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The Role of Intimate Partnership Among Older Adults on Pain Severity and the Engagement in Preventative Health Behaviors

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The Role of Intimate Partnership Among Older Adults on Pain Severity and the
Engagement in Preventative Health Behaviors

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Dedication

I would like to dedicate this to my family, particularly to my parents who have always supported me in all my endeavors.

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Abstract

Bodily pain is a frequently disabling condition among older adults, which has broad biopsychosocial implications on health and wellbeing. As adults age, diminishing support systems can result in poor health outcomes and the presence of an intimate partner relationship can positively impact physical health, including influencing pain severity. The number of adults in the United States over 65 is expected to double by 2030, meaning that a significant portion of the population will be entering a stage of increased healthcare utilization. Therefore, behaviors which improve physical health will only become increasingly important over time. While previous research has pointed to the salience of intimate partner relationships on both shaping healthy behavior, as well as on pain outcomes, this project sought to bridge a gap in the current research by examining both relationship satisfaction and relationship status, and the indirect effects of health behaviors on pain outcomes in older adults. This study utilized data from the National Social Life, Health, and Aging project to test a theoretical moderated mediation model. It was hypothesized that 1) relationship quality would be negatively associated with pain severity 2) healthy behaviors would mediate the negative relationship between relationship quality and pain severity; and 3) relationship status would moderate the effect of relationship quality on health behaviors and, subsequently, the extent of the mediation between relationship quality and pain severity. While analyses did not support the full model, data did show a trend effect such that those who report higher initial relationship satisfaction tended to report lower levels of physical pain. Furthermore, additional analyses found that, for female-identified individuals, relationship satisfaction significantly predicted later pain severity, with additional gendered differences in specific health behaviors. Result of this study suggest that older adulthood is a dynamic and complex stage of life, influenced by a myriad of factors which should inform both clinical practice and future research. Limitations and future directions are discussed.

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Chapter 1

Introduction and Literature Review

Among the many changes to the landscape of the United States over the past century, the

transition of increasingly large cohorts of individuals from infancy through adulthood has meant

that a larger-than-ever contingent of the US population is reaching advanced ages. As of 2015,

adults aged 65 and older represented approximately 8.5 percent of the 7.3 billion global

population (He, Goodkind, & Kowal, 2016). In the United States alone, the roughly 35 million

adults over the age of 65 measured in 2000 is expected to nearly double in size to over 70 million

by the year 2030 (Center for Disease Control, 2003). In the course of almost a century, the

eradication of many infectious diseases and other medical advances have contributed to increases

in life expectancies in the United States from under 50 years in 1900, to nearly 79 years by 2010

(Crimmins, 2015). The United States is expected to continue to undergo a continued "graying"

process, as life expectancies rise and birth rates stagnate or fall the number of adults over 65 in

the US population is projected to overtake the number of children by the year 2034 (Vespa,

2018).

To fully understand the needs of this population, aging should be conceptualized as not

simply a temporal process, but a biological and social process as well. The purposes of this

study, detailed in the following sections, will be to examine relationships, physical wellbeing,

and experiences of pain severity in older adulthood. Specifically, this study aims to understand

the extent to which the relationship between intimate partner relationships and subsequent

instances of self-reported physical pain is indirectly influenced by positive (or preventative)

health behaviors, and whether this relationship differs based on changes in relationship status

group (e.g., married, divorced, widowed). A comprehensive understanding of the experiences of

those who reach advanced ages is important, as increases in lifespan are not intrinsically accompanied by commensurate increases in "healthspan", or the number of healthy and disease-free years experienced prior to late-life morbidity (Partridge, Deelen, & Slagboom, 2018). The implications of longer life expectancies, as well as continual changes in healthcare infrastructure, point to the importance of understanding the effects of age across key aspects of both physical and mental wellbeing.

Creating a culture of healthy aging in the United States will be integral to the biopsychosocial wellbeing of the population as a whole and will have implications across all aspects of day-to-day life. Health, though a broad term to attempt to define, is a key factor in understanding human wellbeing and quality of life. Victor (2005) outlines three potential approaches which can be employed in the difficult task of defining "health", including a medical model approach, a sociological perspective, and the World Health Organization model of health as an 'optimal state'. While these models each have their differences, each model is essentially defined to varying degrees by the presence of good health and/or the absence of poor health (i.e., disease state, disability), and could broadly be synthesized as the combination and interplay of both strengths or protective factors along with weaknesses or deficits in the human body (Victor, 2005).

Lower physical functioning among older adults has been associated with increased healthcare utilization, including both in- and outpatient visits, home health services, and healthcare expenditures (Cheng, Goodin, Pahor, Manini, & Brown, 2020). It is perhaps unsurprising then that the United States can anticipate a possible per capita increase of almost 18% in healthcare costs due to aging by the year 2050 (Mary Martini, Garrett, Lindquist, & Isham, 2007). These changes impact not just the healthcare system, but the individual as well, as

morbidity and disability from noncommunicable chronic diseases pose a significant burden among older adults across the globe (He et al., 2016). More than 4.6 million (9.3%) older adults in the United States are estimated to live below the national poverty level; when adjusted for regional costs of living and additional expenditures, that rate rises to about 14.5%, with the difference primarily attributed to medical expenses (US Department of Health and Human Services, 2017). It can therefore be surmised that the impact of the changing age demographics in the United States on the economy and healthcare infrastructure will continue to unfold and evolve across multiple generational cohorts over the course of many decades. However, it is clear that the wellbeing of the population as a whole cannot be fully understood without a thorough examination of the factors influencing the physical and mental health of our aging adults, from new senior citizens through the "oldest old" over the age of 85 (Suzman & Riley, 1985).

One characteristic which is key to assessing overall individual health in older adults should be the presence of physical pain, as both acute pain or chronic pain are frequently occurring and potentially disabling conditions among the elderly (Zis et al., 2017). Pain as a concept can generally be conceptualized as a manifestation of distress, whether as a direct result of real or perceived tissue damage or unpleasant sensory stimuli, or through emotional or cognitive experiences (Williams & Craig, 2016). Therefore, intrusive physical pain is a unique indicator, as it can act as both a cause and as an effect in a myriad of ways. Pain acts as an impediment to overall global level of functioning, including social and occupational functioning, with chronic pain reported as a frequent co-occurring diagnosis in mood and other psychiatric disorders (Abplanalp, Mueser, & Fulford, 2020). In part due to this frequent co-occurrence of chronic pain and mental health disorders, it is theorized in some instances that pain and

psychopathology can influence each other; chronic pain leading to psychiatric symptomatology, and psychiatric symptoms leading to onset and/or exacerbation of chronic pain. Prolonged physical pain can also act as a disruption to other day-to-day activities which are key for maintaining wellbeing, including disruption to sleep hygiene, eating habits, and physical activity, all of which are important aspects of maintaining mobility and healthy functioning throughout the lifespan (Didikoglu et al., 2020; Vancampfort et al., 2020; Ward et al., 2020).

In addition to physical wellbeing, an individual's social support system, interpersonal connections, and intimate partner relationships can also act as critical factors in influencing their overall quality of life. As adults age, it is not unusual to see a decrease in the size of their support systems, in part through such predictable life landmarks such as retirement, geographic moves, and death or loss (Hsieh & Liu, 2020). Significant changes to one's support system, such as loss of a primary life partner, have been linked to poorer outcomes ranging from depression through cardiovascular disease, as well as decreases in preventative healthcare measures such as attending regular doctor's visits or abstaining from tobacco use (Manvelian & Sbarra, 2020). Additionally, some research points to the ability of partner behaviors and validation to influence such complex outcomes as reported pain severity and emotion regulation (Leong, Cano, & Johansen, 2011).

Yet there is still room for more exploration into the complexities involved in the influence of intimate partnerships on physical health and wellbeing. This includes exploring the potential effect of relationship quality, rather than relationship status alone. Further research into changes in relationship status when also accounting for relationship quality (i.e., the loss of a satisfying relationship vs. the presence of an unsatisfying one) is necessary to understand not only if relationships impact physical pain outcomes, but how they impact them. This

understanding is necessary to contribute to the continually evolving culture of healthy aging in the United States and could benefit not just the current population, but future generations to come.

The proposed study will use data from waves 1-3 of the National Social Life, Health, and Aging Project (NSHAP), a longitudinal study of health and social factors focused on older, community dwelling adults in the United States. The primary aim of this study is to test a proposed model in which preventative health behaviors mediate relationship quality and physical pain, as depicted in Figure 1. The study aims to first assess the relation between intimate partner relationship quality and pain severity among a population of older adults over a ten-year span. Subsequently, data analyses will look for a potential indirect effect of proactive, preventative health behaviors (e.g., visiting the doctor, engaging in physical activity, avoiding tobacco and alcohol) on the aforementioned relation between relationship quality and pain severity. Finally, the significance of the effect of relationship quality on pain severity through health behaviors will be examined at different levels of change in relationship status (e.g., married, widowed, divorced, etc.). The following sections will provide a theoretical and empirical review of the relationships in the proposed model.

Physical Pain and Wellbeing

Physical pain is a frequently occurring condition in the United States for which increased age is a common risk factor, with some estimates of prevalence rates for intrusive pain in older adults at over 50% (Patel, Guralnik, Dansie, & Turk, 2013). Because the experience of pain can cut across biopsychosocial domains, the onset of severe or chronic pain can be accompanied by a complex set of implications and outcomes. The physiological and emotional manifestations of

pain may be influenced by the duration (i.e., chronicity), severity, as well as the source (Williams & Craig, 2016; Zis et al., 2017). While pain as a simple biological response can serve a valuable function of drawing the body's attention to real tissue damage or perceived threat, updated definitions of pain take into account additional complex causes of a pain response beyond tissue damage alone (Williams & Craig, 2016; Zis et al., 2017). This complexity is imperative for understanding and managing issues such as psychogenic pain that is without observable physical cause and possible psychological underpinnings (Millan, 1999), or connecting the depressive symptoms with chronic pain which is found with increasing prevalence among the elderly (Zis et al., 2017). It is therefore important not to overlook the significant burden posed by intrusive pain experiences, be they chronic or acute, on the increasingly large portion of the population reaching advanced ages, when one considers how it may contribute to challenging life transitions likely to occur during older years.

Physical pain is a frequently endorsed symptom found among a myriad of health conditions in the general population, with common headaches and musculoskeletal conditions tending to be at the top of the list (Velly & Mohit, 2018). Other slightly less frequent but still significant pain disorders, such as arthritis and rheumatic conditions, are also projected to increase in prevalence to effect over 25% of older adults by the year 2040 (Hootman, Helmick, Barbour, Theis, & Boring, 2016). Additionally, chronic pain may be more likely to occur in individuals with other disease multi-morbidity, such as the multi-morbidity that is already associated with advancing age (Van Hecke, Torrance, & Smith, 2013). Social factors which can be found to commonly occur in elderly populations are often implicated as risk factors for chronic pain as well, such as less secure housing status or employment status (Elliott, Smith, Penny, Cairns Smith, & Alastair Chambers, 1999). Physical pain is therefore not only common

but may come from several sources both individually and cumulatively across many different health disorders.

Taken together, a picture begins to emerge of convergent and accumulating risk for a poor and painful quality of life as one ages, without the benefit of prevention or intervention. Furthermore, age-related changes in cognitive status may further impact pain outcomes, in that patients with cognitive impairments or dementia may find that treatment for their pain symptoms is determined by variations in caregiver perception and their own ability to communicate (Kaasalainen, Middleton, Knezacek, & Hartley, 1998). Individuals with age-related cognitive decline may then be at risk for not only increases in their pain frequency and severity through the natural course of physical aging, but also at risk for untreated or under treated pain symptoms that they are unable to effectively communicate.

Due to the complex function of pain as a cognitive, physiological, and emotional process, it is unsurprising that experiences of significant pain would also have ramifications on mental health and psychiatric morbidity. This relationship can be bidirectional, with pain acting as both a symptom and a cause of psychological distress (Velly & Mohit, 2018). Not only is frequent comorbidity between psychiatric and pain diagnoses to be expected, but patients with pain and comorbid major depression are also more likely to be disabled by their pain (Arnow et al., 2006). This disabling effect in the relationship between depression and pain is particularly noteworthy when considering that some estimates of depression in chronic pain patients project upwards of 50% (Sharp & Harvey, 2001). This would mean that approximately half of all chronic pain patients would be vulnerable to becoming stuck in this cycle in which their depression creates worse pain outcomes, all while that same pain exacerbates their emotional distress. Similar dynamics can be found across other diagnoses as well, with pain contributing to reduced global

functioning among individuals with schizophrenia (Velly & Mohit, 2018), poorer quality of life in individuals with bipolar disorder (Miller et al., 2013), and greater instances of substance use (Zvolensky, Rogers, Garey, Shepherd, & Ditre, 2020). Preventing or managing pain is therefore not only a physical necessity, but important for preventing the exacerbation of existing mental health disorders as well as the onset of new symptomatology. While pharmaceutical interventions for pain management may draw significant attention among media and policy makers, additional interventions for patients with physical pain which target cognitive, emotional, and/or social factors have been explored in order to be utilized in a wide variety of settings. This significant overlap of psychological and physical health symptomatology would lead one to believe that interventions targeting both simultaneously would be pivotal to increasing overall wellbeing, particularly among populations vulnerable to other sources of life stress such as older adults. The development of creative and diverse interventions could also be beneficial when accounting for not only the current generation of older adults, but the continued flow of different generational cohorts through the lifespan.

One such example, spouse assisted coping skills training, trains couple dyads in employing cognitive behavioral strategies for chronic pain management (Keefe et al., 1996). A longitudinal study of osteoarthritis patients and their spouses found increases in patient self-efficacy and improvements in relationship adjustment after participation in spouse assisted coping skills, and those with improvements in marital adjustment were similarly better able to maintain positive long-term pain outcomes post-treatment (Keefe et al., 1999). The efficacy of treatments which target an individual's social and emotional functioning simultaneously further supports the concept of pain as a complex expression of many factors. Furthermore, this complexity may allow for multiple avenues in which to intervene across different levels of care.

However, while encouraging individual outcomes can be a primary focus of biopsychosocial interventions targeting intimate partner dyads, a more concrete understanding of the specific role of intimate partner relationships on pain outcomes is still needed. The long-term role of relationships on pain, irrespective of intervention efforts, could have wide ranging benefits from risk assessment, treatment formulation, and prevention planning. Individual patients do not exist in a vacuum and examining the influence of their social support system on the severity of their pain outcomes should start with the most proximal of relationships; in this instance, their intimate partners.

Intimate Partner Relationships and Pain

While intimate partner relationships are inherently influential on many areas of one's life, with marital relationships holding particularly strong significance (Beach, Martin, Blum, & Roman, 1993), they serve a unique function as a form of social support. Intimate partners can provide the perception of "invisible" social support, or the unstated knowledge and security that support could be available if needed, which can itself alleviate stress even outside of being the recipient of specific social support behaviors or transactions (Bolger, Zuckerman, & Kessler, 2000). But as Keefe et al. (1999) found in couples who received spouse-assisted coping skills training for chronic pain, the long-term outcomes for pain patients were best when partners were both a supportive presence and learned specific interpersonal skills which influenced marital adjustment. This would suggest that it is not presence of a partner alone which may be significant, but that understanding the role of support in the context of intimate partner relationships which may have implications for pain outcomes.

Social support more broadly has long been understood to influence physical health outcomes, although the specific mechanisms through which this influence occurs are slightly less clear (Gallant, 2003). Low perceived social support and depression have been implicated as risk factors for musculoskeletal pain and chronic low back pain (Dueñas et al., 2020; Hauke, Flintrop, Brun, & Rugulies, 2011; Hoogendoorn, van Poppel, Bongers, Koes, & Bouter, 2000). In a study by Stevens and colleagues, broadly defined social support was found to have a direct influence on adults' physical activity level, however researchers found a significant indirect effect of social support on physical activity level through a reduction in pain (Stevens, Cruwys, & Murray, 2020). Thus, if both individual behaviors and social networks have the ability to influence pain, increased understanding into how and for whom these factors might play a role in pain severity could benefit healthcare providers and patients alike.

Social support has been generally examined as a factor in the mitigation of pain severity and level of disability, and there currently exists multiple theoretical models for the relationship between social support and pain. A meta-analysis conducted by Che and colleagues (2018) specifically examined multiple studies utilizing either *buffering effect* or *main effect* hypotheses of social support on pain reduction. The main effect model is the theoretical concept that social support has a direct analgesic effect on pain, while the buffering effect theorizes that social support acts to decrease overall stress and therefore indirectly decreases pain severity (Che, Cash, Ng, Fitzgerald, & Fitzgibbon, 2018; Cohen & Wills, 1985). Results of the meta-analysis pointed to stronger support for a buffering effect in some instances, however the authors did find variations in the strength of study designs and the type of social support or reaction implicated (Che et al., 2018). Additionally, the *communal coping models* (Sullivan et al., 2001) and *operant models* (Fordyce, 1976) have been proposed which conceptualize social support and interactions

with partners as potential instigators of higher pain responses, through mechanisms such as behavioral reinforcement or exaggerated expression of catastrophization. Similarly, a *schema-activation model* hypothesizes that individuals can develop a pain schema comprised of negative information and pessimistic beliefs around pain experiences (Sullivan et al., 2001). However, Sullivan et al. (2001) were unable to establish a clear mechanism for circumstances under which the activation element of pain schema-activation would develop. While the internal logic and face validity of such a model might be apparent, the actual applicability remains unclear.

Additional research has also investigated some of the possible bolstering effects social support within partner relationships may have on pain experiences. An *intimacy model*, drawn from Reis and Shaver's (1988) interpersonal process model of intimacy, characterizes discussions of pain experiences from both partners as emotional disclosures, which are important elements in the development of intimacy and relationship satisfaction (Cano & Williams, 2010). Therefore, emotional disclosures met with empathetic validation can create increased intimacy, suggesting that individuals are not only shaped by their partner's behaviors, but also by the quality of their emotional response and affect in response to intimate disclosures (Cano & Williams, 2010). While the evidence points to a clear connection of some sort between relationships and pain outcomes, perhaps these seemingly conflicting theoretical models point to a more complex dynamic; one in which individual relationship factors which could vary from person to person may impact health broadly, including physical pain.

While the specific mechanisms through which social support within interpersonal relationships impacts pain are not currently concretely defined, research points to variations in the different types of social support and different pain experiences, in that they represent a variety of processes acting upon each other (Che et al., 2018). Some theorize that the impact of

interpersonal relationships on pain experiences may be as straightforward as a function of attention to (Sullivan et al., 2001) or distraction from (Che et al., 2018) pain. Focus drawn towards others may simply serve to draw one's focus away from thoughts or rumination on pain. Because of the wide variety of forms these systems can take, further research designed with specificity could aid in understanding how specific types of social relationships (i.e., intimate partner relationships) fit into this complex picture. Thus, the current study seeks to examine not only the presence of a relationship alone, but the quality and nature of the relationship, and the subsequent severity of physical pain.

Relationship Support and Health Behavior

The significance of relationships which provide social support can also be seen in their influence on individual behavior. In behavioral modification interventions, such as weight control and exercise programs, social support is among the factors patients endorse as important for new habit formation and maintenance (Fischer, Donath, Zahner, Faude, & Gerber, 2020). When it comes to personal behavior, increased social support bolsters feelings of self-efficacy as well, which may ease the stress or perceived obstacles to health behavior change (Bandura, 1998; Duncan & McAuley, 1993). This impact of social support on healthy behaviors has been found in multiple different domains, including physical activity, smoking cessation, blood pressure intervention adherence, and diabetes self-management (Fischer et al., 2020; Gallant, 2003; Levy, 1983). While health care needs undoubtedly vary from individual to individual, the areas of physical health which can be impacted, improved, or prevented through behavioral methods will be impacted to some extent by the availability of social support. And while social relationships can exist in many forms, it would be a reasonable assumption that the higher the degree of connection in the relationship, the greater the influence it may hold over health behaviors.

As social networks and relationships can exist without automatically conferring support, the benefits of social support on physical health and wellbeing are not necessarily inherent to any and all relationships, but rather can be a beneficial quality in some relationships (Berkman, 1984). And while social networks can be comprised of any number of interpersonal connections and relationships, nuclear family and close-kin relationships appear to become increasingly salient with age, particularly as social networks may otherwise diminish over time (Lang & Carstensen, 1994). In fact, relationships with both a close familial status as well as emotional intimacy, such as intimate partnerships, can confer a sense of social connection and embeddedness in older adults which would otherwise require a higher number of non-familial social partners to accomplish (Lang & Carstensen, 1994). When examining an earlier generational group of adults, researchers Hughes and Waite (2009) found that a consistent and uninterrupted presence of a spousal relationship throughout the lifespan for adults in midlife had positive implications for physical health, particularly in lowering risk for mobility impairment and chronic illness. Yet further research by Zhang and Hayward (2006) in a sample of nearly 10,000 middle-aged adults, found that while marital loss (i.e., through divorce or death) was associated with poorer baseline cardiovascular health, marriage length was actually associated with unhealthier behaviors and increased comorbidity. These results taken together would suggest that there is something significant not only in having and maintaining a relationship alone, but what is happening within the relationship, and how these factors can influence one's health. Because of the potential long-term impact of marriage and intimate partnerships on health, there may be particular benefit to examining this dynamic in older populations as well.

Due to the evolving cultural role of marriage and romantic partnerships throughout history, the salience of marriage as a specific form of social support may differ for future

generations of older adults. While one might logically predict that negative characteristics of intimate partner relationships could have deleterious effects on wellbeing and health, the influence of positive characteristics remain an emerging area of interest. There is some research to suggest that the current generation of older adults report greater decreases in level of disability than other generational cohorts when they and their partner perceive each other as more supportive (Choi, Yorgason, & Johnson, 2016). A 2013 meta-analysis of 126 studies of marriage quality and health found that, while longitudinal studies showed poor marital quality is a consistent risk factor for overall poor health, positive relationship qualities in a marriage may be associated with particularly good health outcomes (e.g., cardiovascular functioning) and subjective health ratings (Robles, Slatcher, Trombello, & McGinn, 2014). In terms of overall wellbeing, the same study found comparatively larger effect sizes in the associations between marital quality and psychological wellbeing (Robles et al., 2014). Meta-analytic analysis found that across mood disorder symptoms, self-esteem, happiness, and other psychopathology, greater psychological wellbeing is associated with better marital relationship quality (Robles et al., 2014). Therefore, it would seem that relationships not only play a role in pain outcomes and that there are more generalized physical health benefits not just to being romantically partnered, but in finding oneself in a high-quality and supportive partnership. Thus, it is plausible to suggest that health behaviors may indirectly influence the association between one's relationship quality and their pain over time.

Health Behaviors as a Mediator between Relationship Quality and Pain

As described above, individual contextual factors such as relationship quality play a role in the management of one's health, be they positive or negative influences (Gallant, 2003). Relationships can both encourage positive health behaviors and decrease risk taking, with increased salience in the importance of social support emerging at advanced ages (Hibbard, 1988). Beyond the simple demographic information conferred when a patient reports their relationship status –single, married, widowed, divorced—a better understanding of the context of their relationship could allow for increased clarity into the role said relationship may be playing in their health, as well as additional avenues for increasing motivation or implementing interventions. It is plausible to suggest that preventative health behaviors (e.g., physical activity, alcohol/tobacco consumption, doctor's visits) will impact physical health outcomes, including those related to physical pain.

Ultimately, the state of one's health in advanced age will be influenced by the culmination of these biopsychosocial factors influencing each other throughout the lifespan. While some individuals may naturally experience increased physical disability as they age, it is possible to attenuate some risk factors for age-related physical disability through physical exercise or lifestyle habits (Hall, Chiu, Williams, Clark, & Araujo, 2011). Attenuating risk, however minor, is of critical importance considering that limitations in mobility are associated with decreased quality of life in older adults (Hall et al., 2011). Physical disability, broadly characterized by significant impairments in activities of daily living, impairments in specific functioning, or need for assistive devices or resources, is estimated to be highest among those ages 65 or older (Center for Disease Control, 2001). Of those who endorse physical disability in the United States, over 51% (18.1 million) are over the age of 64 (Center for Disease Control,

2009). Falls are a particular risk factor for physical impairment in older adults, with some studies

estimating that approximately 32-35% of adults report experiencing a fall within the past year,

and the vast majority of all fractures among older adults stemming from falls (Hogan, 2005).

Functional decline and increased impairments in daily living can also worsen after

hospitalization in older adults (Covinsky et al., 2003). This suggests a dangerous, cumulative

severity in a cycle of decreased muscle mass, increased incidence of falls, increased fracture risk,

and poor post-hospitalization outcomes. While recovery from this cycle is not impossible,

finding avenues for increasing proactive, preventative health habits could save an already

vulnerable population time, money, and pain in the long term.

Preventative health behaviors have been found to decrease morbidity in older adults

(Levy & Myers, 2004) and are therefore a critical aspect of not only maintaining physical health

but for preventing social, emotional, or financial strain later in life. Exercise and physical activity

have numerous health benefits for all individuals throughout their developmental trajectory, and

in addition to improving mood and outlook, older adults can reduce their risk of functional

decline through regular exercise (Kahana et al., 2002). Even among older adults with existing,

significantly impairing health conditions, physical exercise can yield wide-ranging benefits. In a

2012 randomized controlled trial, patients over the age of 55 with existing symptoms of

Alzheimer's-related cognitive decline who underwent a 26-week exercise intervention not only

demonstrated improved functional ability, but also improvements in cardiorespiratory fitness

which were similarly associated with improved memory performance (Morris et al., 2017).

Throughout the systems of human body (cardiovascular, musculoskeletal, nervous), physical

activity and exercise can add benefits and reduce risks, including all-cause mortality (Blair et al.,

1989; Fletcher et al., 1996; Hayes, Hayes, Cadden, & Verfaellie, 2013). Yet in a longitudinal

analysis of over two-thousand Medicaid beneficiaries, approximately 47% of participants, all of whom were at or over the age of 65, became or remained sedentary over the four-year observation period (Burton, Shapiro, & German, 1999).

Preventative health behavior is not limited to exercise alone and can come in many forms. Prevention, education, and maintenance can all be useful resources to obtain from regular contact with appropriate healthcare providers, given the high prevalence of comorbidity of chronic disease in older adults (Weiss, Boyd, Yu, Wolff, & Leff, 2007). Research conducted by Sarkisian et al. (2002) of 429 community-dwelling older adults (mean age = 76 years) found that 50% endorsed worsening physical health and cognitive functioning as simply an expected part of aging, and those endorsing these lower health expectations are similarly less likely to view seeking healthcare as important for these conditions.

While one may assume that significant, arduous behavioral changes or drastic measures would be necessary to extend overall life expectancy in older adulthood, the reality is that incremental or cumulative gradual changes can impact both healthspan and lifespan, even when implemented at advanced ages. For example, those who quit smoking tobacco products at or even over the age of 65 may still potentially increase their lifespan by approximately 1.4-3.7 years (Taylor Jr, Hasselblad, Henley, Thun, & Sloan, 2002). Low-impact exercise paired with socialization done daily has been tied to enhanced slow-wave sleep and subsequent memory functioning (Naylor et al., 2000). And, importantly, exercise habits (Kichline & Cushing, 2019), smoking (Ditre, Brandon, Zale, & Meagher, 2011), alcohol misuse (Aamodt, Stovner, Hagen, Bråthen, & Zwart, 2006), and pain-related activity avoidance and fear of injury (Zale & Ditre, 2015) are all behaviors which impact the course and severity of pain disorders. Therefore,

finding the motivating factors for accumulating as many regular, healthy, preventative habits as possible would logically provide many different pathways for preventing poor health outcomes.

If, as discussed above, the supportive nature and quality of an intimate partnership can influence engagement in health behaviors--the same preventative behaviors which influence the course of bodily pain and physical health--then the impact of intimate partner relationships on pain severity may well be found through their influence on health behaviors. Given the importance of intimate partner relationships as a form of social support and the influence of relationships on pain outcomes, an individual's intimate relationship should be explored as an effective motivator and a potential pathway for intervention in establishing positive health behaviors and pain management. In addition, it may be the case that changes in relationship status impact these associations and should be considered when examining these relationships.

The Moderating Effect of Relationship Status

Given that older adulthood can be a time of change or upheaval in general, the addition of a change or loss in partnership status might pose a significant and unanticipated source of stress. A change in marital status through death or divorce has been indicated as a risk factor for poor cardiovascular health in women (Zhang & Hayward, 2006), as well as limited mobility (Hughes & Waite, 2009), even when individuals become re-partnered later in life. A 2006 Canadian study also found that not only are older women at the highest risk for more severe chronic pain, but that being divorced, separated, or widowed were all risk factors for chronic pain in older women (Reitsma, Tranmer, Buchanan, & Van Den Kerkhof, 2012). Particular health behaviors, such as physical activity and not smoking, are thought to be more sensitive to relationship status for men, wherein married men are more physically active and smoke less than their widowed or divorced

counterparts (Schone & Weinick, 1998). A greater understanding of how, under what circumstances, and for whom the impact of intimate partner relationships might influence health behaviors and pain outcomes could be beneficial for assessing individual risk and subsequent intervention. The relationship characteristics that may predict increased pain severity in older adults could be utilized to not only better patient's current health status, but to tailor resources or find opportunities for change and motivation. The interconnectedness of physical health, mental wellbeing, and interpersonal relationships would suggest that a wide array of both patients and healthcare providers would benefit from a more in-depth understanding of how the relationships between these constructs function, with an eye towards improving overall health and wellbeing. Based on this information, it may be that relationship changes impact the extent to which health behaviors mediate the relationship between relationship quality and pain.

Exploring the Potential Role of Gender

In addition to the indirect effects of physical health on relationship quality and pain illustrated in Figure 1, this study will seek to explore the possible impact of gender on the proposed model. The specific role of gender and traditional gender roles on individual health outcomes remains somewhat muddled in current empirical research, in part perhaps due to the manner in which gender and relationship status often intersect. Among older adults in the United States, more men than women were married as of 2017 (70% compared to 46%), with there being vastly more widows than widowers (8.9 million compared to 2.5 million), and only 15% of older adults identifying as divorced or separated (US Department of Health and Human Services, 2017). While non-married individuals in the United States have generally higher mortality rates than married individuals (Verbrugge, 1979), greater within-group complexity emerges upon closer examination. The within-group diversity is an important factor in understanding the role

relationships, and more specifically marriage, might play on health and wellbeing. Without accounting for the possible differences to be found among different demographic groups who may all fall under the same umbrella of "married", research outcomes may fail to yield results which could realistically generalize to the larger population.

The benefits of marriage, including increased health behaviors, has been shown in some contexts to apply primarily to heterosexually partnered men, without similar benefits being conferred on married peer women (Brown & McCreedy, 1986). This is a somewhat counterintuitive dynamic, given that women have been shown in some instances to individually perform more proactive health behaviors than men (Brown & McCreedy, 1986; Deeks, Lombard, Michelmore, & Teede, 2009). However, to further complicate the picture, women in the United States also generally endorse more negative health outcomes—e.g. chronic pain (Munce & Stewart, 2007), acute injuries (Verbrugge, 1979), depression (Kessler, 2003; Munce & Stewart, 2007)—than their male peers, while men appear paradoxically more likely to have a shorter life span overall (Nakamura & Miyao, 2008). One explanation for these trends may be related to traditional gender roles and the overall likelihood of women in heterosexually partnered marriage to be in a proactive caregiver role, without necessarily receiving reciprocal behavioral influence or attention to health status from their spouse. However, this explanation would not provide much clarity into the individual variations found within relationships and which relationship qualities may bolster health and wellbeing over others. It would therefore be worth exploring if gender differences influence the proposed model, resulting in different pain outcomes for women as compared to men.

Rationale for the Current Study

To understand this interplay between relationship quality, relationship status, health behaviors, and pain outcomes, the present study seeks to examine a moderated mediation model (see Figure 1). Specifically, the study aims to assess if there is an indirect effect of preventative health behaviors on the relation between relationship quality and pain severity, as well as whether the model is moderated by change in relationship status. The proposed model is anticipated to account for the possible simultaneous influences of key theoretical models detailed above. Namely, while intimate partner relationships can directly influence pain outcomes (*main effect model*), those individuals who are in relationships may receive more support or feel increased motivation in maintaining their health, which may reduce pain long-term (*buffering effect model* and *operant model*). The current study seeks to examine both relationship quality and relationship status, as the available evidence seems to support that being partnered (and partnership quality in particular) has an impact on pain outcomes through conferring support and the interpersonal process of emotional intimacy (*intimacy model*). While previous studies have examined these pathways individually, this study aims to account for these constructs within the same model and among a population most likely impacted by these issues.

This study will use data from waves 1-3 of the National Social Life, Health, and Aging Project (NSHAP) to evaluate whether the relationship between intimate partner relationships and subsequent physical pain severity is mediated by health behaviors over a 10-year span (see Figure 1). Based on the theoretical and empirical evidence, it is hypothesized that Time 1 relationship quality will be negatively associated with Time 3 pain severity. In addition, it is hypothesized that health behaviors at Time 2 will mediate the negative relationship between relationship quality and pain severity, such that those with higher relationship quality will engage

in healthier preventative behaviors and thus report less severe pain. Finally, it is hypothesized that relationship status (e.g., married, widowed, divorced) will moderate the effect relationship quality on health behaviors, which in turn will impact the extent to which health behaviors mediate the relationship between relationship quality and pain severity. Specifically, it is hypothesized that the relationship between relationship quality and health behaviors will be strongest for individuals who remain married between and first and second waves (compared to those who become separated, divorced, or widowed). Separate from these a priori hypotheses, this study will also explore the potential influence of gender of respondents, as well as gender of identified partners, on the proposed model.

Chapter 2

Method

Participants

Data for this study was compiled from the National Social Life, Health, and Aging Project (NSHAP), which is published and made accessible through the Inter-university Consortium for Political and Social Research (ICPSR). Data collection began in 2005 and is currently collected at five-year intervals. The current project analyzed data from wave 1 (2005-2006), wave 2 (2010-2011), and wave 3 (2015-2016). The original purpose of NSHAP was to longitudinally examine a variety of health and social factors among older adults in the United States. Data collection took place through a combination of in-person interviews, physical examinations, mail-in surveys, and biological specimen collection. The first wave included data from n = 3,005 adults born between 1920-1947; wave 2 included n = 3,400 participants (including those who declined participation in wave 1 but were approached for wave 2); wave 3 yielded n = 4,777 respondents, including all surviving participants and an additional cohort of baby boom participants (born 1948-1965). Based on the methodologies of a previous study utilizing the NSHAP data (Anderson, 2018), it was anticipated that excluding all participants who did not supply data at all three time points will yield an approximate sample of n ≈ 2,400. The sample for this study included those individuals who identified themselves as "married" at wave 1 (n = 1801). Participants were excluded if they were not married at wave 1, or if their marital status changed between waves 2 and 3. However, participants remained in the sample if their marital status changed between waves 1 and 2 in order to test the moderating effect of relationship status on the model.

Procedures

Recruitment for NSHAP utilized a national area probability sample based on household screenings conducted for a previous 2004 Health and Retirement Study. In-person interviews and biomeasure data collection lasting about 120 minutes total were conducted by field interviewers in the participant's homes. The additional paper-and-pencil questionnaires were left with participants at the end of their in-person interviews, and they were able to return completed surveys to the researchers via USPS in the pre-paid envelope provided. Proxy interviews were conducted in waves 2 and 3 for individuals who had died or were incapacitated between time points.

Measures

Demographics

Sample demographics were assessed using self-report responses for questions identifying participant gender (male or female), age (in years), race/ethnicity (White, Black, Hispanic/Latino, or Asian/Pacific Islander), and sexual orientation (heterosexual/straight, Gay/Lesbian, Bisexual). Additional socioeconomic variables include highest level of education attained (none, high school, associate's degree, bachelor's degree, master's degree, law/MD/PhD), and self-reported household income in the past year (0-$24,999, $25,000-$49,000, $50,000-$99,999, $100k-or higher). Participants identified their relationship status as married, partner, separated, divorced, widowed, or never married at each time point.

Relationship Status and Quality

Relationship status (e.g., married, divorced, never married, etc.) is assessed through a single variable detailed in the "Demographics" section above. It was proposed that relationship quality in this study be measured in through combining data from ten self-report questions into a

cumulative index. These included rating frequency of relationship behaviors, such as how often do they sleep in the same bed, how often do they rely on their partner, how often does their partner make too many demands, how often do they criticize, and how often do they open up to their partner about worries. These questions are each rated on Likert-type scales ranging from "never" through "often" or "all the time". Additionally, participants were asked to rate how "physically pleasurable" and "emotionally satisfying" the relationship in question is, also on a Likert-type scale ranging from "not at all" through "extremely". Furthermore, participants reported if they and their partner spent their free time with each other (i.e., together/some together, different or some different, or separate). Finally, participants were asked to rate how happy their current relationship is, rating from 1-7 ranging from "very unhappy" through "very happy". Variables assessing negative constructs (e.g., being too demanding, critical) were reverse coded so that higher scores indicate more positive qualities. Therefore, a cumulative relationship quality score could range from 0-33, with higher scores indicating more positive overall relationship quality.

Health Behaviors

Participants self-rated their recent level of physical activity at each time point, with possible response options: never, <1 per month, 1-3 times per month, 1-2 times per week, 3-4 times per week, or 5+ times per week. Participants' alcohol consumption was measured by the number of days they endorsed consuming four or more alcoholic beverages over the preceding three months. Similarly, participants reported how many "cigarettes, cigars or pipes" they smoked per day on average. Therefore, in assessing physical activity, alcohol, and tobacco consumption, higher scores on each of these variables indicate more of the behavior. However, it should be noted that, for alcohol and tobacco, higher scores would indicate lower amounts of

healthy behaviors; higher physical activity scores would indicate higher rates of healthy behavior. In addition to these behaviors, engagement with healthcare services can be ascertained during waves 1 and 2, as participants were asked how long since their last visit to the doctor (never, ≤6 months, 6 months-1 year, 1-3 years, 3+ years).

To facilitate data analysis, each of these health behaviors will be analyzed independently. Therefore, after variable recoding and transformation, there will be four health behavior treated as continuous variables: 1) self-reported frequency of physical activity 2) self-reported frequency of daily alcohol consumption of 4 or more drinks 3) self-reported number of smoked tobacco products (cigars, cigarettes, pipes) daily, and 4) frequency of doctors' visits.

Pain

Participants were assessed at waves 2 and 3 for the presence of pain through the question "In the past four weeks, have you had any pain?", and were subsequently asked to rate the level of pain (none, slight, mild, moderate, severe, extreme, most intense pain imaginable).

Data Analytic Plan

Data for analysis will be pulled from the NACDA-ICPSR Colectica portal, an online portal for combining multiple data collection waves into one comprehensive dataset for analysis. This will allow for the creation of a balanced panel dataset, for analysis of only those participants who were interviewed and provided data for all three waves. To test the presented hypotheses, OLS regression will be conducted using IBM SPSS Statistics 25 with the added PROCESS macro.

The PROCESS computation tool allows for path analysis-based models in SPSS, estimating OLS model coefficients and generating direct and indirect effects. Relationship status,

as a categorical variable, will by dummy coded in order to be included in the model. Hypothesis 1 will be tested using OLS regression to determine if relationship quality is negatively associated with pain severity. Four health behaviors, coded as continuous variables, will be examined independently to evaluate their influence on the overall model: 1) physical activity 2) frequency of daily alcohol consumption of four or more drinks 3) daily number of smoked tobacco products, and 4) recency of preventative healthcare service utilization. Using model 7 in PROCESS (Hayes, 2017), the significance of the effect of relationship quality on health behaviors, and then the significance and variance of the effect of relationship quality on pain severity will be tested both with and without the indirect effect of health behaviors through a series of linear regression models. Hypothesis 2 theorizes that the effect of relationship quality on pain severity will be nonsignificant in the presence of health behaviors in the model, supporting a mediation effect. Each health behavior—physical activity, alcohol use, tobacco use, and health care utilization—will be individually tested as a mediator in the proposed model. The individual testing of each behavior will allow for closer examination of the variety of health behaviors assessed, in order to better understand how and which of the different types of behaviors may impact the overall model. Finally, to examine hypothesis 3, the model will test the effect of relationship status on pain severity through health behaviors as moderated by the different relationship status, such that health behaviors will mediate the relation between relationship quality and pain severity, but the relation will be strongest for married partners.

Chapter 3

Results

Descriptive Statistics

The final sample (n=1437) included 41.8% respondents who identified as female and 58.2% who identified as male, with a mean age of 67.14 years (SD = 7.08). The majority (n = 1082; 75.3%) of participants identified their race/ethnicity as white. In addition, the majority of participants (n = 851, 59.3%) had some form of education beyond high school, including vocational certificates, associate's, or bachelor's degrees. While the original data collection did begin to include variables assessing sexual orientation during wave 3 in 2015-16, all individuals who met the inclusion criteria for the present study identified as heterosexual (see Table 1 for additional details).

The original measure of relationship satisfaction included a total of nine variables assessing both attitudes (e.g., "*how happy is this relationship?*") as well as reported behaviors (e.g., "*how often do you sleep in the same bed [as partner]?*"). However, further analysis found poor internal consistency for all nine relationship satisfaction variables when computed together as one index of satisfaction (α = .502). Therefore, further analyses were conducted to determine if a reliable measure of the construct could be identified. Indeed, a brief measure of relationship satisfaction with stronger internal consistency was identified and utilized in the analyses. The new scale consisted of 3 questions: "*how happy is this relationship?*", "*how physically pleasurable do you find your relationship with [partner]?*", and "*how emotionally satisfying is your relationship with [partner]?*" (α = .714).

One-way ANOVAs compared the mean pain severity scores between relationship status groups (*married, living with a partner, separated, divorced, widowed*, or *never married*) at time

points two and three, respectively. Results revealed a statistically significant difference only between relationship status groups at Time 3, $F(5, 1190) = 2.397$, $p = .036$. However, Tukey's post-hoc analyses did not reveal any statistically significant between-group differences on pain severity scores. Furthermore, bivariate correlations between variables of interest found that, of relationship satisfaction as assessed at each time point (see Table 3), only Time 3 relationship satisfaction significantly correlated with reported pain severity at any time point. While pain severity at Time 2 was positively correlated with relationship satisfaction at Time 3, $r(827) = .085$, $p = .02$, pain severity at Time 3 was negatively correlated with relationship satisfaction at Time 3, $r(842) = -.095$, $p = .01$.

Hypothesis 1

Hypothesis 1 posited that Time 1 relationship quality would be negatively associated with Time 3 pain severity. Bivariate correlations found a significant cross-sectional effect such that Time 3 relationship satisfaction had a statistically significant negative relationship with Time 3 pain severity, $r(842) = -.095$, $p = .006$, while the correlation between Time 1 relationship satisfaction and Time 3 pain severity only trended towards significance, $r(1193) = -.05$, $p = .08$. OLS regression was utilized to further evaluate the relationship between Time 1 relationship satisfaction and Time 3 pain severity. Regression analysis also found Time 1 Relationship Satisfaction to trend towards predicting Time 3 Pain Severity, $R^2 = .003$, $F(1, 1193) = 3.01$, $p = .08$.

Similar OLS regressions assessed the relationship between relationship satisfaction and pain severity at all other available time points (relationships satisfaction = Times 1, 2, and 3; Pain Severity = Times 2 and 3; see Tables 6 and 7). Regression analyses did reveal a significant

relationship between Time 3 relationship satisfaction and Time 3 pain severity, $R^2 = .01$, $F(1,$ 842) = 7.67, $p = .006$, such that greater satisfaction was tied to lower pain severity. However, relationship satisfaction at Time 1 was not found to significantly predict Pain Severity at Time 2. $R^2 = .00$, $F(1, 1194) = .005$, $p = .95$. Similarly, Relationship satisfaction at Time 2 did not significantly predict either Time 2 pain severity, $R^2 = .00$, $F(1, 1018) = .099$, $p = .75$, or Time 3 pain severity, $R^2 = .00$, $F(1, 1002) = .166$, $p = .68$. Overall, the analyses provided little support for hypothesis 1 as proposed.

Hypothesis 2

Hypothesis 2 predicted that health behaviors at Time 2 would mediate the negative relationship between relationship quality and pain severity, such that the relationship between Time 1 relationship quality and Time 3 pain severity is explained by Time 2 health behaviors. The health behaviors assessed as potential mediators at Time 2 included 1) frequency of physical activity in the past 12 months, 2) tobacco consumption, 3) alcohol consumption, and 4) recency of health care utilization i.e., doctor's visits (see Table 2 for additional details). As discussed in the section above, because a trend effect established between Time 1 relationship satisfaction and Time 3 pain severity, further analysis to examine potential mediation effects were carried out as well. Preliminary analyses of these four behaviors revealed that only physical activity was found to significantly correlate with Time 1 relationship satisfaction ($r(1431) = .119$, $p = <.001$).

To test for any mediation effects, linear regression was first utilized to test the relationship between Time 1 relationship satisfaction and each of the potential mediators. Tobacco use ($R^2 = .000$, $F(1, 1432) = .034$, $p = .854$), alcohol use ($R^2 = .000$, $F(1, 819) = .003$, $p = .95$), and doctor's visits ($R^2 = .000$, $F(1, 1430) = .103$, $p = .748$) were not significantly

predicted by Time 1 relationship satisfaction. However, Time 1 relationship satisfaction did have a significant effect on self-rated frequency of physical activity at Time 2, $R^2 = .003$, $F(1, 1431) = 4.12$, $p = .04$, with increased relationship satisfaction predicting higher levels of physical activity ($\beta = .054$, $p = .04$). To assess Time 2 physical activity as a mediator between Time 1 relationship satisfaction and Time 3 pain severity, we utilized simple linear regression testing the IV (relationship satisfaction) and mediator (physical activity) as predictors of the DV (pain severity) and conducted a Sobel test (Preacher & Hayes, 2004) of the resulting coefficients utilizing the online calculation tool by Preacher and Leonardelli (2001). In this analysis (see figure 2), the path coefficient between relationship satisfaction and physical activity ($a = .037$; $s_a = .018$), and of physical activity and pain severity ($b = -.011$; $s_b = .025$) yielded a Sobel test statistic of -0.43 ($p = 0.67$), which suggests that there is no evidence of mediation.

Overall analyses for hypothesis two found that, while there is a general trend effect in the association between time 1 relationship satisfaction and time 3 pain severity, that relationship does not appear to be significantly mediated by any of the proposed time 2 health behaviors. The evidence therefore does not support hypothesis 2.

Hypothesis 3

Hypothesis 3 posited that a moderated mediation effect would occur such that Time 2 relationship status (e.g., married, widowed, divorced) would moderate the effect of Time 1 relationship quality on Time 2 health behaviors, impacting the extent to which Time 2 health behaviors then explained the relationship between Time 1 relationship quality and Time 3 pain severity. The PROCESS macro model 7 for SPSS was utilized to test the hypothesized moderated mediation model.

Tobacco Use: Time 2 relationship status was not found to moderate the effect of Time 1 relationship satisfaction and Time 3 pain severity (Unstandardized interaction B = .08, Bse = .14, t = .55, p = .58) and Time 2 tobacco use was not significantly associated with level of pain, B = -.00, Bse = .01, t = -.09, p = .93. An index of moderated mediation = -.00 (95% CI = -.00; .01) did not support the overall model.

Doctor's Visits: Time 2 relationship status was not found to moderate the effect of Time 1 relationship satisfaction and Time 3 pain severity (Unstandardized interaction B = -.01, Bse = .04, t = -.13, p = .89) and Time 2 doctor's visits were not significantly associated with level of pain, B = .00, Bse = .03, t = .04, p = .97. An index of moderated mediation = -.00 (95% CI = -.003; .002) did not support the overall model.

Physical Activity: Time 2 relationship status was not found to moderate the effect of Time 1 relationship satisfaction and Time 3 pain severity (Unstandardized interaction B = .00, Bse = .05, t = .07, p = .94) and Time 2 physical activity was not significantly associated with level of pain, B = -.01, Bse = .02, t = -.46, p = .64. An index of moderated mediation = -.00 (95% CI = -.003; .003) did not support the overall model.

Alcohol Use: Time 2 relationship status was not found to moderate the effect of Time 1 relationship satisfaction and Time 3 pain severity (Unstandardized interaction B = -.11, Bse = .42, t = -.26, p = .80) and Time 2 alcohol use was not significantly associated with level of pain, B = -.01, Bse = .01, t = -1.59, p = .11. An index of moderated mediation = .00 (95% CI = -.001; .007) did not support the overall model.

Overall, analyses did not yield sufficient evidence to support the model as proposed and does not

support rejecting the null hypothesis. Additional analyses of constructs of interest were

conducted for clarity and future directions.

Additional Analyses

<u>Impact of Gender</u>

Independent Samples T-tests were used to compare participants who identified as male

with participants who identified as female in the health behaviors of interest at Time 2 (tobacco

use, physical activity, doctor's visits, and alcohol consumption; see Table 8). While a significant

difference for doctor's visits and tobacco use did not arise (see Table 2 for additional details),

there was a statistically significant difference between men and women in both physical activity,

(t(1433) = 3.36, p = .02, d = .180), as well as alcohol consumption (t(820) = 2.60, p < .001, d =

.186). While regression analysis of Hypothesis 1 in the total sample did not yield a significant

relationship between relationship satisfaction and pain severity, further analysis dividing the

sample by gender uncovered differences between the groups (see Tables 4 and 5). For

participants who identified as male, the relationship remained non-significant (R^2 = .00, F(1,

707) = .43, p = .51). However, the same analysis of participants who identified as female found

that Time 1 relationship satisfaction significantly predicted Time 3 pain severity, R^2 = .01, F(1,

484) = 3.95, p = .047. These results suggest that for female participants, increased relationship

satisfaction at Time 1 leads to decreased pain severity at Time 3 (β = -.09, p < .05). Next, the

aforementioned mediators proposed in Hypothesis 2 (tobacco use, alcohol use, physical activity,

and doctor's visits) were similarly assessed in each gender group. However, these mediation

relationships all remained non-significant even when assessed separately by gender. Further

analysis of the full moderated mediation model for each of the four moderators (tobacco use,

alcohol use, physical activity, and doctor's visits) in each gender group (i.e., males only and females only) did not support moderated mediation, and did not yield statistically significant results.

The moderated mediation proposed in hypothesis 3 was then re-evaluated using gender as the proposed moderator, in place of relationship status, to test whether the effect of Time 2 health behaviors on the relationship between Time 1 relationship satisfaction and Time 3 pain severity would be moderated by gender. However, all subsequent analyses yielded non-significant results, finding that gender did not act as a moderator for the relationship between Time 1 relationship satisfaction and Time 3 pain severity in the presence of any of the four mediators, and indices of moderated mediation did not support these models.

Because participants were also asked to self-rate their level of loneliness, this construct was added to the analyses as it was thought that it could potentially influence relationship satisfaction. Multiple linear regressions of both Time 2 and 3 relationship satisfaction and loneliness (see Table 9) found that they collectively predicted Time 3 pain severity across the entire sample, $F(6, 492) = 3.121$, $p = .005$, $R^2 = .037$. Of these variables, only Time 3 loneliness added significantly to the prediction, $p = .002$. However, when examining this relationship by gender, the model fit only remained in place for female-identified participants, $F(6, 164) = 2.73$, $p = .02$, $R^2 = .091$, with only Time 3 loneliness adding significantly to the prediction, $p = .002$. When looking at participants who identified as male alone, all effects were non-significant.

Chapter 4

Discussion

The purpose of this study was to examine the relationship between intimate partner relationship satisfaction, health behaviors, and self-rated pain severity among older adults in the United States. The demographics of the US are expected to continue shifting over the next decade, as the number of adults begin to overtake the number of children in the general population (Vespa, 2018). It is therefore imperative that society establishes a culture of healthy aging, which begins by clarifying what constitutes health in the latter stages of one's life. To do this, a thorough understanding of not only the physiology and psychology of aging and health, but of external factors such as social support and interpersonal relationships will be key research, clinical interventions, and even broader policy concerns.

One such indicator of health that effects a large portion of the population is intrusive physical pain, which impacts more than half of the older adult population (Patel, Guralnik, Dansie, & Turk, 2013). As previously discussed, certain interventions for pain disorders target intimate partnerships or interpersonal dyad/triad relationships, as partner relationships are thought to provide social support, shape behaviors, and even influence individual beliefs about pain. However, the precise mechanisms through which relationships influence health outcomes such as pain remains unclear. While the impact of intimate partner relationships on multiple different health domains has been examined in the past focused on factors ranging from diabetes to smoking cessation to cardiovascular health, the current study sought to investigate the extent to which relationship satisfaction, in addition to relationship status, both uniquely contribute to perceived pain outcomes over time. The aim of this study was to test a proposed model of moderated mediation on a longitudinal data sample from the National Social Life, Health, and

Aging Project. This model assessed if relationship satisfaction among older adults at Time 1 could effectively predict physical pain severity ten years later at Time 3 as well as the indirect effects of several health behaviors (e.g., doctor's visits, physical activity, and tobacco and alcohol consumption) as mediators, at different levels of relationship change (e.g., married, divorced) as moderators.

This model was examined utilizing data across three specific time points collected between 2005 and 2016. The first study aim was to assess whether relationship satisfaction among older adults at Time 1 was negatively associated with self-rated physical pain severity at Time 3. Regression analyses for hypothesis 1 found a trend effect in the strength of the relationship between relationship satisfaction at Time 1 and pain severity at Time 3, such that individuals who report higher initial relationship satisfaction report lower levels of physical pain. However, the significance of these analyses suggests that relationship satisfaction alone may not serve as a reliable predictor of later pain severity. On the one hand, finding a trend effect over a period of 10 years may indicate that relationship satisfaction indeed plays a strong role in later individual ratings of pain severity. On the other hand, a trend effect emerging across such a large sample capturing over ten years' worth of data may in fact indicate that other factors influence this relationship which were not captured by the present model altogether.

The second aim of this study was to examine if engagement in health behaviors mediated the relationship between Time 1 relationship satisfaction and Time 3 pain severity. Because a definitive relationship could not be established between these two constructs when testing hypothesis 1, analyses for hypothesis 2 were naturally somewhat limited, and further exploratory analyses did not support any form of mediation effect. While it is difficult to draw conclusions from these non-significant effects, perhaps the specific behaviors included in the model, or the

manner in which they were assessed during data collection, were ineffective measures of indirect effects. Further investigation into the most reliable and valid measures of these constructs would be useful going forward.

The third aim of this study was to assess the full model of moderated mediation. In this model, Time 2 relationship status was proposed to moderate the effect of Time 1 satisfaction on Time 2 behaviors and, subsequently, the relationship between Time 1 relationship satisfaction and Time 3 pain severity. However, this model could not be initially supported based on the results of the first two hypotheses. Additional analyses confirmed this, as moderated mediation was not supported across any of the proposed variables.

Taken together, results of this study did not support moderated mediation as a definitive model for characterizing relationship quality, relationship status, health behaviors, and self-rated pain severity in older adults as a whole. However, additional analyses did find some differences when dividing groups by gender. When analyzing data only from individuals who identified as female, hypothesis 1 was in fact supported in that Time 1 relationship satisfaction did significantly predict Time 3 pain severity ratings. While mediation and moderation were not established, even when dividing groups by gender, significant differences in the amount of alcohol consumption and physical activity alone did emerge. These results suggest that a full population model may not be the most effective way of examining these constructs in this population and that different demographic factors including, but not limited to, gender identity may play an important role. Perhaps in part because of the of the timing of data collection (i.e., prior to the passage of Obergefell v. Hodges in the United States in 2015), this dataset did not include a large enough sample of individuals who identified as being in same-sex marital relationships to engage in separate data analysis.

However, given the influence gender appears to play, this would be an important dimension for future research to include. Prior research has shown that women tend to take on a greater proportion of caregiving duties in many cultures, and also suffer greater negative consequences of caregiver burden (Morgan, Williams, Trussardi, & Gott, 2016). While not covered by the scope of the present study, there is also some evidence to suggest that women tend to take on caregiver roles at younger ages as compared to men, which increases the deleterious effects of this role, and may be more likely to rely on multiple individuals for their care (Barusch & Spaid, 1989). It therefore stands to reason that an intersection of gendered and generational influences on aging and caregiving could increase the significance of relationship quality for individuals who identify as women, rather than men. These gendered differences in both caring and being cared for throughout the lifespan further support examining this population with an eye towards complexity and diversity, as aging and health are likely to link inextricably with other dimensions of individual identity.

Additionally, the emergence of loneliness in this study as a significant construct in predicting pain severity in the current study supports the need to account for potentially greater complexity in studying pain in older adulthood. Other researchers have identified loneliness as having a particular, seemingly bidirectional (Loeffler & Steptoe, 2021) relationship with physical pain. Therefore, the presence or absence of satisfying or pleasurable relationship characteristics, as was measured in the current study's original model, may not negate the influence of self-rated loneliness. In fact, the significance of perceived loneliness from within a relationship, rather than loneliness as a result of literal isolation or disconnection, may be a useful area of further study. These additional questions again point to the necessity of understanding what aspects of intimate

relationships influence health outcomes, above and beyond the presence or absence of a partner alone.

Furthermore, as previously stated this study not only captured a snapshot of data from a group of individuals in one specific phase of their lives, but of a segment of the population at one point in time. Meaning that the population of "older adults" is a near constantly evolving cohort that contains new members always representing different generational and cultural influences. Previous researchers have suggested that addressing late-in-life changes necessitates taking a *life course* theoretical approach, which encompasses both individual roles as well as the multiple transitions and trajectories of the individual and those around them (Dentinger & Clarkberg, 2002). If we are to examine an accumulation of experiences and transitions experienced by all genders, inevitably these are going to be highly varied depending on the historical and cultural contexts in which they are occurring. Dentiger and Clarkburg (2002) discuss the role transition of older adults as they approach retirement and shift to balance professional and caregiver roles. However, the effects of gender on individual's experiences in the workforce (and, therefore, of retirement) is undoubtedly going to differ as the demographics of the American workplace have changed. The consistent differences for male-identified participants and female-identified participants, while not supportive of the hypothesized model, suggest that both gender identity and gender roles are an important dimension to examine moving forward.

Another conclusion that could be drawn from these results is that the larger umbrella of "older adulthood" may be better conceptualized as multiple smaller stages. If conceptualized in this manner, the impact of positive or negative life changes, health events, and relationships may vary based on when in the older adulthood period they are occurring. While a clear, statistically significant longitudinal relationship did not necessarily emerge in the current study, a significant

cross-sectional effect found that Time 3 relationship satisfaction did negatively correlate with Time 3 Pain Severity. This further supports the idea that accounting for not just the age of the individual but also their unique stage of life may be necessary to clearly examine how relationship satisfaction may influence physical health, specifically pain severity.

Furthermore, because a clear mediator did not emerge between Time 1 relationship satisfaction and Time 3 pain severity, we were not able to support the proposed moderator of relationship status. However, this study also did not include an assessment of overall relationship length, nor did it assess other forms of close interpersonal relationships. With this study, the question remains if being married or partnered as a concept alone plays some significant role in older adult's overall health or if there are more complex and varied individual and environmental factors which have yet to be accounted for.

Limitations and Future Directions

This study, while a first step in clarifying the important interplay between intimate partner relationships and physical wellbeing over time in older adults, did possess limitations which should be addressed in future research. First, overall relationship length was not assessed and may impact the influence of the key constructs of interest even at time point 1. Assessing relationship length along with constructs such as satisfaction could be an important dimension to understanding the influence of intimate partners upon each other. It would stand to reason that couples who have been partnered for an extended period of time will have had increased and varied opportunities to influence each other's behaviors more so than those who have not. Including relationship length in future models may also help account for any health benefits of being partnered whcih participants may have accumulated over time, prior to entering old age.

Second, because this study utilized secondary data analysis, analyses were limited to the

variables collected by the primary investigators of the original study. Particularly when

examining potential mediators, it may well be that significant mediation does exist if it were to

be assessed utilizing different variables and measures of health behaviors. For example, future

research may focus on adherence to new health behaviors (e.g., quitting smoking, increasing

exercise, starting a diet plan, adopting sleep hygiene) rather than maintenance of existing

behaviors. Within the older adult population, future studies may also want to specifically focus

on preventative healthcare behaviors, particularly factors with increased relevance in a post-

COVID19 pandemic culture such as vaccine willingness and adherence. Finally, while this study

did utilize longitudinal analysis, older adults as a demographic group are not stagnant in nature;

rather it is a demographic group through which new cohorts of individuals are moving in and out

at all times. While this study captured one specific cohort of individuals who were older adults

between the years 2005-2016, generational and cultural factors were not able to be sufficiently

accounted for and should be explored by future researchers.

Future Directions and Conclusions

Still, it is clear that to create a culture of healthy aging, adopting a broad perspective

which accounts for biological, psychological, and interpersonal/social factors would be most

beneficial. Future research in this area would benefit from focusing on the differences in various

gender groups, including individuals in same-gendered intimate partnerships, as well as

individuals who are trans-identified or outside of the gender binary. Additionally, longitudinal

research across multiple cohorts, representing different generations of older adults would be

beneficial to understand what effects can be expected from older adults in general, as opposed to

specific generations as they reach older adulthood. Furthermore, additional qualitative research

to assess and design measures and variables which best represent constructs such as satisfaction, pain, or health may be useful going forward, to ensure reliability and validity throughout older adulthood to account for factors such as potential changes to cognition and memory.

However, clinicians across the healthcare spectrum would be wise to consider the intersecting aspects of identity present in the individual patients before them. For older adults presenting in a psychotherapeutic context, the interplay of physical health and psychological functioning cannot be ignored, particularly if there is any shifting in intimate relationship roles to include increased caregiving or receiving. Additionally, partner's perceptions of their partnerships may differ from each other, and gaining a thorough psychosocial history as well as a clear understanding of current functioning can be key. Finally, clinicians should be wary about adopting a shallow view of an ultimately complex social group such as older adults, particularly when we consider the lack of clarity around how these long-standing beliefs around the benefits of partnership and marriage may or may not play out for those who do not identify as heterosexual and/or cisgender.

In conclusion, older adults face specific social, medical, and psychological challenges that should be the focus of those in position to influence policy and research, as well as those who oversee direct care and intervention. It would appear that clinicians adopting a narrow belief that being married or partnered as an older adult would mean these challenges are absent or insignificant would be an overly simplistic way of viewing this population. Rather, viewing aging as a dynamic and diverse stage of life with many phases and variations within it could allow stakeholders to attend to the constellation of both deleterious and protective factors that are likely to arise with the older adults in our population.

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Appendix. Tables & figures

Table 1. Demographics

		n	Percent of Total Sample
Total Sample	n=1437		
Age range T1	57-85 years		
Gender	Female	600	41.8%
	Male	837	58.2
Education	<HS	241	16.8%
	HS equiv	345	24%
	Voc cert/some college/assoc	465	32.4%
	Bachelors or more	386	26.9%
Race/Ethnicity	White	1082	75.3%
	Black	164	11.4%
	Non-black hispanic	157	10.9%
	No response/Missing	5	
	Other	29	2.0%
Sexual Orientation T3			
	Heterosexual/straight	1084	75.4%
	Gay or Lesbian	10	.7%
	Bisexual	10	.7%
	No response/no data	333	23.2%

Table 1 continued

		n	Percent of Total Sample
Marital Status T2			
	Married	1250	87.0%
	Living w/ partner	9	.6%
	Separated	12	.8%
	Divorced	13	.9%
	Widowed	152	10.6%
Total Number of Marriages	N/A or refused	988	68.8%
	2	331	23.0%
	3	83	5.8%
	4	25	1.7%
	5	9	.6%
	6	1	.1%
Ever cohabit with someone else?	Refused	3	.2%
	No	1345	93.6%
	yes	89	6.2%

Table 2. Variables of Interest

Variable		Mean(SD)
Relationship Satisfaction (1-15 total possible)		
	Time 1	12.08(2.73)
	Time 2	12.17(2.79)
	Time 3	11.99(2.65)
Pain Severity (0-6 total possible)		
	Time 1	*Data on pain severity not assessed at time 1*
	Time 2	1.97(1.59)
	Time 3	1.96(1.59)
Current # of cigarettes smoked per day (T2)		1.47(5.11)
Current days with 4+ drinks (T2)		1.99(9.84)
Frequency of rigorous physical activity (T2)		2.75(1.87)
Number of doctor's visits (T2)		3.03(1.52)

Note: Response options for frequency of rigorous physical activity in the past 12 months included 0 = Never, 1 = less that 1x/month, 2 = 1-3x/month, 3 = 1-2x/week, 4 = 3-4x/week, 5 = 5 or more x/week.

Table 3. Bivariate Correlations of Relationship Satisfaction and Pain severity across available time points

		Rel. Satis T1	Rel. Satis T2	Rel Satis T3	Pain T2	Pain T3
	Pearson Correlation	1	**.507****	-0.014	-0.002	-0.05
	Sig. (2tailed)		<.001	0.66	0.945	0.083
Relationship Satisfaction T1	*N*	1435	1203	993	1196	1195
	Pearson Correlation	**.507****	1	-0.016	-0.01	0.013
	Sig. (2tailed)	<.001		0.653	0.753	0.683
Relationship Satisfaction T2	*N*	1203	1204	893	1020	1004
	Pearson Correlation	-0.014	-0.016	1	**.085***	**-.095****
	Sig. (2tailed)	0.66	0.653		0.015	0.006
Relationship Satisfaction T3		993	839	994	829	844

Table 4. Bivariate Correlation- **Male** Identified Participants Only

		Rel. Satis T1	Rel. Satis T2	Rel Satis T3	Pain T2	Pain T3
Relationship Satisfaction T1	*Pearson Correlation*	1	.446**	-.016	.000	-.025
	Sig. (2tailed)		<.001	.690	.992	.513
	N	836	742	591	693	709
Relationship Satisfaction T2	*Pearson Correlation*	.446**	1	.015	.009	-.003
	Sig. (2tailed)	<.001		.723	.819	.942
	N	742	743	530	627	630
Relationship Satisfaction T3	*Pearson Correlation*	-.016	.015	1	.076	-.043
	Sig. (2tailed)	.690	.723		.090	.426
		591	530	591	496	515

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Table 5. Bivariate Correlation- **Female** Identified Participants Only

		Rel. Satis T1	Rel. Satis T2	Rel Satis T3	Pain T2	Pain T3
Relationship Satisfaction T1	*Pearson Correlation*	1	.541**	.003	.021	-.090*
	Sig. (2tailed)		<.001	.951	.643	.047
	N	599	461	402	503	486
Relationship Satisfaction T2	*Pearson Correlation*	.541**	1	-.044	.005	.024
	Sig. (2tailed)	<.001		.445	.921	.649
	N	461	461	309	393	374
Relationship Satisfaction T3	*Pearson Correlation*	.003	-.044	1	.095	-.167**
	Sig. (2tailed)	.951	.445		.084	.002
		402	309	403	333	.792

Table 6. Time 2 Gender, Age, Relationship Status, Relationship Satisfaction, Pain level, Loneliness, Cigarette use, Doctor's Visits, Alcohol, Physical Activity

Variable	1	2	3	4	5	6	7	8	9	10
[1]Gender	1	-.03	.17**	-.20**	.06*	.04	.	.03	-.09**	-.09**
[2]Age	-.03	1	.21**	-.04	-.03	.03	.	.12**	-.04	-.11**
[3]Relationship Status	.	.21**	1	.01	-.07*	.18**	.	.3	-.02	-.05
[4]Relationship Satisfaction	-.20**	-.04	.01	1	-.01	-.33**	.	.00	-.00	.12**
[5]Pain Level	.06*	-.03	-.07*	-.01	1	.10**	.	.24**	-.03	-.04**
[6]Loneliness	.04	.03	.18**	-.33**	.10**	1	.	.03	.01	-.06**
[7]Tobacco	.	.	.	.	.	.	.	.	.	.
[8]Doctor's Visits	.03	.12**	.03	.00	.24**	.03	.	1	-.00	-.19**
[9]Alcohol	-.09**	-.04	-.02	-.00	-.03	.01	.	-.00	1	.03
[10]Physical Activity	-.09**	-.11**	-.05	.12*	-.14**	-.06*	.	-.19**	.03	1

Note: **Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level

Table 7. Time 3 Gender, Age, Marital Status, Relationship Satisfaction, Pain level, Loneliness, Cigarette Use, Alcohol, Physical Activity

Variable	1	2	3	4	5	6	7	8	9
[1]Gender	1	.04	.03	.04	-.02	-.02	.02	.02	.07**
[2]Age	.04	1	.16**	.01	-.02	-.02	-.16**	-.13**	-.21**
[3]Relationship Status	.03	.16**	1	-.12**	.09**	.23**	.07*	-.03	-.10**
[4]Relationship Satisfaction	.04	.01	-.12**	1	-.10**	-.35**	-.06	.01	.04
[5]Pain Level	-.02	-.02	.09**	-.10**	1	.19**	.04	.01	-.15**
[6]Loneliness	-.02	-.02	.23**	-.35**	1.9**	1	.08**	-.03	-.10**
[7]Tobacco	.02	-.16**	.07*	-.06	.04	.08**	1	.14**	.00
[8]Alcohol	.02	-.13**	-.03	.01	.01	-.03	.14**	1	.04
[9]Physical Activity	.07**	-.21**	.10**	.04	-.15**	-10**	.00	.04	1

Note: **Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level

Table 8. Independent Samples ttest of Health Behaviors by Gender

	Men		Women					
	M	SD	M	SD	df	t	p	Cohens d
Tobacco	1.68	5.45	1.19	4/59	1434	1.78	.001	.095
Doc Visits	2.998	1.51	3.07	1.53	1432	-.932	.383	-.050
Phys Act	2.89	1.84	2.55	1.89	1433	3.36	.017	.180
Alcohol	2.69	11.60	.87	5.87	820	2.60	<.001	.186

Table 9. Linear Regression Analysis of Relationship Satisfaction and Loneliness Predicting Time 3 Pain Severity

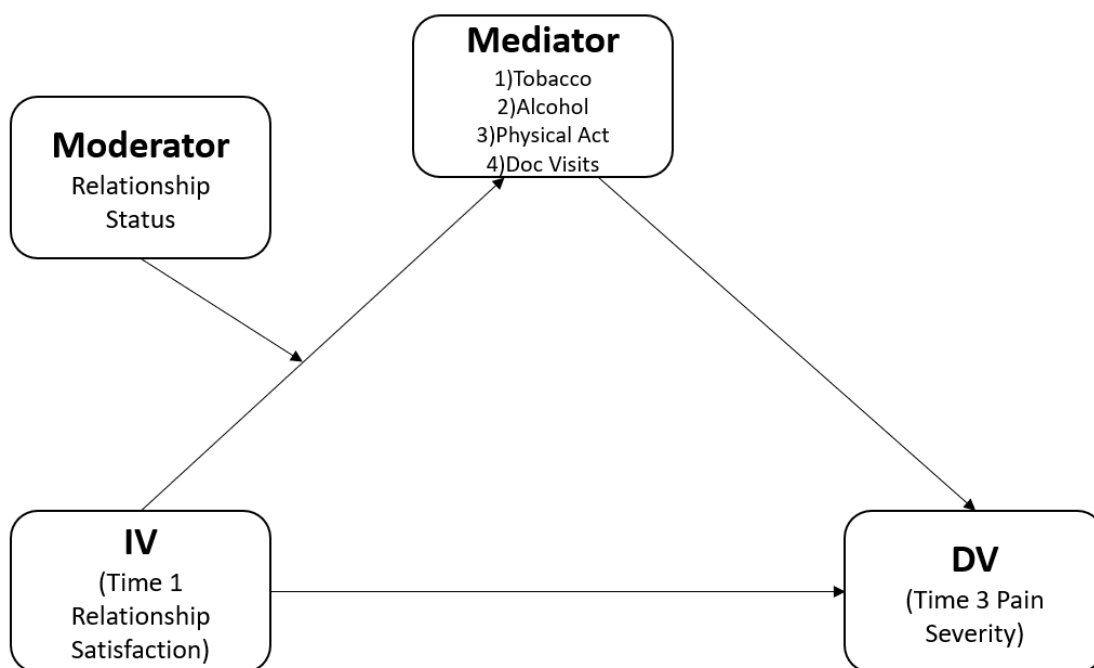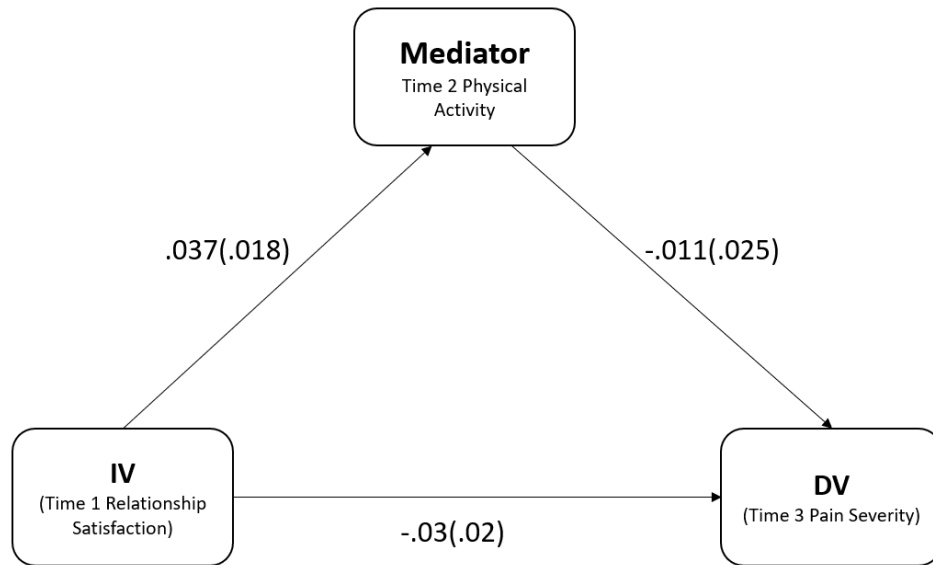| Variable	B	95%CI	β	t	p
(Constant)	2.68	[1.36 4.01]		3.98	<.001
Relationship Satisfaction (T1)	-0.04	[-0.10 0.03]	-0.06	0.24	0.24
Relationship Satisfaction (T2)	-0.02	[-0.08 0.05]	-0.03	-0.53	0.60
Relationship Satisfaction (T3)	-0.32	[-0.09 .03]	-0.05	-1.08	0.28
Loneliness (T1)	-0.03	[-0.17 0.12]	-0.02	-0.35	0.73
Loneliness (T2)	0.02	[-0.06 0.09]	0.03	0.50	0.62
Loneliness (T3)	0.11	[0.04 0.18]	0.15	3.18	0.002

Figure 1. Moderated Mediation (full model)

Figure 2. Mediation with path correlation coefficients and standard errors

Vita

Lauren Fox received her Bachelor's in Music Performance and her Master's in Clinical Psychological Science from University of Maryland, College Park, as well as a Master of Arts in Clinical Psychology from the University of Tennessee, Knoxville with a thesis titled American Indian Gang Involvement: Changes and Associated Risk Factors for Adolescents on Reservation Communities 1993-2013. As a doctoral candidate at the University of Tennessee, Lauren has had the opportunity to participate in a diverse range of research and clinical projects including focusing on chronic pain and health psychology. Lauren is currently completing her predoctoral internship as a Behavioral Medicine/Health Psychology Resident at the Alpert School of Medicine at Brown University.