PAIN AND EMOTIONAL WELL-BEING AS VARIABILITY PREDICTORS AND THE ROLE OF MINDFULNESS IN COMMUNITY-DWELLING OLDER ADULTS

by

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ABSTRACT

This dissertation examines pain, emotional well-being, affect variability, pain variability and mindfulness in community-dwelling older adults diagnosed with osteoarthritis (OA) of the knee. Osteoarthritis is one of the most common chronic illnesses. Its sufferers experience a great deal of pain and a potentially substantial decline in emotional well-being. This data comes from an ongoing research project, Everyday Quality of Life in Osteoarthritis (EQUAL; R01 AG046155), which examines quality of life among African American (AA) and non-Hispanic White (NHW) older adults with a diagnosis of OA. Subjects aged 50 and older complete a comprehensive baseline assessment, as well as an experience sampling method (ESM) procedure. Baseline measures include Philadelphia Geriatric Center Pain Scale, Freiburg Mindfulness Inventory, Center for Epidemiological Studies Depression Scale, as well as the short form Spielberger State Anxiety Scale. Variability was examined via the ESM procedure which includes responses to mood and pain questions 4 times daily over 7 consecutive days.

Structural equation modeling (SEM) was used to examine whether traditional summary measures of pain and overall well-being are predictors of within-day pain and affect variability. Second, the role of mindfulness as a moderator was examined. Path analyses indicated that baseline pain, negative affect, and number of pain locations predict positive affect variability; negative affect predicts negative affect variability; and negative affect predicts pain variability. Mindfulness moderated the effect of emotional well-being on pain variability, but did not moderate the remaining three hypothesized relationships. These results highlight the complex nature of pain and affect in older adults suffering from OA, and how variability and mindfulness may affect that relationship.

DEDICATION

This dissertation is dedicated to my family, particularly my parents and grandparents, who encouraged and supported my move to the United States from Poland in order for me to have access to the best educational opportunities. Additionally, this dissertation is dedicated to my long-time partner, David Gleixner, who has shown unconditional support and love, even when it meant moving a thousand miles away to pursue my dream. Lastly, I dedicate this dissertation to all my friends, old and new, who always offer support, love, friendship, laughter, tears, and everything in between.

LIST OF ABBREVIATIONS AND SYMBOLS

α Cronbach's alpha: used to measure internal consistency

β Beta: a standardized partial regression coefficient

M Mean: the sum of a set of measurements divided by the number of measurements in the set

N Sample size of group

p Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

r Pearson product-moment correlation

R^2 Coefficient of determination

SD Standard Deviation: value of variation from the mean

$\chi 2$ Chi-square: test of significance of model fit

$<$ Less than

$>$ Greater than

$=$ Equal to

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CHAPTER ONE

INTRODUCTION

Osteoarthritis (OA) is one of the most common chronic illnesses among older adults, and it causes a great deal of pain and disability (Felson & Zhang, 1998; Hootman, Bolen, Helmick, & Langmaid, 2006; Lawrence et al., 2008; Peat, McCarney, & Croft, 2001). This disorder can affect many joints, however the most common unifocal site of OA is in knees (Felson & Zhang, 1998). The pain and disability associated with this disorder make its sufferers particularly vulnerable to emotional distress and mobility complications (Carr, 1999; Peat et al., 2001). The present study examined the relationships among pain, emotional well-being, affect and pain variability, and mindfulness in older adults with knee OA.

Twenty-five percent of people over the age of 55 years report persistent episodes of knee pain, and one in six people have consulted with a general practitioner about this pain (Peat et al., 2001). The same study reported that ten percent of people over 55 years old report painful and disabling knee OA, and a quarter of these people report being severely disabled.

Not only does knee OA cause a great deal of pain, it also can cause severe mobility issues in older adults. Some have even referred to knee pain in older adults as the latest musculoskeletal epidemic (Annals of the Rheumatic Diseases, 2001). Understanding the risk factors for onset of knee OA can be beneficial in targeting prevention and management of knee pain. A meta-analysis found that the risk factors associated with knee OA were obesity, previous knee trauma, hand OA, female sex, and older age (Blagojevic, Jinks, Jeffery, & Jordan, 2010).

Management of knee pain is tremendously important in helping individuals decrease their overall level of pain and increase mobility and functionality. Knee pain and mobility can be further complicated by obesity in older adults. Messier et al. (2012) found that modest weight loss and moderate exercise increased functionality and mobility, as well as decreased knee pain. Thomas et al. (2002) found that simple home-based exercise programs can significantly reduce knee pain in adults aged 45 and older. Jordan et al. (2003) conducted a meta-analysis of recommendations for management of knee OA. They found that although there are many treatment options for knee OA, treatment outcomes are unknown, and many questions exist as to which treatment options will manage knee OA the best.

Pain Assessment

Pain is a multidimensional experience containing sensory, affective, and cognitive processes which affects approximately 70% of older adults (Gagliese, & Melzack, 1997). Collett, O'Mahoney, Schofield, Closs, and Potter (2009) modified this definition slightly, arguing that pain comprises sensory processes (e.g., intensity, location, and other general characteristics of pain), affective processes (the emotional component of pain and how pain is perceived), and physical processes (e.g., impact, functionality). Gagliese (2009) proposed that a biopsychosocial model of pain and aging, as well as a lifespan approach to pain and aging, is needed in order to better understand the complex group of factors that are related to pain.

There are also age related pain differences that need to be accounted for when assessing pain in older adults (Gagliese, & Melzack, 1997; Molton, & Terrill 2014; Sibille et al., 2012).

Molton and Terrill (2014) related these variations to changes in nervous system, attitudes towards and expectations about pain (e.g., pain is “normal” in aging), and altered pain coping strategies. Research on age related pain and pain perceptions is mixed and inconsistent (Gagliese, 2009; Molton, 2014). The general consensus appears to be that pain threshold (the point at which pain begins to be felt) increases with age, and pain tolerance (the maximum level of pain that a person is able to tolerate) decreases with age (Gagliese, & Melzack 1997). These age-related pain differences need to be accounted for when assessing pain in older adults, and are discussed further in the methods and discussion section of this paper.

Emotional Well-Being in Osteoarthritis

Chronic illness and functional impairments, including decreased mobility and reduced strength, have been found to limit overall well-being in older adults (Smith, Borchelt, Maier, & Jopp, 2002). Keefe et al. (2004) highlighted the important role many psychological factors (psychological distress, pain-related anxiety, helplessness, acceptance, etc.) play in people’s experiences with persistent pain. Specifically, chronic illness and depression perpetuate one another; pain can cause depression and in turn, depression can be a catalyst for further pain (Romano & Turner, 1985). Chronic illness can cause financial and social burdens, and a decreased ability to cope with stress, which may lead to negative psychological adjustment (Dobie & Mellor, 2008). Thus, older adults suffering from OA are at a particular risk for reduced emotional well-being.

Prevalence of major depressive disorder in community-dwelling samples of older adults (65 years or older) ranges from 1-5%; clinically significant depressive symptoms (not diagnosable as major depression) are present in 15% of older adults (Fiske, Wetherell, & Gatz, 2009). When arthritis is introduced as an issue, these numbers increase. A cross-sectional study found that the prevalence of major depressive episodes in the arthritic population aged 18 and older was 10%, which may indicate specific clinical needs for this population (Patten et al., 2005). Specific to OA, prevalence of clinically significant depressive symptoms in an outpatient older adult sample was 40% (Axford et al., 2010). Rosemann and colleagues (2007) also reported an increased prevalence rate of depression in persons with OA, finding that approximately 20% of men and 19% of women have moderate to severe depression.

Individuals with OA have high rates of comorbid depression and anxiety (Murphy et al., 2012). Depressed mood in OA patients has been found to be significantly associated with knee pain and activity limitations; increased depressed mood is related to increased knee pain and increased activity limitation (Holla et al., 2013). Another study of older adults with knee/hip OA found that higher scores on the Center for Epidemiological Studies Depression Scale (CESD) were significantly associated with experiencing greater pain related to one's illness (Sale, Gignac, & Hawker, 2008).

Amongst institutionalized older adults, anxiety and depression have both been found to be significantly related to pain (Casten, Parmelee, Kleban, Lawton, & Katz, 1995). Osteoarthritic pain may be the root of both disability and depressive symptoms (Parmelee et al., 2007), and this relationship may be further complicated by race and sex (Parmelee et al., 2012). Pereira and colleagues (2013) discovered that adults with knee pain and depressive symptoms were less likely to seek a radiographic detection of OA than those without depressive symptoms. The authors suggested that adults with depressive symptoms may have altered pain perceptions, although it is also possible that these patients may be too depressed to seek help for their knee pain. Regardless, examining emotional distress in addition to the biological signs is integral in treating and managing OA patients.

It is unproven whether negative emotions are the direct cause of the effects of chronic disease, or vice versa (Romano & Turner, 1985; Friedman, & Kern, 2014). Therefore, Friedman and Kern developed a comprehensive model of relationships among well-being, biological characteristics, lifestyle patterns, overall health, and interventions. They proposed that a more integrated and comprehensive model is needed to understand causality of health outcomes, rather than assuming, for example, that depression directly causes pain, or vice versa. The Friedman and Kern model guides the current proposed model of interactions between pain, mood, and mindfulness, which will be discussed in further detail later in this document.

The Importance of Variability

In order to better understand emotion regulation and emotional stability in older adults, it is important to understand both the socioemotional selectivity theory (SST; Carstensen, 1995) as well as strength and vulnerability integration model (SAVI; Charles, 2011). Socioemotional selectivity theory seeks to explain the "paradox of aging," which posits that although aging brings physical and cognitive deterioration and social changes, older adults tend to be happy and lead fuller lives than young adults (Carstensen, 1995; Carstensen, Isaacowitz, & Charles, 1999; Lochenhoff & Carstensen, 2005). As adults age, their social contact declines (Carstensen, 1995), and they may narrow their social networks and devote more emotional resources to fewer social relationships (Lansford, Sherman, & Antonucci, 1998). Additionally, when time yet to live is perceived as limited, present-oriented emotional goals are prioritized over future-oriented information acquisition goals. These changes in perceptions and motivations, which are strongly related to age, influence social preferences, social networking, emotion regulation, and cognitive processing.

Building upon SST, the strength and vulnerability integration (SAVI) model further expands upon older adults' ability to regulate emotion while accounting for vulnerabilities (Charles, 2010). Aging itself may be the most salient vulnerability, as it contributes to many physical changes. This, in turn, interacts with personality and overall psychological functioning. Although older age is related to better emotional outcomes, aging is also related to emotion regulation vulnerabilities, particularly in context of negative circumstances (e.g., chronic illness). The Arousal Regulation Theory (ART) posits that emotional response intensity functions within an individual to compensate for regulation of internal stimulation (Larsen, & Diener, 1987); however, following the SAVI model, older adults suffering from negative circumstances may be less able to engage in strategies (such as the one ART proposes) that could help regulate their emotions

In the current project, the SAVI model is more applicable than the SST model due to the nature of the sample: biologically vulnerable older adults. Charles and Carstensen (2009) stated that SST is primarily a social model, while SAVI "maintains the notion that biological systems become less flexible with age." The SAVI model seeks to understand the complex interactions between physical and emotional/psychological processes, rather than just the social ones as in the SST model. The SAVI model further explains that older adults regulate low levels of and time-limited negative distress well; however, they have increased difficulty regulating when the distress occurs for long periods of time. Chronic pain, a biological vulnerability, may increase distress for long periods of time and thus decrease stability in regulatory processes. Additionally, chronic illness and other challenges older adults face (e.g., reduced cognitive capacity, experiences of loss in the social network), can result in decreased effectiveness and number of emotion-regulation strategies. This decrease in emotion regulation strategies may result in further distress. This complex interaction of biological and emotional processes is important to understand in the current project, rather than simply the social processes as suggested by SST.

Rast (2013) reviewed the importance of examining intraindividual variability, stating that examining variability can help predict cognitive, affective and behavioral change. For example, cognitive variability (e.g. slower reaction time) is related to lower intelligence over time (Ghisletta et al., 2013). The authors posited that increased cognitive intraindividual variability indicates brain degeneration, decreased neurological mechanisms, and overall decreased cognitive functioning in older adults. Furthermore, shifting from a between-subjects to within-subjects level of analysis can provide more information about an individual that can drive theoretical and practical recommendations. Rocke and Brose (2013) also discussed the importance of examining intraindividual variability, particularly affect variability. They posited that by examining affect variability, we can better understand stability in older adults, which may give insight into their emotion-regulation processes. They also stated that variability can be both an adaptive and maladaptive function that can both limit and promote healthy aging. Ram and Gerstorf (2009) further promoted the importance of studying variability. They postulated that especially in late life development, intraindividual variability can provide information on both individual characteristics (e.g., capacity for change), and processes (such as regulation).

Pain Variability

Pain is not constant, and can fluctuate considerably over short periods of time (Harris et al., 2005). The presence and intensity of pain can change drastically within days, weeks, or months. Thus, there are many benefits to understanding pain variability. Zakoscielna and Parmelee (2013) found that greater baseline pain severity and daily mean pain both predicted higher pain variability across days in older adults. This suggests that pain variability is an important characteristic that can give insight to both pain and overall quality of life in older adults.

Pain variability can be very common among individuals with various health conditions (Harris et al., 2005; Allen, 2007; Waling, Sundelin, Nillson, & Jarvholm, 2001). Therefore, understanding pain variability can be particularly useful with predicting treatment outcomes (Harte et al., 2009), recommending pain management programs (Allen, 2007) and coping with pain (Waling et al., 2001).

Affect Variability

Emotional variability and reactivity is a general temperament with individual differences (Larsen, & Diener, 1987). Larsen (1987) defined variability as frequent and extreme changes in mood or emotion over time. Intensity, although different from variability, relates to general mood strength and is important to understand in light of the age-related changes that occur in emotionality. Larsen and Diener (1987) stated that intensity (a stable individual difference characteristic) refers to the strength of affective states, while variability refers to frequency of affective changes. Furthermore, they reported a positive correlation between mood variability and intensity, indicating that variability and affect intensity overlap. Larsen, and Diener (1987) found that intensity is consistent across both positive and negative mood. The more intense a stimulus, the more intense the response (Larsen, Diener, and Emmons, 1986). There are age differences in both variability and intensity. For example, Larsen and Diener (1987) found a decrease in affect intensity as age increases. Additionally, high intensity emotions are more likely to decrease with age than low arousal emotions (Diener et al., 1985).

Older adults are more emotionally stable than young adults (Brose, Scheibe, & Schmieder, 2013), with emotional stability being defined as having low affect variability and low affective reactivity to daily events. Additionally, older adults experience significantly less variability in positive affect and negative affect; they also do not react as strongly to positive or negative events than their younger counterparts (Rocke, Li, & Smith, 2009).

Not only are there differences between younger and older adults, there are also affective differences between the young old and older old. Smith (2002) found that young (less than 85 years old) older adults have greater subjective well-being than those 85 years and older. This is consistent with Charles and Carstensen (2009), who reported that negative emotions in older adults are infrequent, until very old age, as well as Iglesias (2009), who reported decreased distress in younger old adults until very old age. Gerstoff et al. (2009) reviewed well-being and stability across old age. They reported that most older adults are mildly happy even after negative events, and that well-being is generally stable across old age until impending death. There are individual differences; Gerstoff and colleagues, similarly to the SAVI model, noted that some factors that may affect the stability of late-life well-being include chronological age, pathology/disability, and cognition.

In a study examining variability of negative and positive event appraisals on depressive symptoms and emotional well-being, researchers highlighted differences in variability as older adults age, as well as the importance of examining variability to understand well-being (Whitehead, & Bergeman, 2014). The authors found that variability does not decline with age, and in fact there were no age differences in event appraisal variability among 40-75 year old subjects. Those who were older, however, were better able to keep their variability from having a negative effect on their depressive symptoms and overall well-being than when compared to younger older adults. Affect variability is particularly related to depression, in that depressive symptoms have been found to be associated with greater negative affect variability (Koval, Pe, Meers, & Kuppers, 2013).

Research has suggested that daily stress levels are more strongly associated with negative affect in community-dwelling older adults than in younger adults (Mroczek & Almeida, 2004). This is relevant to pain, as pain itself can act as a stressor, putting knee OA patients at risk for negative affect. Thus, chronic pain sufferers experience increased negative moods such as tension, worry, and irritability (Sofaer & Walker, 1994).

Daily pain has similarly been found to affect next-day mood in older adults with chronic pain. Affleck et al. (1999) found that women with either OA or rheumatoid arthritis (RA) are more likely to report daily pain than men. Older adults with either form of arthritis who experienced daily pain also experienced higher levels of overall pain and negative mood, and lower levels of positive mood.

Mindfulness

Mindfulness is an ancient Eastern practice which involves paying attention in a particular way (Kabat-Zinn, 1996). Specifically, it is the nonjudgmental awareness of the present moment, with sustained attention to quality of sensory, emotional, and cognitive events (Zeidan, Grant, Brown, McHaffie, & Coghill, 2012). In addition, one is able to recognize this quality of events as fleeting, changeable, and momentary, and is able to witness these events without reacting to them. In sum, mindfulness is the ability to maintain attention on what is happening in the present moment without judgment or reactivity – that is, being aware of and receptive to the present moment experiences (Creswell et al., 2007; Prakash et al., 2013).

The scientific community has recently developed interest in this practice, slowly recognizing that it can have benefits in a wide range of settings and among a wide range of audiences. Mindfulness is associated with many positive psychological effects in adults, including increased self-reported well-being, reduced psychological symptoms and emotional reactivity, as well as improved behavioral regulation (Keng, Smoski, & Robins, 2011). Mindfulness as a trait has also been found to be a protective factor for adults. For example, Brown-Iannuzzi et al. (2014) found that trait mindfulness attenuated the relationship between perceived discrimination and depressive symptoms, and promoted positive emotions.

It is important to distinguish trait mindfulness and state mindfulness. State mindfulness refers to momentary sensory, cognitive, and self-awareness changes during, for example, a practice. State mindfulness is generally associated with interventions, such as mindfulness training. Trait or dispositional mindfulness, on the other hand, refers to lasting attributes, similar to personality traits (Cahn & Polich, 2006). Both trait and state mindfulness can be beneficial to older adults; however, the proposed project deals with trait mindfulness. In sum, state refers to altered sensory and cognitive awareness during a meditation practice, while trait refers to long lasting sensory and cognitive changes that exist regardless of being actively engaged in a meditation practice (Cahn & Polich, 2006). The research on both trait and state mindfulness remains scarce.

Mindfulness and Pain

Being mindful has been found to be particularly useful for older adults experiencing pain, as state mindfulness can reduce pain (Kingston, Chadwick, Meron, & Skinner, 2007; Zeidan, Gordon, Merchant, & Goolkasian, 2010). Greater engagement in mindfulness-based meditation was associated with lower pain unpleasantness ratings as well as reduced pain intensity when presented with noxious heat stimulation (Brown & Jones, 2010). A meta-analysis of mindfulness and pain found that mindfulness meditation reduced pain symptoms in patients with fibromyalgia, as well as in patients with chronic back pain (Zeidan et al., 2012). Further research on mindfulness and pain gives some insight into pain-related mobility. Subjects participating in an 8-week mindfulness-based meditation program showed significant improvement in pain acceptance, activity engagement, and physical functioning (Morone et al., 2008). A qualitative analysis of older adults with chronic pain practicing mindfulness reported improved attention skills, sleep latency, and quality of sleep, and an overall feeling of mood elevation (Morone et al., 2009).

Pain and Catastrophizing

Although catastrophizing is not examined in the current research project, its importance in the study of chronic pain demands some attention in this literature review. Catastrophizing is the individual's tendency to focus on and exaggerate painful stimuli, which can negatively affect ability to cope with pain. Keefe et al. (2000) found that women are more likely to catastrophize than men in response to OA pain. Additionally, they found that catastrophizing was associated with higher frequency of pain episodes, and increased pain intensity. In a study examining catastrophizing and pain in chronic pain adults, those who catastrophize report more pain intensity, as well as increased disability, and psychological distress (Severeijns, Vlaeyen, van den Hout, & Weber, 2001).

Catastrophizing may also have a negative effect on emotional well-being, in addition to pain. A study that examined persistent pain in older adults found that catastrophizing mediated the relationship between pain intensity and depressed mood (Wood et al., 2013). This study further confirmed the strong relationship between depression and pain. As catastrophizing is frequently viewed as a byproduct of depression (Sullivan & D'Eon, 1990), this may be an important concept to evaluate when examining pain and emotional well-being relationships.

Mindfulness may be a key component to combat the vulnerabilities associated with catastrophizing. In a sample of outpatient chronic pain patients, a unique relationship between pain, pain catastrophizing, and trait mindfulness was discovered (Schutze et al, 2010). This study found that with increased mindfulness, there was decreased pain intensity, negative affect, and pain catastrophizing. Furthermore, trait mindfulness moderated the relationship between pain intensity and pain catastrophizing, such that low mindfulness predicted pain catastrophizing. Another study examined catastrophizing in a sample of adults enrolled in a pain management program. This study found that greater trait mindfulness was associated with less disability and less pain catastrophizing. Furthermore, the relationship between mindfulness and disability were found to be mediated by catastrophizing (Cassidy et al., 2012). Building upon the SAVI model, when older adults are presented with vulnerabilities (chronic disease, chronic pain, catastrophizing), mindfulness may be an asset to help ameliorate the negative impact of those vulnerabilities.

Mindfulness and Emotional Well-Being

In a study of adult women with breast cancer, high levels of trait mindfulness were associated with fewer stress-related symptoms and fewer mood disturbances (Tamagawa et al., 2013). Creswell et al. (2007) found that dispositional mindfulness was associated with reduced negative affect and improved health outcomes. High trait mindfulness was associated with increased prefrontal cortical activity, which is linked to affect regulation.

State mindfulness has also been found to be beneficial to older adults for an array of symptoms both physically and mentally. Exercising the state of mindfulness has been found to have many health benefits to older adults such as improving anxiety depression (Young & Baime, 2010; Splevins, Smith, & Simpson, 2009; Smith, Graham, & Senthinathan, 2007) and decreasing stress (Young & Baime, 2010; Splevins et al., 2009).

Young and Baime (2010) found that engaging in an 8-week mindfulness-based training reduced emotional distress and improved overall mood in older adults. Mindfulness has been found to be particularly useful in alleviating depressive and anxiety symptoms in older adults. Veterans with post-traumatic stress disorder (PTSD) participating in mindfulness-based training showed reduced symptoms of depression and improved functionality (Kearney et al., 2013). Although mindfulness did not alleviate PTSD symptoms, it still may be a useful technique in decreasing emotional distress in a variety of older adults. Additionally, a combination of mindfulness and cognitive therapy may be particularly beneficial in reducing depressive symptoms in older adults. Thus, mindfulness may be a cost-effective addition to ongoing treatments of depression (Smith, Graham, & Senthinathan, 2007).

State mindfulness can also be beneficial to overall well-being by decreasing stress, improving sleep, and improving attention. For example, mindfulness was found to be beneficial in improving stress management skills (Young & Baime, 2010), and decreasing overall stress in older adults (Splevins et al., 2009).

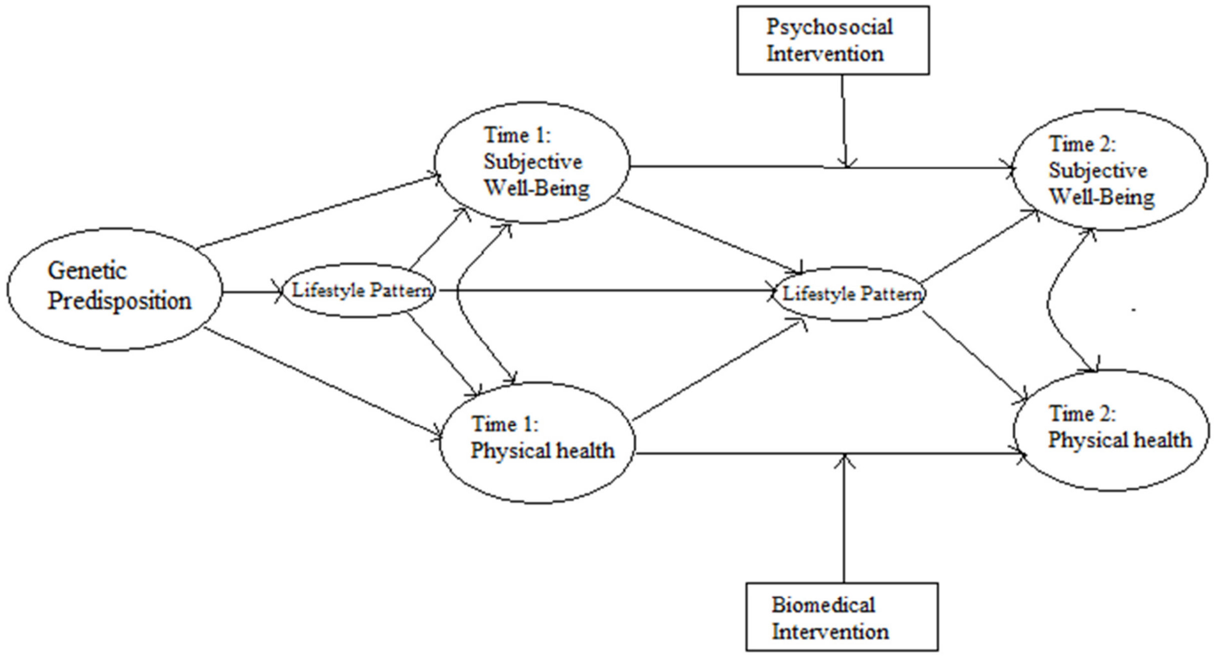
Self-Regulation and Self-Monitoring

In order to better understand how mindfulness may affect variability, we draw from the self-regulation as well as the self-monitoring literature. Self-regulation is the voluntary control of many processes including physiological, psychological, and behavioral (Kafner, 1975), whereas self-monitoring is simply the attending to and manipulation of social behaviors (Kafner, 1970). Self-monitoring, also known as the exercise of expressive controls, is more oriented towards interpersonal functioning, socialization, and self-adjusted behavior (for example, responding in a way that is socially appropriate). There are three stages of self-regulation: self-monitoring, self-evaluation, and self-reinforcement. Kafner (1970) further explains that self-monitoring clarifies the process of self-regulation and it is imperative for self-adjusted behavior. In sum, self-monitoring is a function of self-regulation.

Snyder (1974, 1979) defined self-monitoring as adults' ability to monitor, through self-observation and self-control, and express their behavior. Graziano and Bryant (1998) found that people higher in dispositional self-monitoring may be less willing to respond to their own immediate emotional reactions than lower self-monitoring people. Additionally, high self-monitoring people may rely more on external cues than low self-monitoring people. Self-monitoring is important in understanding self-regulation; however, given that self-monitoring is more oriented to socialization (Nelson, 1981), the current project draws from the self-regulation literature in order to better understand mindfulness and variability.

Leventhal (1980) developed a self-regulation based approach known as the common sense model of illness representation. As this theory focuses on illness representation, it can give insight into chronic illnesses such as OA. This theory postulated that illness representation is determined by two processes: cognition and emotion. The way that a person interprets the health threat (cognition) and the subjective reaction to the health threat (emotion) affect health behaviors. Research has connected self-regulation to health outcomes in cases such as smoking cessation and diabetes (Browning, 2009; Jayne, 2001). Thus, the self-regulation theory is particularly useful for understanding the dynamic factors associated with health and chronic illness, and may help further explain the causal model of health outcomes proposed by Friedman and Kern (2014). For example, a person may have a genetic predisposition to an illness while engaging in poor lifestyle patterns. Their cognition and emotions related to their health (as explained above) may have both direct and indirect impact on well-being and overall physical health. These may also influence any positive psychosocial (e.g. mindfulness) and biological interventions, and in turn, the interventions affect health outcomes. This, in turn, directly impacts the progression of the illness (see Figure 1 below).

Figure 1: Correlated Outcomes Model (Friedman & Kern, 2014).



Note: An example of a broader, more comprehensive causal model of relationships among personality, mediators and moderators, and correlated outcomes (Friedman & Kern, 2014)

Emotional and affective self-regulation is a central process in mindfulness (Hulsheger, 2013). In a study of academic achievement in undergraduates, mindfulness was found to facilitate well-being by indirectly affecting self-regulation (Howell. 2011). Young adults who reported higher levels of mindfulness reported increased ability to effectively regulate their emotions (Hill, 2012). In a study of heart rate variability among young adults, mindfulness exercises (those focusing on attention) increased heart rate variability, which was associated with better mental and physical health. Individuals' ability to adjust physiological arousal can be critical in self-regulation, and mindfulness can be the key for that.

Additional research has tied dispositional mindfulness to self-regulation, both emotional and behavioral. Brown and Ryan (2003) reported that both dispositional and state mindfulness predicted better self-regulated behavior and promoted positive emotional states in both student and adult samples. In a meta-analysis, Keng, Smoski, and Robins (2011) stated that trait mindfulness promoted reduced emotional reactivity and improved behavioral regulation. Shapiro and Schwartz (2000) reported that self-regulation is twofold in that it maintains stability of functioning as well as allows for adaptability to change. Furthermore, these researchers also discussed that self-regulation is enhanced by attention, which is a central focus of mindfulness.

By examining more global self-regulation, we can better understand how cognition, affect, and even mindfulness contribute to an older adult's experience with chronic illness and pain. By examining the self-regulation theory, Friedman and Kern's (2014) common sense model, as well as the SAVI model (Charles, 2010) we can have a more global understanding of the complex interactions associated with and around pain.

Research Needs

A large body of research has examined pain and emotional well-being among community dwelling older adults. Previous research has suggested connections between pain and affect, and pain and depression. However, few studies have examined the role of short-term variability in pain and affect, or the relationship of that variability with overall global measures of pain and emotional well-being. Second, ever-growing research on mindfulness suggests that not only do trait mindfulness and mindfulness-based therapy help alleviate depressive and anxiety symptoms, but they also lessen pain severity in older adults with chronic pain (Young & Baime, 2010; Cassidy et al., 2012)

This study is unique in examining mindfulness in a moderating role between pain and affect. By understanding emotion regulation in the context of SAVI, we may be better able to understand the complex relationship of pain and overall well-being in chronic disease patients. Older chronic pain sufferers are at particular risk for decreased emotion regulation and emotional well-being given the high comorbidity between pain and emotional distress. Both overall pain and momentary variations in pain may be contingent upon emotional well-being and stability of emotion, or vice versa. Other components, such as self-regulation or pain catastrophizing, may further complicate people's experiences with OA. Trait mindfulness may better equip OA patients to deal with the vulnerabilities of chronic pain, pain variability, decreased emotion regulation, and decreased emotional well-being. Mindfulness may also combat indirect vulnerabilities such as reduced self-regulating that put older adults at even more increased risk of pain and negative emotional well-being.

Specific Aims

The specific aims of this study are as follows:

1) To examine summary measures of pain at baseline using the Philadelphia Geriatric Center (PGC) Pain Scale, and overall well-being, measured by both the Center for Epidemiological Studies Depression Scale and short form Spielberger State Anxiety Scale, as predictors of subsequent within-day pain variability and affect variability.
2) To examine the role of mindfulness, as measured by the Freiburg Mindfulness Inventory, as a moderator of associations between pain and pain variability, pain and affect variability, emotional well-being and pain variability, as well as emotional well-being and affect variability.

Hypotheses

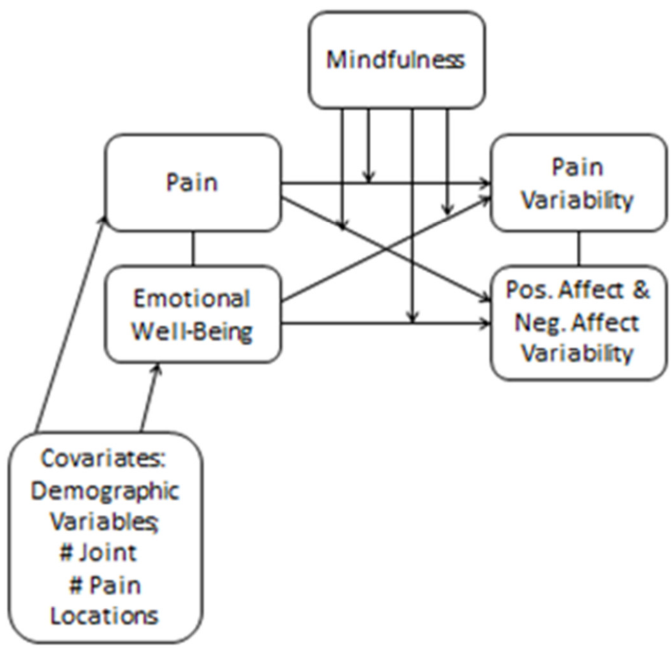
Given the potential for frequent pain fluctuations in people experiencing chronic pain (Harris et al., 2005), it is hypothesized that summary measures of pain will predict pain variability, such that the higher a person's global pain, the higher his or her variability in momentary pain (Hypothesis 1a). Previous research supports the notion that depression may predict higher daily levels of pain (Zakoscielna & Parmelee 2013; Finne-Soveri & Tilvis 1998). Thus, I also expect that emotional well-being, measured as levels of depression and anxiety, will predict pain variability, such that lower emotional well-being will be associated with higher pain variability (Hypothesis 1b).

Research supports the findings that affect variability may be related to depressive symptoms (Lawton et al., 1996; Koval, Pe, Meers, & Kuppers, 2013). Hence, I hypothesize that emotional well-being will predict affect variability (Hypothesis 1c). I expect lower emotional well-being to be associated with higher positive and negative affect variability. Previous research also supports the notion that pain predicts next-day mood in older adults (Affleck, 1999). Hence, I hypothesize that pain will also predict affect variability in older adults, such that higher global measures of pain will be associated with higher affect variability (Hypothesis 1d).

Lastly, trait mindfulness has been found to be associated with pain and emotional well-being in a variety of ways (Young & Baime, 2010; Prakash et al., 2013, etc.) Levels of mindfulness may not fully account for fluctuations in pain and affect, but it is an important component in helping understand the associations of emotional well-being and pain in older adults. Given existing evidence, I expect mindfulness to moderate the relationships between pain and pain variability (Hypothesis 2a), pain and affect variability (Hypothesis 2b), emotional well-being and pain variability (Hypothesis 2c), as well as emotional well-being and affect variability

(Hypothesis 2d). At low levels of mindfulness, these relationships will be enhanced. At high levels of mindfulness, these relationships will be weakened. Below is a conceptual model outlining these hypotheses, based on the correlated outcomes model as proposed by Friedman and Kern (2014), Leventhal's (1980) common sense model, and Charles' (2010) SAVI model. Although the Friedman model has a "time 2" longitudinal component, this project focuses on baseline time. Hence, the proposed model is cross-sectional:

Figure 2: Proposed Hypothesis Model.



CHAPTER TWO

METHODOLOGY

Procedures

This is a secondary data analysis of data from the larger parent study, Everyday Quality of Life in Blacks and Whites with Osteoarthritis (EQUAL), R01 AG046155. Principal investigators for this study are Dr. Patricia A. Parmelee, of the University of Alabama, and Dr. Dylan Smith, of Stony Brook University. The overall goal of the EQUAL project is to examine the relationship of OA-related pain to everyday activities and mood states and long-term quality of life among African American (AA) and non-Hispanic White (NHW) older adults. This project is a 5-year multi-site (University of Alabama and Stony Brook University) project in which AA and NHW individuals with physician-diagnosed OA of the knee complete a comprehensive baseline assessment, as well as an experience sampling method (ESM) procedure. The baseline assessment is completed in person in the Tuscaloosa-Birmingham area as well as on Long Island, NY. Participants receive a small packet of self-report questionnaires to be completed at home before the interview, and then in-person baseline interviews are conducted by graduate students in Alabama and nonstudent staff in New York. The detailed battery examines social vulnerability, biological vulnerability, psychological vulnerability, pain, functional limitations, activity restriction, and emotional distress. This interview takes approximately 90 minutes to complete. Participants are then given a cell phone, charger, and actigraphs for the second phase of the project, as well as $30 compensation for completing the interview. The actigraphs (wrist and waist monitors that measure fine motor movements and gross motor movements respectively) were not be used in the current project.

Beginning the day following the baseline assessments, participants take part in a seven day ESM procedure. In this second part of the project, participants are called four times per day for seven days consecutively, while wearing their actigraphs. Timing of calls is randomized within three hour time blocks (9:00AM-noon; noon to 3:00PM; 3:00PM to 6:00PM; and 6:00PM to 9:00PM, or on an alternative 12-hour schedule as preferred by the respondent). These phone calls take approximately five minutes to complete. Participants are encouraged to turn off cellphones in situations where it would be intrusive; however, they are encouraged to answer the majority, if not all, of the calls. In the few situations where a participant is unable to be reached all day, they are asked to do an additional day of the ESM procedure. During these brief phone calls, measures include an activity report and measures of current pain, positive and negative affect, and coping responses related to pain and activity limitations. Upon completion of the ESM procedure, participants are compensated $10/day for a possible total of $70 for the ESM portion of the study.

The EQUAL project encompasses many domains, including pain, functional limitations, activity restriction, and emotional distress. Data from the baseline assessment and the ESM procedure were used for this analysis. Procedures are approved by The University of Alabama and Stony Brook University's Institutional Review Boards (IRB) for the EQUAL grant, as well as for this dissertation.

Participants

In order to be eligible to participate, subjects must meet the age criterion (minimum age of 50), and have diagnosed osteoarthritis in one or both knees. Subjects of race/ethnicity other than AA and NHW are excluded from the study. Additionally, subjects may not have other major chronic illness, in particular fibromyalgia, lupus, or rheumatoid arthritis, or any other life-threatening or severely functionally limiting disorders. As these major illnesses potentially produce considerable pain and disability, these subjects are deemed ineligible to avoid confounding with specifically osteoarthritis-related pain and distress. Lastly, subjects with moderate to severe cognitive deficits are excluded from the study. Thus, subjects must score at least 6/10 on the Short Portable Mental Status Questionnaire (Pfeiffer, 1975). Participants must also consent for the research team to receive confirmation of the diagnosed OA from their treating physicians.

The sample is recruited from two primary locations: Tuscaloosa-Birmingham area, as well as Long Island, NY area. This sample is recruited from several community resources. For the Tuscaloosa-Birmingham area, this includes the University of Alabama Medical Center (UMC), local rheumatology practices, as well as other local physicians working with osteoarthritis patients. In addition, recruitment takes place at local senior citizens centers, churches, and other local public places. New York recruitment occurs primarily through outpatient clinics as part of the Stony Brook University Medical Center, but also from other local sources.

The final sample of the current project consists of 103 participants who completed both the global interview and at least 17 of their 28 (60%) ESM phone calls. This sample uses the baseline interview for 71 participants and the one-year follow-up interview for 32 participants.

Sixty-six participants (64.1%) are from the Tuscaloosa-Birmingham area, and 37 (35.9%) from New York. Seventy participants (68.6%) identified themselves as Caucasian, 33 (32.0%) identified themselves as African American. Age range for this group of participants was 52-99, with a mean age of 65.15 (SD = 8.89). Twenty participants were male, and 83 were female. Refer to Table 1 for sample descriptives, including marital status, education, employment status, and income.

Table 1

Sample Descriptives

	N	(%)
Marital Status		
Married	62	60.2
Widowed	9	8.7
Never Married	11	10.7
Living with partner	1	1
Divorced/Separated	20	19.4
Education		
Grade 11 or less	13	12.6
High School/GED	19	18.4
Technical/Vocational Training	3	2.9
One to 4 years College	11	10.7
College graduate	23	22.3
Graduate/Professional degree	34	33.0
Employment Status		
Full time	31	30.4
Part time	8	7.8
Looking for work	1	1.0
Retired	41	39.8
Homemaker	4	3.9
Disabled/Unable to work	15	14.7
Other/Decline to answer	3	15.6
Income		
Less than 10,000	14	14.4
10,001-20,000	13	13.4
20,001-30,000	6	6.2
30,001-40,000	6	6.2
40,001 or 50,000	7	7.2
50,001 – 60,000	9	9.3
60,001-70,000	4	3.9
70,001-more	38	39.2

Measures – Baseline

Covariate Variables

The following demographics were planned to be used as covariates: race, age, gender. Number of pain locations *and* arthritis joint count were controlled. Additionally, positive and negative affect were hypothesized as covariates given that positive and negative affect variability may be affected by (or confounded with) overall levels of positive affect (M = 3.36, SD = .72) and negative affect (M = 1.26, SD = .36). Pain locations were assessed using questions from the Philadelphia Geriatric Center (PGC) Pain Scale (Parmelee, 1994), which asked patients whether or not they experience pain in 11 pain locations. Forty four (42.7%) of participants reported suffering from headaches; 48 (46.6%) suffered neck aches; 83 (80.6%) arm or leg aches and pains; 71 (68.9%) backaches; 30 (29.1%) reported intestine or stomach pain; 7 (6.8%) reported pain; burning or discomfort in urinating; 74 (71.8%) reported aches or pains in hands or feet; 14 (13.5%) chest pains; 34 (33.0%) report burning; tingling; or crawling feelings in skin; 57 (55.3%) pain in bones; 98 (96.1%) pain in knees; and 58 (56.3%) pain in muscles. A composite of all 11 pain locations was computed for the number of pain locations covariate (M = 6.65, SD = 2.83). Refer to Appendix for measures.

With regards to arthritis joint count, participants are asked a two-fold question asking whether they have problems with other joints in addition to knee; and if so, "What other joints are affected?" Eighteen participants (19.6%) reported only having arthritis in their knees, while 74 (80.4%) reported having it elsewhere. Of those having arthritis elsewhere, 32 (68.9%) reported it in their hip(s), 31 (30.1%) reported it in their ankles/feet, 60 (58.3%) reported it in their hands/knuckles/wrists, 39 (37.9%) in shoulder, 40 (38.8%) in back/spine, and 26 (25.2%) in neck. A composite of all six arthritis joint counts was computed for the number of joint count covariate (M = 2.21, SD = 1.89).

Independent Variables

Philadelphia Geriatric Center Pain Scale

The Philadelphia Geriatric Center (PGC) Pain Scale (Parmelee, 1994) was used to measure global pain at baseline. The PGC Pain Intensity Scale (M = 3.51, SD = .79) is a six item scale that yields scores on a 1-5 metric. Five items on the scale are on a Likert scale (1 = not at all to 5 = extremely), and one question asks how many days a week the pain gets severe (0-7 days); however this item was recoded onto a 1-5 metric to match the first five items. Questions include: “How much are you bothered by pain right now?” and “How much has pain interfered with your day to day activities?” The mean of all individual items was computed to develop scale metric. For all items on the scale, higher scores indicate greater pain. These six items yielded a Cronbach’s alpha of .834, suggesting appropriate reliability.

Center for Epidemiological Studies Depression Scale (CESD)

This measure is one of two that make up the emotional well-being construct. The Center for Epidemiological Studies Depression Scale (M = 11.04, SD = 10.18) is a 20-item scale which yields scores on a 0-60 metric measure to assess depressive symptoms (Radloff & Teri, 1986). Twenty two participants (21.36%) in this study scored above the standard cut-off score for depression on the CESD ($\geq$ 16). This questionnaire presents different statements, and asks the subject to respond on a Likert scale (0 = rarely or none of the time [less than 1 day], to 3 = most or all of the time [5-7 days] the degree to which they have felt this way over the past week. Questions include: “I was bothered by things that usually don’t bother me”, “I thought my life had been a failure", and "I could not get 'going'." The composite of all individual items was computed to develop scale metric. For all items on the scale (including four reversed items), higher scores indicate the presence of more symptomatology. These 20 items yielded a Cronbach's alpha of .867, suggesting appropriate reliability.

Spielberger State Anxiety Scale short form

This is the second measure that will make up the emotional well-being construct. Anxiety symptoms are measured using the brief Spielberger State Anxiety Inventory (Marteau & Bekker, 1992). This 6-item measure (M = 4.52, SD = 3.89) asks subjects whether they have felt calm, tense, upset, relaxed, content, or worried during the last week using a Likert scale (0= rarely or none of the time to 3 = most or all of the time). This measure yields a score of 0-18 The composite of all individual items was computed to develop scale metric. For all items on the scale (including three reversed items), higher score indicating greater anxiety. These six items yielded a Cronbach's alpha of .799, suggesting appropriate reliability.

<u>Moderator Variable</u>

Freiburg Mindfulness Inventory

The Freiburg Mindfulness Inventory (M = 3.25, SD = .49) is a 14-item measure used to assess people's experiences with mindfulness (Buchheld, Grossman, & Walach, 2001). This measure also uses a Likert scale (1 = rarely or none of the time, to 4 = most or all of the time). For all items on the scale (including one reversed item), low scores indicate low mindfulness, and high scores indicate high mindfulness. Questions include "I am open to the experiences of the present moment", "I watch my feelings without getting lost in them", and "In difficult situations, I can pause without immediately reacting." The mean of all individual items was computed to develop the scale metric. These 14 items yielded a Cronbach's alpha of .802, suggesting appropriate reliability.

Outcome Variables

Pain Variability

Pain variability (M = 1.96, SD = 1.06) is a single-item variable which consolidates subjects' ESM responses. Subjects were asked four times a day over seven consecutive days whether they were in pain, and if so, whether they were "not at all," "a little," "moderately," "quite a bit," or "extremely" in pain. This item yields scores on a 1-5 metric, higher score indicating higher pain. The standard deviation of the approximately 28 pain ratings was used to assess pain variability, following previous literature (Lawton, Parmelee, Katz, & Nesselroade, 1996). The standard deviation is more sensitive than the overall range because it addresses daily variability around the individual's own mean, versus a simple range of scores.

Affect Variability

Affective intra-individual variability is a multidimensional construct that is valid enough to be considered a psychological trait (Eid & Diener, 1999). The same study also reported that affective variability can be reliably measured by examining the intra-individual standard deviations. The current project measured affect variability using the PGC Positive and Negative Affect Scales (Lawton et al., 1992). For positive affect (M = 3.35, SD = .867), subjects were asked four times a day over seven days whether they felt energetic, warm toward others, interested, happy, and content, and if so whether they felt that way "not at all," "a little," "moderately," "quite a bit," or "extremely." In order to measure affect variability, the mean of all 28 time points were computed. For all items on the scale, higher scores indicate higher positive affect. These five items yielded a Cronbach's alpha of .843, suggesting appropriate reliability. The standard deviation of these 28 data points was used as the positive affect variability measure.

The same was done for negative affect variability (M = 1.26, SD = .51), using responses to items assessing the degree to which participants were annoyed, depressed, irritated, worried, and sad. Similarly to positive affect, the means of all 28 time points were computed. For all items on the scale, higher scores indicate higher negative affect. These five items yielded a Cronbach's alpha of .800, suggesting appropriate reliability. The standard deviation of these 28 data points was used as the positive affect variability measure.

Data Analysis

Analyses were preceded by data cleaning. This included setting up an analytic file, and checking for the integrity of the data. The next step was to conduct preliminary analyses. This included descriptive statistics as well as checking for missing data, assessing for normality, transforming or reversing any variables as needed, and scale construction.

Next, zero-order correlations among pain, emotional well-being, mindfulness, and the dependent variables affect variability and pain variability were examined to determine whether or not significant relationships exist among the variables. In addition, multi-level modeling (MLM) was used to examine any trends across the ESM data.

The final part of the analysis involved testing the hypothesized model using the structural equation modeling (SEM) software, MPlus. Three SEM models were analyzed. The first model was a baseline model examining direct relationships without interaction terms. The second model was a moderation model which examined mindfulness moderating emotional well-being and outcome variables (affect variability and pain variability). The third and final model was a moderation model which examined mindfulness moderating pain and outcome variables (affect variability and pain variability). A moderator variable is a variable that affects the direction and/or strength of the relationship between an independent variable and a dependent variable (Baron & Kenny, 1986). Little, Card, Bovaird, Preacher, and Crandall (2007) discuss the benefit of running moderation analyses in SEM, rather than using individual OLS regressions. One of the major benefits of this approach is SEM's ability to address the presence of measurement error within the statistical model, compared to OLS regression, which assumes that the variables are perfectly reliable. By using SEM in this approach, we avoid violating this assumption, which could lead to a bias in parameter estimates.

CHAPTER THREE

RESULTS

Preliminary Analyses

Descriptive Statistics

The core sample for this project is 103 participants. Basic descriptive statistics for primary variables can be found in Table 2, which displays the Ns, obtained minimum and maximum scale values, means, and standard deviations. Possible ranges for each scale are as follows: emotional well-being 0-104 (larger numbers mean poorer emotional well-being), mindfulness 1-4 (larger numbers mean higher mindfulness), and pain 1-5 (larger numbers mean higher pain).

Table 2

Descriptive Statistics for Primary Variables

Variable	N	Min	Max	Mean	SD
Emotional Well-Being	103	0	63	15.56	12.83
Mindfulness	103	1.86	4.0	3.25	0.49
Pain	103	2.0	4.98	3.51	0.79
Positive Affect Variability	103	0	1.05	0.47	0.19
Negative Affect Variability	103	0	1.10	0.29	0.22
Pain Variability	103	0	1.53	0.71	0.31

Scale Construction

To create the emotional well-being variable, the CESD and State Anxiety scales were combined to create a composite variable. An exploratory factor analysis on the 26 items (20 CESD and 6 Anxiety), using varimax rotation, was conducted, in order to determine whether the components of this scale loaded unidimensionally or multidimensionally. Although the analysis yielded seven factors with eigenvalues greater than 1, the scree plot indicated that there was one main factor. The first main component of the analysis accounts for 32.81% of the variance, versus the second component which accounts for 7.73% of the variance. The remaining factors were smaller in descending order. Cronbach's alpha for all 26 items (α=.89) confirms that the underlying construct is unidimensional; therefore, the emotional well-being scale was constructed to consist of a single summed composite combining both scales as described above.

Covariates

Seven covariates were initially hypothesized: age, gender, race/ethnicity, number of pain locations, arthritis joint count, positive affect, and negative affect. In order to test the significance of these covariates, separate ordinary least squares (OLS) regression analyses were run, using all covariates as predictors of the primary predictor and outcome variables (emotional well-being, mindfulness, pain, positive affect variability, negative affect variability, and pain variability).

For the emotional well-being scale, the overall model was significant, F (7, 94) = 21.22, $p < .001$, adjusted $R^2 = .584$, with three significant predictors: number of pain locations (β= .314, $p < .001$), positive affect (β= -.339, $p < .001$), and negative affect (β= .419, $p < .001$). When regressing the potential predictors onto the mindfulness scale, the overall model was significant, F (7, 94) = 6.37, $p < .001$, adjusted $R^2 = .271$, with two significant predictors: positive affect (β= .391, $p < .001$), and negative affect (β= -.275, $p < .01$). For the pain scale, the overall model was significant, F (7, 94) = 6.50, $p < .001$, adjusted $R^2 = .280$; number of pain locations and negative affect proved to be the only significant variables, (β= .232, $p < .04$; β= .204, $p < .045$, respectively). When regressing the potential predictors onto positive affect variability, the overall model was significant, F (7, 94) = 1.31, $p < .01$, adjusted $R^2 = .154$, with negative affect being the only significant variable, (β= .342, $p < .01$). Next, when regressing the predictors onto negative affect variability, the overall model was significant, F (7, 94) = 21.08, $p < .05$, adjusted $R^2 = .582$, and both positive affect (β= -.209, $p < .01$) and negative affect (β= .614, $p < .001$) were significant. Lastly, when regressing the predictors onto pain variability, the overall model was not significant, F (7, 94) = 1.98, $p < .07$. Based on these findings, age, gender, race/ethnicity, and arthritis joint count were discarded, leaving three covariates in the final model: number of pain locations, positive affect and negative affect.

Correlations

Zero-order correlations were calculated among number of pain locations, positive affect, negative affect (the only covariates that emerged as significant) and each of the other key measures. Refer to Table 3 for correlations among emotional well-being, mindfulness, pain, positive affect variability, negative affect variability, pain variability, number of pain locations, positive affect, and negative affect.

Detrending

Time-dependent trends in the variability measures were examined using multilevel modeling (MLM). Trends were determined by examining time of day (4) of ESM calls across the seven days. Pain variability was the only variable that showed trends, and the pattern of trends was linear, ($\beta = -.007$, $p < .02$); quadratic, ($\beta = -.0002$, $p < .02$), and cubic ($\beta = -7.909$, $p < .02$). These multiple patterns suggests that the trends may be an artifact of the noncontinuous nature of the scale. Given that the scale is a 5-point measure, any movement is going to create the perception of the trend because there are only 5 items to move across, as opposed to a scale that includes smaller units (ex. scale units of 0.2). Despite these significant trends, the decision was made that, because within-day variability is a primary focus of the study, detrending this variable would remove variance that is of conceptual interest. Therefore, no detrending of the data was conducted.

Table 3

Correlations Among Covariates and Primary Variables

Variable	EWB	Mindfulness	Pain	PAV*	NAV*	PV*	#PL*
Emotional Well-Being	-						
Mindfulness	-.507***	-					
Pain	.579***	-.296*	-				
Positive Affect Variability	.300**	-.218***	.171	-			
Negative Affect Variability	.555**	-.448***	.341***	.440***	-		
Pain Variability	.283**	-.090	.435***	.262**	.182	-	
Number of Pain Locations	.431***	-.045	.448***	.037	.205*	.257**	-
Positive Affect	-.605***	.509***	-.294**	-.286**	-.494***	-.196*	-.181
Negative Affect	.632***	-.424***	.329**	.369***	.731***	.084	.215*

Notes: PAV: Pain Affect Variability; NAV: Negative Affect Variability; PV: Pain Variability; #PL: Number of Pain Locations
*p < .05; **p<.01; ***p<.001

Primary Analyses: Path Analyses

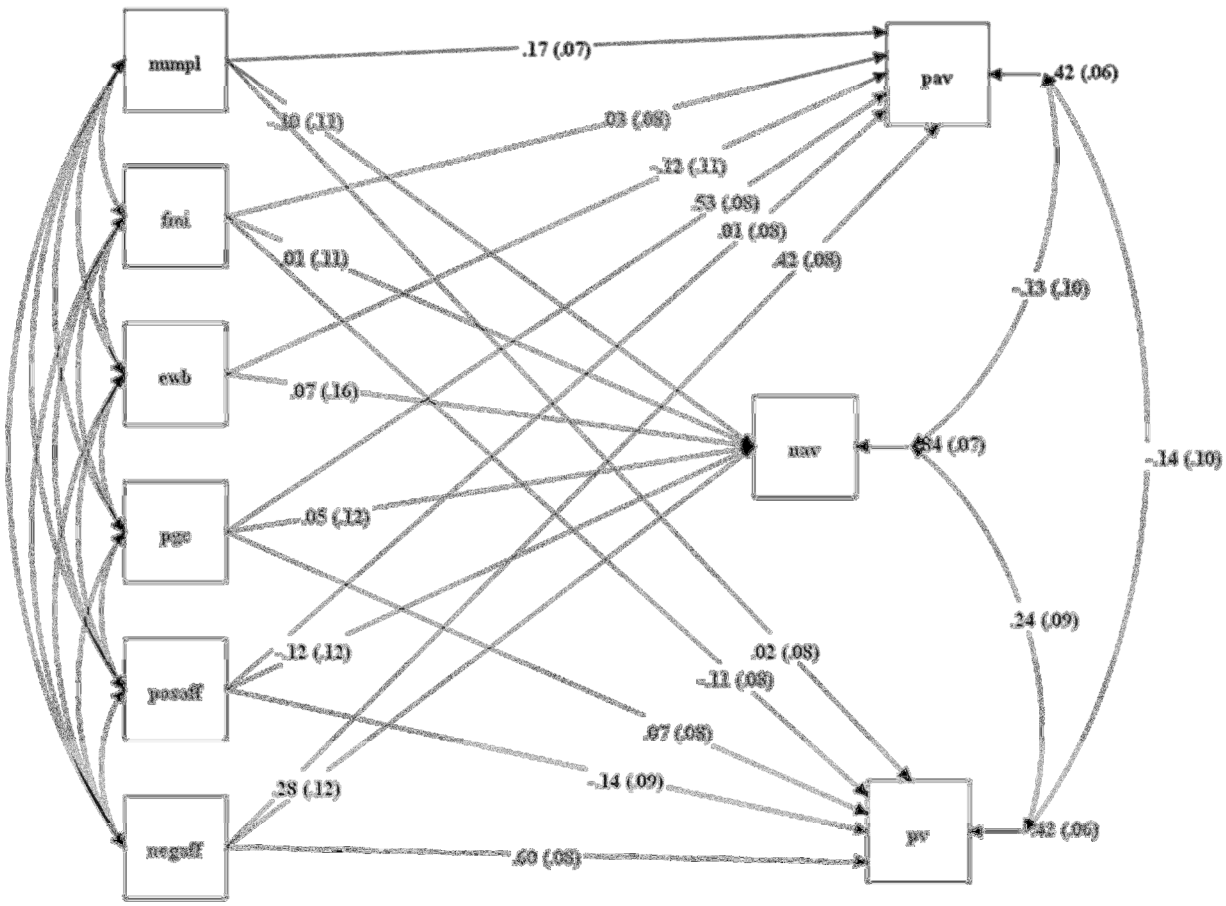
Baseline (nonmoderated) Model:

In the first model (see Figure 3), we ran a basic model without any interaction terms. This model examined effects of emotional well-being, mindfulness, and pain directly on affect variability and pain variability while controlling for number of pain locations, positive affect, and negative affect. The model was fully saturated (just-identified), and the resulting model fit was by definition perfect, $\chi 2$ (0, N = 103) = 0.000, p = 0.000, CFI = 1.000, TLI = 1.000, RMSEA = .0000 (C.I. = 0.000 - 0.000), SRMR = 0.000. Chi-square is the classic goodness of fit index. A significant chi-square value indicates poor model fit, and may warrant rejection of the null hypothesis. The chi-square test is extremely sensitive to sample size, however; thus, researchers agree that fit indices such as the root mean square error of approximation (RMSEA), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and standardized root mean square residual (SRMR) can provide more accurate information about model fit.

In this model, the results indicated that 4 direct paths were significant. The direct paths are as follows:

Positive affect variability is well predicted by pain ($\beta = 0.530$, $p < 0.001$), as well as two covariates: negative affect ($\beta = 0.416$, $p < 0.001$), and number of pain locations ($\beta = 0.174$, $p < 0.025$). Negative affect variability is only predicted by the covariate negative affect ($\beta = 0.275$, $p < 0.025$). Pain variability is significantly predicted by negative affect ($\beta = 0.600$, $p < 0.001$).

Figure 3:Baseline SEM Model (no interaction terms)



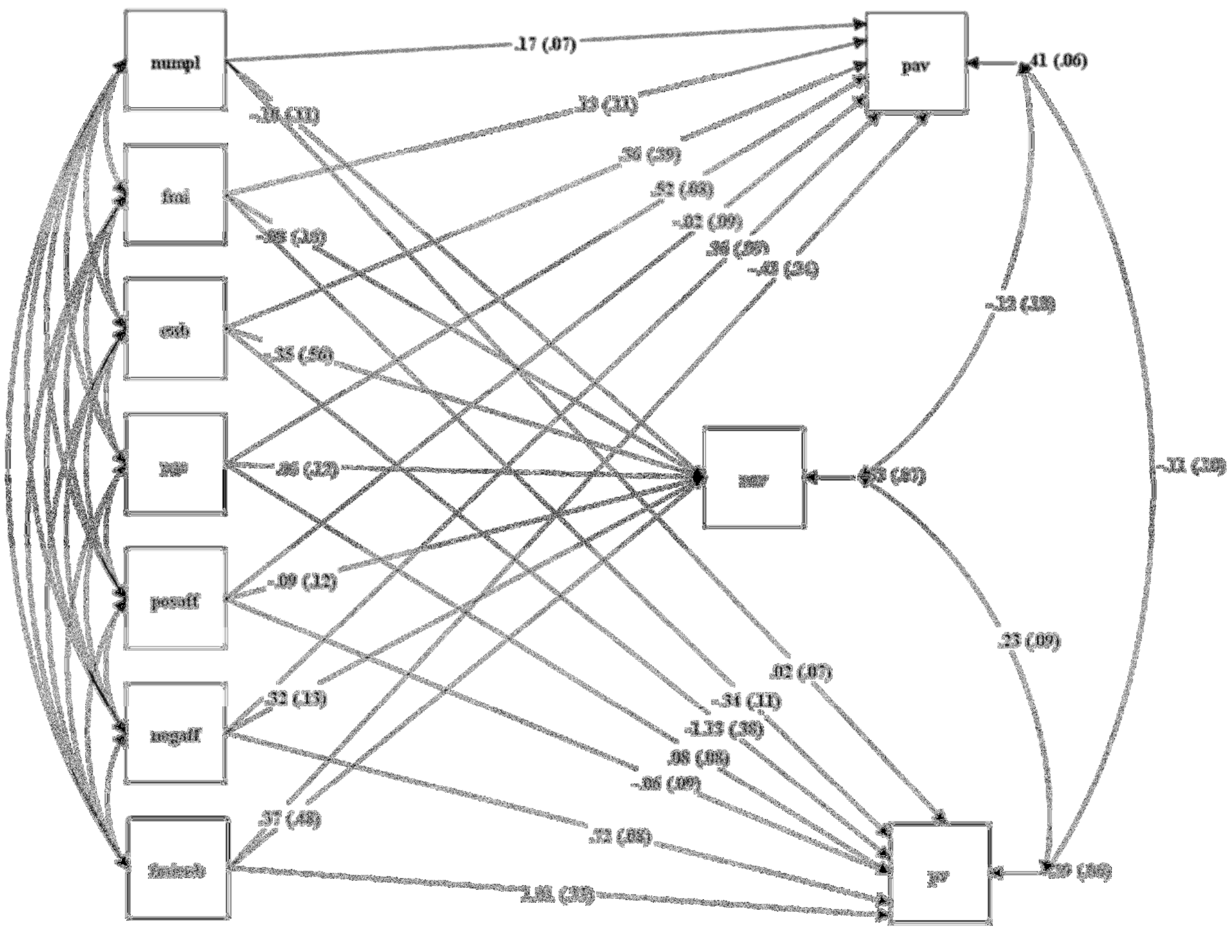
*Notes: *Structural equation model includes standardized Beta values (standard error) for all possible associations*
***numpl = Number of Pain Locations; fmi = Mindfulness; ewb = Emotional Well-Being; pgc = Summary Measure of Pain; posaff: Positive Affect; negaff: Negative Affect; pav: Positive Affect Variability; nav: Negative Affect Variability; pv: Pain Variability*

Moderation Models

Two separate models tested mindfulness as a moderator. Moderated model 1 (see Figure 4) examined mindfulness as a moderator of the effects of emotional well-being on the outcomes while controlling for number of pain locations, positive affect, and negative affect. This model was fully saturated (just-identified), and the resulting model fit was by definition perfect, $\chi2$ (0, N = 103) = 0.000, p = 0.000, CFI = 1.000, TLI = 1.000, RMSEA = .0000 (C.I. = 0.000 - 0.000), SRMR = 0.000.

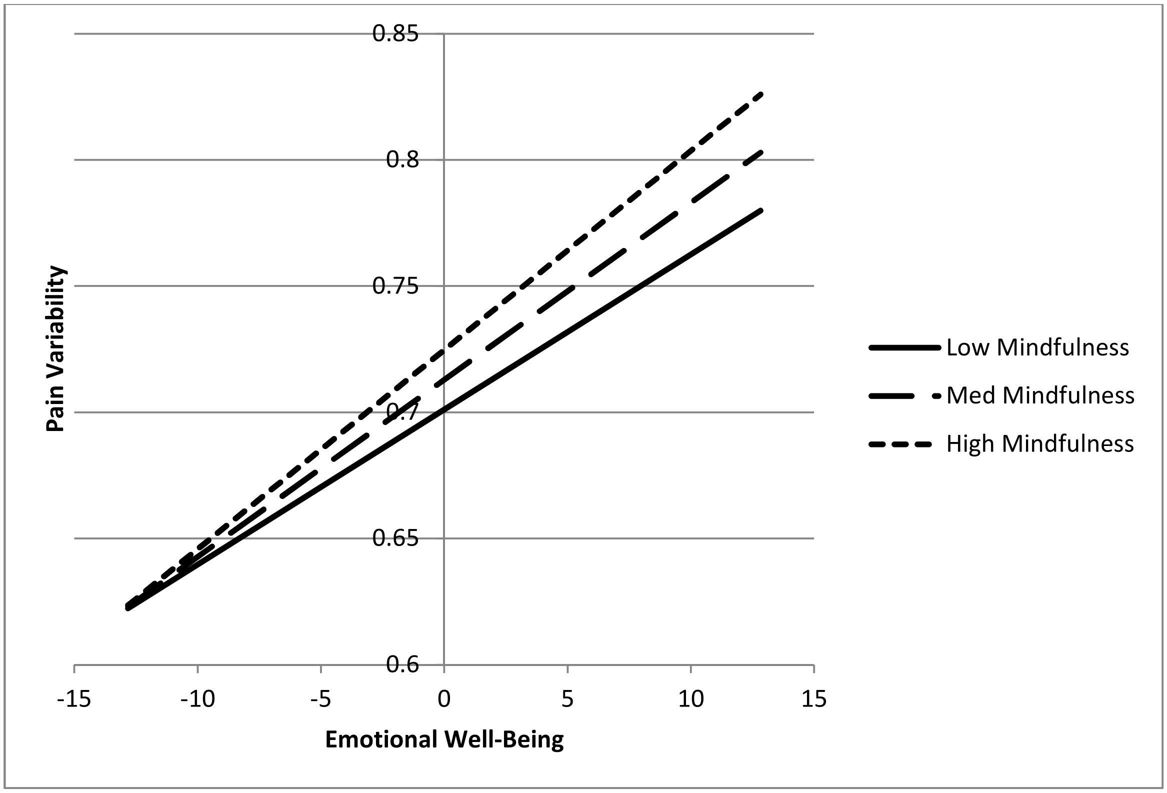
In this model, the results indicated that mindfulness does not moderate the association of emotional well-being with positive (β = -0.433, p = 0.201) or negative affect variability (β = 0.373, p = 0.438). The results did indicate, however, that mindfulness moderates the association between emotional well-being and pain variability (β = 1.006, $p < 0.003$). In the absence of emotional distress, mindfulness is not associated with pain variability. As emotional distress increases (or emotional well-being decreases), mindfulness is associated with increased variability in pain. Figure 5, developed using the PROCESS module (Hayes, 2013), shows three levels of mindfulness: low (≥1 standard deviation below the mean), medium (<1 standard deviation above or below the mean), and high ((≥1 standard deviation above the mean) across three levels of emotional well-being (low, medium, and high via (1) standard deviation below/above the mean) and pain variability (on its normal scale).

Figure 4: Mindfulness Moderating Emotional Well Being and Outcomes



*Notes: *Structural equation model includes standardized Beta values (standard error) for all possible associations.*
***numpl = Number of Pain Locations; fmi = Mindfulness; ewb = Emotional Well-Being; pgc = Summary Measure of Pain; posaff: Positive Affect; negaff: Negative Affect; pav: Positive Affect Variability; nav: Negative Affect Variability; pv: Pain Variability; fmiewb: Mindfulness and Emotional Well-Being interaction*

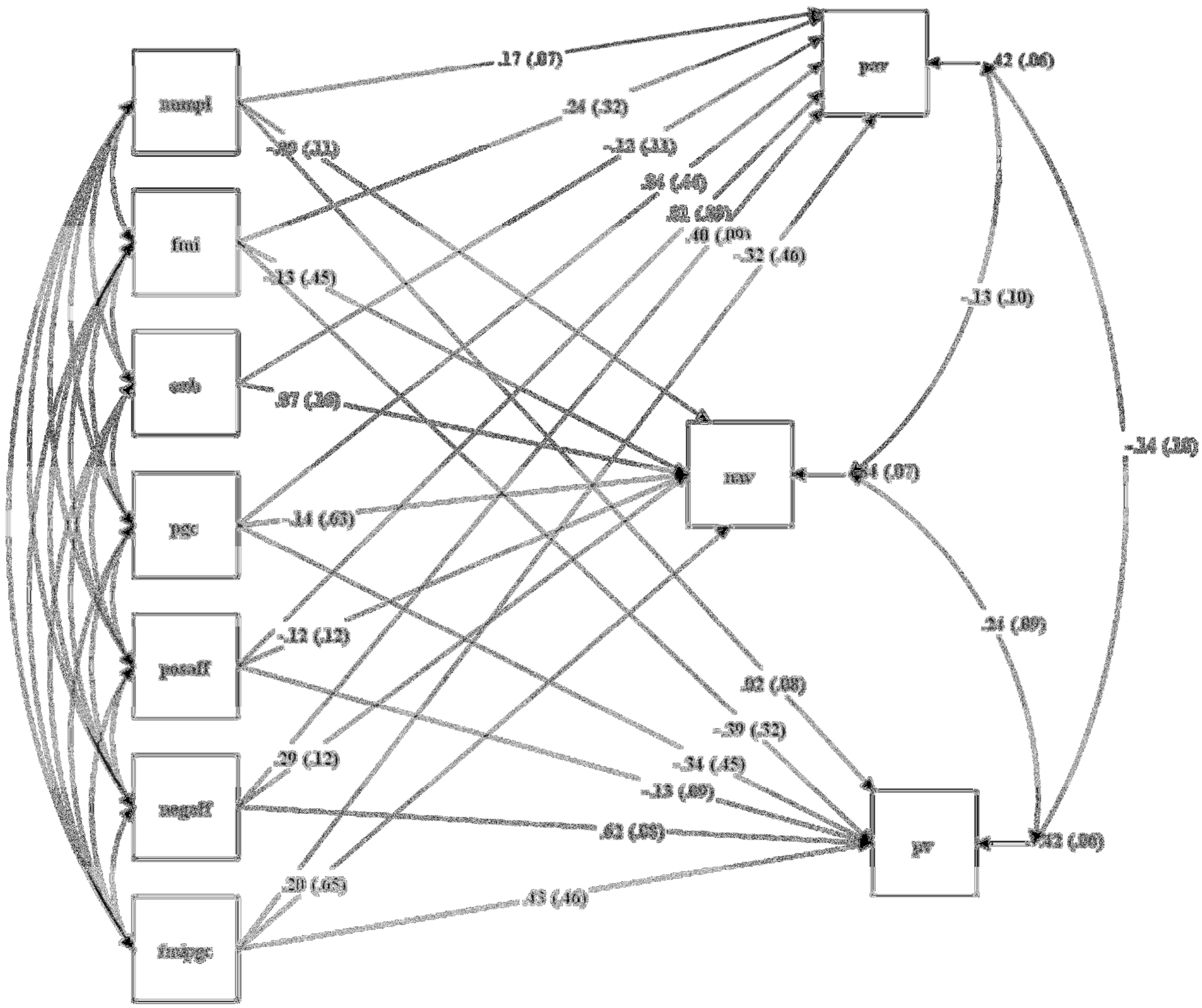
Figure 5: Mindfulness Moderating Emotional Well-Being and Pain Variability



Notes: Emotional Well-Being and Mindfulness mean plus/minus (1) standard deviation from mean; Pain Variability is on its normal (non-standardized) scale.

Moderated model 2 (see Figure 6) examined mindfulness as a moderator of the association of pain with the outcomes while controlling for number of pain locations, positive affect, and negative affect. This model was fully saturated (just-identified), and the resulting model fit was by definition perfect: $\chi2$ (0, N = 103) = 0.000, $p < 0.001$, CFI = 1.000, TLI = 1.000, RMSEA = .0000 (C.I. = 0.000 - 0.000), SRMR = 0.000. In this model, the results indicated that mindfulness does not moderate the associations between pain and the three outcomes: positive affect variability (β = -0.321, p = 0.481), negative affect variability (β = 0.202, p = 0.755), and pain variability (β = 0.426, p = *0.352*).

Figure 6: Mindfulness Moderating Pain and Outcomes



*Notes: *Structural equation model includes standardized Beta values (standard error) for all possible associations.*
***numpl = Number of Pain Locations; fmi = Mindfulness; ewb = Emotional Well-Being; pgc = Summary Measure of Pain; posaff: Positive Affect; negaff: Negative Affect; pav: Positive Affect Variability; nav: Negative Affect Variability; pv: Pain Variability; fmipgc: Mindfulness and Pain interaction*

CHAPTER FOUR

DISCUSSION

The aim of the current study was to examine direct and moderated associations among baseline pain, emotional well-being, and mindfulness, and within-day pain variability and affect variability in community-dwelling older adults diagnosed with OA. There were two primary goals associated with the study. The first was to examine summary measures of pain and emotional well-being as predictors of short-term pain variability and affect variability. I hypothesized that summary pain would predict pain variability (higher pain, higher variability) and that emotional well-being would predict pain variability (lower emotional well-being, higher variability). Additionally, I hypothesized that both emotional well-being and pain would predict positive and negative affect variability (higher pain and lower emotional well-being predict higher variability). The second goal was to determine whether mindfulness moderates emotional well-being and affect variability, emotional well-being and pain variability, pain and affect variability, and pain and pain variability. I hypothesized that at low levels of mindfulness, the relationships between primary and outcome variables would be enhanced, and at high levels of mindfulness they would be weakened.

Summary of Findings

Findings confirmed the hypothesis that pain would predict positive affect variability (Hypothesis 1a). Analyses did not confirm the hypotheses that pain predicts pain variability, that emotional well-being predicts affect variability, or that emotional well-being predicts pain variability. These findings also indicated that mindfulness moderates the association between emotional well-being and pain variability. Mindfulness did not moderate the remaining three expected associations.

Direct Associations

The final model established several significant direct associations. First, as hypothesized, positive affect variability was strongly predicted by pain (Hypothesis 1a), negative affect, and number of pain locations, suggesting that positive affect is more variable among persons with higher overall pain, higher negative affect, and higher number of pain locations. Next, negative affect variability was strongly predicted by negative affect, suggesting that negative affect variability is higher with higher negative affect. Lastly, pain variability was strongly predicted by negative affect, suggesting that pain variability is higher with higher negative affect.

Some hypotheses were not confirmed in the primary analyses, including pain predicting pain variability (Hypothesis 1b), emotional well-being predicting pain variability (Hypothesis 1c), and emotional well-being predicting affect variability (Hypothesis 1d). Although these hypotheses were not confirmed in the primary analyses, pain was positively correlated with pain variability, emotional well-being was positively correlated with pain variability, and emotional well-being was positively correlated with both positive and negative affect. This discrepancy may be the result of univariate vs. multivariate models. When examining single predictors in the model (correlations), there are greater significant associations than when examining multiple predictors in the model (SEM). Univariate analyses are commonly more descriptive in nature, followed by the more advanced multivariate analyses.

Mindfulness as a Moderator of Emotional Well-Being and Outcomes

The moderation analyses indicated that mindfulness does not moderate the associations between emotional well-being and positive affect variability nor between emotional well-being and negative affect variability (Hypothesis 2d). The results did indicate that mindfulness moderates the association between emotional well-being and pain variability such that at high levels of distress (lower emotional well-being), mindfulness is associated with greater pain variability (Hypothesis 2c). These results highlight the important role mindfulness may play in the complex dynamic between emotional well-being and pain among individuals with chronic illness.

Mindfulness as a Moderator of Pain and Outcomes

Surprisingly, the moderation analyses indicated that mindfulness does not moderate the associations between pain and pain variability (Hypothesis 2a). Mindfulness also did not moderate the association between summary measures of pain and positive affect variability, nor between pain and negative affect variability (Hypothesis 2b). Despite these unexpected results, mindfulness was strongly correlated with pain, positive affect variability, negative affect variability, positive affect and negative affect. Although mindfulness may not moderate the hypothesized associations, it may still be an important component to better understanding pain and affect in older adults with chronic illness.

Clinical Implications

Emotional Well-Being and Pain

These results are congruent with previous literature discussing the associations of pain with depression, anxiety and other measures of psychological distress (Romano & Turner, 1985; Dobie & Mellor, 2008; Casten et al. 1985). Although not all of the pain and emotional well-being hypotheses were confirmed in the primary analyses, strong correlations between the variables are consistent with analyses suggesting the important pain-depression relationship in chronic pain (Fiske, Wetherell, & Gatz, 2009; Rosemann et al. 2007).

Negative affect was a particularly influential variable in the primary analyses, predicting positive affect variability, negative affect variability, and pain variability. This suggests that pain intervention and management programs should focus not only on the physical pain itself, but also on decreasing negative affect and treating potential coexisting emotional distress. Psychological therapies, such as cognitive behavior therapy, in addition to pharmacological therapies may be beneficial in managing pain for chronic pain patients in particular (Ehde, Dillworth, & Turner, 2014; Sturgeon, 2014).

These results do not explain whether pain causes emotional distress or vice versa. This model is similar to the Friedman and Kern (2014) common sense model of health (refer to Figure 1); however, the current model does not include a longitudinal component that the common sense model has. Both models give a more integrated and comprehensive understanding of health outcomes than simply understanding whether one single variable causes another single variable. This study elaborated on that model by integrating other important information, including number of other pain locations in addition to the knee, to better understand the pain-affect association in an individual with chronic pain in one coherent model. To further understand the relationships in the present study's model, a causal longitudinal analysis would be necessary.

Variability

This study gives further evidence about the importance of examining variability in older adults, especially those suffering from chronic illness and chronic pain. These results replicate previous research highlighting the important role both affect variability and pain variability may play in the pain-affect relationship in older adults (Zakoscielna & Parmelee, 2013; Affleck et al. 1999). By examining variability, we have a very comprehensive understanding of the changes a person may be experiencing in their pain and affect on a within-day and across-day basis. Understanding this variability could provide older adults with better pain coping mechanisms (for example learning better self-regulatory techniques that can decrease pain and affect variability when they are experiencing greater distress). Additionally, better understanding variability can guide older adults' treatment, leading to better health outcomes (Harte, 2009), and drive better pain management (Allen, 2007).

This study found that greater positive affect variability, negative affect variability and pain variability were associated with greater emotional distress (lower emotional-well-being), and that greater negative affect variability and pain variability were associated with greater pain. This is consistent with previous literature. Older adults are generally more stable (Brose, Scheibe, & Schmieder, 2013) than younger adults, with better self-regulatory processes that decrease affect variability in particular (Rocke, 2013). They experience less variability in positive and negative affect than younger adults, and do not react as strongly to positive or negative events (Rocke, Li, & Smith, 2009). These results examining a biologically vulnerable sample are also consistent with the SAVI model (Charles & Carstensen, 2009), suggesting that when vulnerabilities (such as chronic illness - in this case, OA) are present, adults may be less equipped to deal with more variability combined with negative events since they generally have been functioning in a more stable and neutral way.

Interestingly, pain only predicted positive affect variability and not negative affect variability. Additionally, emotional well-being did not predict any variability (pain or affect) outcomes. This is inconsistent with Koval et al's (2013) study suggesting that affect variability is related to depression; however, in our analyses negative affect did predict all three outcomes (pain variability, positive affect variability, and negative affect variability). The analyses indicated that pain and negative affect may play a more direct role than decreased emotional well-being (or higher emotional distress) in increasing pain or affect variability. This may also be contingent on a generally less emotionally distressed (greater emotional well-being) sample, and analyses may yield different results if the sample had high overall emotional distress. For example, Zakoscielna and Parmelee (2013) found that depression made the biggest contribution in explaining pain variability (such that pain variability was greater in persons with more depressive symptoms) out of depression, perceived pain, mean pain, and overall health. Emotionally distressed older adults perhaps may be less engaged in activities and more attuned to changes of their pain levels than nondepressed individuals.

Another possible explanation for this discrepancy is direction of the relationships in the model. The current study's model predicted variability as a function of well-being, as opposed to predicting well-being from variability, as previous literature has done (eg., Zakoscielna & Parmelee, 2013). An area of interest in this study was to examine what may predict or be related to variability, given variability's importance in the older adult population (Koval, Pe, Meers, &

Kuppers, 2013; Zakoscielna & Parmelee, 2013). Perhaps variability may be a predictor of emotional well-being and pain outcomes, even if it is not predicted by emotional well-being or pain outcomes.

Mindfulness

Mindfulness moderated only one expected path, between emotional well-being and pain variability. Although mindfulness did not moderate other relationships, higher mindfulness was associated with lower emotional distress (higher emotional well-being), lower pain, lower positive and negative affect variability, greater positive affect, and lower negative affect. Although the results did not confirm three out of four hypotheses, mindfulness still appears to play some role in the pain-affect relationship. Again, this is likely to do with the basic univariate analyses of correlations which provide a more descriptive understanding of the variables in the model, compared to the complex multivariative structural model which examined all of the variables cohesively in one model.

The moderate univariate correlation of greater mindfulness with lower emotional distress and greater positive affect replicates previous findings on the mindfulness and emotional well-being connection. Specifically, previous literature suggests that high trait mindfulness is associated with fewer mood disturbances (Tamagawa et al., 2013), and reduced negative affect (Creswell et al., 2007). Although not studied here, state mindfulness has also been found to improve anxiety and depression (Young & Baime, 2010; Splevins, Smith, & Simpson, 2009; Smith, Graham, & Senthinathan, 2007) and decrease stress (Young & Baime, 2010; Splevins et al., 2009).

In additional to emotional well-being, previous literature discusses the benefits that interventive state mindfulness has on pain (Kingston, Chadwick, Meron, & Skinner, 2007; Zeidan, Gordon, Merchant, & Goolkasian, 2010) by reducing pain intensity (Brown & Jones, 2010) and reducing pain symptoms (Zeidan et al., 2010). These studies, like the majority of mindfulness and pain research, examined the role of state mindfulness and not trait mindfulness. The current research is one of few studies examining the role of trait mindfulness in a chronic pain population, with results suggesting that trait mindfulness is associated with lower overall pain.

It is not surprising that mindfulness moderated the association between emotional well-being and pain. The direction of the moderation, however, was unexpected. It was hypothesized that at higher levels of mindfulness, the association between emotional well-being and pain variability would be weakened; however, analyses indicated that at higher levels of mindfulness the relationship was enhanced. In other words, these results suggest that if one is already distressed, mindfulness is associated with greater variability of one's pain. These results are inconsistent with self-regulation and mindfulness literature, which suggests that mindfulness could decrease variability by engaging a self-regulatory process.

A possibility for this inconsistency is that most self-regulation mindfulness literature focuses on affect variability (Hill, 2012) rather than pain variability. Literature on self-regulation in mindfulness suggests that self-regulating could reduce emotional reactivity and improve behavioral regulation (Keng, Smoski, & Robins, 2011; Brown & Ryan, 2003). Perhaps self-regulation directly affects emotions and affect variability (e.g., by reducing emotional reactivity), but indirectly affects pain variability via behavioral modification rather than targeting the pain directly. Another possible explanation is that self-regulation is enhanced by attention, which is a central process in mindfulness (Shapiro & Schwartz, 2000). This could potentially be an adaptive (e.g., being more mindful of changes occurring within the body) or maladaptive process (e.g., variability is distressing, especially for older adults). Perhaps older adults that are better able to attend to the variations in their pain are more likely to notice increased pain and engage in appropriate treatment/pain management. Alternatively, they may take notice when their pain is at lower levels, and be mindful of what may have contributed to lower pain (e.g., time of day, outcomes of pain management). Additionally, overall mean level of pain may be important in interpreting the mechanism of mindfulness. Perhaps if pain is low on average, mindfulness is an adaptive process; however, when pain is high on average, than it may be a maladaptive process. Although results in this study controlled for absolute levels of pain, it is worthwhile to examine baseline pain directly in future studies.

Notably, the above inconsistencies may also have to do with trait vs. state mindfulness. Although the current results did not confirm three out of four moderation hypotheses (1: mindfulness moderating emotional well-being and affect variability; 2: mindfulness moderating pain and affect variability; and 3: mindfulness moderating pain and pain variability), state mindfulness may influence these relationships differently than trait mindfulness. For example, engaging in mindfulness meditation (a state mindfulness exercise) may reduce pain (Brown & Jones, 2010), which may in turn reduce both affect and pain variability. Examining these associations using state mindfulness rather than a trait mindfulness measure could give different insight into the pain-affect relationship in older adults with chronic pain. Given the strong correlations mindfulness has with both variability and summary measures of pain, it is worthwhile to continue to examine its role in older adults.

Limitations and Strengths

Limitations

There were several limitations associated with this study. Given that this study relies on its parent study, EQUAL, it is limited by the measures and variables available to the larger study. There are some limitations related to the proposed project outside of the realm of the parent study. For example, this dissertation is cross-sectional in nature, while EQUAL is longitudinal. Although this analysis gave insight into within-person processes, future research should focus on how these processes change over time. Additionally, this study focuses on a specific population of older adults: those suffering from OA. Thus another limitation is that we cannot generalize to the entirety of the older adult population. Older adults with different chronic illnesses may display different associations among pain, emotional well-being, and mindfulness.

The next limitation is related to the measurement of daily pain. As Zakoscielna and Parmelee (2013) noted, pain variability is frequently not studied due to data collection problems. Waling et al. (2001) state that how pain is measured (for example visual analogue scale vs. pressure pain threshold) may provide information on different characteristics of pain. In women with trapezius myalgia, larger pain variability was found using visual analogue scale (VAS) assessment than pressure pain threshold (PPT) assessment. The authors posit that since VAS is a global self-report measure, it may be more susceptible to variability than PPT (self-report measure based on physiometric stimulus). Furthermore, Waling et al. (2001) state that very diminished cognitive abilities affect the ability to appropriately detect and/or report pain. Although our sample ruled out those with moderate to severe cognitive deficits, some participants may have been experiencing mild cognitive deficits that may have had an effect on reported pain. Further exploration is needed on how to best measure within-day variability in older adult samples.

Lastly, there are some analytical limitations specific to this study. Given the small sample size (103), number of indicators for measures (44), and number of potential parameters, a confirmatory factor analysis (CFA) was not conducted in SEM. Although psychometric properties were examined, ideally a CFA measurement model would be run prior to running the path model. Consequently, the primary variables were examined as observed variables in the primary analyses rather than latent variables. Although the measures used in the primary analysis have been statistically validated, ideally all indicators of all measures would be included in the model. Again, this was not possible in the present analyses given the smaller samples size compared to the number of indicators. Upon completion of the parent study's data collection, it would be beneficial to run these analyses again as latent variables and with a CFA model prior to running the primary analyses.

Strengths

There are several strengths associated with this study. This model examined the associations among emotional well-being, affect, pain, mindfulness, affect variability and pain variability in one theoretical model. Previous studies generally only investigated these constructs individually (e.g., emotional well-being and pain). Literature suggests the benefits of examining these constructs in a multi-dimensional, comprehensive model (Friedman, & Kern, 2013), and this is one of the first studies to do so.

Another strength of this study is the representativeness of the sample. Although small, the sample represents a wide range of participants with varying levels of emotional well-being (including those who are at risk for clinical depression based on CESD cut-off scores), mindfulness, and pain. Overall, the sample reports relatively positive emotional well-being, average mindfulness, and moderate overall pain. Additionally, the sample was recruited from both Alabama and New York, and included participants with widely varying levels of education level, employment status, income, and marital status, making this sample generalizable across older adults with OA. Lastly, the parent study has many methodological strengths including the use of both baseline interviews and follow up ESM methodology to measure pain and affect variability.

Future Research

Future studies should continue to study the role of mindfulness and variability in the pain-affect connection among older adults and chronic illness, and in a more generalizable chronic pain sample rather than specifically those with OA. Previous studies find mindfulness to be a successful pain management intervention strategy (Kingston, Chadwick, Meron, & Skinner, 2007; Zeidan, Gordon, Merchant, & Goolkasian, 2010; Brown & Jones, 2010; Zeidan et al., 2012; Morone et al., 2008), thus it is worthwhile to continue to examine its intervention benefits. Future studies should continue to examine the role of state vs. trait mindfulness to determine relative intervention benefits. Additionally, future studies should continue to look at both pain and affect variability, perhaps across a greater period of time than seven days. Lastly, future studies should examine this set of phenomena longitudinally.

Conclusion

In sum, the present study confirms the important influence of variability of pain and affect in older adults suffering from OA. Although mindfulness played a different role than originally expected, it may still provide important information about how older adults regulate themselves in the context of chronic illness. By understanding these relationships and using them to guide modifications to OA pain treatment plans, improvements could be made to both pain management and overall emotional well-being interventions in those suffering from chronic pain.

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APPENDICES

Demographics Form

1. Sex: M / F

2. What is your date of birth? _____ / _____ / _________

3. What is your marital status? Married; Widowed; Never married; Living with partner; Separated

4. Do you have any children? N/Y

   4a. (if yes) how many? ______

5. What race do you consider yourself to be? Caucasian; African American; Asian/Pacific Islander; Hispanic; American Indian/Alaskan Native; Other (specify):

   5a. What was your mother's racial/ethnic background?

   5b. What was your father's racial/ethnic background?

6. What is the highest level of education you have completed?

   ______ Grade 11 or less

   ______ High school /GED

   ______ Technical school / vocational training (post-high school)

   ______ One to 4 years' college

   ______ College graduate

   ______ Graduate/professional degree: _______________________________

7. Are you currently working?

_____ work full-time _____ retired

_____ work part-time _____ homemaker

_____ looking for work _____ disabled / unable to work

_____ Other: ___________________________________

7a. (If currently employed):

What kind of work do you do? ____

7b. (If previously employed):

What kind of work did you do most of your life? __________________________

8. Over the past four weeks, have you had any difficulty getting transportation to where you want to go? N/Y

9. Do you limit your activities because you don't have transportation? N/Y

10. How difficult is it for you to live on your household income right now?

____ Not at all difficult

____ Somewhat difficult

____ Difficult or can barely get by

____ Very difficult or losing proposition

____ Extremely difficult or impossible

10a.What is your yearly household income, before taxes?

_____ Less than $ 10,000 _____ $40,001 - 50,000

_____ $10,001 - 20,000 _____ $50,001 - 60,000

_____ $20,001 - 30,000 _____ $60,001 - 70,000

_____ $30,001 - 40,000 _____ $70,001 or more

Joint Count

Is your arthritis only in knee(s), or do you have problems with other joints as well?

If so, what other joints are affected: Hip (Y/N), Ankles/Feet (Y/N), Hands/Knuckles/Wrists (Y/N), Shoulder (Y/N), Back/Spine (Y/N), Neck (Y/N), Other

PGC Pain Scale

Now I have some questions about any pain you might have – either because of your arthritis or because of any other health problems. There are no right or wrong answers. Just tell me the response that best represents how you feel on a scale of Not at all, A Little, Moderately, Quite a bit, or Extremely.

DURING THE PAST MONTH…

1) In general, how much have you been bothered by pain?
2) How much are you bothered by pain right now?
3) How much are you bothered by pain when it is at its worst?
4) How much are you bothered by pain when it is at its least?
5) How much has pain interfered with your day to day activities?
6) How many days a week does your pain get really bad? __________ DAYS
7) Now I'm going to read a list of types of pain people may have. After each, please tell me if you are bothered by that type of pain:

		YES	NO
a.	Headaches	1	0
b.	Neck aches or Pains	1	0
c.	Arm or Leg aches and pains (PROBE FOR	1	0
e.	Backaches	1	0
f.	Intestine or stomach pain	1	0
g.	Pain, burning or discomfort in urinating	1	0
h.	Aches or pains in your hands or feet	1	0
i.	Chest pains	1	0
j.	Burning, tingling or crawling feelings in your skin	1	0
k.	Pain in your bones	1	0
l.	Pain in your knees	1	0
m.	Pain in any other joints (Specify):	1	0
o.	Pain in your muscles	1	0
p.	Any other pain? (Specify):	1	0

Freiburg Mindfulness Inventory

For these next questions, please use the last 2 weeks as the time-frame to consider each item. Provide an answer for every statement as best you can. Please answer as honestly and spontaneously as possible. There are neither “right” or “wrong” answers, nor “good” or “bad” responses. What is important to us is your own personal experience on a scale of rarely or none of the time, some or a little of the time, occasionally or moderate amount of time, or most or all of the time.

1) I am open to the experience of the present moment.
2) I sense my body, whether eating, cooking, cleaning or talking.
3) When I notice an absence of mind, I gently return to the experience of the here and now
4) I am able to appreciate myself
5) I pay attention to what’s behind my actions
6) I see my mistakes and difficulties without judging them
7) I feel connected to my experience in the here and now
8) I accept unpleasant experiences
9) I am friendly to myself when things go wrong
10) I watch my feelings without getting lost in them
11) In difficult situations, I can pause without immediately reacting
12) I experience moments of inner peace and ease, even when things get hectic and stressful
13) I am impatient with myself and with others
14) I am able to smile when I notice how I sometimes make life difficult

CESD

These next questions deal with statements people might make about how they feel. For each of the statements, please indicate if you have felt that way **during the past week** on a scale of rarely or none of the time, some or a little of the time, occasionally or moderate amount of time, or most or all of the time.

1) I was bothered by things that usually don't bother me
2) I did not feel like eating; my appetite was poor
3) I felt that I could not shake off the blues even with help from my family and friends
4) I felt that I was just as good as other people
5) I had trouble keeping my mind on what I was doing
6) I felt depressed
7) I felt that everything I did was an effort
8) I felt hopeful about the future
9) I thought my life had been a failure
10) I felt fearful
11) My sleep was restless
12) I was happy
13) I talked less than usual
14) I felt lonely
15) People were unfriendly
16) I enjoyed life
17) I had crying spells
18) I felt sad
19) I felt that people disliked me
20) I could not get "going"

Spielberger State Anxiety Scale short form

People describe themselves in a number of different ways. I am going to read some statements and I would like for you to tell me how you've been feeling for the past week. There are no right or wrong answers. Just give the answer that seems to describe your present feelings best from the following: : rarely or none of the time, some or a little of the time, occasionally or moderate amount of time, or most or all of the time.

1) I feel calm
2) I am tense
3) I feel upset
4) I am relaxed
5) I feel content
6) I am worried

IRB Project #: EX-15-CM-022

UNIVERSITY OF ALABAMA
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS

I. Identifying Information

	Principal Investigator	Second Investigator	Third Investigator
Names:	Karolina M. Zakoscielna	Patricia Parmelee	
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Title of Research Project: Everyday Quality of Life in Osteoarthritis

Date Submitted: 02/10/2015
Funding Source: National Institute on Aging

Type of Proposal ☐ New | ☒ Revision | ☐ Renewal Please attach a renewal application | ☐ Completed | ☑ Exempt

Please attach a continuing review of studies form

Please enter the original IRB # at the top of the page

UA faculty or staff member signature: [redacted]

II. NOTIFICATION OF IRB ACTION (to be completed by IRB):
Type of Review: _____ Full board _____ Expedited

IRB Action:
___ Rejected Date: ________
___ Tabled Pending Revisions Date: ________
___ Approved Pending Revisions Date: ________
✓ Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 2-19-16
Items approved: ___ Research protocol (dated ________)
___ Informed consent (dated ________)
___ Recruitment materials (dated ________)
___ Other [redacted] (dated ________)

Approval signature [redacted]