Exploring Exercise as a Dyadic Moderator between Perceived Stress and Relationship Satisfaction for Couples in Therapy

by

Dylan Hillock

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Approved by

Dr. Joshua Novak, Assistant Professor of Human Development & Family Science
Dr. Scott Ketring, Associate Professor of Human Development & Family Science
Dr. Danielle Wadsworth, Associate Professor of School of Kinesiology

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Abstract

Despite the overwhelming evidence for exercise as an effective form of stress management, very little research exists in the context of couple relationships. The purpose of this study was to examine how exercise could moderate the dyadic associations between each partner's perceived stress and relationship satisfaction using an actor-partner interdependence moderation model (APIMoM) for couples in therapy. Analyses were conducted to address four research questions using the baseline (pre-therapy) scores: (1) Is an individual's reported stress associated with their own relationship satisfaction? (2) Does an individual's reported weekly METs (Metabolic Equivalent of Task) moderate the association between their own stress and their own relationship satisfaction for each partner? (3) Is an individual's reported stress associated with their partners' reported relationship satisfaction? (4) Does an individual's reported weekly METs moderate the association between their partners' stress and their own relationship satisfaction? Higher men's and women's stress was associated with lower men's relationship satisfaction, and higher women's stress was associated only with lower women's relationship satisfaction. Results also indicated low, moderate, and high weekly METs significantly moderated the relationship between stress and relationship satisfaction for men and women, such that at lower stress and high weekly METs, relationship satisfaction increased, while at higher stress and high weekly METs, relationship satisfaction decreased. However, weekly METS did not moderate the relationship between one's *partners'* stress and their *own* relationship satisfaction. These findings both support and contradict dyadic theories of stress and suggest the differential associations between stress and relationships (either buffering or exacerbating) could be related to the internal and external nature of stress rendering exercise less

stress reducing. These results could help therapists in both the assessment and intervention in stress and exercise for couples in therapy.

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Chapter 1: Introduction

Marriage and family therapists (MFTs) have a particular interest in the relationship between physical, mental, and relational health because of their holistic perspective of health and well-being (Commission on Accreditation for Marriage and Family Therapy Education, n.d.). This holistic perspective is best conceptualized through the biopsychosocial (BPS) healthcare model, which accounts for the individual's biological, psychological, and social context in assessment, diagnosis, and treatment (Engel, 1977). The BPS model specifically highlights health behaviors such as diet, sleep, and exercise as important factors in an individual's functioning. These health behaviors, which can be considered extra therapeutic factors (or factors that influence the client outside of the context of therapy), are vital components of an individual's ability to change physical, mental, and relational outcomes throughout treatment (Hubble et al., 2010). Considering the holistic approach to care that MFTs take, it is surprising that exercise has not received much attention in the context of systemic therapy despite the overwhelming evidence for the benefit of exercise in mental health treatment for stress-related disorders (Chekroud et al., 2018; Scully et al., 1998, Stathopoulou et al., 2006). In recent innovation, Novak and Ellis (2021) called for MFTs to integrate exercise into assessment and treatment due to the benefit of physical activity on mental, cognitive, and social health.

A common measure used by MFTs in assessing overall well-being is perceived stress, as it is directly related to many physical, mental, and relational health outcomes (Cohen et al., 1983). Stress is a widely used term to describe mental and physical reactions to challenges or demands (Randall & Bodenmann, 2017). Both mental and physical stress can lead to detrimental consequences for individuals, such as increased stress-related mental health issues, increased risk of illness, and cardiovascular decline (Bodenmann, 1995; Bodenmann, 2005). A common and

well-documented perspective of the stress response system in the body is termed allostasis, or the process by which the body achieves physiological homeostasis after stress induction (McEwen & Wingfield, 2003). Allostatic load is the measurement of allostasis that reveals the physiological toll caused by the response to chronic stressors (McEwen & Stellar, 1993). Similar to outcomes measuring perceived stress, allostatic load specifically is positively correlated with many negative physical and mental health outcomes (Guidi et al., 2020), such as cardiovascular decline (Seeman et al., 1997), all-cause mortality (Beckie, 2012), and increased stress-related mental health disorders (McEwen & Rasgon, 2018; Strain, 2018).

Of particular interest to MFTs, stress and allostatic load are directly related to an individual's relationship, specifically relationship satisfaction which is a commonly used measure for the overall well-being of client relationships (Funk & Rogge, 2007). Medical and mental health experts have widely examined the interaction between stress and relationships (e.g., Bodenmann, 1995, 2005; Karney & Bradbury, 1995; McCubbin & Patterson, 1983; Neff & Karney, 2004; Repetti, 1989; Story & Bradbury, 2004), leading to the discovery of specific mechanisms through which stress impacts relational functioning. Types of stressors are categorized as either internal (stress originating from within the relationship) or external (stress originating from outside the relationship (Bodenmann, 1995; Bodenmann, 2005; Story & Bradbury, 2004). External stress is specifically linked to decreases in relationship satisfaction and is higher among couples when either partner is unable to cope with the stress (Randall & Bodenmann, 2017). This stress then spills over into the couple relationship, leading to increased negative relationship behaviors and emotions (Story & Repetti, 2006). The relationship between individually experienced stress and relationship functioning highlights the importance of individual stress management for relational well-being.

As previously mentioned, exercise is widely recognized as an effective method for coping with stress and is known to reduce allostatic load (Ensari et al., 2020; Hamer et al., 2006; Popovic et al., 2022; Robinette et al., 2016; Zschucke et al., 2015), which could buffer the negative impacts of stress on couple outcomes. In both clinical and nonclinical samples, exercise is shown to significantly decrease stress and stress-related mental health disorders, including fewer anxious and depressive symptoms (Chekroud et al., 2018; Scully et al., 1998). Due to the promising outcomes of exercise in stress reduction and psychological functioning when compared to other forms of treatment (Jacquart, 2014; Powers et al., 2015; Ströhle, 2018), exercise is regularly prescribed by health professionals as a means to achieve optimal biopsychosocial well-being (Firth et al. 2020; Smith & Merwin, 2021).

Despite the overwhelming evidence for exercise as an effective form of stress management, very little research exists in the context of couple relationships. Although, some recent studies have begun to explore the role of exercise in couple processes. Physical activity is associated with increased marital satisfaction for wives and husbands (when the exercise is completed together) (Johnson et al., 2018), and a reported increase in positive relationship events for both partners (Yorgason et al., 2018). Further, marital satisfaction increases for wives when they exercise daily and increases for both wives and husbands when the exercise is completed together (Yorgason et al., 2018). Wilson and Novak (2021) found both joint health behaviors—and particularly exercising together—and relationship satisfaction predicted better health and stronger health concordance. The results of the recent studies, in addition to the potential moderating effect of exercise in the relationship between stress and relationship satisfaction, bring attention to the need to further explore how this interaction could impact outcomes for couples in therapy.

This thesis aims to examine if exercise buffers the dyadic associations between individual stress and relationship satisfaction for couples in therapy. The findings will provide clinicians with insight into the benefit of assessment and intervention related to exercise in systemic therapy (Novak & Ellis, 2021). As such, I will test an actor-partner interdependence moderation model exploring the dyadic associations between both partners' stress and relationship satisfaction, as well as the dyadic moderating effect of exercise on stress and relationship satisfaction.

Chapter 2: Literature Review

Overview of The Link between Individual and Relationship Functioning

Stress has received considerable attention in the context of individuals and couple relationships, with overwhelming evidence for the relationship between individual stress and relationship functioning (e.g., Bodenmann, 1995, 2005; Karney & Bradbury, 1995; McCubbin & Patterson, 1983; Neff & Karney, 2004; Repetti, 1989; Story & Bradbury, 2004). A literature review of 24 empirical studies, consisting of both cross-sectional and longitudinal studies, indicated that both individually experienced stress and stress experienced by the couple are associated with decreased marital satisfaction and increased marital distress (Randall & Bodenmann, 2009). The authors highlighted that stress influences the relationship but that the relationship can also be a stressor through negative couple interactions. Overall, increased stress for either partner can result in increased conflict, more intense arguments, increased risk of divorce, decrease in sexual satisfaction, and a significant decrease in relationship satisfaction (Randall & Bodenmann, 2017). These results are concerning considering that stress is often a daily experience for most couples (Falconier et al., 2016).

Types of Stress in Relationships

According to Randall and Bodenmann (2009), it is important to distinguish the origin between different stressors to best understand how to buffer the impact of the stress on couple relationships. Stress that arises within the relationship is considered "internal" stress (Bodenmann, 1995; Bodenmann et al., 2006), while stress that originates outside of the relationship is considered "external" stress (Bodenmann, 1995; Bodenmann, 2005; Story & Bradbury, 2004). More specifically, external stressors can include stress from several domains, including social interactions, the workplace, financial stress, or relational stress with family

members. The external stress individuals experience can indirectly impact the relationship by spilling over to cause dyadic stress, which again can lead to increased conflict and arguments between partners (Randall & Bodenmann, 2017). External stress specifically has been significantly linked to increases in divorce risk, mental health disorders, and cardiovascular decline for both partners (Bodenmann, 1995; Bodenmann, 2005) and negative relationship behaviors and emotions (Story & Repetti, 2006). Some studies suggest external stress is more detrimental to couple satisfaction than internal stress, depending on the partner's ability to cope with the external stressor (Randall & Bodenmann, 2017). Taken together, these findings strongly support the impact of individual stress on couple functioning and highlights the importance of coping mechanisms to buffer the negative consequences of stress on the couple dyad. Although much research has investigated how couples cope together (Weitkamp & Bodenmann, 2022), the present study only focuses on individual stress management as it applies to couple relationships. To that end, understanding the physiological mechanisms of stress may highlight unique and important avenues for stress management.

Theoretical Framework: Allostatic Load

Stress plays a significant role in overall well-being (Dupont et al., 2020; Yang et al., 2022), but an important question is *how* stress impacts the body and brain. Stress triggers a response in the body called allostasis, or the process by which the body achieves physiological homeostasis after stress induction (McEwen & Wingfield, 2003). A specific measurement of allostasis is *allostatic load*, which refers to the physiological toll caused by the response to chronic stressors (McEwen & Stellar, 1993), which may include adverse childhood experiences (Danese & McEwen, 2012), low socioeconomic status, individual health habits, and daily life events (McEwen & Seeman, 1999). Considering that the brain plays a significant role in the

stress response system (Berretz et al., 2021; Steinberg et al., 2019), stress is often strongly related to psychiatric disorders and emotional distress (McEwen & Rasgon, 2018; Strain, 2018).

The allostatic load model assesses the effects of allostatic mechanisms from a multi-systemic perspective, accounting for behavior, development, history of stress, relationships, major life events, and trauma (Juster et al., 2010). Allostatic load is measured through various biomarkers, which are used to develop a sum score (Seeman et al., 1997; Beckie, 2012), although recently, researchers used an item response score to better account for the nuance of individual stressors (Liu et al., 2021). As a measurement of stress response in the body, allostatic load provides a lens through which the vast influence of stress on physical, mental, and relational health can be observed.

Individual and Relationship Functioning and Allostatic Load

Physiological Outcomes. Allostatic load is associated with an individual's health in significant ways, and many of the relevant health outcomes of allostatic load are physiological and psychological (Guidi et al., 2020). Considering allostatic load measures the toll stress response takes on the body, higher levels are often associated with bleak outcomes, including physical, cognitive, cardiovascular, and mental decline (Seeman et al., 1997). One meta-analysis reviewed 58 studies to determine the broad influence of allostatic load on physical health and found that higher allostatic load is associated with declines in immune system functioning and recovery rate and increases in fatigue and all-cause mortality (Beckie, 2012). More recently, researchers reviewed 267 studies related to the influence of allostatic load on overall health. In general population studies and clinical trials, allostatic load was positively correlated with diabetes risk, BMI, cancer, cardiovascular disease, poor sleep quality, and poor diet choices (Guidi et al., 2020).

Psychological Outcomes. The repercussions of allostatic load are detrimental to physical health and affect psychological functioning through physiological means, specifically by creating dysregulation in the parasympathetic response, leading to poor mental health outcomes (Carbone, 2020). Both depression and post-traumatic stress disorder (PTSD) are associated with higher allostatic load, linked to deficits in the functioning of the amygdala, which regulates stress and stress response in the body (McEwen, 2003). Individuals who experience chronic stress and thus accumulate allostatic load are particularly vulnerable to negative mental health consequences (Beckie, 2012), often experiencing more mood and anxiety disorders, alcohol dependence, psychotic disorders, and PTSD when compared to those with lower allostatic load (Guidi et al., 2020). The overwhelming research on the impact of allostatic load on health outcomes presents a major concern for the overall well-being of individuals.

Relational Outcomes. As mentioned previously, individually experienced stress is directly related to relational well-being. Although not as robust as the literature on stress and couple relationships, research shows that stress measured through allostatic load leads to corrosion in couple relationships (Saxbe et al., 2019). Recently, Saxbe et al. developed a measure for the toll stress response takes on social relationships, termed "social allostatic load" (Saxbe et al., 2019). Like allostatic load, social allostatic load accumulates when partners within a couple cannot effectively adapt to or cope with the stress they experience. The authors specifically mention external stress contributing to increased social allostatic load. Using the biomarkers associated with stress and allostatic load, such as cortisol production and heart rate, researchers found that increased external stress promotes social allostatic load, which leads to increased relationship distress (Saxbe et al., 2019; Saxbe et al., 2015; Timmons et al., 2015).

The negative relationship outcomes associated with allostatic load highlight the importance of potential buffers between the individual experience of stress and relationship distress. Due to their direct association with stress, health behaviors such as diet, exercise, and sleep are important factors to consider, as they could moderate the impact of individually experienced stress on the couple's relationship.

Allostatic Load and Health Behaviors

A specific area of interest in the relationship between allostatic load and health outcomes is the role of health behaviors, specifically physical activity, sleep quality, diet/obesity, and substance use (Forrester et al., 2019; Rodriquez et al., 2018; Suvarna et al., 2020). A recent meta-analysis highlighted the importance of health behaviors as both a contributing factor and a buffer in the development of allostatic load (Guidi et al., 2020). Physical activity is particularly important due to the significant impact of physical *inactivity* increasing allostatic load, while physical *activity* significantly decreases allostatic load (Forrester et al., 2019; Gay et al., 2013; Suvarna et al., 2020). Further, research shows individuals often adopt maladaptive health behaviors to cope with chronic stress (McEwen & Stellar, 1993; Morris et al., 2016), with physical inactivity being among the most common factors, leading to increased allostatic load (Siew, 2022).

Exercise is considered a significant and relevant coping mechanism to reduce the level of experienced stress (Edenfield & Blumenthal, 2011; Starkweather, 2007) and the associated adverse mental (Checkroud et al., 2018) and physical health outcomes (Lobelo et al., 2014). The beneficial effects of exercise have been widely studied in the context of the body and brain, as well as the use of exercise in the context of therapy (Daly, 2002; Hays, 1999; Thomas et al.,

2020). The following sections will outline how exercise effectively serves as a buffer for the impact of stress/allostatic load on physical, mental, and relational health.

Exercise and the Brain

Though individuals choose to reduce stress in many ways, one method that has garnered considerable attention is exercise due to the significant positive influence on both mental and physical health, specifically through reducing stress by increasing sympathetic activity and decreasing parasympathetic activity in the nervous system and improving cardiovascular functioning (Ensari et al., 2020; Hamer et al., 2006; Popovic et al., 2022; Zschucke et al., 2015). Exercise is a relatively broad term that can include many forms of physical activity, commonly divided into aerobic and anaerobic, and categorized as light, moderate, or vigorous intensity (Norton et al., 2010; Pageaux, 2016; Patel et al., 2017). *Aerobic* exercise refers to sustained activities that stimulate the breath and heart rate, including running, cycling, cardio machines, or swimming, while *anaerobic* exercises are completed in quick bursts and often build muscle, such as high-intensity interval training or sprinting, according to the American College of Sports Medicine (ACSM) (Liguori et al., 2022; Norton et al., 2010). Several measures are used to quantify exercise as a variable, and among the most common are measures that estimate the perceived exertion of a given exercise routine. The Borg Rating of Perceived Exertion scale determines how hard the individual feels their body is working (Borg, 1982; Williams, 2017). The measure uses physical sensations such as breathing, sweating, heart rate, and muscle fatigue to determine where the exercise is rated on a scale from very light to maximum effort. Another common measure uses the metabolic equivalent of tasks (METs) to estimate the amount of energy expended based on the perceived exertion and duration of an exercise (Ainsworth et al., 1993)

Clear physical health benefits are associated with exercise, such as improved cardiovascular health (Lavie et al., 2019; Luepker et al., 1996), fitness (Astrand, 1992; Dieli-Conwright et al., 2018), pain management (Cashin et al., 2021), immunity (Nieman, 2011), and weight control (Clark, 2015). These physical health benefits are directly related to allostatic load in the literature. Research has found that individuals who exercise regularly have lower allostatic load than those who do not exercise as often (Robinette et al., 2016), which is associated with improvements in many health outcomes, as previously mentioned. Further, the intensity of exercise required to achieve lower levels of allostatic load is lower than previously thought, according to a recent study including over 6,000 participants (Forrester et al., 2019). The authors found that participants who engaged in just 2.5 hours of moderate physical activity per week had significantly lower allostatic load and cardiovascular risk than participants who were sedentary (less than 2.5 hours of moderate physical activity).

In addition to the physical payoffs of exercise, recent literature has investigated its brain-boosting mental and emotional benefits. Exercise is significantly related to mental health, as engaging in exercise leads to less stress and stress-related mental health disorders, including fewer anxious and depressive symptoms (Chekroud et al., 2018; Scully et al., 1998). A recent study that included 1.2 million participants found that individuals who exercised for durations of 45 minutes at a frequency of 3 to 4 times per week reported less stress and fewer poor mental health days than those who did not exercise (Chekroud et al., 2018). A relevant and well-supported explanation of the mechanism is that exercise creates stress on the body and brain, which raises the threshold for the innate fight-or-flight response and ultimately creates a cascading effect in the body that results in a calm reaction to future stress (Dishman et al., 2006). In other words, exercise prepares the brain to cope better under stress. Although many

mechanisms for the stress-reduction effect of exercise have been discussed, a universal consensus has not yet been established (Sharon-David & Tenenbaum, 2017). Still, exercise is widely documented to be effective in reducing stress and is regularly used by clinicians to treat stress-related disorders (Stubbs et al., 2017). The following section will explore how exercise is understood in the clinical setting and the influence of exercise on therapeutic outcomes.

Exercise and Therapy

The use of exercise as a mental health treatment has been explored as an alternative to traditional methods such as psychotherapy and pharmaceutical intervention (Pratt et al., 2016), as well as an adjunct treatment in therapy (Gaudlitz et al., 2014; Merom et al., 2008). Recent meta-analyses have found that exercise serves as an effective treatment for many clinically significant mental health disorders, including depression (Cooney et al., 2014) and anxiety (Ensari et al., 2015), and is effective when compared to other forms of treatment as well (Powers et al., 2015; Ströhle, 2018). Researchers showed support for exercise as a first-line treatment for depressive symptoms because exercise is as effective as pharmaceutical intervention (Carek, 2011). Exercise is also equally effective in treating anxiety and depressive disorders as psychotherapy (Martinson, 2008). Regarding adjunct treatment, one meta-analysis found that exercise treatment in conjunction with psychotherapy produces effective mental health outcomes, lowering depressive and anxiety symptoms (Stathopoulou et al., 2006), leading the researchers to call for the integration of adjunctive exercise interventions in clinical practice. One study goes a step further, not only finding exercise as an effective treatment for individuals with depression in addition to therapy but also showing better outcomes compared to individuals who only received talk therapy (Jacquart, 2014).

A literature review examining the role of exercise in the management of mental health disorders found that the specific exercise regimen used as treatment varies greatly among professionals. However, aerobic exercise is commonly used and found to be an effective form of treatment (Smith & Merwin, 2021). Ultimately, the authors found that effectiveness was primarily related to whether participants reached the minimum guideline recommended by the CDC and American Heart Association of 150 minutes of moderate physical activity per week. Based on a meta-review of the literature, Firth et al. (2020) found 150 minutes of physical activity to be an effective clinical intervention for stress-related disorders. They recommended the continued use of exercise as a primary form of treatment. While research on clinical populations is robust regarding individual treatment, there is a significant gap in the context of couples in therapy. The following section will outline the minimal research on exercise and couple relationships.

Exercise and Relationships

Currently, there is little research on the direct association between exercise and relationship processes. Some research suggests a positive relationship between exercise and positive relationship events for both partners (Johnson et al., 2018). In addition to the payoffs of individual exercise, exercising with a partner may reap similar rewards. Reported marital satisfaction increases for wives when they exercise daily and increases for both wives and husbands when the exercise is completed together (Yorgason et al., 2018). Partnered exercise is effective for couples during particularly stressful times, such as chronic illness. Compared to a control group, couples coping with prostate cancer increased their physical intimacy by exercising together (Lyons et al., 2015). Wilson and Novak (2021) specifically sought to examine whether joint health behaviors, including exercise and relationship satisfaction, are

related to better health and health similarity in couples. The authors found both joint health behaviors and relationship satisfaction predicted higher health satisfaction and lower depressive symptoms, and joint exercise was most predictive of this relationship. Despite the hopeful outcomes discovered in these studies, a significant interaction between exercise and couple outcomes could be overlooked because of the lack of research in this area. Exercise could help couples better manage the impact of stress on relationship outcomes, highlighting an important public health solution to combat the distress and dissolution of close romantic relationships.

The Current Study

Keeping in line with the biopsychosocial model of healthcare, as MFTs pursue information that will lead to "overall, long-term well-being of individuals and their families" (Commission on Accreditation for Marriage and Family Therapy Education, n.d.), health behaviors will continue to be an integral component to optimizing couple outcomes. This thesis is informed by the BPS framework and emphasizes the mutual interacting and reinforcing influences of biological, psychological, and social factors (Engel, 1977). Although both stress and exercise are often individually experienced (particularly through allostatic load (McEwen & Stellar, 1993)), their impact can reach into the couple dyad (Randall & Bodenmann, 2009, 2017; Johnson et al., 2018), specifically relationship satisfaction (Bodenmann, 1995, 2005; Karney & Bradbury, 1995; McCubbin & Patterson, 1983; Neff & Karney, 2004; Repetti, 1989; Story & Bradbury, 2004). Indeed, research on the far-reaching benefits of physical activity (Ensari et al., 2020; Hamer et al., 2006; Popovic et al., 2022; Zschucke et al., 2015), especially on stress management and related mental health disorders (Biddel & Asare, 2011; Dishman et al., 2006; Mikkelsen et al., 2017; Stubbs et al., 2017), highlights an important biological factor relevant for relational functioning (Novak & Ellis, 2021). Thus, understanding the interaction between these

factors both within and outside the therapy room could be significant for MFTs as they conceptualize treatment for couples in therapy. To that end, the current study examines how exercise could moderate the dyadic associations between each partner's perceived stress and relationship satisfaction using an actor-partner interdependence moderation model for couples in therapy (at baseline, pre-therapy). Given these understandings, my research questions are four-fold (see Figure 1):

1. At baseline, is an individual's reported stress (PSS) associated with their *own* relationship satisfaction (CSI)? If so, I hypothesize that lower stress will be associated with higher relationship satisfaction.
2. At baseline, does an individual's reported weekly METs moderate the association between their stress (PSS) and their *own* relationship satisfaction (CSI)? If so, I hypothesize that higher levels of weekly METs will have a greater moderating effect on the association between stress and relationship satisfaction outcomes than lower levels of weekly METs.
3. At baseline, is an individual's reported stress (PSS) associated with their *partners'* relationship satisfaction (CSI)? I hypothesize that individuals whose partners report less stress will report higher relationship satisfaction.
4. At baseline, does an individual's reported weekly METs moderate the association between their *partners'* stress (PSS) and their relationship satisfaction (CSI)? If so, I hypothesize that higher levels of weekly METs will have a greater moderating effect on the association between stress and relationship satisfaction outcomes than lower levels of weekly METs.

Chapter 3: Methods

Participants

Demographics for all participants are listed in Table 1. All participants are couples (N=188) who came in for couples' therapy at the Auburn University Marriage and Family Therapy Clinic between 2016 and 2019. The participants ranged in age from 18 to 69 (men M = 32.9, SD = 10.2, R = 19 – 69; women M = 31.6, SD = 9.7, R = 18 – 66), and the couples had been together anywhere between 1 month to 41 years (M = 64.7 (months), SD = 69.9, R = 1 – 492). Among the men, 75.5% were White, 14.9% African American, 1.1% Hispanic, 1.1% Asian, and 1.6% Other. The women were 77.7% White, 13.8% African American, 0.5% Hispanic, 1.1% Asian, and 1.1% Other. Regarding education, slightly less than a third of men had a bachelor's degree (31.4 %) or GED/high school diploma (31.9%), while the remainder earned a graduate or professional degree (17.6%), associate's degree (11.7%), vocational/technical school certificate (6.4%), or junior high school or less (1.1%). Over a third of the women had a bachelor's degree (34.6%), while the others had a graduate/professional degree (22.3%), associate's degree (10.1%), GED/high school diploma (28.2%), or vocational/technical school certificate (4.3%). Almost one-fourth of the couples made under $20,000 total income per year (23.4%), while the other participants made $20,000 to $39,999 (20.8%), $40,000 to $59,999 (16.5%), $60,000 to $79,999 (11.2%), $80,000 to $99,999 (9.6%), and $100,000+ (12.8%).

Measures

Predictor: Stress

Stress was measured via the Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983). The PSS-10 is a 10-item scale that measures the stressful situations in an individual's life relative to

their coping ability and is the most popular measure for perceived stress. Participants are asked to report how often they felt a specific way throughout the last month on a five-point Likert scale ranging from 0 "*never"* to 4 "*very often."* Example questions include "In the last month, how often have you been upset because of something that happened unexpectedly?", "In the last month, how often have you felt that things were going your way?" and "In the last month, how often have you been angered because of things that were outside your control?". Higher scores represent higher perceived stress. The Cronbach's alpha reliability coefficient was $\alpha = .89$ for men and $\alpha = .86$ for women.

Moderator: Weekly METs

METs (metabolic equivalent of task) were measured using a self-report assessment of both frequency and intensity of exercise during the previous week. Participants were asked to report the number of times they exercised (0 to 7 or more), the number of hours they exercised (0 to 7 or more), and the average intensity of their exercise using a 7-point Likert scale ranging from 1 "*extremely easy"* to 7 "*extremely hard."* Scores were then calculated using a formula to determine average energy expenditure using a scaled score equivalent of METs, in which 1 on the Likert scale equals 2 METs, and 7 equals 13 METs (Ainsworth et al., 1993). The scaled score equivalent will be multiplied by the duration and frequency of the exercise to get the total number of MET hours per week (Example: 5 times x 1 hour @ Likert 4 (7) = 35 MET hours/week).

Outcome: Relationship Satisfaction

Relationship satisfaction was measured via The Couple Satisfaction Inventory (CSI; Funk & Rogge, 2007). The CSI is a 16-item self-report questionnaire that measures individuals' level of satisfaction in their relationship. The CSI uses several different Likert scales throughout to

measure happiness which uses a 7-point Likert scale ranging from 0 "*extremely unhappy"* to 6 "*perfect,"* disagreements which uses a 6-point Likert scale ranging from 0 "*always disagree"* to 5 "*always agree,"* relationship strength which uses a 6-point Likert scale ranging from 0 "*not true at all"* to 5 "*completely true,"* expectations which uses a 6-point Likert scale ranging from 0 "*not at all"* to 5 "*completely,"* enjoyment which uses a 6-point Likert scale ranging from 0 "*extremely bad"* to 5 "*extremely good,"* and feelings about the relationship which uses a 6-point Likert scale ranging from 0 "*bad"* to 5 "*good."* Examples include "My relationship with my partner makes me happy," "How well does your partner meet your needs?" and "In general, how satisfied are you with your relationship?". Higher scores represent more satisfaction with the relationship. The Cronbach's alpha reliability coefficient was $\alpha = .97$ for men and $\alpha = .97$ for women.

Control Variables

In addition to controlling for age, race/ethnicity, relationship length, income level, and level of education, I will also control for other mental health symptoms, including anxiety and depressive symptoms.

Anxiety Symptoms. Generalized anxiety disorder (GAD) is among the most significant associations with marital distress (Whisman, 2007). A foundational study by McLeod (1994) and replicated by Whisman (1999) found that marital distress was significantly higher for wives with GAD. Further, relationship distress can lead to the development and maintenance of anxious symptoms, and the presence of anxiety disorders can lead to dissatisfaction in the relationship (Kasalova et al., 2017). Due to this correlation, anxiety symptoms will be included as a control variable.

Anxiety symptoms were measured via the Generalized Anxiety Disorder 7-Item Scale (GAD-7; Spitzer et al., 2006). The GAD-7 is a brief screening and assessment measure for the prevalence and severity of Generalized Anxiety Disorder. This seven-item scale uses a 4-point Likert scale ranging from 0 "*not at all"* to 3 "*nearly every day"* to determine how often individuals have experienced specific problems over the last two weeks. Some example statements include "Feeling nervous, anxious, or on edge," "Worrying too much about different things," and "Feeling afraid as if something awful might happen." Higher scores represent more severe anxiety symptoms. The Cronbach's alpha reliability coefficient was $\alpha = .92$ for men and $\alpha = .92$ for women.

Depressive Symptoms. Depressive symptoms are predictive of marital discord for the individual and their partner, and no differences are apparent between genders (Whisman & Uebelacker, 2009). Whisman et al. (2004) also found that higher anxiety and depressive symptoms were associated with lower marital satisfaction for both husbands and wives and that partner depressive symptoms were predictive of marital satisfaction. As such, depressive symptoms will be included as a control variable.

Depressive symptoms were measured via the Major Depression Inventory (MDI; Bech et al., 2001). The MDI is a self-report diagnostic measure of major depressive disorders and their severity. The MDI uses a 6-point Likert scale ranging from 0 "*at no time"* to 5 "*all the time"* to determine how often participants have been bothered by specific feelings or behaviors over the past two weeks. Examples include "Have you lost your interest in daily activities?", "Have you felt life was not worth living?" and "Have you suffered from reduced appetite?" Higher scores represent more severe depressive symptoms. The Cronbach's alpha reliability coefficient was $\alpha = .90$ for men and $\alpha = .91$ for women.

Procedure

Quantitative data for this study was collected via self-report paper assessments given to the clients when they attended therapy at the Auburn University Marriage and Family Therapy clinic. Auburn University is an accredited program by the Commission on Accreditation for Marriage and Family Therapy Education (COAMFTE), providing services to individuals, couples, and families living in the Auburn-Opelika area of East Alabama. Participants were asked to fill out an initial intake survey, which gathered data on both partners' CSI, PSS, MDI, and GAD measures. Exercise data was collected immediately before each session through another self-report assessment clients were asked to fill out at the beginning of therapy. The paperwork of the data collected in the clinic was then given to undergraduate interns, who input it into an SPSS database.

I filtered down the data to our target population of only heterosexual couple cases whose paperwork was thoroughly completed prior to the first session of therapy. I eliminated cases that included same-sex couples, had duplicate data, or were missing large chunks of data. I also eliminated cases in which either intake or intersession before paperwork was missing, so each dataset included the same cases. The final sample included 188 couples for analysis.

Data Analysis Plan

After filtering the data, I combined the data and created composite scores for the main variables (PSS, CSI, and Exercise) and covariates (MDI and GAD) for the male and female partners. I ran descriptive statistics for each main variable and covariate. I tested for the assumptions of linear regression and normality, including heteroscedasticity, skewness, kurtosis, and outliers.

When these tests were completed, I ran an actor-partner interdependence moderation model to assess how exercise impacts the relationship between perceived stress and relationship satisfaction outcomes for partners in therapy. The actor effect refers to the participant's effect of their stress score on their own CSI score, whereas the partner effect refers to the effect of the participant's stress score on their partner's CSI score (Garcia et al., 2014). First, men's and women's stress were regressed onto their own (RQ1) and the other partner's CSI (RQ3). Second, men's exercise was explored as a moderator (1) between his stress and his relationship satisfaction (RQ2) and (2) his partner's stress and his own CSI (RQ4). Third, women's exercise was explored as a moderator (1) between her stress and her relationship satisfaction (RQ2) and (2) her partner's stress and her own CSI (RQ4). This model also included age, race/ethnicity, relationship length, income level, level of education, and depressive and anxiety symptoms as covariates.

Chapter 4: Results

Descriptive Statistics

Descriptive statistics are listed in Table 2. The data met all assumptions of linear regression. Women's stress (M = 21.98, S.D = 6.64) was significantly higher than men's stress (M = 19.15, S.D = 6.92; t(187) = -4.54, p <0.001). Men's relationship satisfaction (M = 47.12, S.D = 18.00) was significantly higher than women's relationship satisfaction (M = 44.13, S.D = 18.87; t(187) = 2.72, p = 0.007). Women's anxiety (M = 11.43, S.D = 6.14) was significantly higher than men's anxiety (M = 8.86, S.D = 5.97; t(186) = -4.33, p <0.001). Women's depressive symptoms (M = 20.24, S.D = 12.47) was significantly higher than men's depressive symptoms (M = 17.17, S.D = 11.37; t(186) = -2.67, p = 0.008). Men's weekly METs (M = 71.80, S.D = 118.47) were not significantly different from women's weekly METs (M = 61.23, S.D = 107.40; t(177) = 0.99, p = 0.325).

Correlation Analysis

Preliminary analysis using bivariate correlations were examined (see Table 3). Higher men's stress was significantly correlated with lower men's relationship satisfaction (r = -.234, p < .01) and higher women's stress (r = .207, p < .01) but not associated with women's relationship satisfaction. Higher men's stress was also associated with higher anxiety for men (r = .702, p < .01) and women (r = .262, p < .01), as well as higher depressive symptoms for men (r = .641, p < .01) and women (r = .205, p < .01). Higher women's stress was associated with lower women's relationship satisfaction (r = -.349, p < .001) and lower men's relationship satisfaction (r = -.274, p < .001), as well as higher women's anxiety (r = .671, p < .01) and depressive symptoms (r = .593, p < .01), but there was no association with men's depressive symptoms and anxiety. Higher men's relationship satisfaction was associated with higher women's relationship satisfaction (r =

.667, p < .01), lower men's anxiety (r = -.213, p < .01) and depressive symptoms (r = -.248, p < .01), lower women's anxiety (r = -.190, p < .01) and depressive symptoms (r = -.227, p < .01), and relationship length (r = -.225, p < .01). While women's relationship satisfaction was not correlated with men's anxiety and depressive symptoms, higher women's relationship satisfaction was associated with lower women's anxiety (r = -.241, p < .01) and depressive symptoms (r = -.293, p < .01). Interestingly, there was no correlation between stress and weekly METS or weekly METs and relationship satisfaction for either partner. However, higher men's weekly METs were associated with lower men's anxiety (r = -.162, p < .05) and lower men's depressive symptoms (r = -.199, p < .01).

SEM Results

The final structural equation model results are shown in Figure 2. Initially, all variables in the model were regressed on the control variables. However, only relationship length and income were related to the endogenous variables, so all others were pruned systematically. Model fit was evaluated to determine if the removal of paths significantly harmed model fit. The final model revealed good fit to the data: χ^2 = 6.65 (4), *p* =.16, CFI = .982, TLI = .906, RMSEA = .06 (.00 - .15), SRMR = .029 and accounted for 23.9% of the variance in men's relationship satisfaction and 29.5% of the variance in women's relationship satisfaction.

Higher men's and women's stress was associated with lower men's relationship satisfaction (men: β = -.28, *p*<.001; woman: β = -.21, *p* <.01). Higher women's stress was associated with lower women's relationship satisfaction (β = -.36, *p* <.001). The interaction between men's stress and men's weekly METs was significantly associated with men's relationship satisfaction (β = -.15, *p* =.015). The interaction between women's stress and weekly METS was significantly associated with women's relationship satisfaction (β = -.15, *p* =.020).

Longer relationship length was associated with lower relationship satisfaction for men (β = -.24, p <.01) and women (β = -.24, p <.01). Higher income was associated with lower men's relationship satisfaction (β = -.28, p <.001).

Moderation Results

Men Moderation Results

Consistent with Holmbeck's (2002) process for probing significant interaction effects, post hoc regressions were conducted to test the simple slopes of the conditional effects of men's perceived stress on men's relationship satisfaction at relatively low (−1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of men's weekly METs. Results are plotted in Figure 3. Men's perceived stress was negatively associated with men's relationship satisfaction for men at low (no exercise), moderate, and high weekly MET levels, as evidenced by significant slopes (low weekly METs: b = -.499, p = .03, LLCI -.95, ULCI -.04; moderate weekly METs: b = -.578, p = .001, LLCI -.99, ULCI -.16; high weekly METs: b = -1.07, p <.001, LLCI -1.60, ULCI -.53).

To further probe the interaction, I used the Johnson-Neyman (JN) technique (Bauer & Curran, 2005; Johnson & Neyman, 1936) to identify regions of significance for the simple slopes of men's stress on men's relationship across levels of men's weekly METs. Table 3 presents the results from the JN analysis. The JN technique identified zero regions of nonsignificance, meaning that the effect of men's stress on men's relationship satisfaction was significant at all levels of men's weekly METs. Overall, the moderating effect was significant for all study participants.

Women Moderation Results

I also probed the simple slopes of the conditional effects of women's perceived stress on women's relationship satisfaction at relatively low (−1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of women's weekly METs. Results are plotted in Figure 4. Women's perceived stress was negatively associated with women's relationship satisfaction for women at low (no exercise), moderate, and high weekly MET levels, as evidenced by significant slopes (low weekly METs: b = -.81, p <.001, LLCI -1.24, ULCI -.37; moderate weekly METs: b = -.84, p < .001, LLCI -1.25, ULCI -.42; high weekly METs: b = -1.19, p <.001, LLCI -1.71, ULCI -.67).

To further probe the interaction, I used the Johnson-Neyman (JN) technique (Bauer & Curran, 2005; Johnson & Neyman, 1936) to identify regions of significance for the simple slopes of women's stress on women's relationship across levels of women's weekly METs. Table 4 presents the results from the JN analysis. The JN technique identified zero regions of nonsignificance, meaning that the effect of women's stress on women's relationship satisfaction was significant at all levels of women's weekly METs. Overall, the moderating effect was significant for all study participants.

Chapter 5: Discussion

The present study sought to explore the relationship between stress and relationship satisfaction with exercise as a moderator for both men and women in a sample of 188 couples in therapy. An actor-partner interdependence moderation model was performed to test for these associations. Covariates such as relationship length, age, race, education, income, depressive symptoms, and anxiety were all included in the analyses. Several significant associations were discovered, most notably the moderating effect of weekly METs on the relationship between stress and relationship satisfaction. The significant interaction effects suggest that all levels of weekly METs (low, moderate, and high) moderate the association between an individual's stress and their relationship satisfaction.

In support of research questions 1 and 2, all levels of weekly METs were associated with higher relationship satisfaction when the participant reported lower stress for both men and women. Further, only high weekly METs and lower stress were associated with a relationship satisfaction score above 51.5 (above notable relationship dissatisfaction or indicating clinical distress) (Funk & Rogge, 2007) for men and women compared with low and moderate weekly METs. This result is in agreement with the literature on the association between stress and relationship satisfaction (Bodenmann, 1995, 2005) and supports the concept of exercise as a potential buffer for stress. Participants with lower stress that engage in more intense exercise pre-therapy could effectively manage their stress levels (Edenfield & Blumenthal, 2011; Starkweather, 2007), which prevents stress from impacting their relationship satisfaction.

Interestingly, all levels of weekly METs were associated with lower relationship satisfaction when the participant reported higher stress for both partners. More specifically, high weekly METs and high stress were associated with the lowest relationship satisfaction. A lack of

clarity in the specific domain of the stressors could explain the difference in these results. The PSS-10 assesses for general perceived stress (Cohen et al., 1983), but specifying whether the stress is internal or external could reveal an important distinction, as Randall & Bodenmann (2009) emphasized. The impact of external stress on relationship satisfaction largely depends on an individual's ability to cope (Randall & Bodenmann, 2017) and partners with high weekly METs but lower stress could be effectively utilizing exercise as a form of coping with external stress, which helps buffer the impact of their stress on the relationship. Conversely, partners who are heavily relying on an individually-focused coping technique such as exercise to deal with stress arising from within the relationship (internal) rather than engaging in dyadic coping (Weitkamp & Bodenmann, 2022) could contribute to dissatisfaction in the relationship because they are spending more time away from their partner—thus doing less dyadic coping—resulting in a lack of connection (Randall & Bodenmann, 2017).

This potential dynamic is further supported by research on the impact of leisure time on relationship satisfaction. Overall, the results of this study revealed no significant differences in weekly METs between men and women, suggesting men and women exercise the same amount during the week, which is consistent with health concordance literature (Li et al., 2013). However, differences in the level of exercise within each couple could be present, meaning one partner spends much of their time exercising individually. If partners are engaging in leisure activities that exclude their partner rather than involve their partner, it can lead to increased marital distress (Orthner & Mancini, 1990; Smith et al., 1988). Similarly, research on leisure activities in couples highlights the integral role of social support in individually focused activities (Baldwin et al., 1999; Johnson et al., 2006). When individuals feel their partner supports their exercise by providing encouragement and engaging in conversations about their

progress, their relationship satisfaction increases despite not engaging with their partner (Novak et al., in press). Men and women who report high weekly METs, lower stress, and higher relationship satisfaction could receive social support from their partners. In contrast, participants who report high weekly METs, higher stress, and lower relationship satisfaction receive less social support from their partners.

Important to note higher women's stress was significantly associated with their own lower relationship satisfaction and their partner's lower relationship satisfaction. In contrast, higher men's stress was only associated with men's lower relationship satisfaction (research question 3). In other words, only women's stress was related to each partner's perception of the relationship. The presence of partner significance in the association between women's stress and men's relationship satisfaction could be explained by stress spillover (Story & Repetti, 2006). The results revealed that women's stress was significantly higher than men's stress overall. It is possible that men's stress was not high enough to spill over into the relationship (or men tried not to show or discuss their stress) and lead to a subsequent decline in women's relationship satisfaction, but women's stress did spill over to their partner, explaining the associated lower relationship satisfaction.

Interestingly, weekly METs did not significantly moderate the relationship between one's partner's stress and one's own relationship satisfaction (research question 4). Regarding women, this could be because their partner's stress was not associated with their relationship satisfaction. As mentioned previously, both partners could rely on exercise as an individually-focused coping mechanism rather than engaging in dyadic coping with their partner. Especially regarding external stress, which can spill over into the relationship, dyadic coping is directly related to improving relationship satisfaction (Randall & Bodenmann, 2017), which could explain the lack

of moderation for weekly METs on men's relationship satisfaction despite its association with women's stress. Likewise, weekly METs perhaps were not high enough for either partner to see a significant effect. This fits with previous findings that higher-intensity exercise releases significant stress-fighting neurotransmitters and improves brain functioning (Firth et al., 2020; Chekroud et al., 2018; Smith & Merwin, 2021), which sets the stage for better relationship functioning (Johnson et al., 2018; Yorgason et al., 2018).

Implications for Therapy

The results of the current study have important implications for couple therapy. Of note, the significance of weekly METs in the relationship between stress and relationship satisfaction further highlights the importance of assessing for exercise for couples in therapy (Novak & Ellis, 2021). Assessing each partner's exercise levels could reveal helpful information about their health habits and methods of utilizing exercise as a coping mechanism. Thus, for couples who are relationally distressed, exercise could potentially contribute to a lack of connection and decreased satisfaction for partners. This interpretation is important when considering the prevalence of exercise prescription for stress management and mental health treatment (Gaudlitz et al., 2014; Merom et al., 2008; Stubbs et al., 2017). Therapists should be diligent in providing psychoeducation on the benefit of exercise on individual well-being while assessing the potential impact of increased physical activity on the couple dyad.

Ultimately, these results highlight the importance of dyadic rather than individual coping techniques when addressing the association between stress and relationships (Bodenamnn 2005, 2009; Randall & Bodenmann, 2017). Although weekly METs moderate the relationship between stress and relationship satisfaction on an individual level, exercise did not appear to be the most effective stress coping in the couple context. It could be beneficial for therapists to integrate

assessments and interventions that focus on dyadic-focused coping skills and techniques. Considering the evidence for the benefits of partnered exercise on couple outcomes (Lyons et al., 2015; Wilson & Novak, 2021; Yorgason et al., 2018), suggesting partnered exercise rather than individual exercise for stress coping could be more effective for couples in therapy. Further, established dyadic coping mechanisms such as emotional support, effective communication, and problem-solving (Randall & Bodenmann, 2017) could be practiced in conjunction with exercise to promote stress management for both the individual and the couple. This necessitates validation in future research.

Limitations and Directions for Future Research

There were several limitations to the present study. Although the participants' race within the sample was representative of the larger population, all participants were gathered from one rural geographical area in Alabama. The sample also excluded same-sex partners, which prevents generalizability to same-sex couples in therapy. Regarding the measures used in the study, an updated exercise variable could be used to portray more accurate energy expenditure. The MET calculation used in this study was adapted to fit the questions asked in the pre-therapy survey completed by clients. This measure could be improved with a proper MET questionnaire (Ainsworth et al., 2011) or other energy expenditure surveys such as the Perceived Exertion Scale (Borg, 1982). Researchers could also use actigraphy data rather than self-report measures for more accurate energy expenditure data. As mentioned previously, the PSS-10 measures general stress levels rather than assessing for the specific origin of the stressor. Identifying and measuring specific stress domains such as external (stress from finances, workplace, social interactions) and internal (ineffective arguing, lack of support, differences in relational goals) could provide more clarity for future researchers.

The methodology of the present study also presents some limitations. This study focused on the couple's pre-therapy rather than including data throughout therapy. It is unclear whether couples that exercise in conjunction with therapy could have produced different results. Results from data at intake are limited in generalizability to couples actively in therapy. Similarly, variance in the type of exercise (aerobic vs. anaerobic) could produce different results. Future research could prescribe a specific exercise routine to reduce confounding variables and increase standardization, which would be helpful for therapist intervention. Partnered exercise could also be explored in addition to individual exercise to account for previous research on leisure activities and health support.

Conclusion

To further explore the interaction between biological, psychological, and social functioning in couple therapy, the present thesis focused on the relationship between stress and relationship satisfaction with exercise as a moderator. While this study's results confirmed a significant moderating effect of exercise on stress and relationship satisfaction on an individual level, the effect was not present between partners as predicted. These results emphasize the importance of detailed psychoeducation, assessment, and intervention involving exercise on the therapist's part. Intense exercise may not be an effective treatment for stress depending on the couple’s level of support or ability to connect and engage with each other. Conversely, intense exercise could be very effective for couples who report low stress, support each other’s individual activities, or use exercise as a form of dyadic coping for internal and external stressors.

Ultimately the nuance within the results has important implications for therapists and future research. Based on the present study, future research can add to the literature by including

more specific measures for stress and exercise, looking at changes in outcomes throughout treatment, and standardizing exercise regimens. Further understanding the biopsychosocial influences for couples in therapy will aid MFTs in utilizing a holistic perspective of health and well-being and lead to more informed assessment and interventions that help clients achieve their goals.

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Table 1

Demographic information for all couples (N = 188)

	Women %	Men %
Age (in years)		
18 - 25	33	25.6
26 - 32	30	32
33 - 39	15.5	20.2
40 - 46	13.4	10.1
47 - 53	4.2	6.8
54 - 60	1.5	2.6
61 +	2	2
Race		
Asian American/Pacific Islander	1.1	1.1
African/Black	13.8	14.9
Hispanic	0.5	1.1
Caucasian	77.7	75.5
Other	1.1	1.6
Missing	3.2	3.2
Education		
Junior High School or less	0	1.1
High school or GED	28.2	31.9
Vocational or Technical School	4.3	6.4
Associate's degree	10.1	11.7
Bachelor's degree	34.6	31.4
Graduate or professional degree	22.3	17.6
Missing	0.5	0

	Both (Couple Variable)
Income	**%**
Under $20,000	23.4
$20K-$39,999	20.8
$40K-$59,999	16.5
$60K-$79,999	11.2
$80K-$99,999	9.6
$100K+	12.8
Missing	5.3
Relationship Length	**%**
24 months and under	32
25-48 months	21.4
49-60 months	5.8
61-84 months	14.2
85-108 months	7.2
109+ months	16.4

Note: [a]Relationship Length calculated in months. [b]Education (1 = Junior High School or less, 2 = GED/High School, 3 = Vocational/Technical School, 4 = Associate Degree/2 years, 5 = Bachelor Degree, 6 = Graduate/Professional Degree). [c]Income (1 = Under $5,500, 2 = $5,501 to $11,999, 3 = $12,000 to $15,999, 4 = $16,000 to $19,999, 5 = $20,000 to $24,999, 6 = $25,000 to $29,999, 7 = $30,000 to $34,999, 8 = $35,000 to $39,999, 9 = $40,000 to $49,999, 10 = $50,000 to $59,999, 11 = $60,000 to $69,999, 12 = $70,000 to $79,999, 13 = $80,000 to $89,000, 14 = $90,000 to $99,999, 15 = $100,000 or more). [d]Race (1 =white 0 = not white).

Table 2
Paired Sample T-Test of Main Variables

	Descriptive Statistics			**Paired Samples T-Test Differences**				
Variable	**Mean**	**SD**	**SD Error**	**Mean Diff.**	**SD Error Diff.**	**t**	**df**	**Sig. (2-tailed)**
Men PSS	19.154	6.917	0.505	-2.830	0.623	-4.544	187	<0.001
Women PSS	21.984	6.641	0.484					
Men CSI	47.122	18.004	1.313	2.995	1.100	2.724	187	0.007
Women CSI	44.128	18.869	1.376					
Men METs	71.803	118.468	8.880	10.573	10.718	0.986	177	0.325
Women METs	61.230	107.400	8.050					
Men GAD	8.856	5.968	0.436	-2.572	0.594	-4.328	186	<0.001
Women GAD	11.428	6.141	0.449					
Men MDI	17.166	11.366	0.831	-3.070	1.142	-2.688	186	0.008
Women MDI	20.235	12.468	0.912					

Table 3

Bivariate Correlation Matrix of Main Variables

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	Men PSS	-																	
2.	Women PSS	.21**	-																
3.	Men CSI	-.23**	-.27**	-															
4.	Women CSI	-.06	-.35**	.67**	-														
5.	Men METs	-.13	.01	.05	.12	-													
6.	Women METs	-.07	-.07	.05	.11	.20**	-												
7.	Men GAD	.70**	.10	-.21**	-.07	-.16*	-.03	-											
8.	Women GAD	.26**	.67**	-.19**	-.24**	-.08	-.06	.10	-										
9.	Men MDI	.64**	.08	-.25**	-.14	-.20**	.01	.72**	.12	-									
10.	Women MDI	.20**	.59**	-.23**	-.29**	-.03	-.08	.10	.78**	.14*	-								
11.	Men Age	-.09	-.05	-.23**	-.37	-.11	.02	-.07	-.04	-.06	-.03	-							
12.	Women Age	-.06	-.02	-.27**	-.39**	-.06	-.11	-.03	-.03	-.03	.03	.90**	-						
13.	Men Education	-.08	-.15*	-.02	.08	.10	.15*	-.04	-.16*	-.05	-.16*	.10	.07	-					
14.	Women Education	-.18*	-.18*	.06	.14	.11	.15*	-.21**	-.25**	-.16	-.24**	.13	.08	.38**	-				
15.	Men Race	-.02	-.06	.07	.10	.14	.12	.01	-.10	.09	-.06	-.04	-.03	.13	.24**	-			
16.	Women Race	.05	.03	.14	.15*	.14	.14	.04	-.01	.12	.01	-.13	-.14	.11	.20**	.70**	-		
17.	Relationship Length	.02	.04	-.23**	-.29**	.02	-.09	.08	-.03	.10	.05	.40**	.48**	-.01	.03	.07	.03	-	
18.	Income	-.08	-.09	-.14	-.24**	-.03	-.01	-.03	.18*	-.02	-.13	.58**	.50**	.14	.33**	.21**	.12	.33**	-
Mean		19.15	21.98	47.12	44.13	71.26	63.11	8.86	11.39	17.17	20.17	32.99	31.55	3.93	4.19	.78	.80	64.73	8.4
SD		6.92	6.64	18.00	18.87	117.68	110.0	5.97	6.14	11.37	12.47	10.19	9.73	1.57	1.55	.42	.39	69.85	4.7
Range		4 – 37	4 – 40	3 – 81	1 – 80	0 – 539	0 – 637	0 – 21	0 – 21	0 – 50	0 – 50	19 – 69	18 – 66	1 – 6	2 – 6	0 – 1	0 – 1	1 – 492	1 – 20

* p < .05 **p < .01

Table 4

Conditional Effect of Men's Stress on Men's Relationship Satisfaction at Values of Men's METs (N = 168)

Men METs	Effect	se	t	p	LLCI	ULCI
0.000	-0.499	0.233	-2.139	0.034	-0.959	-0.038
25.667	-0.600	0.207	-2.896	0.004	-1.009	-0.191
51.333	-0.701	0.195	-3.603	0.000	-1.085	-0.317
77.000	-0.802	0.198	-4.049	0.000	-1.194	-0.411
102.667	-0.904	0.217	-4.163	0.000	-1.332	-0.475
128.333	-1.005	0.248	-4.055	0.000	-1.494	-0.516
154.000	-1.106	0.287	-3.860	0.000	-1.672	-0.540
179.667	-1.207	0.331	-3.652	0.000	-1.860	-0.554
205.333	-1.308	0.378	-3.462	0.001	-2.055	-0.562
231.000	-1.410	0.428	-3.296	0.001	-2.254	-0.565
256.667	-1.511	0.479	-3.155	0.002	-2.456	-0.565
282.333	-1.612	0.531	-3.034	0.003	-2.661	-0.563
308.000	-1.713	0.585	-2.931	0.004	-2.867	-0.559
333.667	-1.814	0.638	-2.843	0.005	-3.075	-0.554
359.333	-1.916	0.693	-2.766	0.006	-3.283	-0.548
385.000	-2.017	0.747	-2.699	0.008	-3.492	-0.541
410.667	-2.118	0.802	-2.641	0.009	-3.702	-0.534
436.333	-2.219	0.857	-2.589	0.011	-3.912	-0.526
462.000	-2.320	0.913	-2.543	0.012	-4.123	-0.518
487.667	-2.422	0.968	-2.501	0.013	-4.333	-0.510
513.333	-2.523	1.024	-2.464	0.015	-4.544	-0.501
539.000	-2.624	1.080	-2.431	0.016	-4.756	-0.492

Note. CILL = 95% confidence interval lower limit; CIUL = 95% confidence interval upper limit.

Table 5

Conditional Effect of Women's Stress on Women's Relationship Satisfaction at Values of Women's METs (N = 168)

Women METs	Effect	se	t	p	LLCI	ULCI
0.000	-0.807	0.219	-3.683	0.000	-1.240	-0.375
30.333	-0.889	0.197	-4.522	0.000	-1.278	-0.501
60.667	-0.971	0.192	-5.049	0.000	-1.351	-0.591
91.000	-1.053	0.207	-5.077	0.000	-1.463	-0.644
121.333	-1.135	0.238	-4.765	0.000	-1.605	-0.665
151.667	-1.217	0.280	-4.353	0.000	-1.769	-0.665
182.000	-1.299	0.328	-3.966	0.000	-1.946	-0.652
212.333	-1.381	0.380	-3.638	0.000	-2.130	-0.631
242.667	-1.463	0.434	-3.368	0.001	-2.320	-0.605
273.000	-1.545	0.491	-3.148	0.002	-2.514	-0.576
303.333	-1.627	0.548	-2.966	0.004	-2.709	-0.544
333.667	-1.708	0.607	-2.815	0.006	-2.907	-0.510
364.000	-1.790	0.666	-2.688	0.008	-3.105	-0.475
394.333	-1.872	0.726	-2.580	0.011	-3.305	-0.440
424.667	-1.954	0.786	-2.487	0.014	-3.505	-0.403
455.000	-2.036	0.846	-2.407	0.017	-3.706	-0.366
485.333	-2.118	0.907	-2.336	0.021	-3.908	-0.328
515.667	-2.200	0.967	-2.274	0.024	-4.110	-0.290
546.000	-2.282	1.028	-2.219	0.028	-4.312	-0.252
576.333	-2.364	1.089	-2.170	0.031	-4.514	-0.213
606.667	-2.446	1.150	-2.126	0.035	-4.717	-0.175
637.000	-2.528	1.212	-2.086	0.039	-4.920	-0.136

Note. CILL = 95% confidence interval lower limit; CIUL = 95% confidence interval upper limit.

Figure 1.

Conceptual Actor-Partner Interdependence Moderation Model

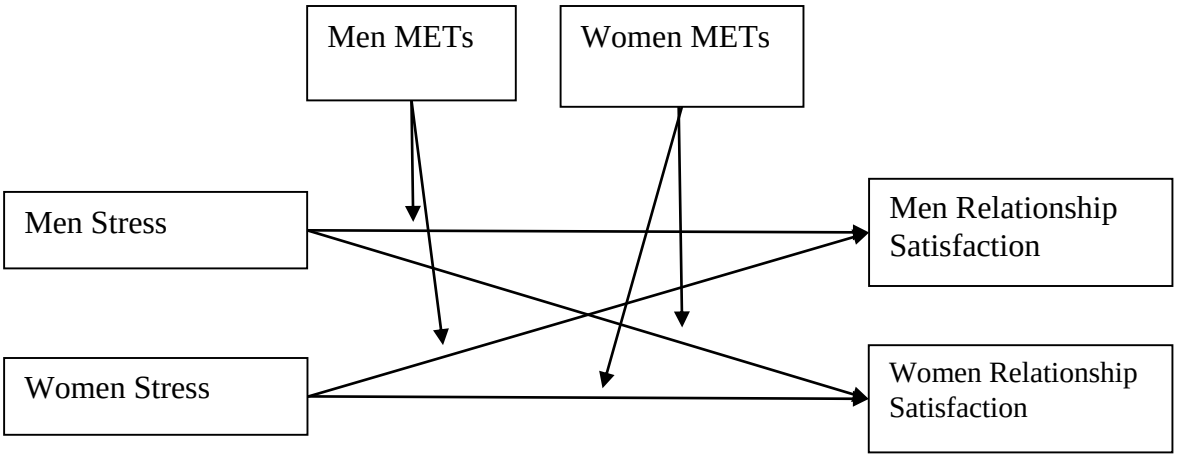
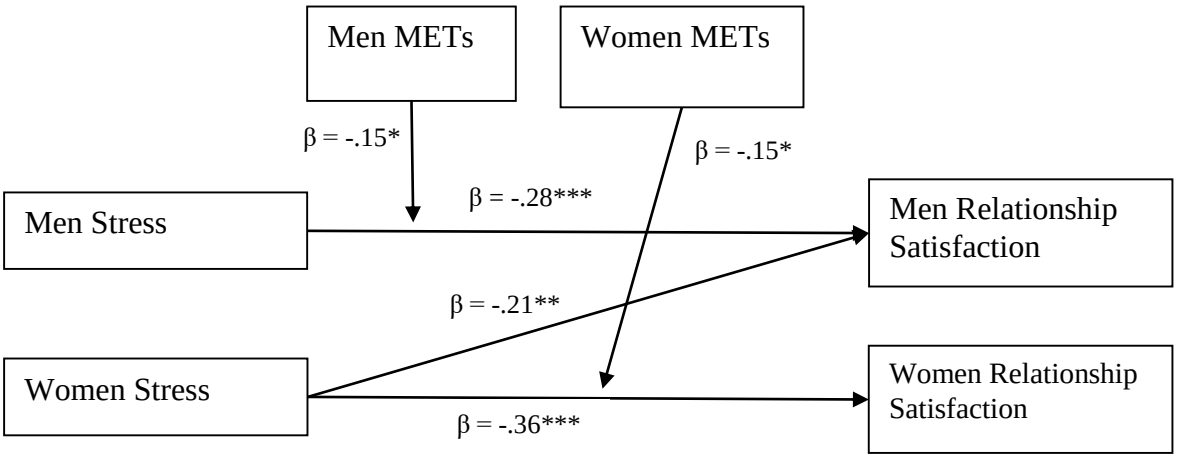


Figure 2.

Significant Pathways of Actor-Partner Interdependence Moderation Model



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

Figure 3.

The Effect of Men's Perceived Stress on Men's Relationship Satisfaction at Low, Moderate, and High Levels of Men's METs

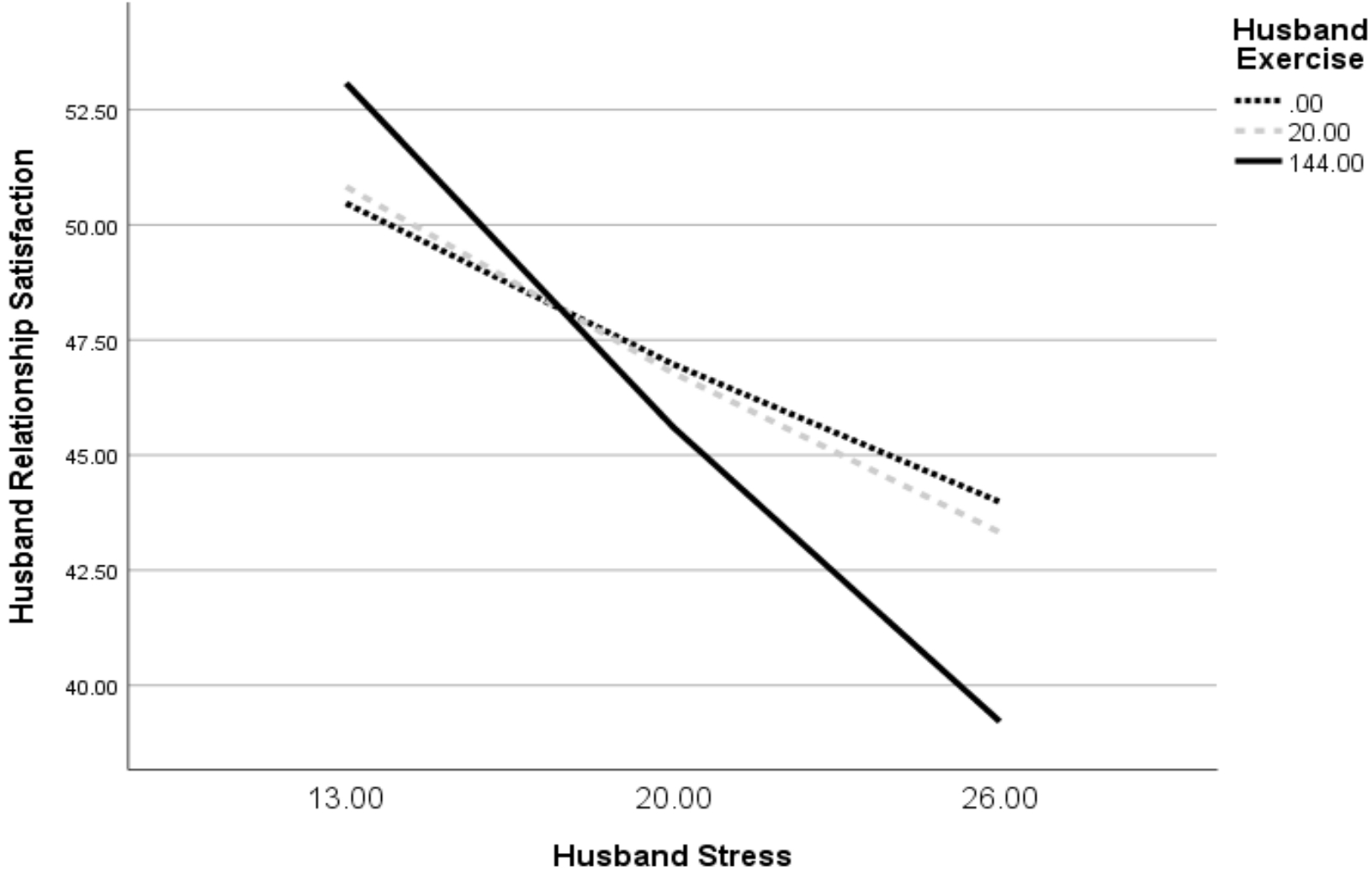


Figure 4.

The Effect of Women's Perceived Stress on Women's Relationship Satisfaction at Low, Moderate, and High Levels of Women's METs