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Mindfulness and Alcohol-Related Problems among Individuals with Fibromyalgia: Chronic Pain and Depressive Symptoms as Mediators

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Julie I. Morrissey

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ABSTRACT

Mindfulness and Alcohol-Related Problems among Individuals with Fibromyalgia:

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Mindfulness is a cognitive attribute that is associated with better health and well-being. Fibromyalgia is a neurosensory disorder primarily characterized by chronic pain and comorbid depression, leading to an increased risk for alcohol-related problems. Empirical literature confirms mindfulness has beneficial associations with chronic pain, depression, alcohol-related problems, and fibromyalgia. Mindfulness may lead to better health and well-being by facilitating self-monitoring, objective reperceiving, and purposeful changing of health-related behaviors. It was hypothesized that higher levels of mindfulness would be related to lower levels of chronic pain and depressive symptoms, and, in turn, to fewer alcohol-related problems among individuals with fibromyalgia. Cross-sectional data was collected from 287 participants, and statistically analyzed using parallel mediation models. Hypotheses were only partially supported; mindfulness had an inverse relationship with alcohol-related problems, as hypothesized, although the relationship was not mediated by chronic pain or depressive symptoms.

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CHAPTER 1

INTRODUCTION

Research has shown that individuals with fibromyalgia are at an increased risk for self-management of or coping with their chronic symptoms through alcohol use; and, in turn, this may lead to numerous alcohol-related problems (Askay, Bombardier, & Patterson, 2009; Patten et al., 2005). Individuals with fibromyalgia are also likely to have a high comorbidity of depressive symptoms. Prior research has identified a positive biopsychological feedback mechanism that ensues when an individual suffers from chronic pain, as is common in fibromyalgia (Díaz-Marsa et al., 2011), coupled with depression (Patten et al., 2005). Indeed, the combination of chronic pain and depressive symptoms engender the potential for an exacerbation of poor health by the cyclical and compounding system of physiological and psychological distress. Currently, effective treatments for fibromyalgia are limited (Wolfe et al., 2010; Wolfe et al., 2013). Thus, individuals with fibromyalgia who experience a physiopsychological nexus of distress have a greater clinical need for effective medical and psychological treatments.

Mindfulness may be a protective factor that modulates the subjective experience and intensity of chronic pain and depressive symptoms (Kabat-Zinn, 1994) and may abate alcohol-related problems (Fernandez, Wood, Stein, & Rossi, 2014; Segal, Williams, & Teasdale, 2013). Mindfulness is defined as a cognitive attribute that is characterized by moment-to-moment purposeful and focused awareness (Brown & Ryan, 2003; 2004; Kabat-Zinn, 1982; 1994). Substantial research has identified a salutary relationship between mindfulness and psychological and physical well-being (e.g., Baer, Lykins, & Peters, 2012; Brown & Ryan, 2003; Carmody & Baer, 2008; Didonna, 2009; Greeson, 2009; Webb, Phillips, Bumgarner, & Conway-Williams, 2013; Weinstein, Brown, & Ryan, 2009). Independently, the inverse associations between

mindfulness and chronic pain (Kabat-Zinn, 1994; Zeidan et al., 2011), between mindfulness and depressive symptoms (Hofmann, Sawyer, Witt, & Oh, 2010; Segal et al., 2013), and between mindfulness and alcohol-related problems (Fernandez et al., 2014) is well supported in the empirical literature. As an adaptive cognitive attribute, mindfulness incorporates such elements as the self-monitoring of thoughts and the self-regulation of affect and behavior, which facilitate positive health behaviors that cultivate better overall health-related quality of life (Bishop et al., 2004; Brown & Cordon, 2009; Shapiro, Carlson, Astin, & Freedman, 2006; Webb et al., 2013). Nevertheless, the interrelationships between mindfulness, the physiopsychological system of distress produced by chronic pain and depression, and alcohol-related problems, particularly among those with fibromyalgia, are understudied and not well understood.

Fibromyalgia

Fibromyalgia is a chronic and debilitating neurosensory disorder that is primarily characterized by widespread chronic pain (Díaz-Marsa et al., 2011). In the 1800s, fibromyalgia was first described as a form of muscular rheumatism; yet, the current diagnostic criteria were not available until 1990, and it was not until 2005 that the first treatment guidelines for fibromyalgia were published (American Pain Society, 2005). Those with fibromyalgia frequently experience prolonged periods of lethargy, fatigue, persistent sleep difficulties, and nonrestorative sleep. Moreover, those with fibromyalgia commonly experience physical and psychological comorbidities such as chronic fatigue syndrome, irritable bowel syndrome, central sensitivity syndromes (i.e., temporomandibular disorder, restless leg syndrome, or multiple chemical sensitivity), mood disorders, anxiety disorders, or personality disorders (Lauche, Cramer, Dobos, Langhorst, & Schmidt, 2013; Lawrence et al., 2008; Singh, 2012).

Fibromyalgia currently can only be treated, but not cured, and is exhibited as physiological, neurological, cognitive, and psychological health symptoms. The diversity of symptoms has highly detrimental effects on quality of life among those with fibromyalgia and can encumber an individual's daily functioning by limiting physical activity, and restricting familial and social involvement (Marcus & Deodhar, 2011a; Parra-Delgado & Latorre-Postigo, 2013). Males, females, adults, and children can develop fibromyalgia. A race predilection has not been identified, although for unknown reasons, approximately 90% of those diagnosed with fibromyalgia are adult Caucasian females (Lawrence et al., 2008). While it affects approximately 5 million U.S. adults, the current prevalence among females is reported at 3.4% and 0.5% among males (Castro-Sánchez et al., 2012; Lawrence et al., 2008; Jones et al., 2015). Due to an active debate about the etiology of fibromyalgia - whether it develops via a biophysiological origin or is a psychosomatic disorder - it is theorized that the actual prevalence rate of fibromyalgia is higher than currently documented (Wolfe et al., 2010).

The etiology of fibromyalgia is undetermined based on disputation regarding what causes fibromyalgia to develop; however, it is thought that fibromyalgia does not result from a single factor or event, rather from various etiological mechanisms (Parra-Delgado & Latorre-Postigo, 2013). Etiological risk factors for fibromyalgia, generally, but loosely, are associated with biological factors such as a hereditable predisposition, epigenetic mechanisms, or perhaps physiological influences such as repetitive injuries to the body, prolonged severe infections or viruses, or obesity (Jones et al., 2015; see also Redelmeier, Zung, Thiruchelvam, & Tibshirani, 2015). Further deliberation proposes that environmental influences may cause fibromyalgia by physical insult to the body (e.g., exposure to heavy metal toxins, carcinogenic chemicals ingested from food or absorbed from air or water pollution, or perhaps malnutrition) (Marcus & Deodhar,

2011a; Parra-Delgado & Latorre-Postigo, 2013). In addition, it is thought that psychological factors such as traumatic or stressful events (e.g., physical, sexual, or emotional abuse), or untreated psychiatric or psychological disorders may cause fibromyalgia.

Researchers have acknowledged that inconclusive results of the etiology hinder the understanding of fibromyalgia, as well as the prognosis of those with the disorder; inadvertently leaving many with fibromyalgia with few effective forms of treatment (Wolfe et al., 2010, 2013). Thus, the validity of fibromyalgia as a unique clinical entity is a matter of contention due to no discrete diagnostic boundary separating and differentiating the symptomatic overlap of fibromyalgia, chronic fatigue syndrome, certain chronic pain disorders or rheumatoid disorders (Goldenberg, Burckhardt, & Crofford, 2004; Kanaan, Lepine, & Wessely, 2007).

Chronic pain. Chronic pain is defined as episodic or continuous sensations of pain that persist for more than 6 months and that exceed typical recovery time (Brook, Pickering, & Connell, 2011). Pain is felt as an unpleasant sensory experience associated with potential or actual bodily injury (Mirchandani, Saleeb, & Sinatra, 2011). Chronic pain may be exhibited physiologically as either a symptom (e.g., as with fibromyalgia) or a condition (e.g., lower back pain) (Lawrence et al., 2008). Pain is experienced via the multiple interactions between, and among, (1) the neurons in the neurosensory system; and, (2) the pain reception centers in the brain (Garland & Black, 2014; Perl, 2007). Moreover, pain is generally considered a manifestation of multiple malfunctions in the neural network, predominantly among the neurosensory mechanisms (Grass, 2011; Riddle, Kong, & Fitzgerald, 2011). Chronic pain has been shown to affect one's physical strength, sensory system, reflexes, and general functioning (Leo, Quinton, & Ebert, 2011). Importantly, physiological, psychological, environmental, and social factors may magnify one's subjective experience of pain (Kabat-Zinn, 1994). In any form,

chronic pain has long been documented as a common, yet, debilitating factor of many illnesses (Leo et al., 2011), such as fibromyalgia, multiple sclerosis, trigeminal neuralgia, complex regional pain syndrome, and cervical and lumbar radiculopathies (American Pain Society, 2005; Grass, 2011; Vadivelu & Urman, 2011).

For chronic pain specifically associated with fibromyalgia, it is postulated that the experience of pain may be derived from a neurosensory disorder causing peripheral sensitization, hyperalgesia, and allodynia (Mirchandani et al., 2011). Individuals with fibromyalgia frequently experience chronic polymodal pain as acute or generalized muscle or skeletal pain (Marcus & Deodhar, 2011b). Pain is characterized by joint tenderness and discomfort, muscle spasms, numbness, tingling, paresthesia, and burning and/or cold sensations throughout the body (Lawrence et al., 2008). Pain symptoms also may be accompanied by sensitivity to temperature, touch, light, or sound that may also secondarily produce headaches or migraines, or increased pain during menstruation (Lawrence et al., 2008). Current literature has recommended polypharmacy for the treatment of fibromyalgia pain (e.g., muscle relaxants, antidepressants, anticonvulsants, narcolepsy medications, anti-inflammatory medications, and opioids) (Wolfe et al., 2013). Yet most pharmacotherapeutic recommendations differ from what the leading agencies that formulate treatment guidelines (i.e., American Pain Society, European League against Rheumatism, etc.) consider effective medications for fibromyalgia (Wolfe et al., 2013). Indeed, most recommended pharmacotherapies do not effectively produce a "clinically important change" to fibromyalgia pain symptoms (Wolfe et al., 2013, p. 585).

Pharmacotherapy and substance use. Fibromyalgia is classified as a chronic pain disorder (Lawrence et al. 2008). Opioids are the most common pharmacotherapy used to treat chronic pain (Fox III, Hawney, & Kaye, 2011; Sanders, Sprintz, Ellender, Sabartinelli, & Kaye,

2011), and it is reported that almost 50% of those with fibromyalgia are treated with opioids for

pain (Wolfe et al., 2013). Yet, many individuals with fibromyalgia are unsatisfied with opioid

pharmacotherapy for chronic pain (Wolfe et al., 2013), and dislike the adverse side effects (e.g.,

confusion, constipation, sedation, addiction, etc.) (Berger, 2011). In an effort to provide more

efficacious and effective treatments for individuals with chronic pain, one study tracked the long-

term effectiveness of opioids for up to 15 years. The study found that only approximately one-

third of individuals reported that their pain symptoms were adequately managed by opioids

(Gardner-Nix, 2003). Based on data from fjona national, longitudinal study lasting 11 years,

Wolfe and colleagues (2013) found no clinical benefit for using non-central acting analgesic

medications, such as opioids, for the adequate treatment of fibromyalgia pain. When seeking to

manage pain, The Rule of Double Effect obligates practitioners to relieve suffering caused by

pain (Berger, 2011). This standard, which is an ethical statement from the teachings of Thomas

Aquinas, asserts that (Berger, 2011):

> An action having two effects, one good and one bad, is permissible if five conditions are
>
> fulfilled: 1) The act itself is good or at least morally neutral, e.g., giving morphine to
>
> relieve pain; 2) Only the good effect is intended (relieving pain) and not the bad effect
>
> (killing the patient); 3) The good effect is not achieved through the bad effect (pain relief
>
> does not depend on hastening death); 4) There is no alternative way to attain the good
>
> effect (pain relief); [and] 5) There is a proportionately grave reason for running the risk,
>
> e.g., relief of intolerable pain. (p. 631)

Thus, Vadivelu, Urman, and Hines (2011) argued that the use of opioid pharmacotherapy

for fibromyalgia pain is inappropriate due to detrimental, compounding side effects that simply

outweigh any benefits. Indeed, empirical evidence and clinical experience demonstrates that for

individuals with fibromyalgia chronic pain, the long-term use of opioid pharmacotherapy often leads to increased pain from opioid-induced hyperalgesia and a marked susceptibility for substance abuse. Lack of sufficient treatments also increases the risk of addiction and substance-related problems (Berger, 2011; Singh, 2012).

Those with chronic pain, even those who have no history of substance abuse, may become psychologically and physiologically dependent on opioids due to the high abuse liability (Garland, 2014; Garland & Black, 2014). The chance of developing an opioid misuse problem significantly increases, however, when the individual has a personal history of alcohol-related problems or mixes alcohol with opioid medications (Murphy et al., 2015). The prevalence of substance abuse among those with pain conditions or illnesses characterized by chronic pain is greater than the general population – with substance abuse being reported among those with chronic pain at up to 23%, versus up to 19% among the general population (Singh, 2012). Pain and alcohol-related problems also frequently co-occur; it is not uncommon for individuals with chronic pain to mix pain medications with alcohol (Savage, Kirsh, & Passik, 2008). Individuals who mix alcohol with pain medications may further complicate the treatment of their chronic pain (Savage et al., 2008), and increase the likelihood to develop substance-related problems (e.g., substance-induced hyperalgesia, allodynia, or neuropathies) (Egli, Koob, & Edwards, 2012).

The detrimental effects of mixing pain medications and alcohol are highly dangerous. Alcohol interferes with the way that the body metabolizes opioids, potentially releasing a toxic dose of opioids in the body (Murphy et al., 2015). However, at greatest risk to develop alcohol-related problems are individuals with chronic pain who mix pain medication with alcohol and who also experience comorbid depressive symptoms (Savage et al., 2008). Indeed, Pettinati and

Dundon (2011) stress that, "there are real concerns about [depression-related] medication interactions with alcohol in patients who [are] still drinking" (p. 1).

Depressive symptoms. Importantly, individuals with fibromyalgia commonly report that the experience of chronic pain is usually associated with depressive symptoms (Marcus & Deodhar, 2011c; Singh, 2012). Literature suggests that such depressive symptoms may be the result of an emotional expression of physical pain (Mirchandani et al., 2011), or from psychological distress associated with chronic illness (Patten et al., 2005). Research indicates that the combination of chronic pain and depression is often associated with a greater level of disability than for those who suffer with either chronic pain or depression alone (Singh, 2012). Research has also specified for those with chronic pain, who also develop depressive symptoms, a cyclical association emerges (Lauche et al., 2013), suggesting that those with chronic pain may have an intensification of comorbid depressive symptoms.

Depression can interfere with one's quality of life (Kuyken et al., 2010; 2014; Patten et al., 2005). Depression is one way that psychological distress is exhibited (e.g., as sadness, hopelessness, helplessness, guilt, shame, or despair). Frequently, individuals experience depressive symptoms as changes in eating and weight, sleep difficulties, psychomotor agitation or inhibition, difficulty concentrating, rumination, or suicidality – such as suicide ideation, behavior, or attempts (American Psychiatric Association, 2013). The underlying causal mechanisms of depression are not fully understood. Nevertheless, research reveals that certain risk factors such as poor physical and mental health, a negative psychological environment, and the quality of one's social network each contribute to the development of depressive symptoms (American Psychiatric Association, 2013).

Depression may be acute (e.g., one episode) or persistent (e.g., more than one episode), and can be experienced as a primary disorder or a secondary disorder for individuals with comorbid disorders. Depression, for example, may be preexisting to substance abuse, yet substance abuse may maintain depressive symptoms; whereas, comorbid depression may develop as an aspect of substance abuse, as with opioid withdrawal protracted depression (Center for Substance Abuse Treatment, 2010). According to Patten and colleagues (2005), it is estimated that approximately 60% of individuals who experience one episode of depression will subsequently have another depressive episode; furthermore, three out of every four individuals who have experienced *more than one* depressive episode will likely experience another.

Evaluating the association between depressive symptoms and chronic ill health, Patten and colleagues (2005) found that depressive symptoms were highly persistent among those with chronic illnesses. The prevalence rate of depression among those with chronic pain (i.e., not necessarily associated with a chronic illness) is approximately 50% (Radat, Margot-Duclot, & Attal, 2013). An even greater risk for developing comorbid depression was found among individuals with chronic illnesses characterized by chronic pain (Bair, Robinson, Katon, & Kroenke, 2003).

Depression has one of the highest comorbidities with fibromyalgia (Patten et al., 2005), with a 40% greater prevalence rate among those with fibromyalgia than those with other chronic pain disorders (Steiner, Bigatti, & Ang, 2015). Literature indicates that up to 86% of those with fibromyalgia suffer from depressive symptoms, and that the severity of depressive symptoms is consistently associated with the severity of fibromyalgia symptoms (Parra-Delgado & Latorre-Postigo, 2013). Of note, individuals may often dismiss depressive symptoms as a normal reaction

to chronic ill health (Patten et al., 2005); however, left untreated, depressive symptoms increase the likelihood one will develop alcohol-related problems (Zarreen, 2013).

Alcohol-related problems. The deteriorative nature of alcohol-related problems is comparable to depression in terms of persistent chronic symptoms that debilitate daily functioning and health (Pettinati & Dundon, 2011). Likewise, both are commonly explained by underlying shared environmental or interpersonal etiological factors (Nolen-Hoeksema, Desrosiers, & Wilsnack, 2013). Alcohol-related problems may develop as a primary disorder – typically producing comorbid disorders, or as a secondary disorder (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015). The risk for developing depression is 3.7 times more likely when an individual suffers from alcohol use problems (Pettinati & Dundon, 2011). For some individuals, depression may be a preexisting disorder that the individual attempts to self-manage with alcohol, frequently producing comorbid alcohol-related problems (CBHSQ, 2015). For others, alcohol-related problems may alter one's neurological functioning and disturb homeostasis, often resulting in comorbid depression (CBHSQ, 2015; see also Pettinati & Dundon, 2011). Women are more likely to have preexisting depression with comorbid alcohol-related problems (Nolen-Hoeksema et al., 2013), whereas men are more likely have alcohol-related problems that cultivate comorbid depression (Nolen-Hoeksema, 2012).

Alcohol-related problems can be conceptualized as harmful, hazardous, binge, or heavy drinking, and/or alcohol abuse or dependence. Each can include disregard for detrimental consequences, the deterioration of one's quality of life or health, or the perpetuation of comorbid conditions due to alcohol consumption (American Psychiatric Association, 2013; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2013; World Health Organization [WHO], 2001). Annually, an estimated 3.5 million deaths occur worldwide due to alcohol-

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related problems, with almost 100,000 deaths in the United States alone (NIAAA, 2013). When an individual chronically engages in problematic drinking, it is marked by increased frequency and quantity, impaired control over drinking, and possible alcohol dependence. According to the NIAAA (2013), it is recommended that if individuals consume alcohol, to do so moderately. For females, this is one drink or less per day, and for males, two drinks or less per day. The guidelines also consider heavy or harmful drinking to be 5 or more drinks per occasion during 5 or more days per month, and hazardous binge drinking to be the consumption of 4 or more drinks for females and 5 or more drinks for males within 2 hours. Heavy and binge drinking are notably detrimental to one's health and well-being. Alcohol-related problems include, but are not limited to, engagement in unsafe sex, academic, work, legal, and social problems, increased risk for illness, and even death (NIAAA, 2013; see also WHO, 2001).

Alcohol-related problems may arise as an individual's attempt to cope with or self-manage depressive and/or chronic illness symptoms. Empirical studies have documented the association between depressive symptoms and alcohol-related problems, and those with depression have a greater likelihood to develop alcohol-related problems (Zarreen, 2013). Moreover, alcohol is a method used by many individuals who attempt to self-manage symptoms of fibromyalgia, such as chronic pain or depression (Kim et al., 2013).

Chronic pain and depressive symptoms among those with Fibromyalgia, and alcohol-related problems. The controversy surrounding the etiology, course, and prognosis of fibromyalgia has led some physicians to describe fibromyalgia as a psychosomatic reaction to a stressful life and an unhealthy lifestyle (Wolfe et al., 2013). Individuals with fibromyalgia may suffer physical and psychological pain needlessly due to uncertainty among physicians regarding whether fibromyalgia is, in fact, an actual physical illness (Askay et al., 2009). Indeed, the

invalidation of fibromyalgia as a neurosensory disorder often leads to inadequate medical and clinical treatment of chronic pain and comorbid symptoms (Wolfe et al., 2010; Wolfe et al., 2013), the self-management of symptoms with alcohol, and ultimately, negative health-related outcomes (Singh, 2012).

Paradoxically, physicians are significantly concerned about the addictive nature of painkillers, like opioids, and literature acknowledges that alcohol is one method individuals use to manage chronic pain, due to the undermedication of their experience of pain, which often leads to alcohol abuse (Askay et al., 2009). Many individuals with fibromyalgia and comorbid depressive symptoms indicate that they felt powerless to control their health outcome and well-being (Malin & Littlejohn, 2012), and such feelings are associated with the increased probability that an individual will use alcohol to manage symptoms (Singh, 2012). Nevertheless, while drinking may temporarily buffer pain and distress (Kim et al., 2013) associated with fibromyalgia, it also masks an individual's cognizance of (e.g., awareness and attention to) the detrimental physiological and psychological effects associated with alcohol-related problems (Askay et al., 2009).

Alcohol-related problems and sleep difficulties in the context of fibromyalgia. Sleep difficulties frequently occur for those with fibromyalgia, with over 25% reporting one symptom, and approximately 64% reporting two or more symptoms (Wagner, DiBonaventura, & Chandran, 2012). Sleep disturbances are often linked with pain symptoms, emotional distress, restless leg syndrome, and fibromyalgia sleep-disorder breathing (Lauche et al., 2013). Sleep issues have an impact on health-related quality of life (Wagner et al., 2012). Commonly, individuals report that when sleep is non-restorative, it leaves the individual feeling fatigued, mentally inattentive, irritable, distressed, or experiencing increased pain (Lauche et al., 2013) Although sleep

difficulties and pain experiences are associated, the nature of how sleep disturbances increase pain is not well understood (Carney et al., 2007). Further research is needed to understand the nature of the relationship between chronic pain and sleep difficulties, and to develop effective treatments that can improve both pain symptoms and sleep disturbance. In sum, chronic pain makes sleep more difficult and sleep difficulties exacerbate pain (Lentz, Landis, Rothermel, & Shaver, 1999).

Similarly, the relationship between depression and alcohol-related problems is well established (Bolton et al., 2009; Nolen-Hoeksema et al., 2013; Pettinati & Dundon, 2011), as is that many individuals use alcohol to self-medicate emotional distress (Bolton, Robinson, & Sareen, 2009). Notably, alcohol consumption often has detrimental implications for sleep quality. Ebrahim, Shapiro, Williams, and Fenwisk (2013) conducted a study, which confirmed that any amount of alcohol caused a reduction in sleep onset latency, increased sleep disruptions, and significantly reduced restorative REM sleep. Comparably, researchers Roehrs and Roth (2001) studied the effects of alcohol in relation to sleep quality indicating that alcohol reduced rapid eye movement (REM), which had direct effects on daytime fatigue, diminished alertness, and shortened attentional focus. Nevertheless, alcohol is often used to induce sleep by dulling symptoms that disrupt sleep (i.e., emotional distress, and chronic pain) (Roehrs & Roth, 2001). Their findings show that individuals who use alcohol to self-medicate sleep difficulties were able to induce sleepiness. However, using alcohol in this way is more likely to result in alcohol-related problems, and in the long-term, negated any benefits in sleep quality that the alcohol use may have temporarily achieved.

Pharmacotherapeutics are often utilized to treat sleep problems among those with fibromyalgia. Staud (2011) studied the effects of a narcolepsy medication on symptoms of

fibromyalgia and it was shown to reduce pain and fatigue symptoms, as well as sleep disturbances. However, the U.S. Food and Drug Administration (FDA) rejected the drug in 2010 to treat fibromyalgia on the grounds that it has similar drug effects to the date rape drug gamma-Hydroxybutyric acid (Staud, 2011). Thus, the risks of potential drug misuse and related problems were deemed to outweigh any medical benefits. Wolfe and associates (2013) and Vadivelu, et al., (2011), in regards to opioid treatment for pain symptoms of fibromyalgia, stated a similar argument – harm does not outweigh benefits, nevertheless, opioids have FDA approval.

Health care utilization. Fibromyalgia symptoms notably are not effectively managed through health care provision due to limited effective treatments being available, and this limitation has been well-documented (Wolfe et al., 2013). This suggests that health care utilization is often not constructive. Some physicians think health care services are not constructive and treatments are ineffective due to fibromyalgia being perceived as an unsubstantiated diagnosis. For instance, professional views, such as Ehrlich stated (2003, p. 1666), continue to perpetuate the controversy surrounding treating fibromyalgia:

> The sooner we abandon the diagnosis, fibromyalgia, disband the patient advocacy organizations, and stop the irresponsible publications, the better we serve the public. Is it any wonder that most treatments, at least the drugs and the obscene neurosurgical interventions, do not really work? One cannot really treat non-diseases.

Similarly, Hadler conceptualized fibromyalgia as "the medicalization of misery" (2003, p. 1668-1670), and stated:

> The medical contract demands specific treatment for the cause of the pain. Such a treatment act rests on the shakiest of scientific grounds for the patient with a regional musculoskeletal disorder. It is groundless for the patient with persistent widespread

pain…   The proponents of the fibromyalgia construction are convinced that their pathophysiological insights and theories are valid, albeit as yet unproved, and their therapeutic approaches need but tweaking to produce the benefit that has eluded demonstration to date.

Thus, the validity of fibromyalgia as a unique clinical entity is a matter of great contention. Tense discussions have advanced into a heated controversy due to no discrete diagnostic boundary of fibromyalgia symptoms. Furthermore, health care providers are calling for a separation and differentiation of the symptomatic overlap of symptoms commonly associated with fibromyalgia and other health conditions including chronic fatigue syndrome, certain chronic pain disorders, and rheumatoid disorders (Goldenberg et al., 2004; Kanaan et al., 2007).

Ineffective management of pain symptoms also increases sleep difficulties (Carney, Edinger, Manber, Garson, & Segal, 2007), and sleep problems increase pain sensitivity (Carney et al., 2007), depressive symptoms (Savage et al., 2008), and greater use of health care services (Manocchia, Keller, &Ware, 2001). This suggests that a cycle of inadequate management of symptoms, the maintenance of debilitating pain sensation and depression symptoms, poor sleep quality, and unsatisfactory outcomes from health care treatments have implications for alcohol-related problems (see Carney et al., 2007; Roehrs & Roth, 2001; Savage et al., 2008; Singh, 2012; Zarreen, 2013). According to Savage and colleagues (2008), there exists a synergy of pain and alcohol-related problems that include sleep disturbances, psychological distress such as depression, and increased functional disability. These findings suggest the need for an intervention that improves multiple symptoms.

In sum, fibromyalgia is a complex neurosensory disorder leading to high health care utilization; yet, it remains very difficult to treat. Common and exacerbating sequelae of fibromyalgia include pain sensitivity, depressive symptoms, and sleep difficulties, and the potential for self-medication with alcohol, and its attendant risks. As such, it is important to find consistently effective treatments for fibromyalgia and the compounding debilitation these comorbid symptoms and conditions produce.

Mindfulness

For centuries, spiritual and religious practitioners have advocated the benefits of mindfulness (Brown & Cordon, 2009). The psychological construct of mindfulness was derived from the Buddhist tradition of the Noble Eightfold Path; however, in Western adaptations, it tends to be construed as nonspiritual and nonreligious (see Brown & Ryan, 2003; Christopher, Christopher, & Charoensuk, 2009; Marlatt & Kristeller, 1999). In psychological science, mindfulness is considered a cognitive practice that includes distinctive features of consciousness that are employed by one's present attentive self-awareness, such as sustaining attention on fluctuating stimuli, monitoring events as they arise, emotionally detaching from those events without reaction, and redirecting one's attention (Brown, Ryan, & Creswell, 2007; Zeidan et al., 2011). Brown and Ryan (2003) argue that the attribute of consciousness that augments "well-being is *mindfulness*" (p. 822; emphasis in original).

Furthermore, Shapiro and colleagues (2006) delineate mindfulness with three axioms – attention, intention, and attitude – that constitute a meta-mechanism of action by which health is thought to be enhanced. Attention involves suspending judgment and the interpretation of experience(s) while actively perceiving. Intention regulates thoughts, emotions, and behavior by allowing one to be more adaptive and flexible to change. Both perception and intention affect

one's attitude (which is the quality of one's attention, such as positive or negative), which then affect one's mood from moment to moment. Conceivably, re-perceiving with purposeful intent and a non-judgmental attitude bolsters health by, "(1) self-regulation and self-management, (2) emotional, cognitive, and behavioral flexibility, (3) values clarification and, (4) exposure" (Shapiro et al., 2006, p. 380).

Ideally, the implementation of mindfulness may be used to bolster well-being and treat or manage various psychological and physical symptoms (Riley & King, 2009). Despite the general enthusiasm among researchers regarding the potential therapeutic role of mindfulness, one limitation among research is the lack of a universal conceptualization of what mindfulness entails (Bishop et al., 2004). Even with considerable overlap between the various concepts of mindfulness, different forms of mindfulness show various associations with health behaviors.

For example, two studies by Leigh and colleagues (Leigh, Bowen, & Marlatt, 2005; Leigh & Neighbors, 2009) indicated that college students who scored higher in some aspects of mindfulness (i.e., mind/body awareness) used more alcohol and tobacco than those low in mind/body awareness. This is unexpected given other evidence showing that enhancing mindfulness (i.e., objective observation, attention to thoughts, feelings, and reactions) can be a means to reduce alcohol-related problems (e.g., Pearson, Brown, Bravo, & Witkiewitz, 2015). As such, the relation between mindfulness and alcohol use may depend on which aspects of mindfulness are being examined.

To better clarify research findings and clinical implications, clinicians and researchers have progressively conceptualized variations of mindfulness as a state, trait, or the systematic process of finding equilibrium of stimuli by cultivating insight into thoughts, feelings, and behaviors (Bishop et al., 2004). Accordingly, a state form of mindfulness is viewed as situational

or temporary mindfulness; that is, a transitory state that does not require one volitionally to engage in mindfulness, yet appears extemporaneously and occurs variably on a spectrum of intensity and frequency as a response to a particular situation (Bishop et al. 2004; Brown & Ryan 2003). Trait mindfulness, in contrast, is a dispositional, innate, or preexisting characteristic that is enduring (Brown & Ryan, 2003; 2004). Importantly, individuals may have a capacity to cultivate and utilize various innate levels of dispositional mindfulness.

Related to, but sufficiently distinct from trait mindfulness, is systematic mindfulness. Systematic mindfulness is considered a *habitual practice* (as opposed to an innate disposition in the context of trait mindfulness) to refine one's attention and awareness; in turn, such psychological training may result in a refinement of mental states, mental qualities, and insight regarding body sensations and feelings (Kabat-Zinn, 1994). This habitual practice enables the development of mindfulness as a stable skill (i.e., systematic mindfulness), rather than simply an extemporaneous response (i.e., state mindfulness) or a pre-existing tendency (i.e., trait mindfulness) (Kabat-Zinn, 2013). The process of systematic mindfulness training is commonly associated with devout spiritual or religious practices, such as meditation or prayer (Christopher et al., 2009). Systematic mindfulness training is also used in mindfulness-based psychological therapies (e.g., Mindfulness-Based Stress Reduction, MBSR; Kabat-Zinn, 1982), and is described as cultivating a "way of being" (Kabat-Zinn, 1994, p. 4).

Researchers have continually documented the effectiveness of trait mindfulness to increase well-being (Baer et al., 2012; Brown & Ryan, 2003; Carmody & Baer, 2008; Greeson, 2009), by its effect on psychological, somatic, and physiological health (Baer et al., 2012; Brown & Ryan, 2003; Greeson, 2009; Kabat-Zinn, 2013). Mindfulness-based therapies (MBT) are shown to be: (1) effective in treating psychological conditions (e.g., depression, anxiety,

addictive behaviors, eating disorders, obsessive-compulsive disorder, posttraumatic stress disorder, attention deficit hyperactivity disorder, and psychosis) and physical illnesses, in conjunction with medical treatment (e.g., diabetes, cardiovascular disease, HIV/AIDS, cancer, and psoriasis) (see Kabat-Zinn, 2003; Carlson, 2012; Carlson & Brown, 2005), and, (2) appropriate for clinical and inpatient settings, across the lifespan (Didonna, 2009).

Consistent with clinical research, behavioral neuroscience and neuroimaging research aid in the understanding of how mindfulness may influence an individual's brain functioning and structures. Evidence suggests that increased levels of trait mindfulness may alter the activity and structure of the brain (Treadway & Lazar, 2009). Several EEG, PET, and *f*MRI-based studies noted changes in the brain due to increased levels of trait mindfulness, and concluded, correspondingly, mindfulness may alter the neural networks of cognitive, emotional, and behavioral processes (Treadway & Lazar, 2009). Although imaging findings have been somewhat inconsistent, continued examination into how mindfulness affects the brain, via improving imaging techniques, may provide more insight into the underlying neural mechanisms of how mindfulness may have a therapeutic effect on specific disorders or conditions.

Mindfulness and Health

The World Health Organization [WHO] comprehensively defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (WHO, 1946, p. 1). Similarly, chronic ill health is defined as the presence of a long-term health condition, disease, illness, or disorder [such as fibromyalgia], which encompasses the subjective experience of living with ill health (Centers for Disease Control and Prevention [CDC], 2016). According to the CDC (2016), it is vital for those with chronic ill health to set health goals, identify barriers to health, and monitor one's health. Mindfulness arguably is

"highly relevant to a variety of functional outcomes, including health and health-promoting behavior" (Webb et al., 2013, p. 236).

It is thought that if an individual is not mindfully self-aware, an inability to disengage or distance one's self from an associated unhealthy connotation to a specific stimulus may occur (Hayes, Strosahl, & Wilson, 2012; Hayes & Wilson, 2003). These unhealthy connotations become paired with rigid cognitive rules or judgments that may rouse, prompt, and perpetuate maladaptive or distressing thoughts or feelings, or maladaptive behaviors (Cavanagh, Strauss, Forder & Jones, 2014). The cognitive self-observational feature of mindfulness can allow an individual to detach from harmful or unhealthy thoughts, feelings, or behaviors by re-perceiving a situation and, in turn, may alter a person's behavior by altering one's affective state (Shapiro et al., 2006). In this way, mindfulness may bolster the self-management of health, as well as one's attitude about health and health care (Shapiro et al., 2006), which may contribute to health and well-being (Brown & Cordon, 2009).

Mindfulness and chronic pain. Mindfulness is a protective factor that may decrease one's subjective experience of pain. Mindfulness and pain both alter sensory, cognitive, and affective dimensions of one's subjective experience (Zeidan et al., 2011). Discernment among the various aspects of pain and one's subjective experiences of such pain, tends to encourage and facilitate appropriate pain management and is associated with a better health and quality of life (Garland & Black, 2014; Vadivelu et al., 2011). According to Kabat-Zinn (1994), pain differentiation is key to effectively treating chronic pain, and involves an individual better understanding and identifying different forms of pain, such as the quality of the pain, the duration and frequency, the location and its distribution in certain areas, as well as what symptoms are alleviated or aggravated by certain factors. Mindfulness may be an effective tool

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for individuals experiencing chronic pain to identify and differentiate among the various manifestations of their pain.

Empirical literature indicates that Mindfulness-Based Stress Reduction (MBSR), a formalized approach to clinical therapy, can reduce pain severity and the distress associated with chronic pain, as well as facilitate the appropriate self-regulation of such symptoms (Kabat-Zinn, 1982; 1987; 1994). Some of the earliest trials on the therapeutic effects of mindfulness (i.e., MBSR) to alter the experience of chronic pain found individuals experienced a bolstered ability to cope with and understand sensations of chronic pain (Kabat-Zinn, 1982; 1987; 1994). Similarly, research has shown that not only does mindfulness reduce the subjective experience of pain, but also, that those who participated in a mindfulness program (MBSR) were less likely to control pain with pain medication (Kabat-Zinn, 1985).

Since these initial studies from more than 30 years ago, many researchers continue to evaluate the effect of mindfulness on chronic pain (e.g., Garland & Black, 2014; Lauche et al., 2013; Morone, Lynch, Greco, Tindle, & Weiner, 2008; Schmidt et al., 2011; Zeidan et al., 2011). A more recent study was an eight-week trial, with a 3-month follow-up, of the effects of mindfulness on chronic pain (Morone et al., 2008). Results of the trial echoed Kabat-Zinn's main conclusions, such that those who managed their chronic pain with mindfulness techniques reported a significant reduction in the severity and sensation of pain over time, along with increased attention skills, improved sleep quality, and a better overall feeling of well-being. Such studies suggest that increased levels of mindfulness have a direct effect on augmenting one's attention and awareness to negative attitudes and reactions to pain, the acceptance of limitations, and a sense of greater well-being by purposefully noticing activities or emotional states that aggravated pain.

Garland and Black (2014) evaluated current clinical and neuroimaging research to assess the effect of mindfulness on chronic pain. They report that there is substantial evidence that supports the effect of mindfulness to attenuate pain sensations. Individuals who experienced chronic pain, yet had increased levels of mindfulness, were more objective about negative attitudes associated with pain, had increased awareness of negative attention given to pain, and had augmented attention to how their reactions to pain altered pain sensations. Moreover, the way the pain was processed by the brain was altered by mindfulness techniques. Likewise, Zeidan and colleagues (2011) assessed the effects of mindfulness on one's experience of pain, also evidencing a reduction in chronic pain for individuals with higher levels of mindfulness. Indeed, it was evident on *f*MRI scans that the brain altered how it processed stimuli by changing how it differentiated stimuli into one's subjective sensory, conscious experience.

Another factor in appropriately managing chronic pain is addressing the high risk of developing comorbid depression among those with such pain. Research indicates for those with fibromyalgia that depression is an affective experience associated with pain (Riddle et al., 2011), and the neuro-markers for both depression and pain cannot be examined in isolation (Campbell, Clauw, & Keefe, 2003). Applied to fibromyalgia, research suggests that "neurosignatures for pain and depression exist throughout the neuromatrix [e.g., whole person; see Melzack, 1999] and that these signatures … persist unless modified by interventions that affect the entire network" (Campbell et al., 2003, p. 400).

Mindfulness and depressive symptoms. Depression is one of the most prevalent and debilitating psychopathologies (Patten et al., 2005; Segal et al., 2013). Research continues to elucidate ways in which individuals may more effectively manage and treat the painfully adverse experiences of depression. Depressive symptoms have a particularly salient association with

rumination. Rumination is a perseverative mental cycle in which one dwells on an event, thought, or emotional consequence, replaying events in the mind as a repetitive stream of negative judgements (Didonna, 2009; Kocovski & Rector, 2007). Rumination is well studied and is a substantial contributing factor of depression (Didonna, 2009; Kocovski & Rector, 2007). Rumination inhibits an individual from disengaging and detaching from certain thoughts and encumbers one's ability to objectivity consider the past, present, or future (Barnhofer & Crane, 2009). When a negative thought has a substantial function in driving ruminative processes, it may contribute to undesirable moods and the maintenance of depression (Hayes et al., 2012).

Nolen-Hoeksema (2000) found that those who engage in rumination when depressed tended to have longer and more severe episodes of depression. Furthermore, one detrimental way individuals managed rumination was by the self-medication of alcohol (Nolen-Hoeksema & Harrell, 2002). Indeed, rumination and self-medication with alcohol consistently is highly correlated (Nolen-Hoeksema & Harrell, 2002). Data from the National Epidemiologic Survey on alcohol and related conditions sampled over 10,000 individuals with depressive symptoms (i.e., Major Depressive Disorder, Dysthymia) finding that almost half engaged in self-medication (Bolton et al., 2009). This relationship between rumination and self-medication may stem from an individual's attempt to "escape from the self;" that is, to escape ruminative processes (Nolen-Hoeksema & Harrell, 2002, p. 392).

However, when such a thought is observed mindfully and objectively reperceived it may be experienced as a mental event that will pass, rather than a persistent truth (Teasdale et al., 2002). Objectively challenging thoughts, judgements, or feelings as to whether something is good, bad, neutral, pleasant, tolerable, or unbearable helps individuals better attain and respond to experiences with more meaningful insight into negative thoughts and subjective opinions

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(Kabat-Zinn, 1994; 2007). Negative mental events often lose cyclic momentum (i.e., decreasing rumination) as an individual adopts a stance towards experiencing such processes through openness, curiosity, and recognition (Hayes & Wilson, 2003).

Nevertheless, mindfulness is not a tool intended to "eliminate the thoughts that are generated, but rather to disidentify oneself from them" (Didonna, 2009, p. 9). There is evidence that many individuals who utilize mindfulness experience a beneficial shift in perception – realizing that "thoughts are not facts" (Barnhofer & Crane, 2009, p. 237; also see Teasdale et al., 2002). This form of metacognition highlights that a person is not solely thought-based which, in turn, might help individuals with depression disentangle from rumination (Teasdale et al., 2002). Indeed, several studies (Kocovski, Segal, & Battista, 2009) carried out with non-clinical and clinical samples found that mindfulness training lead to decreased ruminative processes and that those decreases accounted for reductions in depressive symptoms.

Strong empirical and clinical evidence similarly indicate mindfulness contributes to a lessening of distress associated with chronic cognitive and physical symptoms (Barnhofer & Crane, 2009; Didonna, 2009; Kabat-Zinn, 1994; Segal et al., 2013; Williams, Teasdale, Segal, & Kabat-Zinn, 2007). Sephton and colleagues (2007) found mindfulness-based interventions to be a noteworthy self-management method for fibromyalgia-induced depression. Mindfulness showed favorable outcomes for comorbid chronic pain and depression by increasing sensory acuity, decreasing responses to pain, and altering pain-associated neuroactivity, which also have significant implications for the reduction of depression (Gardner-Nix, 2009; Kocovski et al., 2009).

Understanding the underlying mechanisms of how mindfulness affects the brain, psyche, and body is in the early stages; nonetheless, mindfulness techniques have shown substantial

effects on neurological, physiological, and psychological factors associated with depression (Barnhofer & Crane, 2009) and other chronic illnesses like fibromyalgia (Sephon et al., 2007). Researchers continue to elucidate how mindfulness reduces depressive and chronic symptoms as well as increases positive health outcomes. Simply, Sephton and colleagues indicated that mindfulness interventions hold promise for those with fibromyalgia, "especially when viewed in light of the current gaps in medical management of [the] disorder" (Sephton et al., 2007, p. 82).

When medical treatment is inadequate to alleviate symptoms, individuals with chronic illnesses often seek to escape adverse psychophysiological distress through self-medication with alcohol (Singh, 2012). Mindfulness often bolsters a positive feeling of management over one's psychological and physical health status through self-reflection and self-monitoring (Brown & Ryan, 2003). When an individual feels control over one's health and health behaviors, this tends to augment treatment adherence among those with health ailments (Serxner, 2013). Additionally, such mindful awareness to thoughts, feelings and behaviors leads to reductions in rumination about poor health, lack of adequate health care, functional limitations, and life difficulties associated with chronic symptoms (Nolen-Hoeksema, 1991; Kocovski et al., 2009). In turn, decreasing ruminative processes potentially may avert maladaptive coping strategies like the utilization of alcohol to self-medicate (Bien, 2009; Fernandez et al., 2014).

Mindfulness and alcohol-related problems. Considerable evidence has shown that mindfulness improves one's overall quality of life by functioning as an effective coping strategy (Fernandez et al., 2014; Song, Lu, Chen, Geng, & Wang, 2014), which aids in the process of decreasing alcohol-related problems (Pearson et al., 2015). Bien (2009) argued that addictive behaviors, such as alcohol-related problems, are often spurred by the desire to cope with or relieve one's self of the plight of life and all its vicissitudes - that is, the crux of alcohol-related

problems is the avoidance of, or escape from, pain (Nolen-Hoeksema & Harrell, 2002). A person

with problematic alcohol use often experiences the world as an "endless struggle" and alcohol

seems to provide a solution to equivocate reality by altering the subjective and objective senses

(Bien, 2009, p. 290). However, this illusionary or temporary escape from reality (i.e., escaping

from the reality of dealing with chronic symptoms of illness) is short-lived, with excessive

alcohol use, and its related problems, becoming detrimental to well-being (Bien, 2009).

Research indicates avoidance of psychological and physical pain is a primary reason why

many individuals use alcohol problematically (Bien, 2009); in essence, to stop thinking about

limitations, shut out symptoms of pain, and ignore negative sensations (Bien, 2009; Bolton et al.,

2009; Singh, 2012,). Also, based on the notion internal experiences cannot be eliminated, but

merely altered (Hayes et al., 2012), accordingly strategies that augment beneficial internal

experiences improve health and well-being (Hayes & Wilson, 2003). Avoidance maintains

alcohol-related problems among those with chronic pain and distress; therefore, paying attention

to and observing symptoms may be more beneficial than detrimental alcohol-based coping

strategies.

Regardless of what initial factors contributed to developing problematic alcohol

consumption, continued excessive alcohol use can produce unhealthy or unrealistic expectations

of the effects of alcohol consumption (e.g., positive affective states or prosocial behavior will

increase) (Nolen-Hoeksema & Harrell, 2002). Such expectations can cognitively fuse with the

judgment that alcohol is an adequate coping strategy (Hayes et al., 2012). Moreover, such

detrimental expectations or assumptions of the effects of alcohol use may in fact be incredibly

alluring for those with persistent debilitating symptoms of physical pain or emotional distress.

This is suggested by individuals with chronic illnesses having a much greater prevalence of

alcohol-related problems than the general population (Singh, 2012). Approximately one fourth of individuals with chronic pain use alcohol as a means to cope (Singh, 2012), and almost half of those with chronic depressive symptoms self-medicate with alcohol (Bolton et al., 2009). Furthermore, individuals with comorbid chronic pain *and* depressive symptoms, such as those with fibromyalgia, are at greatest risk for self-medicating with alcohol (Savage et al., 2008).

Mindfulness is theorized to alleviate alcohol-related problems by increasing self-awareness of the internal states and triggers for alcohol use, and attention to utilizing a cognitive mode through which cravings can be observed without judgment (Pearson et al., 2014). Awareness of and attention to ambivalence and decisional conflicts about alcohol-related problems could help individuals determine what changes to make to their alcohol use (Miller & Rollnick, 2013). Garland, Schwarz, Kelly, Whitt, and Howard (2012) indicated that mindfulness is a vital component in undoing reactionary alcohol use. Bien (2009) posited that when one utilizes deep awareness to and purposeful attention of the present moment, one has increased clarity before revalidating past judgments, automatic thinking, or future worries. An individual may thereby enter an intentional perception that repeatedly has been shown to abate behaviors that increase alcohol-related problems.

Statement of the Problem

Fibromyalgia alters the way a person lives and functions in day-to-day life. Many individuals with fibromyalgia endure a broad range of unpleasant and chronically painful neurosensory experiences, as well as sleep difficulties, fatigue, gastrointestinal issues, and cognitive issues (see Lauche et al., 2013; Lawrence et al., 2008). Individuals with fibromyalgia report that is it exceedingly difficult to cope with chronic pain while experiencing fatigue due to sleep loss (Carney et al., 2007); suggesting that continual disruption of sleep may deteriorate

one's ability to cope effectively with chronic symptoms. Researchers demonstrated that comorbid sleep disturbances in relation to fibromyalgia symptoms (i.e., chronic pain) frequently contribute to a more general negative mood and increase the likelihood an individual may experience depressive symptoms (Carney et al., 2007). Indeed, studies focusing on illnesses that are highly comorbid with sleep disorders, such as fibromyalgia, must statistically account for sleep quality in association with depression (Carney et al., 2007). Therefore, evaluating sleep quality as a covariate could elucidate mechanisms underlying chronic negative mood states (i.e., depression). Research findings indicated that most individuals with fibromyalgia often suffer from comorbid depression (Singh, 2012). Indeed, the amalgamation of fibromyalgia and depressive symptoms has shown to further decline one's quality of life by simply making life more difficult and limiting (Wolfe et al., 2013).

Those with fibromyalgia often have trouble treating their symptoms due to the scientific community's limited understanding of its etiology and course, and an extended length of time to receive a diagnosis of fibromyalgia - potentially taking years to be diagnosed *before* treatment occurs (Wolfe et al., 2013). Despite some recent advances in the scientific study of fibromyalgia (most notably that many medical studies now consistently recognize fibromyalgia as a legitimate disorder – see Askay et al., 2009), few adequate treatments are available. As such, those with fibromyalgia are left to manage an array of complex and comorbid symptoms with certain interventions that are aimed at one symptom, but generally do not produce effects on the other symptoms (Wolfe et al., 2013).

Further, greater utilization of health care services has not always produced beneficial results for those with fibromyalgia (Wolfe et al., 2013). Vadivelu et al., (2011) contended that the most commonly prescribed treatment – opioid therapy – for fibromyalgia pain is

inappropriate due to the detrimental side effects that offset the benefits (i.e., substance abuse risk and opioid-induced hyperalgesia). In fact, individuals with fibromyalgia are already at increased risk for substance abuse (i.e., illicit drug use or misuse of prescribed opioids) associated with chronic pain and depressive symptoms (Center for Substance Abuse Treatment, 2010; Pettinati & Dundon, 2011). When combined with insufficient treatment options, this can result in individuals supplementing health care or coping with untreated symptoms by self-medicating with alcohol (Pearson et al., 2015; Riley & King, 2009).

Nevertheless, not all those with fibromyalgia use alcohol to cope. While there is scarce research evaluating the effects of mindfulness on alcohol-related problems specifically among those with fibromyalgia, there is promising evidence that mindfulness may attenuate the subjective experience of chronic pain and the intensity of depressive symptoms by enabling one to observe, re-perceive, and facilitate better management of symptoms. Mindfulness has been demonstrated to treat alcohol use problems effectively when used independently or conjoined with other types of health care utilization (Hayes, 2003; Miller & Rollnick, 2013). For those with fibromyalgia, mindfulness often facilitates cognitive-emotional resources that enable better coping strategies (Shapiro et al., 2006). Higher levels of mindfulness (or the propensity to be mindful) also may decrease the likelihood that an individual would engage in compulsive and/or habitual self-medication with alcohol as a form of coping (Black, 2014; Garland & Black, 2014; Garland, 2013; Riley & King, 2009).

To date, many studies have evaluated the effect of mindfulness-based techniques (MBTs) on chronic pain conditions *or* depressive disorders (e.g., Barnhofer & Crane, 2009; Gardner-Nix, 2009; Kabat-Zinn, 1994; 2007; Kocovski et al., 2009; Segal et al., 2013; Teasdale et al., 2002; Sephton et al., 2007), as well as the relationship between MBTs and alcohol-related problems

(e.g., Bien, 2009; Garland et al., 2012; Hayes et al., 2012; Miller & Rollnick, 2013; Pearson et al., 2014). MBTs have also been shown to help those with fibromyalgia improve overall well-being, and facilitate better coping strategies (e.g., Grossman, Niemann, Schmidt, & Walach, 2004; Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007; Kaplan, Goldenberg, & Galvin-Nadeau, 1993; Parra-Delgado & Latorre-Postigo, 2013).

However, recently, Parra-Delgado and Latorre-Postigo noted that, "… no research exists on the use of these programmes [MBTs] in symptoms of depression *and* pain in patients *diagnosed with fibromyalgia*" (2013, p. 1016, emphasis added). Parra-Delgado and Latorre-Postigo proceeded to conduct one of the first studies of this kind. Their study showed that Mindfulness Based Cognitive Therapy (MBCT; Segal et al., 2013) facilitated a meaningful improvement in individuals with fibromyalgia in regards to how their perception of pain sensations and depressive symptoms influenced their quality of life. MBCT helped these individuals to be more accepting of the experience of pain and to be aware of associated automatic thoughts, which lead to a reduction of depressive symptoms.

The beneficial effect of MBTs related to chronic pain, depressive symptoms, and alcohol-related problems in the context of fibromyalgia has not been examined. In particular, the components of mindfulness itself and/or the mechanism(s) of association by which this improvement could be explained have not received empirical attention. Of note, there is some evidence to suggest that while MBTs are associated with beneficial outcomes in general, mindfulness itself may not necessarily be the primary active ingredient (see Webb et al., 2013) and thus verification of the basic role of mindfulness in association with particular outcomes is warranted. In summary, the association of mindfulness with the aforementioned outcomes, whether as a trait or state variable, in and of itself, has not been well studied. The present study

evaluated the mediational relationship of chronic pain and depressive symptoms, among those with fibromyalgia, to better understand the mechanisms of association underlying the relationship between trait mindfulness (rather than taught MBTs) and alcohol use problems.

Hypotheses

The research question addressed by this study is focused on: What is the relationship between mindfulness, chronic pain, depressive symptoms, and alcohol-related problems among people with fibromyalgia? See Figure 1 below for a visual representation. Specifically, the relationship between mindfulness (independent variable) and alcohol-related problems (dependent variable), operating through chronic pain and depressive symptoms (mediator variables), among individuals with fibromyalgia, was examined while controlling for drug-related-problems, sleep quality, and health care utilization. The hypotheses for this study were as follows. Among individuals with fibromyalgia:

1. At the bivariate level of analysis:

    a. Mindfulness would have a statistically significant negative association with alcohol-related problems, bodily pain, depressive symptoms, poor sleep quality, health care utilization, and drug-related problems.

    b. Statistically significant positive associations would be observed among bodily pain, depressive symptoms, poor sleep quality, alcohol-related problems, drug-related problems, and health care utilization.

2. At the multivariable level of analysis, controlling for poor sleep quality, health care utilization, and drug-related problems:

    a. Mindfulness would have a direct, statistically significant negative relationship with alcohol-related problems, bodily pain, and depressive symptoms.

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b. Bodily pain and depressive symptoms would have a direct, statistically significant positive relationship with alcohol-related problems.

c. The association of mindfulness with alcohol-related problems would be mediated by bodily pain and depressive symptoms. That is, higher levels of mindfulness would be associated with lower levels of both bodily pain and depressive symptoms that, in turn, would be associated with less alcohol-related problems.
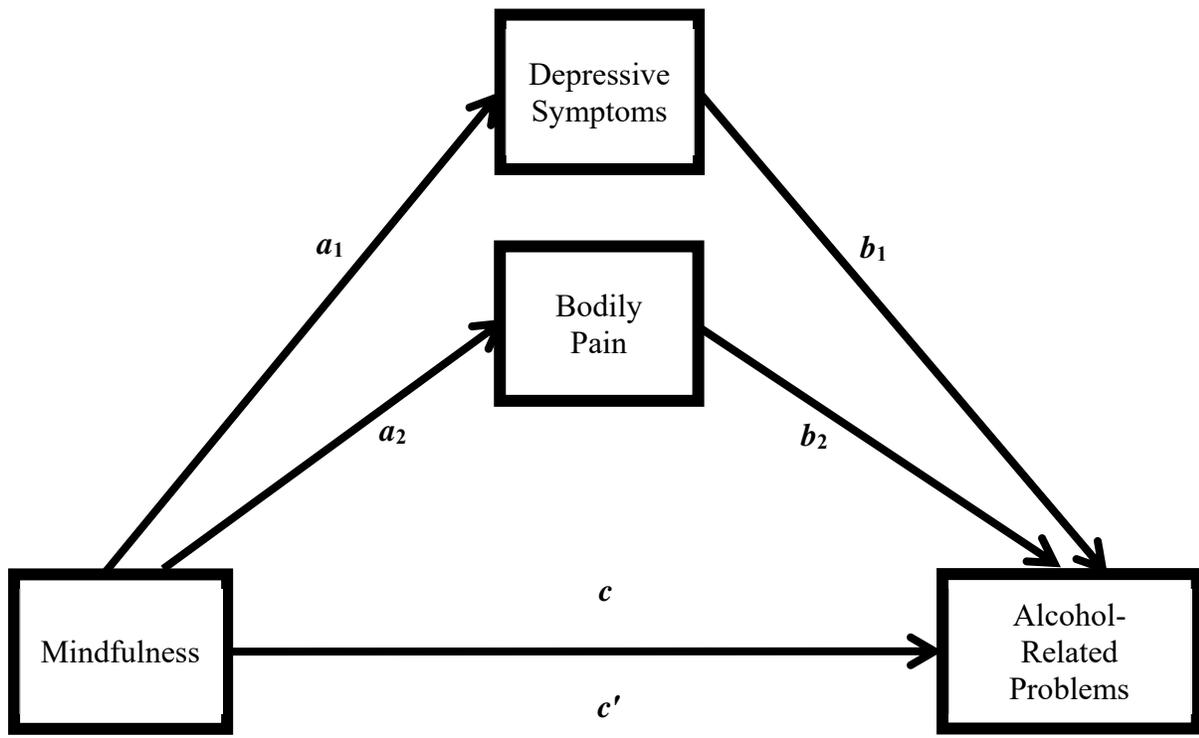
Figure 1. Graphic Illustration of a Parallel Mediation Model

Note: see Hayes (2013).

CHAPTER 2

METHODS

The current cross-sectional study is part of a larger study that was conducted and was

approved by the relevant Institutional Review Board. Participants were recruited (see Table 2 for

eligible participants' demographic information) via advertisements distributed to national,

regional and local organizations, online informational and support groups, and social media

avenues associated with fibromyalgia. Initially, 579 participants were recruited, and eligible

participants (n = 287) provided informed consent to participate in a 30 to 45 minute online

survey (distributed via Survey Monkey) consisting of a variety of self-report questionnaires

related to health and well-being.

Measures

See table 1 below for each key study variable reliability estimate.

Table 1

Reliability estimates for Key Variables

Measures	Number of Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items
MAAS	15	.899	.899
DASS: DEP	7	.916	.915
SF-36: BP	2	.852	.854
AUDIT-10	10	.602	.768
DAST-10	10	.716	.759
MHP-H: HCU	3	.490	.513
PSQI	1	-	-

Note: The closer Cronbach's alpha (α) is to 1.00 the greater the reliability. George and Mallery (2003, p. 231) provide the following rules of thumb: " $\geq$ .9 – Excellent, $\geq$ .8 – Good, $\geq$ .7 – Acceptable, $\geq$ .6 – Questionable, $\geq$ .5 – Poor, and $\leq$ .5 – Unacceptable".

Mindful Attention Awareness Scale. Trait mindfulness was assessed using the Mindful Attention Awareness Scale (MAAS), a 15-item self-report questionnaire that assesses for core attributes of consciousness. Trait mindfulness concerns one's intrinsic and extrinsic modes of perceiving the world. Attributes of trait mindfulness are bare attention and clear awareness that form a nexus of being purposefully focused on the present moment's stimuli. Brown and Ryan (2003) conceptualize awareness and attention as distinct components of mindfulness, yet also acknowledge the considerable overlap between the two (Brown et al., 2007).

The MAAS was designed to assess participant levels of trait mindfulness on a day-to-day basis, for example, "I could be experiencing some emotion and not be conscious of it until sometime later" (MAAS; Brown & Ryan, 2003). Each MAAS item is answered based on a 6-point Likert scale with scores ranging from 1-6 (6 = "Almost Never," 5 = "Very Infrequently," 4 = "Somewhat Infrequently," 3 = "Somewhat Frequently," 2 = "Very Frequently," or 1 = "Almost Always"), which can total a minimum raw score of 15 up to a maximum raw score of 90. Higher scores indicate greater levels of innate, dispositional mindfulness (Brown & Ryan, 2003). The MAAS has robust psychometric properties with Cronbach's alphas (α; estimates of internal consistency or reliability) generally ranging from .80 to .90 among a national sample, samples of community adults, college students, and from clinical settings (Brown & Ryan, 2003; Carlson & Brown, 2005). Good construct validity was indicated, in that the convergent and discriminant validity of the theoretical concepts sufficiently define "one's propensity to be aware of specific events or types of experience, whether in the internal or external world" (see Brown & Ryan, 2003, p. 827). The MAAS also has been shown to be valid in the context of chronic illness, among a sample of individuals with cancer (Carlson & Brown, 2005).

Depression, Anxiety, and Stress Scales – Depression Subscale. Depressive symptoms were assessed using the Depression, Anxiety, and Stress Scales - Depression Subscale (DASS-21; Lovibond & Lovibond 1995). The DASS-21 Depression subscale assesses depressive symptoms as aspects of psychological distress and negative affect including hopelessness, devaluing life and self, anhedonia, lack of motivation, and is distinctive from the anxiety and stress subscales. The DASS-21 is a 21-item, 4-point Likert-type self-report questionnaire that assesses for the presence, frequency, and severity of three distinct aspects of psychological distress – depression, anxiety, and stress (Lovibond & Lovibond 1995).

The DASS-21 has 7 items for each subscale, and assesses participants' symptoms as, 0 = "Did not apply to me at all," 1 = "Applied to me to some degree, or some of the time," 2 = "Applied to me to a considerable degree, or a good part of time," or, 3 = "Applied to me very much, or most of the time" (Lovibond & Lovibond 1995). Raw subscale scores of the DASS-21 can range from 0 to 21, with higher scores indicating greater levels of distress (Lovibond & Lovibond 1995). The DASS-21 exhibited good convergent and discriminant validity for constructs based on one's appraisal of stressors, maladaptive coping strategies as substance abuse, adaptive coping with internal or external stressors by the use of emotional and instrumental support, and life satisfaction.

Construct validity was assessed using a non-clinical sample of younger adults (Gloster et al., 2008; see also Henry & Crawford, 2005). Psychometric properties include excellent internal consistency, as assessed in both clinical and research settings (α = .91 to .97 for the Depression subscale; Gloster et al., 2008). The DASS-21 is based on a dimensional conception (Gloster et al., 2008) and, therefore, has no direct implications for diagnostic categorization, as postulated by the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.) (American Psychiatric

Association, 2013). Nevertheless, the DASS-21 is valid to distinguish depressive, anxiety, and stress related symptoms, and has recommended severity-related cutoff scores for each subscale. For the depression subscale (raw scores multiplied by 2), normal levels are 9 or less, mild severity ranges from 10-13, moderate from 14-20, severe from 21-27, and extremely severe levels are 28 or above (Lovibond & Lovibond 1995).

Medical Outcomes Survey 36-Item Short-Form Health Survey (SF-36; version 2) – Physical Component: Bodily Pain Scale. The SF-36 Bodily Pain Scale (BP) consists of two items. The first item is scored on a 6-point response scale (i.e., none, very mild, mild, moderate, severe, or very severe) that assesses bodily pain as the physical intensity of the pain experienced in the past four weeks. The second item is scored on a 5-point Likert response scale (i.e., Not at all, A little bit, Moderately, Quite a bit, or Extremely) that assesses the extent to which pain has interfered with one's life and daily functioning in the past four weeks. The combined score of these items yields an overall pain index score (Ware et al., 2007).

The full SF-36 survey, second version, was designed to examine the health outcomes of general psychiatric and medical conditions in a clinical or medical setting (Ware et al., 2007; see also Wells et al., 1992). There are eight health domains that evaluate specific functioning and health-related concepts – one being bodily pain (Ware et al., 2007; items: "Intensity of bodily pain," and, "Extent pain interfered with normal work"). In previous work, reliability (α) has ranged from .72 to .97 across the eight health domains (Ware et al., 2007), and for the BP subscale an α of .80 or greater has been consistently observed (Ware et al., 2007). All domains have shown good reliability and validity (e.g., various studies have yielded adequate content, concurrent, criterion, construct, and predictive evidence of validity; see Ware et al., 2007) to monitor health and specific health functioning (McHorney, Ware, Lu, & Sherbourne, 1994;

McHorney, Ware, & Raczek, 1993; Ruta, Addalla, Garratt, Coutts, & Russell, 1994; Ware et al., 2007). Accordingly, the SF-36 may be used in a wide range of applications across various populations, including for those with chronic pain and disease (Ware et al., 2007).

Alcohol Use Disorders Identification Test. Alcohol-related problems were assessed using the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), a 10-item screening measure for alcohol use and problems developed by the World Health Organization (WHO), which includes subscales regarding one's consumption, dependence symptoms, and negative consequences related to alcohol consumption (Babor et al., 2001).

The AUDIT has demonstrated good reliability among the general population ($\alpha \geq .80$, typically), has been used with a variety of subpopulations (e.g., cross-culturally, across genders, and age groups) (Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009), and is considered appropriate to use in a variety of settings including work-related, primary care, hospital, forensic, military, and general settings (Babor et al., 2001). The AUDIT has excellent construct and internal validity, as it has been shown to differentiate 98% of respondents correctly, as either problematic or non-problematic drinkers, and can categorize hazardous or harmful drinking and alcohol dependence (Bohn, Babor, & Kranzler, 1995).

Scores per item range from 0-4 (i.e., for frequency of drinking, typical quantity, impaired control over drinking, increased salience of drinking, and alcohol-related concerns) with a maximum score of 40, with higher scores indicative of greater risk for hazardous or harmful alcohol use, alcohol-related problems, and/or dependence. AUDIT cutoff scores that range from 1-7 reflect a low risk of alcohol-related problems, and scores of 8 through 15 signify a moderate level of alcohol-related risk or problems. Scores of 16 to 19 represent a high level of alcohol-

related problems, and scores of 20 or above "clearly warrant further diagnostic evaluation of alcohol dependence" (Babor et al., 2001, p. 20). The total AUDIT score reflects the individual's level of alcohol-related risk, problems, and/or dependence and, the recommended cutoff score of 8 or above is commonly used to indicate that an individual is likely to be a hazardous or harmful drinker (Babor et al., 2001).

Drug Abuse Screening Test. Problems and consequences related to drug misuse or abuse were assessed using the Drug Abuse Screening Test (DAST; Bohn, Babor, & Kranzler 1991; also, see Skinner, 1982), which is a 10-item questionnaire. Drug-related problems reported on the DAST refers to: 1) any use of over-the-counter or prescription medications in excess of the directions, 2) any use of illicit drugs and, 3) the nonmedical use of any drugs - the DAST does not assess for alcohol consumption (Skinner, 1982). Items endorse patterns of drug abuse that yield a quantitative index based on the rising levels of consequences related to drug use or misuse in the past 12 months, and higher scores are indicative of greater drug use related problems (Bohn et al., 1991; Skinner, 1982; Yudko, Lozhkina, & Fouts, 2007). Additionally, the cutoff score for drug abuse or dependence is typically six or greater (Yudko et al., 2007); however, psychometrics support the notion that a cutoff score of three or four is still highly indicative of drug-related problems (Carey, Carey, & Chandra, 2003).

The DAST is validated for adults and is effective for use in research (Yudko et al., 2007) as well as nonclinical and clinical settings (Cocco & Carey, 1998; Skinner, 1982). Over 30 years ago, the internal consistency for the DAST was substantial at .92 (Skinner, 1982). Cocco and Carey (1998) evaluated concurrent, discriminant, and criterion-related validities, concluding that the DAST has sound psychometrics properties. Yudko and colleagues also conducted a comprehensive review of the psychometric properties of the DAST and concluded that the

validity, sensitivity, and specificity remain adequate (2007). Presently, the DAST continues to have excellent internal consistency at .88 and test retest reliability at .86 (Giguère & Potvin, 2016).

Pittsburgh Sleep Quality Index: Subjective Sleep Quality Component. The Pittsburgh Sleep Quality Index (PSQI) generates a global score based on seven components; specifically, subjective sleep quality rating, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, the use of sleeping medication, and the frequency of daytime dysfunction due to fatigue (Buysse et al., 1989). Sleep quality was assessed using the single-item PSQI Subjective Sleep Quality Component that assesses sleep quality during the past month and effectively differentiates "good" sleep from "poor" sleep (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). A sleep quality score can range from zero to three points. A score of zero indicates good overall sleep quality and a score of three indicates poor overall sleep quality.

The global PSQI effectively distinguished poor sleepers from good sleepers, with a diagnostic specificity of 86.5% (Buysse et al., 1989) and sensitivity of 98.7% (Backhaus, Junghanns, Broocks, Riemann, & Hohagen, 2002). The internal consistency and reliability was found to be good at 0.83 (Buysse et al., 1989). The PSQI has good overall test-retest reliability at .87 (Backhaus et al., 2002). The measure also has been shown to be useful for adults in research, nonclinical, and clinical settings (Buysse et al., 1989).

Multidimensional Health Profile: Health Functioning Index: Health Care Utilization Scale. The complete MHP is a comprehensive health instrument consisting of the psychosocial (MHP-P) and the physiological (MHP-H) indexes (Karoly, Ruehlman, & Lanyon, 2005). The MHP-H was designed to evaluate an individual's proclivity toward health behaviors and health risks (Karoly et al., 2005). For the current study, the MHP-H (physiological index), Health Care

Utilization subscale, was used. The Health Care Utilization subscale is a self-report measure that consists of three items (Karoly et al., 2005). In this dataset, each item was initially gauged on a 6-point scale (i.e., 1-6) assessing the frequency of doctor visits, overnight hospital visits, and emergency room treatment visits over the past year (i.e., scores were tabulated as 0 visits = 1; 1 visit = 2; 2 visits = 3; 3 visits = 4, 4 visits = 5; 6 or more visits = 6).

Convergent and discriminant validity evaluated the associations between health care utilization and related and unrelated constructs, such as previously correlated personality and temperament scales, and as compared to a spousal report, and found no relationships present (Karoly et al., 2005; Machlin, Valluzzi, Chevarley, & Thorpe, 2001). The absence of relationships between health indicators and health care utilization items provide evidence of strong discriminant validity (Karoly et al., 2005). Researchers reported good to adequate retest reliability coefficients for the Health Care Utilization items, with office visits at .86, hospitalizations at .75, and emergency room visits at .58 (Karoly et al., 2005). The MHP-H has been nationally normed, standardized, and validated for populations 18 years to 90 years of age. Thus, the Health Care Utilization subscale is valid to use in clinical or research settings to identify areas of clinical concern (Karoly et al., 2005).

Statistical Analyses

The cross-sectional data used in this study was assessed for erroneous (i.e., some external error is reflected) or missing data, and extreme outliers. Following the cleaning and preparation process, the data was determined to be sufficient for the following analyses.

Primary Variables of Interest. The construction of the primary variables of interest was done using the data collected from the Survey-Monkey website, and then downloaded and cleaned using [SPSS]. The 15-item Mindful Attention and Awareness Scale (MAAS; the

independent variable) was scored on a 6-point scale. The individual item variable names used for construction of the MAAS total score were "MAAS1" through "MAAS15" and these 15 items were summed to create the MAAS total score.

The 10-item Alcohol Use Disorders Identification Test (AUDIT; the dependent variable) was scored on a 5-point scale (0 to 4, except items 9 & 10, which were scored 0,2,4).   AUDIT item #1 specifies whether or not, and if so how often, a respondent drinks alcohol. If the participant responded "never," the score is 0; accordingly, participants may or may not respond to items 2 through 10. A logic-based syntax command was used to ensure that if a respondent endorsed 0 for AUDIT item #1, then items 2 through 10 were also scored 0 so that the respondent could be included in all AUDIT-based analyses (i.e., total score and subscale scores), the AUDIT total score. Thus, allowing for a more accurate representation of alcohol-related problems among the sample. The individual item variable names used for construction of the total score were "AUDIT1a" through "AUDIT10a" and these 10 items were summed to create the total score.

The Depression Anxiety Stress Scales - 21 (DASS-21 - Depressive Symptoms subscale; one of two mediator variables) (7 items), was scored on a 4-point scale (1-4). Although this measure was originally developed to be scored as 0,1,2,3, both are 4-point scales and the situation described in the context of the AUDIT (regarding the incomplete data scenario) was not present. The 7 items were summed to create the total subscale score. The other mediator variable, bodily pain was measured by summing 2 items and a total score was created.

Covariates included the 10-item Drug Abuse Screening Test (DAST) was scored 1 = Yes and 2 = No (2-point scale). DAST items 1-10 were scored 0 = No and 1 = Yes (2-point scale). Also, consistent with the AUDIT, regarding the incomplete data scenario, a logic-based syntax

command was created to ensure that if a respondent endorsed 0 or "No" for DAST item #1 ("Have you used drugs other than those required for medical reasons?"), then items 2-10 were also scored 0 so that the respondent could be included in all DAST-based analyses (i.e., total score). Thus, allowing for a more accurate representation of illicit drug use/problems among the sample. These 10 items were summed to create the total score.

Likewise, sleep quality was measured using a single item from the Pittsburgh Sleep Quality Index which was scored 1,2,3,4. Health care utilization was measured by summing 3 items taken from a larger scale. Importantly, these 3 items generally assess the number of visits to a physician's office, the hospital, and the emergency room. The scoring is intended to generally correspond with the number of visits. This 3-item measure based on a 5-point scale (i.e., 1,2,3,4,5), with scoring, in effect: $1 = 0$ visits; $2 = 1$ visit; $3 = 2$ visits, $4 = 3$ visits; $5 = 4$ or more visits.

Bivariate Analyses. Pearson's product-moment correlation coefficient (r) was used to evaluate the zero-order associations among the study variables. Multicollinearity was evaluated based on $r \geq .80$ (Field, 2013) and was not detected.

Mediation. Mediation analysis (see Figure 1), consistent with Hayes (2013; see also Preacher & Hayes, 2008a; 2008b), was conducted. Specifically, a parallel multiple mediation model with both mediator variables (MVs) included simultaneously (depressive symptoms and bodily pain). Parallel mediation, as opposed to serial mediation, more accurately represented the variables. The markers for both depression and pain cannot be removed from the multidimensional, simultaneous experience produced, and in turn, cannot be held in isolation of each other when evaluated statistically. In reality, the experience of comorbid chronic pain and depressive symptoms are never without the influence of the other, which poses a methodological

challenge. By simulating the actual variables' relationship - including them simultaneously - the best statistical reenactment was utilized.

Mediational models may produce a variety of results (see Figure 1), including a total effect (i.e., c, the association of the IV with the DV, without accounting for any MVs), a direct effect (i.e., c', the association of the IV with the DV, after accounting for the MVs), a total indirect effect (i.e., ab, the association of the IV with the DV, operating through the MVs), and a specific indirect effect (e.g., a_1b_1, the association of the IV with the DV through a particular MV). The presence of a significant indirect effect(s) in the context of the pattern of significance among the total effect and the direct effect allows description of the indirect mechanism of association to be described as a mediated effect (ab and/or a_1b_1, etc. are significant, and c and/or c' are significant) or an indirect only effect (ab and/or a_1b_1, etc. are significant, and c and c' are non-significant) (see Hayes, 2013).

Advantages of the statistical mediation methods developed by Hayes and colleagues (e.g., Bauer, Preacher, & Gil, 2006; Hayes, 2009; 2013; Preacher & Hayes, 2008a; 2008b) over the methods developed by Baron and Kenny (1986) include the facts that indirect effects can be tested without requiring: (1) a direct effect between the IV and the DV, thereby decreasing Type II error, and, (2) the assumption of normally distributed data in the context of assessing for indirect effects. Regarding the latter, bootstrap resampling (Hayes, 2013), a technique that produces bias-corrected confidence intervals, was utilized to evaluate the indirect effect of the IV on the DV, operating through potential MVs (Hayes, 2013; Preacher & Hayes, 2008a; 2008b). Hayes (2013) recommends using a minimum of 10,000 resamples, as a greater collection of simulations of the empirical distributions of the data increases the likelihood of observing the true standard errors, confidence intervals, and significance values. Also, bootstrap resampling

bolsters statistical power and is more sensitive in detecting effects, particularly in smaller sample sizes (Hayes, 2013).

Power analysis. It is common practice to have at least a .80 probability to reject the null; without appropriate power, sample sizes may be too small to detect effect sizes, or large sample sizes may be wasteful of valuable resources while only providing small, if any, effect or benefit to the participants (Cohen, 1988). While the data included in this study was collected as part of a larger study, and the final sample size is a function thereof, a general rule of thumb for regression-based analyses is 10-20 participants per predictor variable (Field, 2013). Including the IV, MVs, and covariates (i.e., poor sleep quality, drug-related problems, and health care utilization), there were 7 predictor variables in this secondary analysis; as such, our study needed 70-140 participants to detect small effect sizes.

CHAPTER 3

RESULTS

Survey data were analyzed using SPSS. Data were cleaned, screened for outliers, and assessed for missing data after completion of the survey. Results of the study are organized as follows: 1) demographic descriptive statistics; 2) bivariate results - Pearson's product-moment correlation coefficients, 3) multivariable associations - statistical mediation analysis, and; 4) exploratory analyses and results.

Demographic Descriptive Statistics

The sample (n = 287) self-reported as 91.64% White/Caucasian, 2.78% as Black/African-American, 1.04% as Asian, 2.43% as Multiracial, and 2.11% as "do not know" or missing. In addition, 4.18% of White/Caucasians self-reported as being of Hispanic or Latino origin. Participants were almost entirely female (97.56%), and ages ranged from 21.19 to 78.13 years old (M = 51.05; SD = 11.63). The sample appears to be similar to the target population (see Castro-Sánchez et al., 2012; also, Lawrence et al., 2008). See Table 2 below for more demographic information.

Table 2

Demographic Information (N = 287)

Variable – Subvariables	Sample	Percent
Sex		
Female	n = 280	97.56%
Male	n = 7	2.44%
Missing	n = 0	-
Age, in years	n = 287	M = 51.05, SD = 11.63
Missing	n = 0	-

Variable – Subvariables	Sample	Percent
White/Caucasian	n = 263	91.64%
Black/African-American	n = 8	2.78%
Asian	n = 3	1.04%
Multiracial	n = 7	2.43%
Missing or Don't Know	n = 6	2.11%
Of Hispanic or Latino Origin		
Hispanic or Latino	n = 12	4.18%
Not Hispanic or Latino	n = 273	95.12%
Missing	n = 2	.70% %
Years of Education		
GED or HS Diploma	n = 87	30.31%
Associate's Degree	n = 55	19.16%
Bachelor's Degree	n = 71	24.73%
Master's Degree	n = 41	14.28%
Doctorate or Postdoctoral Degree	n = 6	2.09%
Missing	n = 27	9.43%
Sexual Orientation		
Homosexual	n = 13	4.52%
Heterosexual	n = 248	86.41%
Bisexual	n = 14	4.87%
Undetermined	n = 2	0.69%
Refuse to answer	n = 3	1.04%
Missing	n = 7	2.47%

Variable – Subvariables	Sample	Percent
Single, never married	n = 41	14.29%
Married	n = 169	58.89%
Separated	n = 8	2.79%
Divorced	n = 54	18.82%
Widowed	n = 8	2.79%
Missing	n = 7	2.42%

Bivariate Analyses

In order to examine zero-order associations between study variables and to test

Hypothesis 1 among people with fibromyalgia, Pearson's product-moment correlation

coefficients were computed (See Table 3 below for bivariate correlation results). Hypothesis 1

was partially supported. Bivariate correlation coefficients demonstrated that mindfulness was

significantly and negatively associated with depressive symptoms ($r = $ -.41, $p \leq .001$) and

alcohol-related problems ($r = $ -.15, $p \leq .05$). Correlation results also only partially statistically

supported the first hypothesis, demonstrating that bodily pain and depressive symptoms

significantly and positively related to poor subjective sleep quality ($r = $ .35 and .24, respectively,

both, $p \leq .001$). Bodily pain and depressive symptoms also were significantly and positively

related to each other ($r = $ .22, $p \leq .001$). However, only bodily pain was significantly and

positively related to health care utilization ($r = $ .23, $p \leq .001$) and negatively related to drug-

related problems ($r = $ -.16, $p \leq .01$).

Table 3

Bivariate Correlations for Key Study Variables (*N* = 287)

Measures	1.	2.	3.	4.	5.	6.	7.
1. Mindfulness	--						
2. Depressive Symptoms	-.41**	--					
3. Bodily Pain	-.05	.22**	--				
4. Alcohol-Related Problems	-.15*	.05	.03	--			
5. Drug-Related Problems	-.08	.04	-.16**	.19**	--		
6. Health Care Utilization	-.04	.11	.23**	.02	-.05	--	
7. Poor Sleep Quality	-.17**	.24**	.35**	-.02	-.03	.20**	--

*

**. *Correlation is significant at the 0.01 level (2-tailed)*
*. *Correlation is significant at the 0.05 level (2-tailed)*
$\underline{p} \leq .10$; ^{ns} = non-significant

Multivariable Associations

Table 4 (see below) includes results relevant to Hypothesis 2 and the statistical mediation

model illustrated in Figure 1; for example, unstandardized regression coefficients for each

pathway segment (a_1, a_2, b_1, b_2, c, c') and the effects for each indirect pathway as a whole (ab,

a_1b_1, a_2b_2). Only statistically significant results (i.e., $p \leq .05$; 95CI did not cross zero) will be

described in detail (for statistically non-significant results, see Table 4). Hypothesis 2 was

largely not supported. See

Table 4

Direct and Indirect Associations between Mindfulness and Each Dependent Variable with Control Variables (N = 287)

§Total Effect Model R^2 = .0576**			
‡Overall Effect Model R^2 = .0630**			
	coefficient		p value
a_1	-.1484		< .0001****
a_2	-.0001		.9816
b_1	-.0108		.6611
b_2	.0995		.2152
C	-.0207		.0165*
c'	-.0223		.0175*
	Effect		95CI
Ab	.0016	-.0077	.0096
a_1b_1	.0016	-.0075	.0095
a_2b_2	.0000	-.0019	.0016

Covariates: Health Care Utilization, Poor Sleep Quality, and Drug-Related Problems

a_1 = basic association of Mindfulness with Depressive Symptoms
a_2 = basic association of Mindfulness with Bodily Pain
b_1 = basic association of Depressive Symptoms with Alcohol-Related Problems
b_2 = basic association of Bodily Pain with Alcohol-Related Problems

ab = total indirect effect
a_1b_1 = specific indirect effect of Mindfulness on Alcohol-Related Problems through Depressive Symptoms
a_2b_2 = specific indirect effect of Mindfulness on Alcohol-Related Problems through Bodily Pain

c = total effect of Mindfulness on Alcohol-Related Problems, without accounting for any Mediator Variables
c' = direct effect of Mindfulness on Alcohol-Related Problems, after accounting for all Mediator Variables

95CI = Bias-corrected 95% Confidence Interval
* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; **** $p \leq .0001$; † $\leq .10$; ns = non-significant
§ = without accounting for any Mediator Variables
‡ = after accounting for all Mediator Variables

For multivariable associations, while controlling for poor sleep quality, health care utilization, and drug-related problems, it was hypothesized that, among people with fibromyalgia, mindfulness would have a direct, statistically negative relationship with alcohol-

related problems, bodily pain, and depressive symptoms (Hypothesis 2a). In the context of alcohol-related problems, the total (c =.-.02) and direct (c' = -.02) effects of mindfulness were statistically significant, such that with or without the mediator variables included in the analysis, higher levels of mindfulness were associated with fewer alcohol-related problems. For depressive symptoms, the association was statistically significant (a_1 = -.15), such that higher levels of mindfulness were associated with lower levels of depressive symptoms. For bodily pain, the association was non-significant (a_2 = -.00). Similarly, Hypothesis 2b stated: bodily pain and depressive symptoms will have a direct, statistically positive relationship with alcohol-related problems. For depressive symptoms (b_1 = -.01) and bodily pain (b_2 = .10), the association with alcohol-related problems was statistically non-significant.

Finally, Hypothesis 2c stated: the association of mindfulness with alcohol-related problems will be mediated by bodily pain and depressive symptoms. That is, higher levels of mindfulness will be associated with lower levels of both bodily pain and depressive symptoms that, in turn, will be associated with less alcohol-related problems. As outlined in Table 4, the association of mindfulness with alcohol-related problems among people with fibromyalgia was not observed to operate through depressive symptoms and bodily pain as mediators. That is, the total indirect effect (ab = .00), the specific indirect effect through depressive symptoms (a_1b_1 = .00), and the specific indirect effect through bodily pain (a_2b_2 = .00) were each statistically non-significant.

In sum, Hypothesis 1 received partial support and Hypothesis 2 received very little support. That is, at the bivariate level of analysis, there were some associations among the variables of interest supporting the notion that mindfulness may be associated with alcohol-related problems among people with fibromyalgia and that depressive symptoms and bodily pain

may be mechanisms of this association. However, at the multivariable level of analysis, the more

complex associations hypothesized were not supported. Upon reflection, it may be that the

hypothesized model was over-controlled. As such, an additional exploratory analysis was

conducted, excluding the originally hypothesized covariates of poor sleep quality, health care

utilization, and drug related problems.

Exploratory Analysis. Table 5 includes results relevant to this exploratory analysis and

the statistical mediation model illustrated in Figure 1; for example, unstandardized regression

coefficients for each pathway segment (a_1, a_2, b_1, b_2, c, c') and the effects for each indirect

pathway as a whole (ab, a_1b_1, a_2b_2). Only statistically significant results (i.e., $p \leq .05$; 95CI did

not cross zero) will be described in detail (for statistically non-significant results, see Table 4).

Table 5

Direct and Indirect Associations between Mindfulness and Each Dependent Variable without Control Variables (N = 287)

§Total Effect Model R^2 = .0225*		
‡Overall Effect Model R^2 = .0237†		
	coefficient	p value
a_1	-.1608	$< .0001$****
a_2	-.0059	.3967
b_1	-.0098	.6924
b_2	.0367	.6243
c	-.0219	.0109
c'	-.0233	.0141
	Effect	95CI
ab	.0014	-.0087	.0100
a_1b_1	.0016	-.0081	.0102
a_2b_2	-.0002	-.0031	.0005

Table 5 Continued

The exploratory analysis excluded the covariates of poor sleep quality, health care utilization, and drug-related problems and, again, the association of mindfulness with alcohol-related problems among individuals with fibromyalgia was observed to be direct and negative, but was not observed to operate through depressive symptoms and bodily pain as mediators. That is, the total indirect effect ($ab = .00$), the specific indirect effect through depressive symptoms ($a_1b_1 = .00$), and the specific indirect effect through bodily pain ($a_2b_2 = -.00$) were each statistically non-significant.

In sum, both mediation-based models were statistically non-significant; although there appears to be a negative direct effect between mindfulness and alcohol-related problems, mindfulness does not appear to have an indirect effect on alcohol-related problems via bodily pain and depressive symptoms in this sample of people with self-identified fibromyalgia. Relevant findings are discussed below, using a list of the hypotheses as a framework for discussion. Where applicable, broader implications of the findings, including potential methods to improve well-being for individuals, particularly those who have fibromyalgia, are discussed.

CHAPTER 4

DISCUSSION

The purpose of the present study was to investigate the relationship between mindfulness, pain and depressive symptoms, and alcohol-related problems, in a sample of those who reported the onset of fibromyalgia symptoms or a diagnosis of fibromyalgia. It was observed that: 1) mindfulness was associated with alcohol-related problems, and; 2) that this relationship was not mediated by pain or depressive symptoms. The broad hypotheses regarding mindfulness being negatively associated with alcohol-related problems among people with fibromyalgia and that pain and depressive symptoms would mediate this relationship, received partial support. Our primary findings, although consistent with relevant research, largely only supported the relationship between mindfulness and alcohol-related problems (e.g., Bien, 2009; Garland et al., 2012; Grossman et al., 2004; Grossman et al., 2007; Kaplan et al., 1993; Hayes et al., 2012; Miller & Rollnick, 2013; Parra-Delgado & Latorre-Postigo, 2013; Pearson et al., 2014). Nevertheless, the findings may have implications for the treatment of alcohol use problems and managing related consequences.

Over the past decade, the mindfulness construct has received greater recognition in both the clinical and empirical domains. Yet, debate over the precise operationalization of mindfulness continues. The generally accepted conceptualization of mindfulness involves intentionally directing attention toward the present moment and adopting a nonjudgmental and nonreactive mindset, intent, and attitude (Bishop et al., 2004; Brown & Ryan, 2003; Grossman, 2008; 2011; Kabat-Zinn, 2013; Shapiro et al., 2006). Empirical literature suggests that mindfulness relates to decreased levels of depressive symptoms (Segal et al., 2013) and subjective experiences of pain (Kabat-Zinn, 1982); whereas, both depression and pain contribute

risk for increased alcohol-related problems (Askay et al., 2009). Examining pain and depressive symptoms, among those with fibromyalgia, provided a means of focusing on a relatively discrete aspect of well-being and how mindfulness may have an indirect relationship with alcohol-related problems. Yet, understanding of the potential underlying factors affecting the relationship between mindfulness and outcomes, such as alcohol-related problems is limited. As such, bivariate correlations and parallel mediation models were examined to better understand the association.

Despite the continued promise of mindfulness techniques to increase attentional control and improve well-being, some fundamental questions regarding the underlying effects of mindfulness remain (Grossman, 2011). Among those with fibromyalgia, specific mechanisms by which mindfulness might beneficially affect one's physical or psychological well-being have been relatively overlooked in the psychological literature (Parra-Delgado & Latorre-Postigo, 2013; Wolfe et al., 2013). Many studies evaluated the effect of mindfulness on chronic pain *or* depressive symptoms (e.g., Barnhofer & Crane, 2009; Kabat-Zinn, 1994; 2007; Segal et al., 2013). Limited studies evaluated these variables also to the potential relation with alcohol-related problems (e.g., Bien, 2009; Garland et al., 2012; Pearson et al., 2014), and a scarce number of studies evaluated the key study variables among those with fibromyalgia (Parra-Delgado & Latorre-Postigo, 2013).

Mindfulness associations. At the multivariable level of analysis, after controlling for poor sleep quality, health care utilization, and drug-related problems, mindfulness did have a direct, statistically negative relationship with alcohol-related problems among people with fibromyalgia, and depressive symptoms; however, not with bodily pain (Hypothesis 2a).   These particular findings support previous research indicating that higher levels of mindfulness can be

a valuable resource for decreasing both alcohol-related problems (Bien, 2015) and depressive symptoms (Hofmann et al., 2010; Segal et al., 2013).

The disabilities that accompany fibromyalgia often encumber an individual's sense of well-being and may deplete adaptive coping efforts (Hayes et al., 2012). Previous research has shown that many use alcohol to self-medicate as a coping mechanism (Singh, 2012). Awareness of and attention to alcohol-related problems may help individuals determine what changes to make to their alcohol use (Miller & Rollnick, 2013). Increased mindfulness may contribute to a more meaningful view of chronic symptoms by cognitive reframing of symptoms and functional limitations through a more objective, nonjudgmental mindset (Segal et al., 2013; Sephton et al., 2007; Williams et al., 2007). Thus, mindfulness was theorized to decrease alcohol-related problems by functioning as an effective coping strategy (Fernandez et al., 2014; Song et al., 2014) and augmenting self-awareness and attention to alcohol use patterns and consequences (Pearson et al., 2014).

Considering possible other mechanisms, there are a number of reasons that higher levels of mindfulness may be associated with less alcohol-related problems. One proposed mechanism that was tested in the current study is chronic pain. In previous research, greater mindfulness is associated with lessened chronic pain symptoms (Kabat-Zinn, 1994), which in turn leads to less alcohol-related problems, perhaps by reducing self-medication of pain symptoms (Singh, 2012). While this model was statistically non-significant in the current study, there are other pathways by which mindfulness and alcohol-related problems may be associated. For example, pain was correlated with drug-related problems (DAST), and depressive symptoms (DASS) at the bivariate level.

For depressive symptoms among people with fibromyalgia, we observed higher levels of mindfulness to be associated with lower levels of depressive symptoms, at both the bivariate and multivariable levels of analysis. Interventions incorporating mindfulness techniques in therapeutic settings have been shown to be effective across a wide variety of populations and health issues, including both psychological and medical disorders (Grossman et al., 2004; Hayes et al., 2012; Kabat-Zinn, 1994). Mindfulness also has been used in the treatment of depressive symptoms as an ability to discern between cognitive events and the totality of the individual. Mindfulness thus involves a disidentification from the activity of the mind (Segal et al., 2013); by becoming aware of sensations, images, feelings and thoughts the mindful individual identifies that these phenomena are merely passing events (Hayes et al., 2012). As previously observed, mindfulness may aid in the management of depressive symptoms, specifically, mindfulness-based interventions have been shown to have immense therapeutic potential for the treatment of depression (Segal et al., 2013).

Relation of bodily pain and depressive symptoms with alcohol-related problems. This study did not find a statistical association with alcohol-related problems for either bodily pain or depressive symptoms (Hypothesis 2b). However, other studies have shown that these variables tend to be associated with each other (Singh, 2012). Perhaps, alcohol-related problems were not a sufficiently large concern for the sample included in this study. Scores or 8 or above on the AUDIT suggest a likelihood for hazardous or harmful drinking (Babor et al., 2001). In this sample, the average AUDIT total score ($M = 1.43$; $SD = 2.01$) was less than 8. Thus, if individuals do not report consequences from drinking patterns, as conceptualized from the AUDIT measure, deleterious effects are less likely to be detected. Perhaps among those with limited ability to engage in daily activities, alcohol-related problems may be displayed in other

ways than measured by the AUDIT. Nevertheless, it is possible that alcohol-related problems

could contribute to the development of depressive symptoms; however, this study's findings did

not evaluate such associations.

Table 6

Means and Standard Deviations for Key Variables

Measures	Number of Items	Mean	Standard Deviation
MAAS	15	55.23	13.78
DASS: DEP	7	15.03	5.39
SF-36: BP	2	8.38	1.62
AUDIT-10	10	1.43	2.01

Note: MAAS scores are in raw form; for interpretation divide mean by the total number of items, 15; possible range for raw scores is 15-90.
Note: AUDIT scores ≤ 8 are considered alcohol-related problems (Babor et al., 2001); possible range equals 0-40.
Note: DASS: DEP scores possible range is 0-21.
Note: SF-36: BP scores possible range is 2-11.

Mindfulness, bodily pain, and depressive symptoms, in the context of alcohol-related

problems. The association of mindfulness with alcohol-related problems was not mediated by

bodily pain and depressive symptoms (Hypothesis 2c). While there was a direct relationship

between mindfulness and alcohol-related problems, neither the combined effect of bodily pain

and depressive symptoms was statistically significant nor the individual specific indirect effects

through bodily pain or depressive symptoms. Several factors may explain why the current

results were not consistent with previous research that supports the relationships between and

among mindfulness, bodily pain, depressive symptoms, and alcohol-related problems. Indeed,

the present results stand in contrast to most of the current literature on mindfulness that suggests

that mindfulness is related to many cognitive, emotional, and physical benefits (Baer et al., 2012;

Garland & Black, 2014; Kabat-Zinn, 2013; and Segal et al., 2013). Thus, the results of this, a

single study should not be relied upon as compelling evidence to the contrary. The notable divergence of the current findings could be accounted for by a variety of explanations.

For trait mindfulness studies using the MAAS, such as ours, significant relationships between mindfulness and related concepts may arise from unmeasured other variables. According to Shapiro and colleagues (2006), self-regulation may be the key aspect to how mindfulness improves health. Indeed, an ongoing debate continues in the literature, as to whether the MAAS scale effectively detects all aspects, or the most important aspects of mindfulness (Grossman, 2011), even though the MAAS was intended to assess the most scientifically measurable factors of mindfulness [i.e., attention and awareness; (Park, Reilly-Spong, & Gross, 2013).

In fact, attempts to measure mindfulness vary considerably across different self-report measures of mindfulness. Some researchers have described the MAAS measure as lacking evidence to report robust convergent, construct, and content validities, and that there is lacking evidence that self-reported mindfulness levels correspond to actual mindful behavior (Grossman, 2008; 2011). This debate goes on to include certain therapies related to the mindfulness construct. Grossman (2011) stated that self-report measures of mindfulness may "serve to denature, distort, and banalize the meaning of mindful awareness in psychological research and may adversely affect further development of mindfulness-based interventions" (p. 1034). These issues should be considered in future developments in the self-report assessment of mindfulness and likely will help develop more confidence in mindfulness-based research findings – whether salutary or deleterious.

A multi-dimensional measurement of mindfulness should be incorporated in future studies. For example, the Kentucky Inventory of Mindfulness Skills (KIMS) consists of four

subscales that evaluate body sensations, thoughts, emotions, and external stimulus (Baer, Smith, & Allen, 2004). Likewise, the Freiburg Mindfulness Inventory (FMI), the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R), the Five Facet Mindfulness Questionnaire (FFMQ), the Toronto Mindfulness Scale (TMS), the Mindfulness/Mindlessness Scale (MMS), the Philadelphia Mindfulness Scale (PHLMS), and the Southampton Mindfulness Questionnaire (SMQ) are reported to have overall good validity, and not dissimilar to some MAAS validity findings (Park et al., 2013). Nevertheless, there is a "great need to establish … validity… [across] diverse populations, and clinical populations with acute and chronic illnesses" (Park et al., 2013; p. 11). The inclusion of various diversity intersections, across visible and latent domains, is needed to better understand these relationships' underlying mechanisms.

Another possible explanation as to why the present findings are contrary to some of the currently accepted research is that mindfulness may be a learned skill that must be induced by habitual mental practice (see Christopher et al., 2009; and Kabat-Zinn, 2013). It is possible that the methods utilized in the previous studies actually elicited reportable changes in levels of mindfulness, whereas, our study is measuring differences in dispositional/trait mindfulness. Nevertheless, individuals were able to report on trait mindfulness levels in the absence of any mindfulness-based practice. There is a possibility that the sampling in this particular study has potential effects of mindfulness that were not discovered, but may have been if a more comprehensive measure of mindfulness (e.g., Five Facet Mindfulness Questionnaire, see Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) was utilized (i.e., Type II error), which should prompt further investigation. Baer et al. (2006) suggested a five-factor structure of mindfulness characterized by nonreactivity, observing, acting with awareness, describing, and nonjudging.

Moreover, consideration should be given to the notion that therapies that include mindfulness techniques may in essence be functioning differently than trait mindfulness. Simply, the concept of trait mindfulness and mindfulness-based interventions are not as related as previously theorized, suggesting that the current conceptualizations of mindfulness and its expected effects need revision. Mindfulness-based approaches are increasingly utilized to treat various health conditions. Consistently throughout literature, mindfulness-based approaches have been shown to be effective to help improve health. Trait mindfulness also has been shown to have strong associations with many health variables. Yet, it is unclear if results from mindfulness-based intervention research studies can be compared to results from studies that evaluate trait or state mindfulness. Significant differences exist across different mindfulness constructs. Some describe mindfulness as a mental state or an innate dispositional trait (Brown & Ryan, 2003). For example, the mindfulness-based intervention research studies, evaluated in this present study, did not report evaluating trait mindfulness as a qualifier to participate in mindfulness-based treatments. Rather, individuals used the intervention as a method to train their attention and awareness, and, in order to observe the present reality, from moment to moment, objectively (Kabat-Zinn, 2013). So far, no consensus has been reached as to how mindfulness should be defined, conceptualized, and operationalized. Nevertheless, there is overall agreement that mindfulness involves attention and awareness, in the present moment, which is similar to Brown and Ryan's (2003) mindfulness construct and scale. Indeed, more research is needed to clarify the relationship between trait mindfulness and mindfulness skills.

Limitations. The current findings must be considered within the context of important limitations. Measurement issues, such as assessments with few items, one-dimensional factor structure of a measure (e.g., MAAS - mindfulness with present-centered attention/awareness as

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main feature), and the usage of self-report measures (e.g., social desirability, the personal motivation why somebody engages in a study needs to be considered) limited the power and accuracy of the results. Also, as with all correlational, cross-sectional studies, for example, assumptions cannot be made regarding the causal order of the variables examined. The variables chosen and the ordering and direction of the variables entered in the mediation model were based on theory and previous empirical work. However, more research, particularly that which is longitudinal, and/or intervention-based, is needed to further examine the causal associations otherwise hypothesized in this study.

Measurement issues may have affected the outcome of the study and the statistical findings. For instance, the reliability estimate for the Health Care Utilization scale showed a low alpha (see Table 5). This suggests that the unbiased estimate of the generalizability for the Health Care Utilization scale is minimal reliability. Moreover, the use of a one-item measure for a control variable (i.e., Sleep Quality), a two-item assessment (i.e., Bodily Pain) for one of the mediator variables, and a three-item assessment for a covariate (e.g., Health Care Utilization) was less than ideal. Measures that have few items tend to tap into only one dimension, or part of one aspect of a concept. In addition, single item measures cannot easily detect the degree and scope of a construct. Indeed, the use of multi-item scales often improves reliability by better testing full continua and breadth of constructs (McCoach, Gable, & Madura, 2013). For future research, the use of more sophisticated measures for analyses likely would enrich the dataset and allow for better control of measurement error by multi-item means leveling out when individual item scores are summed to obtain total scores (Hayes, 2013).

Arguably, another problem with using the Bodily Pain subscale (SF-36) was that it measures for 'bodily' pain and not levels of 'chronic' pain. While the measure was validated

with some individuals who had chronic pain (Ware et al., 2007), the instrument could likely be measuring another variable that is similar to, but not, 'chronic pain' per se. There may be distinct differences in how bodily pain and chronic pain are measured. Accordingly, other measures that assess chronic pain ought to be considered for future research. For instance, there are inconsistent reports regarding whether the DAST predicts aberrant drug-related behaviors among individuals who experience chronic pain symptoms and are being treated with pain medication (Passik & Kirsch, 2008). Meaning, that it is unclear if the specific drug-related problems mentioned in the DAST measure are relevant among individuals with fibromyalgia, who are being treated with opioids for chronic pain.

Each measure used in this study had undergone testing for reliability and validity. In spite of efforts to produce strong, valid, and reliable measures, self-report measures are still susceptible to errors since scale values are merely an arbitrary assignation of a quantity of a latent variable, allowing researchers to operationalize, but which may lead to measurement errors (McCoach et al., 2013). Alternatives to self-report are phenomenological, neuropsychological, biofeedback, and behavioral tools. Additionally, even when participants answer honestly, some may lack the introspective ability to provide an accurate response to an item (Hahn, Judd, Hirsh, & Blair, 2014).

Future Directions

Further research is needed to more fully evaluate the relationship of mindfulness to different modes of pain and depression-related variables in the context of alcohol-related problems among those with fibromyalgia. Future research should evaluate the different types of chronic pain, and how chronic pain is experienced among various populations. Studies should also evaluate this across different diversity intersections (e.g., age, location, ethnicity, race,

gender, religious beliefs, ability levels, health status, etc.). The use of different measures (i.e., of mindfulness, chronic pain, depression, alcohol-related problems, and the control variables) should likely also be evaluated, perhaps using other/additional statistical techniques. In particular, the association between mindfulness and alcohol-related problems among those with fibromyalgia should be further examined. Future research might explore other potential mediators of these relationships (e.g., engaging psychotherapy, etc.) that may provide additional insight into the relationship between mindfulness and alcohol-related problems.

Conclusions

In the current study, individuals with fibromyalgia self-reported their experiences with pain, depressive symptoms, and alcohol-related problems, as well as levels of trait mindfulness. Results indicated no indirect effect of mindfulness, particularly its components of attention and awareness, on alcohol-related problems through bodily pain and depressive symptoms. However, there was a direct negative relationship between mindfulness and alcohol-related problems. Overall, the results did not support most hypotheses. More research is needed to address the current limitations and expand research and understanding of the mechanisms of the association between mindfulness and alcohol-related problems among people with fibromyalgia.

Mindfulness techniques are increasing as one of the primary foci in multiple psychological therapies (e.g., MBSR, DBT, MBCT, ACT). There have been numerous studies documenting the effectiveness of mindfulness-based interventions, which aim to increase mindfulness-based abilities or skills. There is a lack of clarity regarding the association of trait mindfulness, mindfulness practices, and health variables among individuals with fibromyalgia. Examining the relationships between trait mindfulness and health variables is important for better understanding the effects of having a higher level of dispositional mindfulness in everyday

life. A better conceptualization of these variables may facilitate ways in which individuals with fibromyalgia may be better supported throughout their treatment and how one's level of trait mindfulness is associated with other important areas of life.

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