallel prospective processes between changes in self-care skills and sleep dysfunction for women, such that early changes in self-care improved sleep over time and vice versa. Dyadically, early changes in men's self-care skills also improved their partners' sleep over time. In the discussion to follow, we center our findings on each of the couple skills and their relationship to sleep at program start and over time, individually and dyadically.

Concurrent and Longitudinal Dyadic associations between *Conflict Management Skills* and Sleep Quality

In practical terms, we found that at program start, men and women with better conflict management skills sleep better and women with better conflict management skills have partners who sleep better. Consistent with the literature indicating that sleep is a co-behavior that reflects couples' experiences in their couple relationships to a certain degree, our findings further supported Troxel's (2009) conceptual model that couple relationship functioning is related to couples' sleep functioning through a behavioral pathway. Conflict management skills are a key behavior in couple dynamics. Individually, it makes sense that better ability to manage conflict level in the primary intimate relationship would have benefits for an individual's sleep. Emotion regulation likely plays an important role here. A handful of articles indicate that the ability to regulate emotions is essential to high-quality sleep as psychological arousals related to conflicts can lead to poor sleep outcomes (e.g., Costa et al., 2018; Fairholme & Manber, 2015; Hoag et al., 2016). Conflict management skills provide a tool for individuals to manage their emotions during a conflict or an argument, and to pivot their experience with the conflict or argument, which in turn, can minimize the conflict's effects on sleep.

Empirical studies also indicated that experiences in couple relationship tend to have an impact on both of the partners (e.g., Kiecolt-Glaser & Wilson, 2017), which is in part why we expected that an individual's ability to manage conflict would also be related to their partner's sleep quality, but this link was only found in women's conflict management and men's sleep. This result may be related to the unique health challenges that women face. A list of experiences that may contribute to the poor sleep outcomes were consistently found to be more prevalent in women than in men including depressive symptoms, stress induced from interpersonal relationships, and adverse experiences in childhood (Derry et al., 2015; Kiecolt-Glaser & Wilson, 2017). In addition, it is also apparent that women face specific and unique sleep challenges that include peri- and post-menopausal sleep disturbance, pre-menstrual sleep disturbance, and sleep issues related to pregnancy (Mallampalli & Carter, 2014). These gender-specific reasons for sleep challenges that were unmeasured in this study could be stronger predictors of women's sleep dysfunction than partners' conflict management skills.

The indirect effects model, on the other hand, provided a more in-depth perspective for understanding men and women's conflict management skills and sleep quality. In the indirect effects model, we included couples' perceived stress level as an indirect link; both based on the theoretical assumption that constructive ways to handle conflicts promoted by the conflict management skills may buffer the stress that is caused by the conflict itself, and in line with a large body of research indicating stresses from various sources influence people's sleep outcomes (e.g., Eliasson et al., 2010; House et al., 1987; Kashani et al., 2012). Our findings suggested that both men and women's perceived stress level explained the link between their own conflict management skills and their better sleep outcomes. Our dyadic model indicated the added value to one's stress level and subsequent sleep quality when *both* partners have better

conflict management skills. This has valuable implications for the utility of CRE and methods for how communication and conflict management skills are taught in CRE programs. When communication skills are being implemented in interpersonal interactions, one could utilize some communication tactics to facilitate and navigate the interactions to a desired direction even without the other person being aware. In this case, if one of the partners is practicing constructive problem-solving and conflict management skills, that could help alleviate the conflictive situation, and the other partner could benefit from having a less negative interaction without applying conflict management skills themselves.

Consistent with previous studies, the findings from these models also confirmed our understanding on conflicts in couple relationships and perceived stress. We use a measure of conflict management that assesses for pro-relationship behaviors during conflict, rather than a measure of conflict level. Social support theory assumptions are that conflicts can be a source of stress in interpersonal relationships and attempts to manage conflict and show positive emotions, support, and care during conflict, may buffer the stress derived from the conflicts themselves (House, 1987). A body of research confirms that stress from conflicts is more related to how conflicts are handled than conflicts themselves. In Gottman et al. (1998)'s seminal study that predicted newly-wed couples' marriage stability and happiness, they concluded that the amount of positive affect demonstrated in conflicts is the most important predictor for marriage stability and happiness among stable couples indicating the extremely critical role of constructive and positive conflict management in couple relationships. Previous studies also supported that having positive conflict management during the onset of couple conflicts buffers the potential decrease in couple relationship functioning due to the conflicts (e.g., Gordon & Chen, 2015). Accordingly, if the couple relationship functioning is not compromised due to conflicts, couples' sleep quality

is in turn not being negatively influenced. Research on conflicts and health outcomes also informs us that conflicts may introduce deleterious effects for other markers of health, such as immune functioning, but supportive behaviors and positive emotions may be protective against the effects that conflicts have on health (Lee et al., 2020; Robles et al., 2006; Whitson & El-Sheikh, 2003).

To better understand processes of change following CRE participation we found that changes in conflict management and sleep were related over time individually, rather than dyadically. Specifically, for women, post-program improvements in their conflict management skills predicted decreases in their own sleep dysfunction and vice versa, with the earlier changes in sleep predicting later changes in conflict management skills being the more robust path. For men, we found immediate changes in their sleep functioning predicted enhancements in their practices of conflict management skills one year later. Our findings can be understood in the context of current empirical research. It is well understood in the literature that men tend to have a more independent self-construal, meaning that they understand and define themselves individually; whereas women tend to have a more interdependent self-construal where they understand and define themselves in relation to their interpersonal relationships (e.g., Cross & Madson, 1997; Lyons, 1983). Perhaps for this very reason, women's health is more likely to be affected by events happening in couple relationships (e.g., Kiecolt-Glaser & Newton, 2001; Wanic & Kulik, 2011). Our findings that suggested improvements in men's conflict management skills did not predict changes in their own sleep quality, whereas the improvements in women's conflict management skills did predict enhancements in their sleep outcomes one year later, supports the notion that women are more attuned to the changes in practice of a particular behavior in couple relationships.

We can also interpret these findings through a feminist perspective (Allen & Jaramillo-Sierra, 2015) and previous research, contextualizing women's experiences in relationships. In Hasler and Troxel (2010)'s study investigating bidirectional associations between couple interactions and sleep, they also found a similar pattern. For men but not for women, sleep efficiency at night predicted negative interactions the following day, but previous negative interactions did not predict sleep outcomes. We may conclude that sleep is a more important resource for positive interpersonal interactions for men than for women. In addition, taking the non-significant dyadic paths into considerations as well, we further suspect that intra-personal instead of interpersonal processes may be the reason that explains increases in conflict management skills predicted improvements in sleep for women themselves but not for their partners.

From program start to immediately post-program, there are only six weeks of time. For couples who do not have conflicts often, they may not have had the chances to actually utilize the conflict management skills in a conflict with their partners. However, they did acquire the knowledge about conflict management skills, and that may induce intra-personal changes for themselves, which in turn was demonstrated by individual enhancements in later sleep quality. In other words, the improvements in conflict management immediate post-program were intra-personal rather than overt inter-personal processes, which may be why we found individual benefits later but not effects on partner's later sleep.

Concurrent and Longitudinal Dyadic Associations between *Caring Behaviors* and Sleep Quality

Contrary to expectations, we did not find that individuals who demonstrated more caring behaviors had better sleep quality or had partners with better sleep quality. However, we did find

that when women's level of caring was related to lower stress, they reported better sleep quality, indicating the key relevance of stress level to women's sleep. Over time, we unexpectedly found that when women's caring skills were enhanced after CRE program participation, their partners reported decreases in sleep quality one year later. Further investigations are warranted that may help determine whether other variables explain this directional path or whether this is an artifact in the data. We offer some possible interpretations from several perspectives. First, when looking at the *Care* measure from the Couple Relationship Skills Inventory (CRSI; Adler-Baeder et al., 2022), it captures the frequency of one initiating the caring behaviors (i.e., saying "I love you", initiate physical affection, share emotions, feelings, and problems, and tell partner how much they are cared for), but not the feelings and emotions associated with the initiator or the receiver of those behaviors. It is possible that we overlooked the possibility that a person in an intimate relationship may be actively trying while the other partner is not connected with them on an emotional level. It would be valuable to examine congruence in caring behaviors, assessing and combining both the individual's and the partner's-report of their caring behaviors. It would also be valuable to include both self and partner's report of the individual's caring behavior since our approach does not capture the perceived level of caring behaviors initiated by one's partner. Our model uses a broad dyadic approach rather than a with-in couple dyadic approach. Further clarity can come from a more nuanced measurement approach.

This finding may also be interpreted from a feminist perspective (e.g., Allen & Jaramillo-Sierra, 2015). Considerable amount of evidence suggests that women (or those who have more feminine characteristics) are more emotionally expressive than men (or those who have more masculine characteristics; e.g., King, 1993; King & Gordon, 1998). In general, women are more likely to express their emotions and feelings, especially positive ones (Simpson & Stroh, 2004).

According to the past literature, emotion expressiveness is highly associated with the gender roles that men and women subscribe to in terms of what they believe are socially acceptable to express or display (Parkins, 2012). Numerous works on masculinity and emotions pointed out the “ambivalent” relationship men have with their own and other people’s feelings and the notion of their “emotional incapacity” (Reeser & Gottzén, 2018). Perhaps men’s skills of caring improved, but they were not able to practice their caring for partner skills because of barriers with emotion expressiveness. In turn, this inconsistency with skills and behaviors that men experience internally were manifested by their sleep dysfunction. To explore our assumptions about this finding, we conducted posthoc analyses and conducted a paired-sample t-test on men’s caring for partner skills and found there was immediate improvement, but these improvements did not sustain up to one year, which may explain why women’s sleep functioning was not linked to men’s initial changes in caring behaviors.

Furthermore, when men experienced their partner’s enhancements in caring, but were not able to reciprocate their partner’s behaviors in response, they might end up carrying negative emotions that resulted in worse sleep outcomes. Given the way the caring skills were measured, there might be another unique angle for understanding this finding: by women initiating physical affections more often, one feasible assumption is that the couples may be engaging in more sex following the improvements of women’s caring for partner skills which lead to men’s experiences of shorter sleep periods and higher sleep dysfunction. In a recent study with almost 6,000 men and women, researchers found that men who are sexually active have significantly lower odds to report longer sleep hours than men who are not sexually active (Grabovac et al., 2021).

Concurrent and Longitudinal Dyadic Associations between *Self-Care Skills* and Sleep Quality

Our findings for self-care skills across the models tell a consistent and fascinating story. For self-care skills, we found that when men and women take good care of themselves by eating healthy meals, taking time for themselves, exercising regularly, and having self-efficacy for dealing with challenges in lives, they sleep better. Dyadically, when men take better care of themselves, women also sleep better. Further, men and women also experience lower stress when they take care of themselves, and in turn, sleep better. Women also feel less stressed when men's self-care is high. Over time, when men improve their self-care abilities, women also sleep better. Importantly, our study is the first study of CRE to demonstrate that improvements in men and women's self-care skills post CRE-participation predicted better sleep outcomes for themselves up to one year later. The relationship between self-care and sleep has long been studied in health research, with many of the studies in the past regarding this topic investigating correlational instead of directional influences that sleep quality has on self-care behaviors (e.g., Riegel & Weaver, 2009; Zhu et al., 2018; Sandberg et al., 2014). Nonetheless, conceptually, from a planned behavior perspective (Ajzen, 1991), it is clear that people who focus on self-care behaviors and pay more attention to their health would experience better sleep quality over time, which would explain the individual links between men and women's higher level of self-care skills and their lower sleep dysfunction. Other recent research supports the expectation that initiating more self-care behaviors, such as those measured in this study (i.e., I eat healthy meals every day, I exercise at least 3 or more times a week, I have quiet time for myself every day, I have quiet time for myself every day, et cetera) implies a sense of personal responsibility and

focus on well-being and can underly improvements in one's sleep quality as well (e.g., Di Benedetto et al., 2019; Werner et al., 2019).

Further, self-care behaviors may encompass various aspects of caring for self, such as one's ability to care for themselves mentally, emotionally, and physically. Past works suggested that self-care practices are strongly related to lower levels of perceived stress (e.g., Virtue et al., 2012) which was in line with our indirect effects finding. Although there were indirect links between men and women's self-care skills and sleep quality for themselves through perceived stress, the direct associations between self-care and sleep outcomes remained significant in the indirect effects model indicating that stress itself does not fully explain the relationship between self-care and sleep quality.

Ours is also the first study of CRE to document that men's self-care skills were directly related to their partner's sleep quality. We can interpret this finding in the context of research on the pattern of health management in couple relationships. Considerable evidence points out that men in general tend to under-utilize health care and health services compared to women (e.g., Bonhomme, 2007; White & Witty, 2009). We also know from decades of research that women are more likely than men to monitor and regulate their partner's health and health behaviors (e.g., Lewis et al., 2006; Rook et al., 2011; Umberson, 1992). This behavioral difference is one of the fundamental reasons why men gain and benefit more from couple relationships in terms of health indicators (e.g., Rendall et al., 2011; Waite, 1995). In addition, in couple relationships, women usually carry more "caring" responsibilities when it comes to parenting, household work, or taking care of other family members (e.g., Coltrane, 2010; Dentinger & Clarkberg, 2002; Jolly et al., 2014; Lee & Tang, 2015). Therefore, we can reason that when men's self-care improves,

their partners may experience less burden from health monitoring and this may contribute to improvements in their own indicators of health, such as sleep quality.

Practical Implications

Our findings indicated that some specific skills emphasized in CRE programs have meaningful implications for individual and couple physical well-being, which further validated the practice in CRE to emphasize practical, easy-to-implement relationship skills. Based on our findings that also suggested the reverse relationship: that improvements in sleep have implications for the practice of couple relationship skills over time, one of the future steps for CRE program developers and practitioners is to further highlight the bidirectional relationships between individual functioning and couple functioning, and between physical well-being and emotional capacity for positive interactions in interpersonal relationships. We believe the positive effects of couple relationship skills may be generalizable to couples with similar characteristics in the communities participating in CRE programs that highlight the core couple skills that promote couple relationship functioning based on the National Extension Relationship and Marriage Education Model (NERMEM; Furtis & Adler-Baeder, 2013). In addition, our findings may also inform health education programs to highlight the dyadic and interdependent aspects of health management, and to emphasize the critical role that partners play in health management and maintenance.

Limitations

Although the current study has multiple strengths including the large, diverse sample, rigorous methodological practice for addressing missing data, and the use of dyadic, longitudinal models, the findings of the current study need to be discussed in light of limitations. First, the sample of the current study is all different-gender couples. Therefore, the results can only be

interpreted in relation to the heteronormative social context and may not necessarily speak to the experiences in same-gender couples. Another limitation of the current study is the subjective measurement of sleep quality. Although the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) is a long-established measure that have been widely used and recognized in health behavior studies, recent studies suggest differences in subjective and objective assessments of sleep quality, such a sleep actigraphy (Landry et al., 2015), especially among older individuals (Hughes et al., 2018). There appear to be issues with both over-reporting or under-reporting sleep durations when people report their sleep times using a subjective sleep measure, and some studies finding weak correlations between subjective and objective sleep measures (e.g., Lauderdale et al., 2008; O'Brien et al., 2016; Van Den Berg et al., 2008). In addition, the retrospective design of the PSQI may also create difficulties for respondents to recall and report their sleep behaviors accurately especially for individuals who do not have a routine or regular time for bed. Therefore, the self-reported sleep outcomes should be interpreted as perceived sleep outcomes rather than actual sleep behaviors. Further, because the sample of the current study was taken from a community based CRE efficacy study, the participants were not screened for sleep disorders, therefore, we need to take into considerations that those who might have pre-existing sleep issues were also included in the analyses even though their sleep outcomes were not likely to be associated with or predicted by our predictor variables, but rather are attributable to sleep disorders. In addition, all of our measures are limited to self-report, which may introduce social desirability bias in response choices. Future work will benefit from multi-method approaches to assessing relationship skills and sleep that include observation.

Future Directions in Research

The current study provides critical tests of concurrent and longitudinal dyadic links between couple relationship skills emphasized in CRE programs, a critical mental health indicator, and an important indicator of physical health and sets the stage for further implementation science studies of CRE that examine processes and mechanisms of change and that include consideration of multiple, interconnected dimensions of individual and couple functioning. This study also is one of the few to prospectively examine the influence among changes after CRE in distinct domains of functioning, providing further information on processes and sequence of change. Our evidence of both spillover and parallel processes should inform future research to keep testing those relationships among outcomes over time. Future studies can further expand the investigation of sequence of change, with more advanced models such as dyadic models and cascade models that improve our understanding of longitudinal links among outcomes.

Specific to our finding regarding the changes in caring for partner skills that was contrary to one of our expectations, further investigation is warranted to help determine if other variables such as personality, emotional expressiveness level, and age can potentially explain this directional path or whether this is an artifact in the current analyses. We also encourage future studies that investigate the impact of CRE programs on physical health, by including other indicators of health and objective health measures such as health concordance between partners and bio-marker data for inflammatory responses. These types of studies will serve to enhance the intervention science linking relational and physical health and may serve to further validate the utility of CRE. Moving forward, we also encourage future studies to replicate the study using samples of queer couples to better understand similarities or differences in the change processes

and dyadic influences within diverse types of couple relationships. In addition, we suggest that future studies explore the links between other couple relationship skills emphasized in CRE, such as efforts to establish and maintain a couple identity, intentional behaviors that prioritize the relationship, efforts to maintain and enhance intimate knowledge about the partner, and mutually engage in support networks to further our understanding of these other couple relationship skills' implications for sleep and other indicators of individual and partner's health.

Conclusions

The current study offers a number of innovative and informative findings by considering the links between key couple relationship skills emphasized in CRE programs, perceived stress, and sleep function both concurrently and overtime and dyadically. The study expands on the two recent efficacy studies of CRE that found evidence of program impact on sleep quality, suggesting a spillover between the relational and the individual realm (Adler-Baeder et al., 2022; Barton et al., 2020). This study is unique in its consideration of dyadic processes within couples at the start of and post CRE participation. Overall, we found that conflict management skills are important for both oneself and one's partner's sleep through reduced stress. In addition, improvements in sleep after CRE can benefit couple relationship skills up to 1 year later and improvements in conflict management, specifically, benefits women's sleep a year later. Our findings also validate that self-care is vitally critical for individuals sleep function and that women sleep better when their partners gain self-care skills and that lower stress helps explain this link. Overall, we found that couple relationship skills serve as critical factors for couples' individual and relational functioning. These findings provide some evidence of both directional and bidirectional influences between relationship functioning and sleep. The study serves to enhance our understanding of the processes involved in CRE program benefit and sets the stage

for enhanced understanding of the important links between relational functioning and health and wellness individually and as a couple in the context of a community education program.

Table 1.
Demographic Characteristics of Participants at Baseline

Baseline characteristics	n	%
Gender		
Female	308	50.0
Male	308	50.0
Race		
Caucasian/White	367	61.0
African American/Black	196	32.6
Others	39	6.4
Education attainment		
No high school diploma	34	5.7
High school diploma or GED	134	22.6
Some college but no completion	116	19.5
Technical certification/Associate's degree	68	11.4
Bachelor's or advanced degree	242	40.8
Employment status		
Not employed	124	20.8
Part time or temporarily employed	109	18.4
Full time employed	362	60.8
Annual Household Income		
Less than \$7,000	41	7.0
\$7,000 - \$13,999	51	8.7
\$14,000 - \$24,999	83	14.1
\$25,000 - \$39,999	82	13.9
\$40,000 - \$74,999	171	29.0
\$75,000 +	161	27.3
Relationship status		
Committed relationship	116	19.9
Engaged	39	6.7
Married	423	72.5
Separated	5	0.9

Note. $N = 616$. Participants on average were 37.3 years old ($SD = 11.74$).

Table 2. Descriptive Statistics for Key Variables

		Program participants				
Variable		<i>M</i> (SD)	Min	Max	Skewness (SE)	Kurtosis (SE)
Manage	Time 1	24.29 (4.69) 23.29 (4.85)	5.00 5.00	35.00 35.00	-.14 (.14) -.04 (.14)	.48 (.28) -.03 (.28)
	Time 2	25.83 (3.89) 24.99 (4.72)	16.00 8.00	35.00 35.00	.39 (.14) -.06 (.14)	-.113 (.28) .48 (.28)
	Time 3	25.97 (4.12) 24.95 (4.41)	11.00 8.00	35.00 35.00	-.05 (.14) .11 (.14)	.47 (.28) .60 (.28)
Care	Time 1	21.88 (5.15) 21.64 (5.01)	4.00 4.00	28.00 28.00	-.97 (.14) -.79 (.14)	.76 (.28) .14 (.28)
	Time 2	22.88 (4.74) 23.01 (4.87)	4.00 4.00	28.00 28.00	-1.50 (.14) -1.39 (.14)	2.96 (.28) 2.02 (.28)
	Time 3	22.77 (4.28) 22.26 (4.81)	4.00 4.00	28.00 28.00	-1.20 (.14) -1.10 (.14)	2.07 (.28) 1.21 (.28)
Self-Care	Time 1	36.15 (6.95) 35.33 (7.51)	17.00 11.00	56.00 56.00	.22 (.14) -.14 (.14)	.41 (.28) .91 (.28)
	Time 2	38.41 (6.59) 38.00 (6.68)	10.00 20.00	56.00 56.00	-.12 (.14) .12 (.14)	1.29 (.28) .37 (.28)
	Time 3	38.62 (6.52) 37.73 (6.84)	8.00 17.00	56.00 56.00	.04 (.14) .22 (.14)	2.28 (.28) .45 (.28)
Perceived Stress	Time 1	26.09 (6.35) 27.45 (6.88)	10.00 11.00	49.00 50.00	.22 (.14) .31 (.14)	.48 (.28) .24 (.28)
	Time 2	24.48 (6.08) 25.66 (6.29)	10.00 11.00	50.00 48.00	.42 (.14) .17 (.14)	1.58 (.28) .17 (.28)
	Time 3	24.86 (5.53) 25.99 (6.31)	10.00 10.00	45.00 43.00	-.09 (.14) .11 (.14)	.53 (.28) .26 (.28)
Sleep Quality	Time 1	9.68 (3.33) 10.09 (3.37)	2.00 3.00	19.00 20.00	.48 (.14) .43 (.14)	.33 (.28) -.1 (.28)
	Time 2	9.52 (2.87) 9.84 (3.25)	2.00 3.00	20.00 20.80	.38 (.14) .63 (.14)	.42 (.28) .41 (.28)
	Time 3	8.86 (2.98) 9.32 (3.12)	1.00 2.00	18.00 18.00	.36 (.14) .41 (.14)	.75 (.28) -.05 (.28)

N = 616. Women's results in bold. Time 1 = Baseline; Time 2 = Immediate post-program; Time 3 = 1-year follow-up

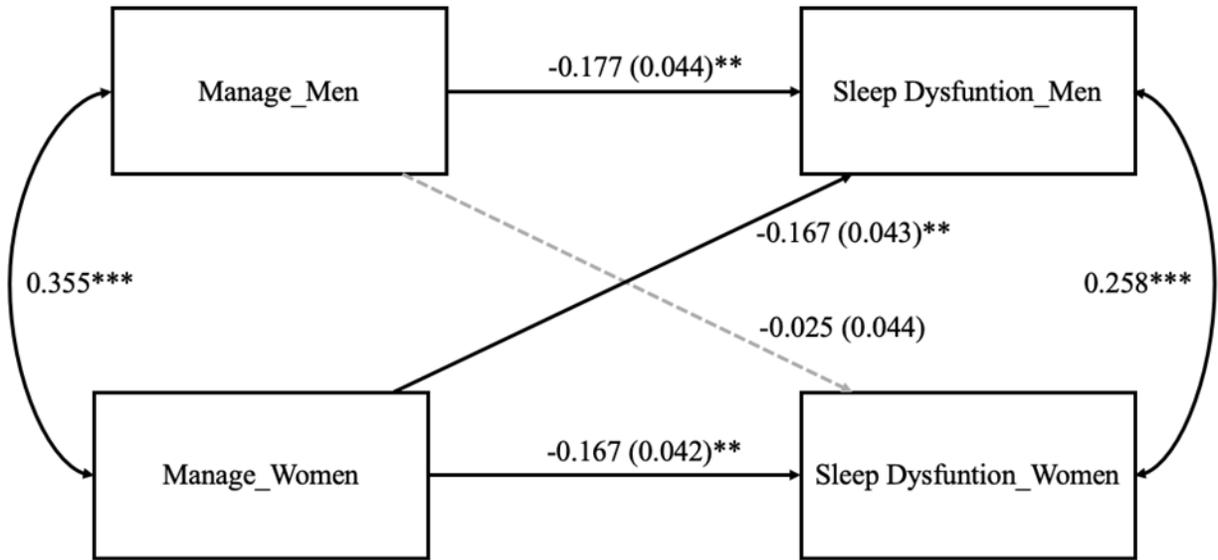
Table 3.

Correlations among Key Variables

	Manage1	Manage2	Manage3	Care1	Care2	Care3	SC1	SC2	SC3	PS1	PS2	PS3	Sleep1	Sleep2	Sleep3
Manage1	1														
Manage2	.57**	1													
Manage3	.52**	.55**	1												
Care1	.40**	.31**	.29**	1											
Care2	.21**	.43**	.29**	.59**	1										
Care3	.24**	.30**	.45**	.50**	.53**	1									
SC1	.48**	.32**	.40**	.32**	.20**	.18**	1								
SC2	.29**	.50**	.45**	.27**	.37**	.27**	.59**	1							
SC3	.31**	.36**	.56**	.19**	.20**	.37**	.49**	.59**	1						
PS1	-.50**	-.37**	-.43**	-.21**	-.12**	-.17**	-.57**	-.49**	-.41**	1					
PS2	-.29**	-.46**	-.42**	-.10*	-.25**	-.18**	-.43**	-.57**	-.45**	.58**	1				
PS3	-.28**	-.33**	-.48**	-.13**	-.13**	-.20**	-.36**	-.43**	-.51**	.51**	.56**	1			
Sleep1	-.20**	-.17**	-.18**	-.05	-.07	-.04	-.40**	-.36**	-.20**	.38**	.24**	.20**	1		
Sleep2	-.18**	-.23**	-.25**	-.02	-.06	-.06	-.35**	-.40**	-.35**	.31**	.39**	.28**	.58**	1	
Sleep3	-.17**	-.19**	-.28**	-.07	-.08	-.12**	-.31**	-.31**	-.38**	.29**	.29**	.38**	.48**	.55**	1

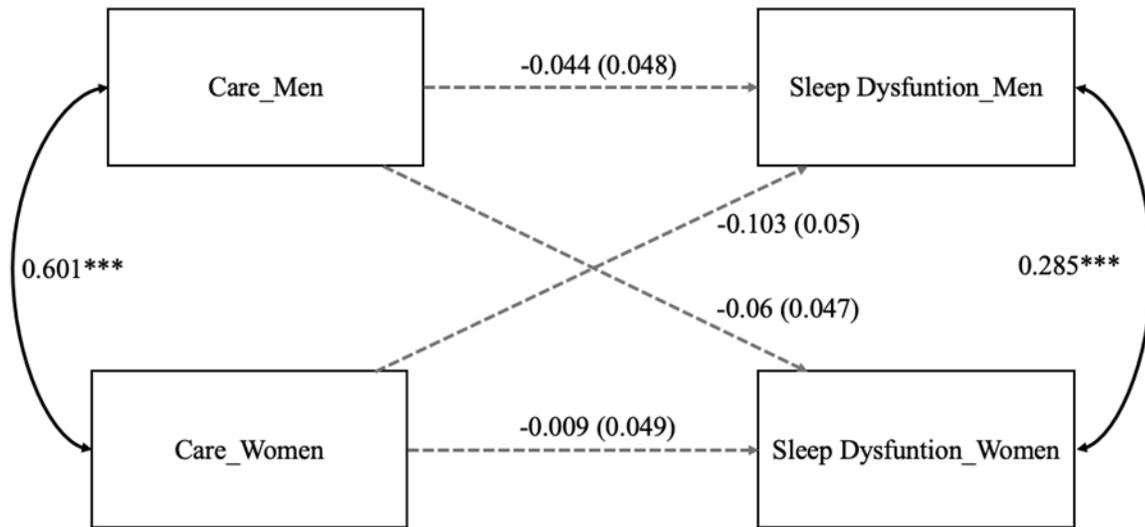
N = 616. SC = Self-Care. PS = Perceived Stress. ** $p < 0.01$.

Figure 1. Actor-Partner Interdependence Model with Conflict Management Skills at Baseline



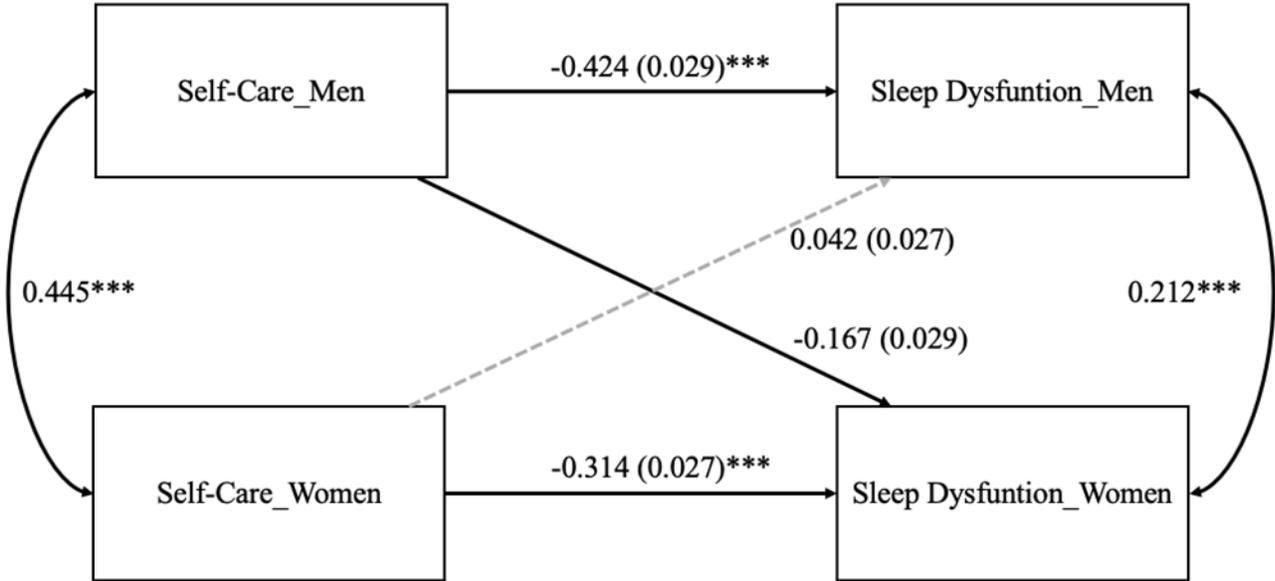
Note. Manage = Conflict Management Skill. $**p < 0.01$; $***p < 0.001$.

Figure 2. Actor-Partner Interdependence Model with Caring for Partner Skills at Baseline



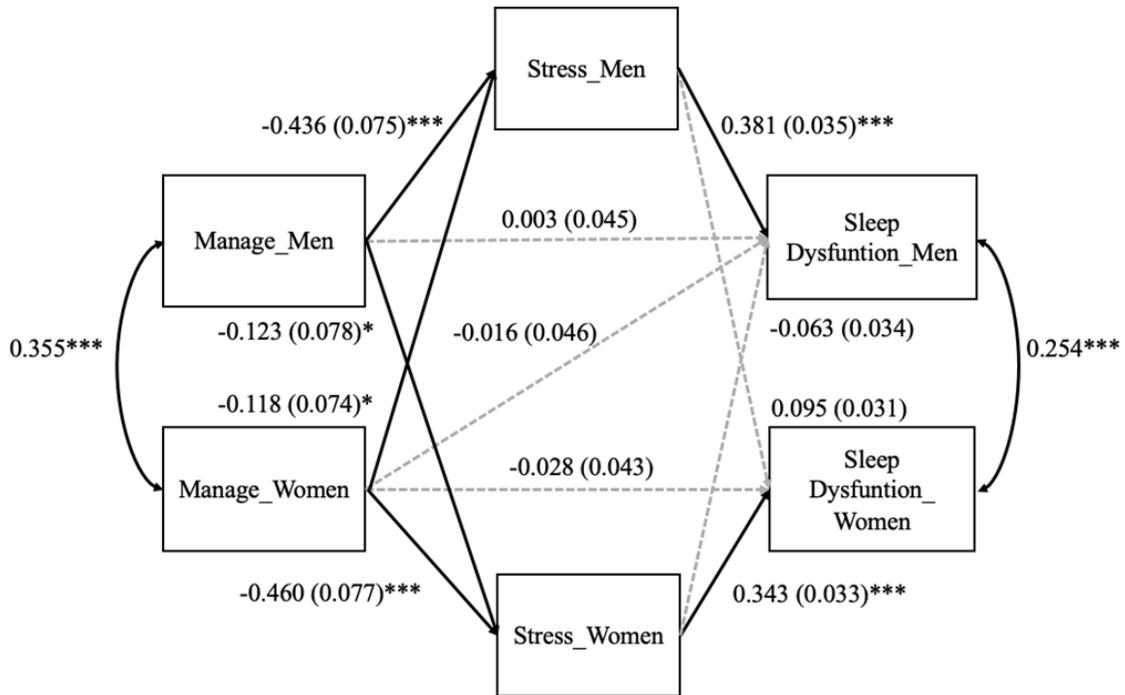
Note. *** $p < 0.001$.

Figure 3. Actor-Partner Interdependence Model with Self-Care Skills at Baseline



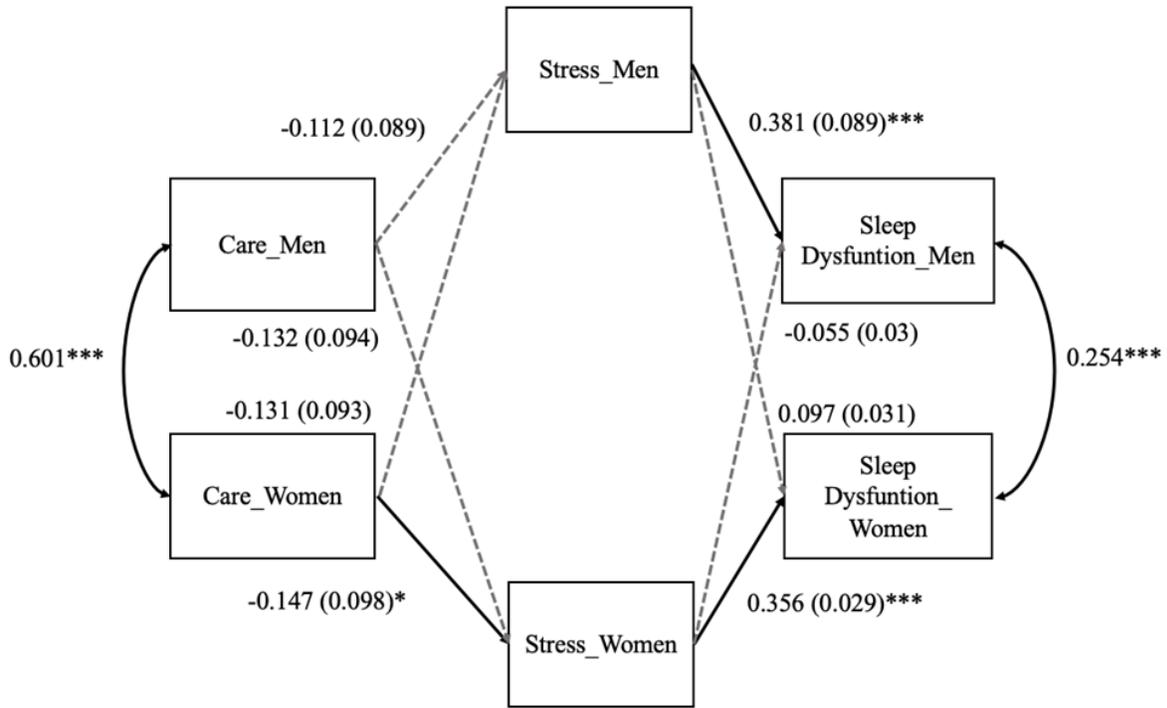
Note. *** $p < 0.001$.

Figure 4. Actor-Partner Interdependence with Mediation Model with Conflict Management Skills at Baseline



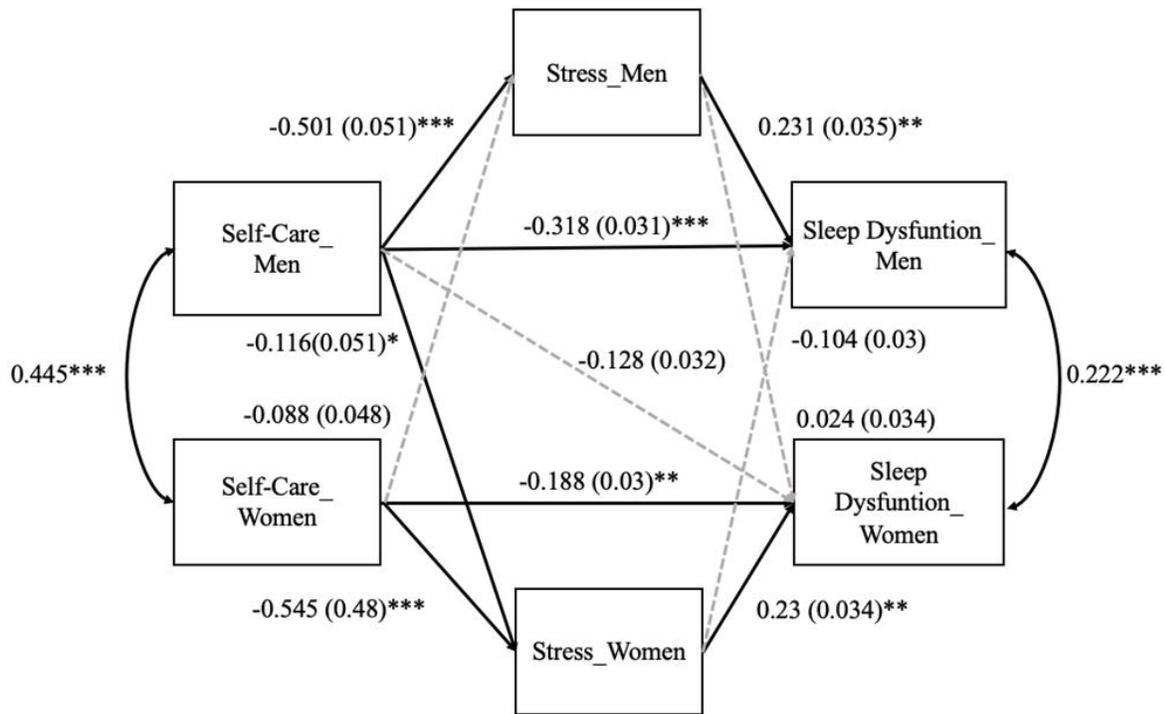
Note. Manage = Conflict Management Skills. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 5. Actor-Partner Interdependence with Mediation Model with Caring for Partner Skills at Baseline



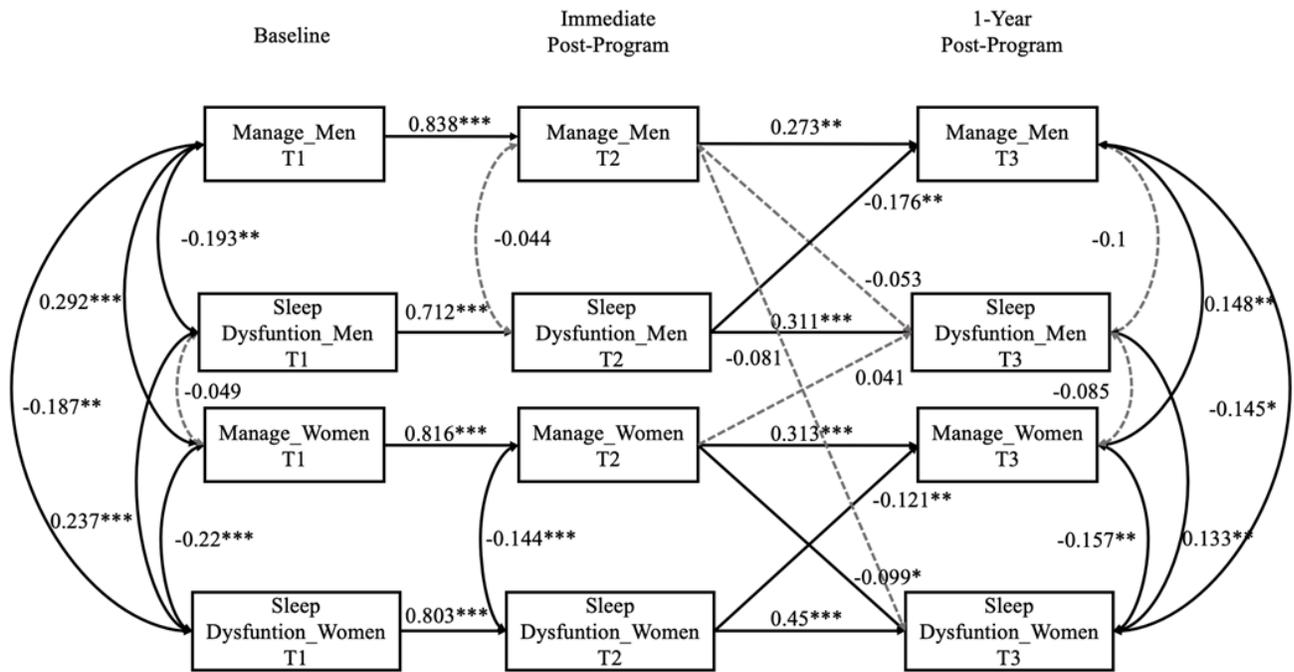
Note. Care = Caring for partner skills. * $p < 0.05$; *** $p < 0.001$.

Figure 6. Actor-Partner Interdependence with Mediation Model with Self-Care Skills at Baseline



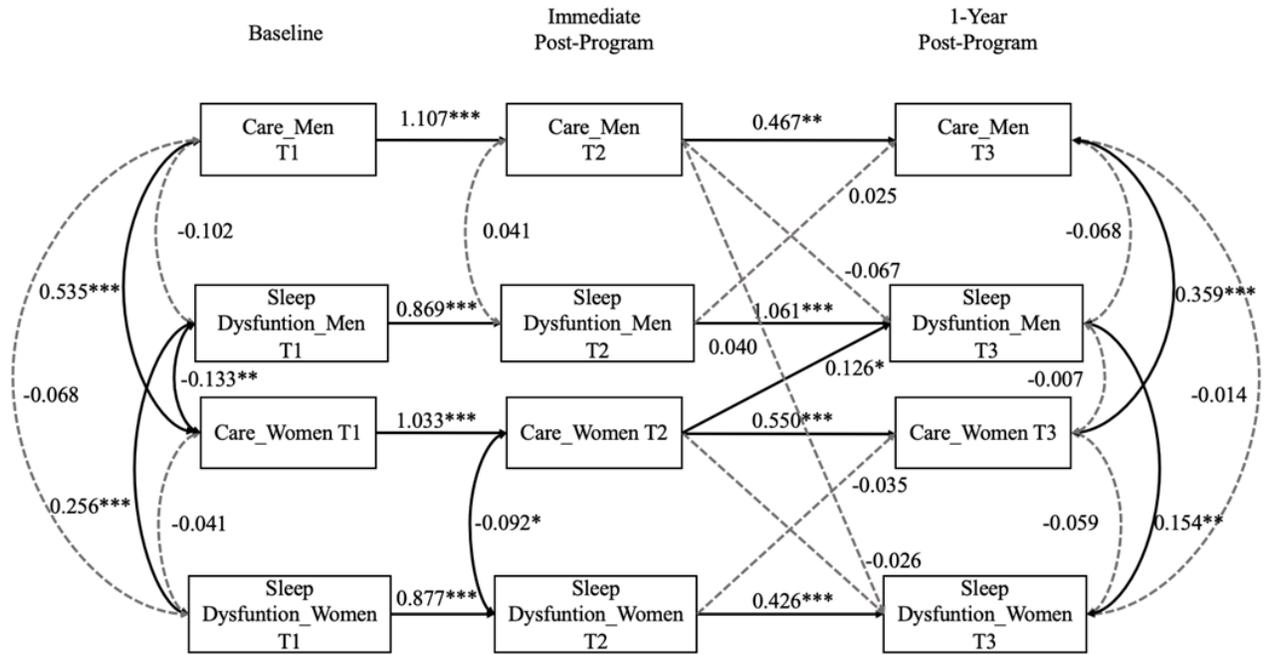
Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 7. *Cross-lagged Autoregressive Model with Conflict Management Skills*



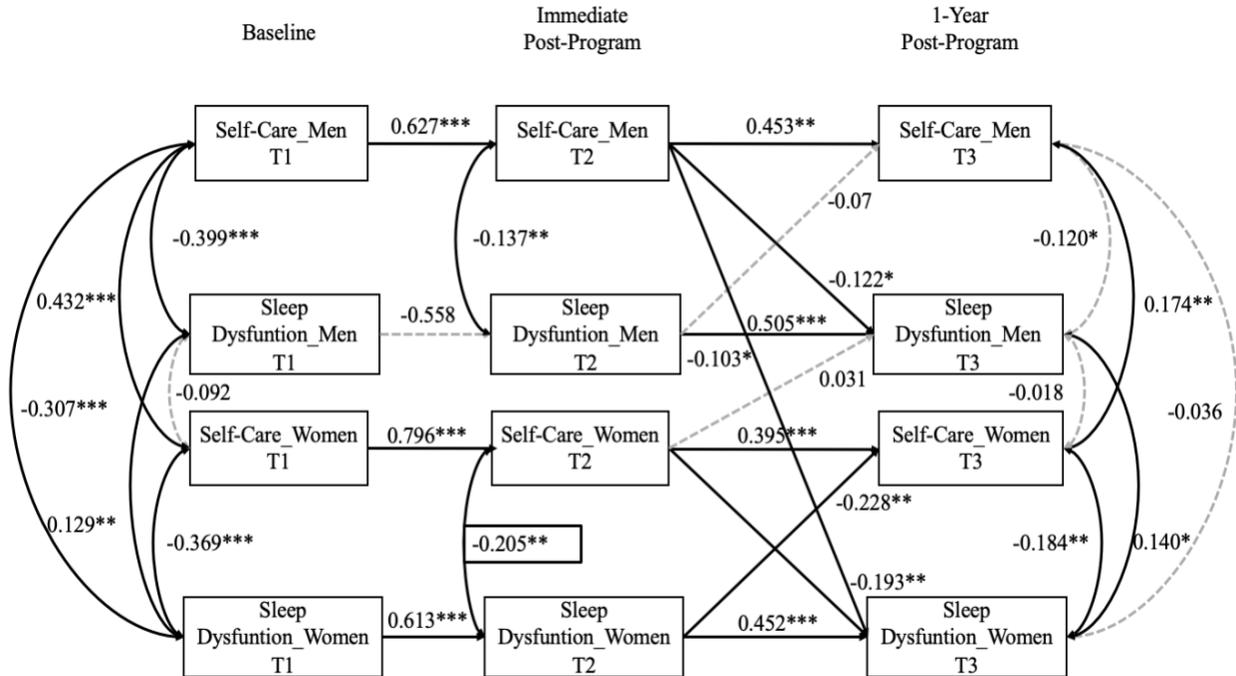
Note. Manage = Conflict Management Skills. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 8. *Cross-lagged Autoregressive Model with Caring for Partner Skills*



Note. Care = Caring for partner skills. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 9. *Cross-lagged Autoregressive Model with Self-Care Skills*



Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

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Appendix

Manage Subscale, Couple Relationship Skills Inventory

(Adler-Baeder et al., 2022)

Select how strongly you disagree or agree with how well each statement describes you during the past month in a typical disagreement:

MN1: I am able to see my partner's point of view and really understand it, even if I don't agree.

MN2: Suggest calm When things "get heated" I suggest we take a break to calm down.

MN3: Forgive I can easily forgive my partner.

MN4: Shout I shout or yell at my partner.

MN5: Blame criticize I blame, accuse, or criticize my partner. (R)

Care Subscale, Couple Relationship Skills Inventory

(Adler-Baeder et al., 2022)

On average, how often in the past month did you:

CR1: Say “I love you” to your partner.

CR2: Initiate physical affection with your partner (e.g., kiss, hug).

CR3: Share emotions Share emotions, feelings, or problems with your partner.

CR4: Say positives Tell my partner things I appreciate about him/her and how much I care for him/her.

Self-Care Subscale, Couple Relationship Skills Inventory

(Adler-Baeder et al., 2022)

Please select how strongly you disagree or agree with each of the following:

SC1: I have the power to manage the challenges in my life.

SC2: Ask for help I ask for help from others when needed.

SC3: I recognize my strengths.

SC4: I manage the stress in my life.

SC5: I eat healthy meals every day.

SC6: I exercise at least three or more times a week.

SC7: Quiet time I have quiet time for myself every day.

Perceived Stress Scale

(Cohen et al., 1983)

In the past month, how often have you...

pss1: Been upset because of something that happened unexpectedly?

pss2: Felt that you were unable to control the important things in your life?

pss3: Felt nervous or stressed?

pss4: Felt confident about your ability to handle personal problems? (REVERSE SCORE)

pss5: Felt that things were going your way? (REVERSE SCORE)

pss6: Found that you could not cope with all the things that you had to do?

pss7: Been able to control irritations in your life? (REVERSE SCORE)

pss8: Felt that you were on top of things? (REVERSE SCORE)

pss9: Been angered because of things that happened that were outside of your control?

pss10: Felt difficulties were piling up so high that you could not overcome them?

Pittsburg Sleep Quality Index

(Buysse et al., 1989)

PSQI1: During the past month, what time have you usually gone to bed at night?

PSQI2: During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

PSQI3: During the past month, what time have you usually gotten up in the morning?

PSQI4: During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

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

PSQI5: Cannot get to sleep within 30 minutes

PSQI6: Wake up in the middle of the night or early morning

PSQI7: Have to get up to use the bathroom

PSQI8: Cannot breathe comfortably

PSQI9: Cough or snore

PSQI10: Feel too cold

PSQI11: Feel too hot

PSQI12: Had bad dreams

PSQI13: Have pain

PSQI14: Other reasons

PSQI15: How often have you taken medicine (prescribed or over the counter) to help you sleep?

PSQI16: How often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

PSQI17: How much of a problem has it been for you to keep up enthusiasm to get things done?

PSQI18: How would you rate your sleep quality overall?