EXAMINING THE EFFECTS OF FAMILY AND PARTNER RELATIONSHIPS ON CHRONIC PAIN EXPERIENCES IN ADULTHOOD

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ABSTRACT

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The present study is a test of the Biobehavioral Family Model (BBFM) with a national, representative sample of adults with chronic pain in order to enhance our understanding of the effects of relational functioning and mental health on health outcomes. Chronic pain patients (ages 25-74) self-reported their family and intimate partner strain, anxiety, depression, and physical health (n = 1,461). Two models of the BBFM were tested using structural equation modeling. Model 1 used family strain and Model 2 used intimate partner strain (n = 1,070) as measures of family emotional climate for path analyses. Results indicate that the BBFM, using family and intimate partner strain as predictor variables, is able to explain health outcomes for adults experiencing chronic pain.

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CHAPTER I

INTRODUCTION

It is estimated that 100 million individuals suffer from chronic pain in the U.S. (American Academy of Pain Medicine [AAPM], 2011). Individuals struggling with chronic pain are challenged with financial burden (Campbell, Jordan, & Dunn, 2012), emotional distress (De Souza & Frank, 2011), and physical disabilities (West, Usher, & Foster, 2011). According to AAPM (2011), costs related to chronic pain are estimated to be between $560-$635 billion annually in the U.S. In 2006, a chronic pain survey found that 60% of participants reported experiencing pain on a daily basis, which resulted in affecting their overall quality of life and well-being (American Pain Foundation) and, more recently, the AAPM (2011) reported that Americans are affected by pain more than diabetes, heart disease, and cancer collectively. Despite the drastic increase of this illness, chronic pain is often misunderstood and remains challenging to properly treat and manage (Pergolizzi et al., 2013).

The National Institutes of Health (2014) explains "the totality of the data points to the need for an individualized, patient-centered approach based on a biopsychosocial model as opposed to the biomedical model that is more commonly employed" (p. 9), and "a more holistic approach to the management of chronic pain, inclusive of the patient's perspectives and desired outcomes, should be the goal" (2014, p. 9). Several studies have found the importance of family and romantic relationships for chronic pain health outcomes. Individuals with a chronic illness report improved health (Barr, Culatta, &

Simons, 2013), less emotional distress (Miller, Hollist, Olsen, & Law, 2013) and fewer chronic pain experiences (Reese, Somers, Keefe, Mosley-Williams, & Lumley, 2010) when healthy close relationships are involved. Although existing research has increased our understanding of the role of family and romantic relationships and mental health in chronic pain, exploring how relational quality contributes to chronic pain experiences could expand possibilities for appropriate treatment strategies for chronic pain patients. Examining a biopsychosocial understanding of how chronic pain is related to and affected by relational and mental health is critical in furthering our understanding of the etiology, maintenance, and treatment of the condition. In addition, using a biopsychosocial, systemic theoretical model to guide this research is imperative to better understand the influence of relational processes on health outcomes, such as chronic pain.

The Biobehavioral Family Model

The Biobehavioral Family Model (BBFM; Wood, 1993) is a "multilevel systemic biopsychosocial model, positing reciprocal pathways of effect " (Wood, Miller, & Lehman, 2015, p. 381) between the constructs of family emotional climate, biobehavioral reactivity, and disease activity. Influenced by general systems theory (von Bertalanffy, 1969) and Minuchin's psychosomatic family model (Minuchin, Rosman, & Baker, 1978), the BBFM explains the influences between close relationships, mental, and physical health (Wood & Miller, 2002). Specifically, this model suggests mutual influence between social, emotional, and physical processes, which may perpetuate or protect against health outcomes (Wood & Miller, 2002), such that biobehavioral reactivity (e.g., emotional dysregulation, psychophysiological experiences of distress) mediates the

relationship between family emotional climate (e.g., hostility, criticism) and disease activity (e.g., chronic illness diagnoses, global health functioning). Because of the complexity of chronic pain, understanding how emotional, social, and physical factors combine and interact to impact chronic pain experiences will give better direction for appropriate treatment of chronic pain (Gatchel et al., 2007).

Statement of the Problem

Researchers repetitively demonstrate links between quality of family and romantic relationships and physical and mental health (e.g., Barr et al., 2013; Carr & Springer, 2010; Miller et al., 2013). Studies have found that higher quality family relationships result in improved mental health (Barr et al., 2013; Miller et al., 2013; Woods, Priest, & Roush, 2014). In addition, positive family behaviors and interactions are associated with greater disease management and health outcomes (Robles, Slatcher, Trombello, & McGinn, 2014; Rosland, Heisler, & Piette, 2012). Researchers also found that marital satisfaction is associated to greater health and decreased cardiovascular reactivity during conflict (Robles et al., 2014). Although researchers have found associations between relational quality and health outcomes, current research neglects to focus on specific pathways between close relationships and health outcomes (Carr & Springer, 2010).

In addition, although the associations between close relationships and pain have been studied, little research has examined family and romantic relationships and chronic pain experiences for adults (Cano, Johansen, Leonard, & Hanawalt, 2005). Given that an approximate 76.5 million Americans age 20 years or older report chronic pain (AAPM,

2011), it is relevant to examine these relationships in adults. Only by establishing pathways of effect by which close relationships affect the mental and physical health of individuals with chronic pain will clinicians understand how best to intervene. Similar to the families and health literature more broadly (Carr & Springer, 2010), research on relationships (family and romantic) and chronic pain fails to utilize a comprehensive biopsychosocial theoretical model and rarely specifies exact mediators by which close relationships affect health. In addition, much of this research has utilized small sample sizes (Wood, Klebba, & Miller, 2000), and fails to integrate variables representative of both mental and physical health. Therefore, the goal of this study will be to explore the impact of family relationships on chronic pain experiences in adulthood.

Purpose of the Study

The purpose of the present study is to address limitations found in the literature described above and to enhance our understanding of the impact of quality of family and romantic relationships on chronic pain experiences in adulthood. Understanding these processes through a biopsychosocial lens could emphasize factors that are protective of or harmful to health outcomes and, in turn, suggest more effective interventions and treatment plans for use with this medical population. Although chronic pain and close relationships has been extensively studied, few studies have explored close relationships and chronic pain experiences in adulthood (Cano et al., 2005), while even fewer have provided a theoretical justification for their analyses.

The present study is a test of the BBFM with a national, representative sample of adults with chronic pain in order to enhance our understanding of the effects of relational

functioning and mental health on health outcomes, in order to contribute to adult health research. While the BBFM has been tested with adult populations (Woods & Denton, 2014; Woods et al., 2014), it has yet to focus on a specific adult medical population; researchers have instead focused on general samples of adults (Priest & Woods, 2015) or adults accessing primary care (Woods & Denton, 2014). The application of this model has been applied to children with asthma (Wood et al., 2008) and can highlight pathways to specific chronic conditions and appropriate treatments and interventions.

Hypotheses

The purpose of the present study is to develop and enhance our understanding of the impact of family and romantic relationships on chronic pain experiences in adulthood. Also, this study will use a biopsychosocial, systemic model, the BBFM, to guide the hypotheses and to further expand adult health research specific to the chronic pain population. As the BBFM is a mediational model, the following hypotheses are similar to previous research using the theoretical model (Woods et al., 2014) and represent a mediation relationship among the constructs of the model: family emotional climate, biobehavioral reactivity, and disease activity. Therefore, it is hypothesized that the quality of family and romantic relationships will be directly related to one's level of depression and anxiety. Also, it is hypothesized that depression and anxiety among individuals will be directly related to chronic pain experiences. Lastly, it is hypothesized that the quality of family and romantic relationships will be indirectly related to chronic pain experiences, through the mediating variable of individuals' mental health

(depression and anxiety). In sum, the following pathways, representing a mediation relationship, is hypothesized for both models:

(1) A significant, direct pathway between family emotional climate and biobehavioral reactivity;

(2) A significant, direct pathway between biobehavioral reactivity and chronic pain experiences; and

(3) A nonsignificant pathway between family emotional climate and chronic pain experiences (Figure 1).

Summary

The present study will explore the interactions between family and romantic relationship quality, mental health, and chronic pain experiences in adults. The application of the BBFM will explore the processes influencing chronic pain experiences in adults. Furthermore, understanding these influences on chronic pain experiences is fundamental for appropriate and effective interventions.

CHAPTER II

LITERATURE REVIEW

Families and Health

Close relationships play an important role in emotional and physical health (e.g., Carr & Springer, 2010; Kiecolt-Glaser & Newton, 2001). Recent research has linked close relationships to health outcomes ranging from inflammation (Kiecolt-Glaser, Gouin, & Hantsoo, 2010) to mortality (Robles et al., 2014). Because of being more emotionally involved (Weihs, Fisher, & Baird, 2002), family relationships, including romantic relationships, have shown to be one of the most influential protective or exacerbating risk factors associated with health (Barr et al., 2013; Carr & Springer, 2010; Wood & Miller, 2002). Research has found that close relationships that demonstrate support, stability, and security influence the individual's ability to regulate emotions and, in turn, protect against physical symptoms worsening or developing in chronic diseases (Barr et al., 2013; Miller et al., 2013; Woods et al., 2014). However, negative close relationships have been found to contribute to an individual's symptoms of depression or anxiety and, in turn, worsen mental and physical health outcomes (Donoho, Crimmins, & Seeman, 2013; Kiecolt-Glaser et al., 2010; Robles et al., 2014).

According to the World Health Organization (2006), health is defined as "complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 2006, p.1). Past health models highlighted biological influences, yet current research emphasizes the mutual influence of social

factors and health outcomes (Carr & Springer, 2010). Although research emphasizes the significance between close relationships and mental or physical health outcomes, past research has failed to integrate the impact of close relationships on both mental and physical health (Carr & Springer, 2010). The BBFM (Engel, 1977) is a systemic approach that integrates relationship functioning on mental and physical health.

The Biobehavioral Family Model

The BBFM is a biopsychosocial approach (Engel, 1977) to explaining health that incorporates biological, psychological, and social factors in a comprehensive systemic model to highlight connections between relationships and health outcomes (Wood, 1993). This theoretical model will be used as a framework to navigate and guide this study. The BBFM aligns with general systems theory beliefs (von Bertalanffy, 1969) and the psychosomatic family model (Minuchin et al., 1978) to describe the interaction between close relationship patterns and biobehavioral processes (e.g., depression) and their influence on health outcomes (Wood, 1993; Wood et al., 2015). The BBFM may be applied to adults or children to explore the processes affecting health outcomes within the family (Wood et al., 2000).

An abundant amount of research testing the BBFM has been largely done with children, and specifically asthmatic children. The BBFM has validated its effectiveness with pediatric asthma (Wood et al., 2007; Wood et al., 2008), and more recent, a child welfare sample (Woods & McWey, 2012). Other findings testing the BBFM suggest multiple pathways that influence asthma in children (Miller & Wood, 2003; Wood et al., 2000).

Recently, research has expanded the BBFM by testing with adult populations (Woods & Denton, 2014; Woods et al., 2014). Though this model has been tested with adults, researchers have solely focused on general samples of adults (Priest & Woods, 2015) or adults accessing primary care (Woods & Denton, 2014). The BBFM has limited research in its application with adults, and more importantly, with specific adult medical populations.

Theoretical Assumptions

Influenced by Minuchin's psychosomatic family model, the BBFM rests upon three theoretical assumptions to explain the mutual influence of close relationships and illness (Minuchin et al., 1978). First, influenced by general systems theory, the BBFM assumes the family is a system (von Bertalanffy, 1969). The second is that individual and relational processes mutually impact one another. The third assumption is that "interpersonal patterns interact with individual biobehavioral processes" and that these interactions may be health-related (Wood & Miller, 2002, p. 60). This model posits the shared influences of physical, emotional, and social factors on illness and implies that close relationships are influential to functioning and can intensify or protect health outcomes (Wood et al., 2000). In addition, this model uses psychobiologic mediators to link family emotional climate and disease activity (Miller & Wood, 2003; Wood et al., 2006; Wood et al., 2007; Wood et al., 2000).

Constructs

Originally, the BBFM attempted to explain family relational processes and their relationship with children's health outcomes with illness (Minuchin et al., 1978). Over

time, Wood (1993) expanded the model to include child biobehavioral reactivity and parent-child attachment security as either a mediating or moderating factor (Wood et al., 2000). The BBFM examines and describes the influences of family emotional climate (FEC) and biobehavioral reactivity to disease activity (Wood, 1993; Wood et al., 2000).

Family emotional climate. FEC is a construct in the BBFM to explain the intense emotional exchanges within the family that are either positive (e.g. support) or negative (e.g. hostility) (Wood et al., 2008; Wood et al., 2015). It is an important element that contributes to emotional processes among family members. The BBFM hypothesizes that negative family emotional processes creates or heightens emotion dysregulation (e.g. anxiety or depression) (Wood et al., 2015; Wood et al., 2007).

Biobehavioral reactivity. Biobehavioral reactivity, the link between family emotional processes with disease activity (Wood et al., 2015), describes the family member's response to emotional stimuli, specifically the individual's capability to regulate his or her emotions, and is often measured as anxiety or depressive symptoms (Wood et al., 2008). The BBFM describes family emotional climate (FEC) and biobehavioral reactivity as two processes that mutually influence one another and serve either as a buffer to protect or exacerbate disease activity or experiences (Wood, 1993; Wood et al., 2008). For example, a positive FEC (e.g. supportive) will influence an individual's ability to manage stress (e.g. biobehavioral reactivity), and therefore the impacts of stress on disease activity will be protected (Wood et al., 2015). This construct mediates the disease process based on one's emotional and physiological reactivity to one's emotional exchange in close relationships (Wood et al., 2015).

Disease activity. Though this theoretical framework hypothesizes that relational processes are mutually impacted by a family member's health, the BBFM predicts health outcomes as an internal process (Wood, 1993). Previous research has focused extensively on the application of the BBFM with asthmatic children and adolescents (e.g., Wood et al., 2000; Woods & McWey, 2012). Though researchers have emphasized the equal influence of families on mental and physical health (Campbell et al., 2012), research on families and health outcomes for adult patients has received less attention (Wood et al., 2000).

In sum, this model demonstrates the reciprocal interactions of close relationships, emotional processes, and physiological changes, while also incorporating the influences of family emotional climate (FEC) and biobehavioral reactivity to illness (Wood, 1993; Wood & Miller, 2002). In this theoretical model, chronic pain is best understood as a experience that is shaped mutually by biological, social, and physical interactions (Engel, 1977; Gatchel et al., 2007). Specifically, examining the quality of adult family relationships and emotional reactivity among chronic pain individuals will allow clinicians to explore and understand stressors contributing to pain severity and outcomes.

Chronic Pain

Chronic pain is often defined as persistent or recurrent pain lasting more than three months and can affect various parts of the body (King et al., 2011). According to the American Chronic Pain Association [ACPA] (2015), chronic pain affects approximately 20% to 40% of children and adolescents and 26% of adults in the U.S. In spite of this profound number, chronic pain continues to be difficult to properly treat and

understand (Pergolizzi et al., 2013). Though treatment for chronic pain may relieve symptoms, chronic pain frequently remains uncured (West, Buettner, Stewart, Foster, & Usher, 2012). Because of the demand of this illness, chronic pain affects the physical, psychological, social, emotional, and financial areas of individuals and their families (De Souza & Frank, 2011; West, Usher, & Foster, 2011). Recent research indicates that chronic pain can develop as a result of tissue damage and inflammation triggered by an injury, trauma, cancer (Mantyh, 2006), or infection (Turk, Wilson, & Cahana, 2011) and can significantly affect quality of life (Sarzi-Puttini et al., 2012).

Because of its stressful and complex symptoms, the presence of chronic pain can significantly impact the larger society as well as the individual and their close relationships. Individuals with chronic pain are challenged every day with their daily routines (West et al., 2012). The results of chronic pain leads to psychosocial (e.g., depression, anxiety), medical (e.g., misuse of pain pills, treatment), and physical (e.g., inability to work earnings, disability) difficulties (Campbell et al., 2012; Dunn et al., 2010). Due to the difficulty to treat and manage (e.g., Campbell et al., 2012), chronic pain patients demonstrate a higher risk of addiction to pain pills (e.g. opioid abuse) (Banta-Green, Merrill, Doyle, Boudreau, & Calsyn, 2009; Jamison et al., 2010) and accidental overdoses (Dunn et al., 2010).

Close Relationships and Pain Experiences

The severity of chronic pain has been closely linked to experiences of family and couple relationships. Research findings have suggested that the quality of close

relationships may contribute to patients' pain outcomes (Campbell et al., 2012; Kiecolt-Glaser et al., 2010).

Several studies, mostly on chronic pain samples, have found the impact of negative relational processes on chronic pain severity and activity (Burns et al., 2013; Campbell et al., 2012). For example, the association between marital conflict and increase in pain experiences was found among female chronic back pain patients and their spouses (Grant, Long, & Willms, 2002). Negative marital interactions (e.g., criticism, hostility) were found to increase pain intensity in chronic back pain patients (Burns et al., 2013). Similarly, researchers found the significance between spouses' negative responses to pain and the severity of pain experienced with chronic pain couples (Cano, Weisberg, & Gallagher, 2000). Guite, McCue, Sherker, Sherry, & Rose (2011) discussed the relationship between parents' negative responses to pain and increased pain intensity among adolescents with chronic musculoskeletal pain. Others have also found that negative and critical responses from spouses predicted more future pain experienced by partners with rheumatoid arthritis (Waltz, Kriegel, & Bosch, 1998). These findings are concurrent with recent research that found a significant relationship between conflicted relationships, depression, and greater levels of pain for chronic pain patients (Vivekanantham, Campbell, Mallen, & Dunn, 2014).

Research has also shown the influence of positive relationships with levels of pain experienced. Reese et al. (2010) studied marital adjustment and pain intensity among rheumatoid arthritis patients and discovered that healthier marital adjustment was correlated with less pain. Palermo, Putnam, Armstrong, & Daily's (2007) study of

adolescents with chronic headaches discovered that participants with healthy family functioning exhibited lower occurrences of pain. Researchers found in several studies the importance of family processes and the impact they have on physical health outcomes (Carr & Springer, 2010).

Multiple studies have found partner reactions about pain behavior as predictors of levels of pain among premenopausal women with vulvovaginal pain (Rosen, Bergeron, Leclerc, Lambert, & Steben, 2010), chronic pain patients (Forsythe, Romano, Jensen, & Thorn, 2012), and entry dyspareunia in women (Lemieux, Bergeron, Steben, & Lambert, 2013). These findings are consistent with past research conducted on partners' responses and pain experiences with chronic pain patients (Cano et al., 2000; Waltz et al., 1998).

Emotional Distress and Pain Experiences

Emotional distress (e.g., depression, anxiety) has also been found to intensify health outcomes (Kiecolt-Glaser et al., 2010; Gatchel et al., 2007). Several studies repeatedly demonstrate links between depression and anxiety and higher risks of heart disease (Frasure-Smith & Lesperance, 2008), respiratory difficulties, and other chronic illnesses (Eisner et al., 2010; Roy-Byrne et al., 2008). Previous research has explored the roles of depression and anxiety and the potential influences it may have on an individual to experience pain or as moderating factors exacerbating or deterring pain severity (Gatchel et al., 2007; Wiech & Tracey, 2009).

Multiples studies have explored depression and anxiety as potential risk factors for pain outcomes (Dersch, Polatin, & Gatchel, 2002; Roy-Byrne et al., 2008). Depressed individuals were found to be at higher risk for developing intense and/or disabling neck

and low back pain (Carroll, Cassidy, & Cote, 2004), while longitudinal evidence concludes the development of back pain as an effect of depression (Larson, Clark, & Eaton, 2004). Tavoli and colleagues (2008) investigated pain in cancer patients and found an association between higher levels of pain consistency and permanence with higher levels of depression. Similarly, evidence has suggested that anxiety disorders lead pain onset (Roy-Byrne et al., 2008). Specifically, a sample that experienced chronic musculoskeletal pain reported preexistent anxiety prior to pain experiences (Asmundson, Jacobson, Allerdings, & Norton, 1996). Consistent with this finding, researchers found chronic mild stress worsens and intensifies painful experiences in animals exposed to chronic constriction injury (Bravo, Torres-Sanchez, Alba-Delgado, Mico, & Berrocoso, 2014).

Based on past and current research findings cited above, family and partner relationships are significant to pain outcomes. Researchers have found a link between family and partner relationships to buffer (Reese et al., 2010) or worsen (Burns et al., 2013) pain experiences. Because family and partner relationships appear to be significant contributors to pain experiences, it is imperative to test the BBFM with a chronic pain sample of adults to explore specific processes between close relationships and mental and physical health.

Chronic Pain and the BBFM

Because current research considers mutual influences of physical, emotional, and social factors on chronic pain (Vetter, McGwin Jr., Bridgewater, Madan-Swain, & Ascherman, 2013), utilizing the BBFM approach may be beneficial to examine the

connections between family and partner relationships, and physical health. In addition, due to the complexity and difficulty to treat and manage chronic pain, the BBFM will be especially helpful in identifying specific pathways influencing chronic pain experiences.

Although research on close relationships and pain has been extensively studied, few studies have studied chronic pain experiences and family relationships in adulthood (Cano et al., 2005). Existing research on chronic pain and close relationships has been mostly studied with children or adolescents and families and romantic relationships. Previous researchers have identified the need for research in adult health and family relationships more broadly (Cano et al., 2005; Woods & Denton, 2014). Using the BBFM as a guiding theoretical model will allow family researchers to examine specific mediators influencing health outcomes. This application meets the needs in relational research on families and health. Therefore, the goal of this study will be to explore the impact of family and romantic relationships and mental health on chronic pain experiences in adulthood.

CHAPTER III

METHODOLOGY

Sample

The data for this proposed study are from the National Survey of Midlife Development in the United States (MIDUS II; Ryff et al., 2012). This study is a follow-up of the original MIDUS study, conducted in 1995-1996 (Brim et al., 2011). The goal of the MIDUS studies were to, "delineate the biopsychosocial pathways through which converging processes contribute to diverse health outcomes" (Singer & Ryff, 2001, p. 18.). The present dataset, also known as Project 1, focuses primarily on participants in the MIDUS II sample that provided follow-up data for the psychosocial, sociodemographic, and health variables that were originally assessed in MIDUS I (Ryff et al., 2012). Participants were asked to complete two questionnaires and a phone interview for data collection purposes, as part of MIDUS II Project 1.

MIDUS II included a total of 4,963 English-speaking, U.S. residents aged 25 to 74 years. Of this sample, a subsample of respondents who reported "yes" to experiencing persistent chronic pain was included in this study (n = 1,461; Model 1). Of this full chronic pain sample, many identified as currently partnered, and responded to the Partner Relationship Quality measures, described below (n = 1,070; Model 2). Within this partnered subsample, 991 respondents reported being currently married. The MIDUS II sample demographics included the following 53% female, aged 25 to 74 years, and 67% reported having more than a high school education (Ryff et al., 2012).

Procedure

Measures

Negative family emotional climate. Two separate measures were used to assess family emotional climate, specifically, negative family emotional climate, as is regularly the focus in the BBFM literature (e.g., Priest & Woods, 2015; Woods & Denton, 2014). These included one self-report measure of family strain and one self-report measure of intimate partner strain.

Family strain. Family relationship quality was measured using a family strain subscale (Schuster, Kessler, & Aseltine, 1990; Ryff et al., 2012). The subscale used four items to assess for family strain. These questions asked: "Not including your spouse or partner, how often do members of your family make too many demands on you?" "How often do they criticize you?" "How often do they let you down when you are counting on them?" and, "How often do they get on your nerves?" All items for family strain are coded using a 4-point Likert scale ranging from "often" to "never". All responses were reverse coded and items were averaged to create a scale score (Ryff et al., 2012). Overall, the family strain subscale included in the MIDUS II dataset had good psychometrics (e.g., Cronbach's $\alpha = 0.78–0.80$) (Schuster et al., 1990; Walen & Lachman, 2000). This measure has been used successfully in similar research using MIDUS II data (e.g., Priest et al., 2015; Schuster et al., 1990; Walen & Lachman, 2000).

Intimate partner strain. Intimate partner relationship quality was measured using an intimate partner strain subscale included in the MIDUS II (Schuster et al., 1990; Ryff et al., 2012). The subscale used six items to assess for intimate partner strain. These items

were completed by participants who identified as currently engaged in an intimate relationship (married or partnered but not married, n = 1,070). The subscale questions asked: “How often does your spouse or partner make too many demands on you?” “How often does he or she argue with you?” “How often does he or she make you feel tense?” “How often does he or she criticize you?” “How often does he or she let you down when you are counting on him or her?” and, “How often does he or she get on your nerves?” All items for partner strain were coded using a 4-point Likert scale ranging from “often” to “never”. All responses for intimate partner strain were reverse-coded and items were averaged to create a scale score (Ryff et al., 2012). Specific to the MIDUS II data, the subscale for intimate partner strain had strong psychometrics (e.g., Cronbach’s $\alpha = 0.86–0.88$) (Schuster et al., 1990; Walen & Lachman, 2000). This measure has also been used successfully in similar research using MIDUS II data (e.g., Priest et al., 2015; Schuster et al., 1990; Walen & Lachman, 2000).

Biobehavioral reactivity. Similar to previous research investigating the BBFM (e.g., Woods et al., 2014), biobehavioral reactivity was defined as including depression and anxiety. Depression and anxiety were measured by participants’ responses in the telephone interview within the Composite International Diagnostic Interview-Short Form (CIDI-SF) (Kessler et al., 1998). Depression was assessed using 7 items, including questions “During two weeks in past 12 months, when you felt sad, blue, or depressed, did you lose interest in most things?” or “feel down on yourself, no good, or worthless?” Participants’ responses self-reported either yes (1) or no (2). All responses that included “yes” were added to create a depressed affect scale score (Ryff et al., 2012). Anxiety was

assessed using 10 items that included questions “How often-over the past 12 months, were you restless because of your worry?” or “…had trouble staying asleep because of your worry?” These items were coded using a 4-point Likert scale ranging from “most days” to “never”. Anxiety items that included “most days” were added to create an anxiety scale score. Reliabilities for both CIDI-SF depressed affect and anxiety subscales are satisfactory for the MIDUS II sample (Ryff et al., 2012).

Chronic pain disease activity. Chronic pain was measured using two sets of questions included in the MIDUS II Project 1 dataset. The first set of questions assessed pain interference through participants’ responses to 5 items within the Brief Pain Inventory Short Form (BPI) (Cleeland & Ryan, 1991). These 5 questions asked: “How much, during the past week, your pain interfered with your general activity” “How much, during the past week, your pain interfered with your mood?” “How much, during the past week, your pain interfered with your relations with other people?” “How much, during the past week, your pain interfered with your sleep?” and, “How much, during the past week, your pain interfered with your enjoyment of life?” All responses were coded using a 10-point Likert scale ranging from “did not interfere” to “completely” and scores were averaged to create a pain interference subscale score (Ryff et al., 2012). Reliabilities for the BPI range from 0.77 to 0.91 (Cleeland & Ryan, 1991).

The second area of disease activity assessed was global health. One question asked about overall self-rated health status: “In general, would you say your physical health is excellent, very good, good, fair, or poor?” Responses were coded using a 5-point Likert scale ranging from “excellent” (5) to “poor” (1). Responses were coded using a 5-

point Likert scale ranging from 1 (much worse) to 5 (much better). Using a single item to assess physical health is recommended for large data collection and analysis approaches (e.g., DeSalvo, Bloser, Reynolds, He, & Muntner, 2006).

Analyses

Structural equation modeling was conducted to test the hypothesized relationships between family strain and intimate partner strain, biobehavioral reactivity, and chronic pain outcomes. Biobehavioral reactivity and disease activity were both included in the models as latent constructs. Specifically, biobehavioral reactivity was estimated using the observed variables of the CIDI-SF depression and anxiety subscales, and disease activity was estimated using the observed variables of the pain interference subscale score of the BPI and the singular self-rated health item.

Two models were tested, reflecting the hypotheses and unique measures of family emotional climate. The first model tested included (1) a direct pathway between family emotional climate and biobehavioral reactivity, (2) a direct pathway between biobehavioral reactivity and disease activity, and (3) an indirect relationship between family emotional climate and disease activity, mediated by biobehavioral reactivity. The second model tested included (1) a direct pathway between family emotional climate and biobehavioral reactivity, (2) a direct pathway between biobehavioral reactivity and disease activity, and (3) an indirect relationship between family emotional climate and disease activity, mediated by biobehavioral reactivity.

Mplus was used to conduct analyses using TYPE = MISSING (Muthén & Muthén, 2012). In order to account for missing data, maximum likelihood with robust

standard errors (MLR) was used as the estimator to account for missing data, and because MLR is robust to non-normality and non-independence of data (Muthén & Muthén, 2012). In addition to testing the hypothesized pathways, Mplus was used to test the overall mediation (indirect) effects in both models.

Structural equation modeling used to calculate standard errors and χ^2 tests of model fit. The χ^2 test, the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the root mean square error approximation (RMSEA) were used to assess model fit. Because of the large sample size and the sensitivity of the χ^2 statistic to sample size (Kline, 2011), the researcher examined multiple fit statistics. Good model fit was determined if the SRMR and RMSEA were less than .05, and the CFI value was greater than .95 (neared 1.00; Kline, 2011). Similar to the CFI value, the χ^2 statistic should be near 1.00 and nonsignificant ($p > .05$).

CHAPTER IV

RESULTS

Structural equation modeling was used to test two models, utilizing two unique measures of family emotional climate (see Figures 4 & 5). Standardized path coefficients, standard errors, and mediation effects were estimated in Mplus using maximum likelihood with robust standard errors. The χ^2 test, the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the root mean square error approximation (RMSEA) were used to assess model fit. Because of the large sample size and the sensitivity of the χ^2 statistic to sample size (Kline, 2011), the researcher examined multiple fit statistics. Good model fit was determined if the SRMR and RMSEA were less than .05, and the CFI value was greater than .95 (neared 1.00; Kline, 2011). Similar to the CFI value, the χ^2 statistic should be near 1.00 and nonsignificant ($p > .05$). MPlus was additionally used to test mediation effects reflective of the Biobehavioral Family Model.

Model One: Family Strain

The first model used the entire MIDUS II Project 1 chronic pain subsample (n =1,461) and tested pathways between family emotional climate (family strain), biobehavioral activity, and disease activity (Figure 4). Biobehavioral reactivity and disease activity were both included in the model as latent constructs. Specifically, biobehavioral reactivity was estimated using the observed variables of the CIDI-SF depression and anxiety subscales, and disease activity was estimated using the observed

variables of the pain interference subscale score of the BPI and the singular self-rated health item. This model demonstrated good fit (χ^2 = 9.51, p = .02, RMSEA = .04, CFI = .99, SRMR = .02). Path coefficients for this model are reported in Figure 4. Indirect effects of the model (Figure 4) demonstrated mixed results. Contrary to hypotheses, the direct effect of family strain on disease activity remained significant. The indirect effect of family strain on chronic pain, through the mediating variable of biobehavioral reactivity, was also significant (Table 2). These results demonstrate a partial mediation relationship (Frazier, Tix, & Barron, 2004).

Model Two: Intimate Partner Strain

The second model used the portion of the MIDUS II Project 1 chronic pain subsample that self-reported being in a romantic relationship (n = 1,070). The second model tested relationships between FEC (partner strain), depression/anxiety, and health. Model-fit statistics demonstrated good fit (χ^2 = 4.80, p = .19, RMSEA = .02, CFI = 1.00, SRMR = .01). While the χ^2 statistic remains significant for the second model, this measure of model fit is sensitive to sample size (Kline, 2011), and its significance for this model likely reflects the large sample size of the present sample. The second model (Figure 5) demonstrated the mediation relationship as hypothesized. The direct effect of partner strain on chronic pain was nonsignificant, while the indirect effect of partner strain on disease activity, through the mediating variable of biobehavioral reactivity, was significant (Table 3). Specifically, as partner strain increases, depression and anxiety increases and as depression and anxiety increases, chronic pain experiences increase.

Summary

Family emotional climate, tested separately in two models using family strain and intimate partner strain, is significantly related to biobehavioral reactivity (depression and anxiety), and, indirectly, disease activity as measured by chronic pain interference and self-reported overall health. Contrary to hypotheses predicting a full mediation relationship, whereby the effects of family strain on disease activity are entirely through biobehavioral reactivity, Model 1 demonstrated partial mediation. However, model testing demonstrated that Model 1's estimated pathways demonstrate a good fit to the data. As hypothesized in Model 2, the effects of partner strain on disease activity was fully mediated through biobehavioral reactivity. In addition, model-testing demonstrated the hypothesized model provided a good fit to the data.

CHAPTER V

DISCUSSION

This study tested two models of the biobehavioral family model (BBFM) with adults who experience chronic pain. In Model 1, family emotional climate was measured by family strain, while Model 2 included intimate partner strain. Hypotheses for both models, reflective of the BBFM (Wood, 1993), included: (1) a significant, direct pathway between family emotional climate (FEC) (measured as both family strain and intimate partner strain) and biobehavioral reactivity (measured as both depression and anxiety); (2) a significant, direct pathway between biobehavioral reactivity and chronic pain experiences (measured using the Pain Interference subscale of the Brief Pain Inventory (Cleeland & Ryan, 1991); and (3) a nonsignificant pathway between family emotional climate and chronic pain experiences, such that the effects of family emotional climate on chronic pain experiences are indirect (see Figures 4 & 5). In other words, these pathways demonstrate a mediation relationship of family relationship quality on chronic pain through emotional processes (e.g., depression, anxiety).

Model One: Family Strain

All three hypotheses were supported for Model 1, and a partial mediation relationship was demonstrated. Specifically, model 1 (Figure 4) demonstrated significant relationships between FEC (family strain) and biobehavioral reactivity (e.g., depression, anxiety), as well as biobehavioral reactivity and disease activity (as measured by self-

evaluated physical health and pain interference). Also, the direct effect of FEC on disease activity was significant.

These results indicate that the BBFM, using family strain as the predictor variable, is able to explain health outcomes for adults experiencing chronic pain. Specifically, family strain predicted depression and anxiety. For example, self-reports of family strain, including demanding and criticizing behavior from family members, affects chronic pain patients' mental health. In turn, heightened emotional responses in this sample predicted greater disease activity. Specifically, as symptoms of depression and anxiety worsened, so did health outcomes for adults experiencing chronic pain, including pain interference and self-reported physical health. These findings demonstrate that the BBFM is valuable in predicting the effects of negative family emotional climate on the health of adults experiencing chronic pain.

Model Two: Intimate Partner Strain

All three hypotheses were supported for Model 2, and a fully mediated relationship was demonstrated. Specifically, Model 2 (Figure 5) demonstrated partner strain was a significant predictor of biobehavioral reactivity (e.g., depression, anxiety), and that both depression and anxiety were significant predictors of health outcomes in a chronic pain sample. Significant relationships were found between FEC (intimate partner strain) and biobehavioral reactivity (e.g., depression, anxiety), as well as biobehavioral reactivity and disease activity (as measured by self-reported physical health and pain interference). Also, as hypothesized, a nonsignificant relationship was found between FEC and disease activity.

These findings confirm that testing the BBFM, with intimate partner strain as the predictor variable, affects health outcomes for adults experiencing chronic pain. Specifically, intimate partner strain predicted depression and anxiety. Self-reports of intimate partner strain, including feeling like one's partner is demanding or criticizing, affects chronic pain patients' mental health. In other words, the more felt intimate partner strain patients experienced in their romantic relationships, the more likely they were to report anxiety and depression and, in turn, their heightened emotional responses predicted greater disease activity. Specifically, as symptoms of depression and anxiety worsened, so did health outcomes for adults experiencing chronic pain, including pain interference and self-reported physical health. These findings demonstrate that the BBFM is valuable in predicting the effects of negative romantic relationship processes on the health of adults experiencing chronic pain.

Limitations and Future Research

While the present study addressed several limitations of the current literature (e.g., Carr & Springer, 2010), it also had limitations in which future research is necessary in order to expand testing the BBFM in adult health research. First, although the use of secondary datasets is beneficial (Smith et al., 2011), researchers are restricted in utilizing specific measures for their selected study. For example, the present study sought to hypothesize relationships between negative family emotional climate and other variables of the BBFM. However, assessment of relationship quality was limited to family and partner strain, and excluded other potential measures of relationship quality (e.g.,

relational process, satisfaction). Future research should consider including other contributions of relationship quality that affects disease activity.

In addition, self-reported data were utilized for the present study. Self-reported measures can create issues because of how participants comprehend questions, their expectations or values, and the meaning they place on specific measures. For example, in this study, only one family member's responses were explored which limited the ability to obtain an accurate measure for family relationship quality. It is recommended for future research to include objective measures of health (e.g., allostatic load) in order to gain a true depiction of relational quality on health.

In addition, despite the hypotheses of the BBFM representative of a mediation relationship, Model 1 demonstrated only partial mediation. A possible explanation for the presence of a significant pathway between family strain and chronic pain experiences may be due to the types of family relationships participants' were considering while responding to the questions. Future research may include exploring types of family relationships participants considered when responding to questions about family strain. Also, because the pathway between family strain and chronic pain experiences was significant, and test of indirect effects demonstrated only a partial mediation effect, it is likely that biobehavioral reactivity (depression and anxiety) does not account for the majority of the relationship between family strain and chronic pain experiences. More research is needed to fully understand the potential for other mediating variables in the relationship between family strain and chronic pain experiences.

Lastly, this study used cross-sectional data to explore the quality of close relationships (family and partner) on health. Previous research indicates the need for longitudinal research to provide a deeper understanding of the possible underlying effects of relational quality on health (Robles et al., 2014). Future research should explore the pathways between close relationships, biobehavioral reactivity, and chronic pain experiences over time.

Clinical Implications

The findings of this study have several implications for clinical practice. First, the results from Model 1 provide unique considerations for clinical practice. For example, the partial mediation suggests that a multipronged clinical intervention approach may be especially useful for adults with chronic pain who are experiencing family strain. Specifically, interventions aimed at biobehavioral reactivity (e.g., depression and anxiety) and family strain may provide unique benefits for adults with chronic pain, as both variables demonstrated significant, direct effects for chronic pain experiences in the present sample. Also, the present sample is a large, national dataset that utilized a sampling procedure indicated to collect data from a nationally representative sample (Ryff et al., 2012). Therefore, clinical implications may be broad and suggests that multilevel interventions that focus on family strain and biobehavioral reactivity are critical.

Although the results from the present study are neither causal nor longitudinal, the findings of Model 2 provide opportunities for clinicians to be effective and appropriate in their interventions. Influenced by Minuchin's psychosomatic family model and structural

family therapy, the BBFM is a unique approach to explain the associations between close relationships and health outcomes (Minuchin et al., 1978). Due to the foundation of the BBFM and the present study findings, interventions focused on adult chronic pain patients should include family and partner-based interventions. For example, structural family therapy would explore family processes (e.g., negative marital interactions) in order to create changes within the family (Minuchin et al., 1978).

As the BBFM is a theoretical model that is able to apply to a broad developmental lifespan, for both child and adult family members (Wood et al., 2008; Priest & Woods, 2015), and for broad measures of physical health (Woods & Denton, 2014), it may also indicate the need for a clinical intervention developed specifically to intervene in areas represented by this theoretical model. Specifically, the model may lend itself for future clinical intervention development, which would meet the need for therapeutic approaches to be based in theory (Shields et al., 2012). Recent research reviewed couple and family interventions for health outcomes and found the significance for including family members in treatment (Shields et al., 2012). Though findings confirm this significance, the studies examined were randomized clinical trials of family psychoeducation and brief therapeutic interventions (e.g., coping skills, problem-solving skills), with the exception of utilizing family therapy for the adolescent and pediatric population (Shields et al., 2012).

A purpose of this study was to test the BBFM with a national, representative sample of adults with chronic pain in order to enhance our understanding of the effects of relational functioning and mental health on health outcomes, in order to contribute to

adult health research. The findings of Model 2 that confirm intimate partner strain affects disease activity through depression and anxiety levels, suggests that marriage and family therapists (MFTs) have a role in treatment for chronic pain patients and will positively influence adults' physical health outcomes.

Conclusion

Despite that 100 million individuals suffer from chronic pain in the U.S. (AAPM, 2011), chronic pain continues to be difficult to treat and manage (Pergolizzi et al., 2013). Because of the complexity of this illness, individuals experience financial burden (Campbell et al., 2012), emotional (De Souza & Frank, 2011), and physical distress (West et al., 2011). Findings have confirmed the importance of family and romantic relationships for chronic pain health outcomes. Individuals with a chronic illness report improved health (Barr et al., 2013), less emotional distress (Miller et al., 2013) and fewer chronic pain experiences (Reese et al., 2010) if they are in healthy close relationships.

To best understand connections between close relationships and chronic pain, a biopsychosocial model is necessary. The present study tested a biopsychosocial model of health, the Biobehavioral Family Model (Wood, 1993) to explore pathways between family and intimate partner strain, biobehavioral reactivity (e.g., depression, anxiety), and disease activity among adults experiencing chronic pain. Although the BBFM has previously been used to examine adults' general health outcomes (Woods & Denton, 2014), it has yet to be used to examine health outcomes for a specific medical population of adults, as it has been used with pediatric populations (Wood et al., 2007; Wood et al, 2008). The present findings support the need for further research testing the BBFM with

adults and specific health outcomes, especially in furthering our understanding of adults experiencing chronic pain. This study and further research can navigate clinicians to tailor interventions that are appropriate and effective to meet the needs of clients experiencing an illness.

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APPENDIX A

Tables and Figures

Table 1

Means, Standard Deviations, Skewness, and Kurtosis for Study Variables (n = 1461)

Measure	Mean	*SD*	Skewness	Kurtosis
Depressed Affect	0.74	1.91	2.35	3.85
Anxiety Disorder	.20	1.10	6.17	39.93
Family Strain	2.14	0.62	0.39	-0.03
Intimate Partner Strain	2.20	0.63	0.35	-0.18
Mean Pain Interference	3.15	2.45	0.68	-0.46
Physical Health	2.81	1.05	0.25	-0.49

Table 2

Model One Mediation Results

FamStr → ChrPain	Estimate	Standard error	*p*
Total	.194	.041	.000
Indirect			
FamStr → BBR → ChrPain	.080	.024	.001
Direct			
FamStr → ChrPain	.113	.038	.003

FamStr = Family Strain, BBR= Biobehavioral Reactivity (Composite International Diagnostic Interview-Short Form), ChrPain=Chronic Pain.

Table 3

Model Two Mediation Results

ParStr → ChrPain	Estimate	Standard error	*p*
Total	.122	.039	.002
Indirect			
ParStr → BBR → ChrPain	.058	.021	.006
Direct			
ParStr→ ChrPain	.064	.039	.100

ParStr = Intimate Partner Strain, BBR= Biobehavioral Reactivity (Composite International Diagnostic Interview-Short Form), ChrPain=Chronic Pain.

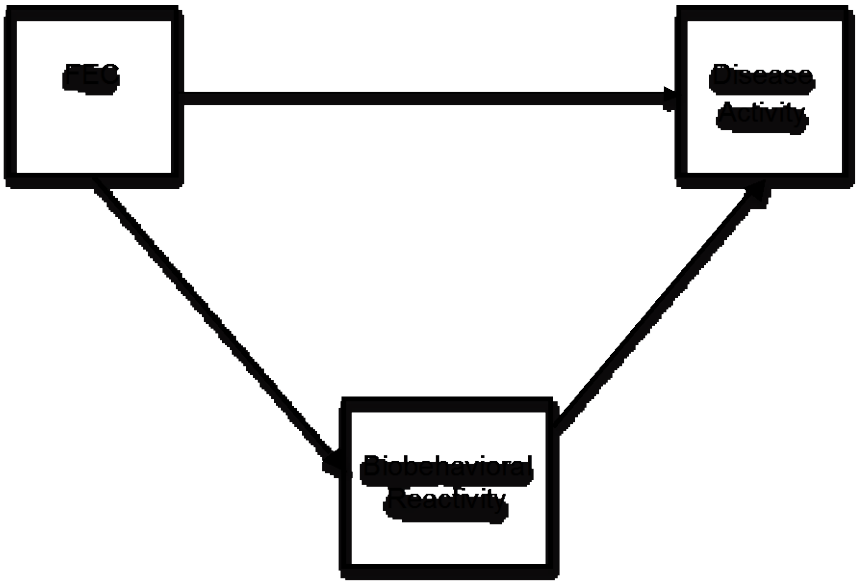


Figure 1. The Biobehavioral Family Model (Wood, 1999). FEC = Family Emotional Climate.

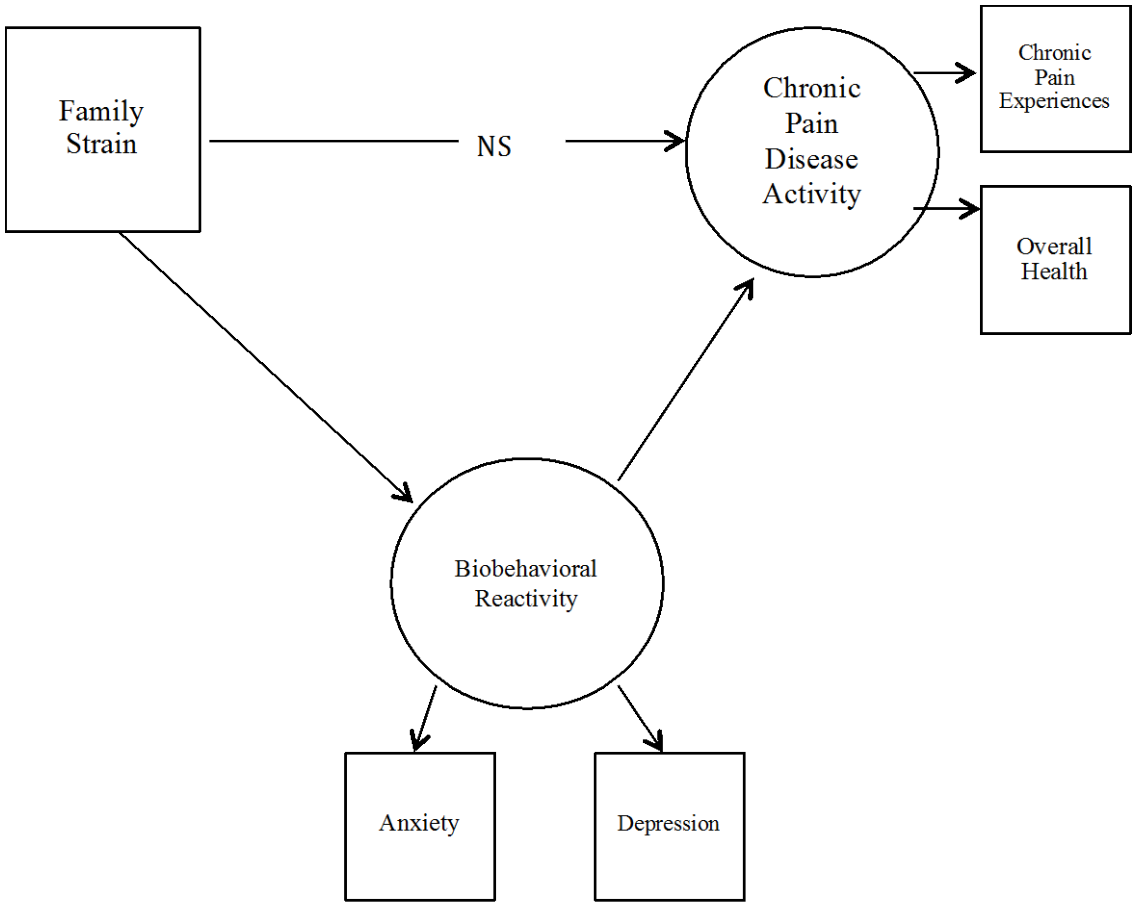


Figure 2. **Hypothesized mediation Model 1, NS = Nonsignificant.**

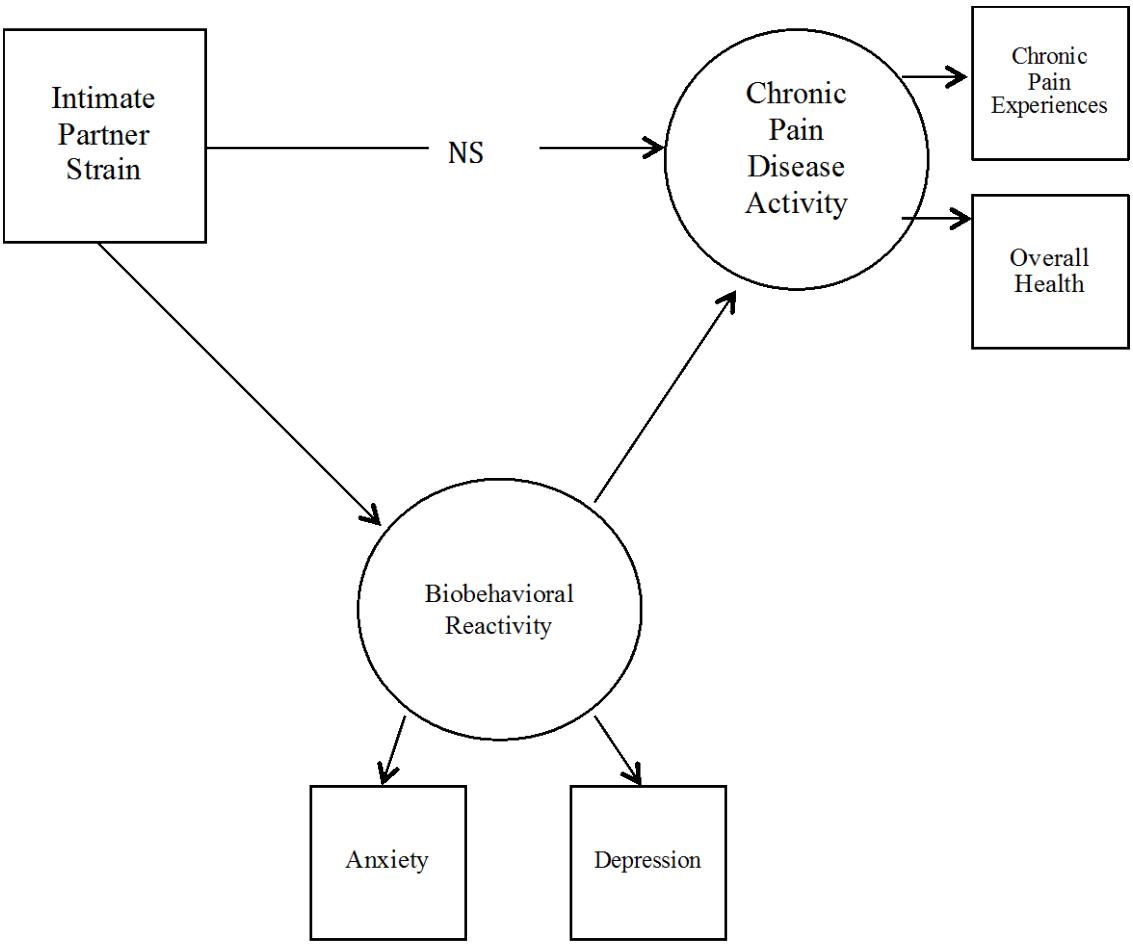
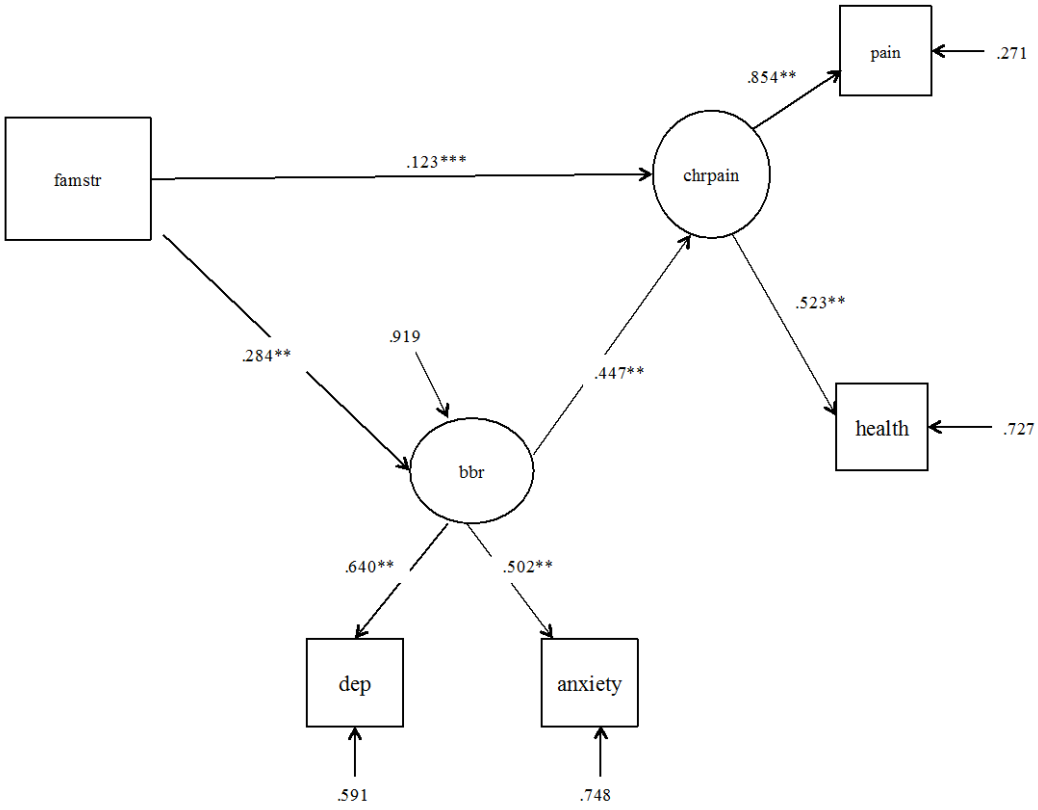
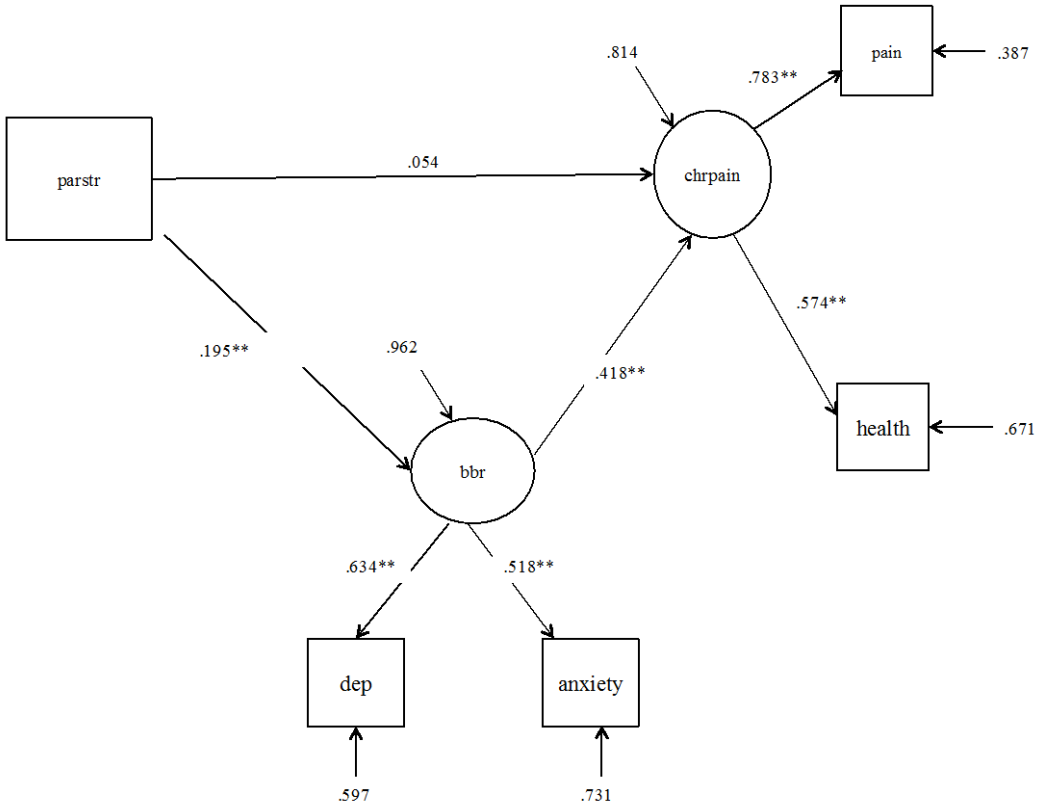


Figure 3. Hypothesized mediation Model 2, NS = Nonsignificant.



χ^2 = 9.51 *p* = .02, RMSEA = .04, SRMR = .02, CFI = .99

Figure 4. First model tested with family strain. Dep. = Depression subscale of the CIDI-SF, Anxiety = Anxiety subscale of the CIDI-SF, Famstr = Family Strain. ***p*<.001, ****p*<.05.



χ^2 = 4.80, *p* = .19, RMSEA = .02, SRMR = .01, CFI = 1.00

Figure 5. Second model tested with intimate partner strain. Dep. = Depression subscale of the CIDI-SF, Anxiety = Anxiety subscale of the CIDI-SF, Parstr = Intimate Partner Strain. ***p*<.001.