Fibromyalgia and Mindfulness: Exploring the Connection

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Clinical Inquiry Project

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Introduction

Description of the Problem

Fibromyalgia (FM) pain affects an estimated 5 million people living in the U.S. and up to 6% of the world population (Lawrence et al., 2008). FM is a debilitating chronic pain condition that can be one of the more severe disorders on the continuum of persistent pain (Jain et al., 2003; White et al., 2005). FM affects both men and women, although research shows that women are at least seven times more likely than men to have a diagnosis of FM (Wolfe et al., 1995). The prevalence of FM increases with age and appears to peak around the sixth decade of life (Weir, 2006; Wolfe et al., 1995).

FM is defined as a self-report of three or more consecutive months of widespread musculoskeletal pain with tenderness at a minimum of eleven out of eighteen specific soft tissue tender points on physical exam (Wolfe et al., 1990). However, other symptoms commonly experienced by those with FM include fatigue, stiffness, disturbed sleep, tenderness to the touch, cognitive deficits, numbness and tingling of extremities, poor balance, impaired functional ability, anxiety, and depression (Bennett, 2009). Common co-morbidities often associated with FM include irritable bowel syndrome, migraine and tension headaches, interstitial cystitis,

temporomandibular disorder, chronic pelvic pain, chemical sensitivities, and chronic fatigue syndrome (Arnold, 2010; & Morris et al., 2005).

Most of those diagnosed with FM use health care and services extensively. It has been estimated that FM carries an annual direct cost for care of greater than twenty billion dollars in the United States (Berger et al., 2007; Spaeth, 2009).

The Federal Drug Administration approved mono drug therapies for FM offer some relief by improving pain (on average thirty percent) and improving function (on average twenty percent) (Cofford et al., 2005; Hauser et al., 2010); yet problems with access, costs, safety, and side effects continue to be a barrier for many (Mease et al., 2009).

The etiology of FM is likely due to a gene and environment interaction. It is suspected that environmental triggers play a role in the development of FM (Arnold, 2004 & Finan, 2010). Common triggers are physical trauma, psychological trauma (Peres, 2009), and chronic stress (Libby, 2010).

Recently, emerging evidence suggests that exercise with mind body therapy is more effective than placebo or aerobic exercise for improving pain, quality of sleep and global improvement (Hadhazy, 2000, Langhorst, 2012, & Hauser, 2010), yet there is minimal understanding regarding how mind/body therapies produce these analgesic and sleep benefits in FM. Mindfulness is now being studied as a possible mechanism of action that may be responsible for these improvements.

FM often compels those afflicted to seek complementary and alternative medicine (CAM) therapies (Barnes, 2002). In search of more comprehensive and continuous symptom relief, FM patients are increasingly adopting mind/body therapies such as yoga or mindfulness

training. Mind-body therapies are especially attractive for patients with medically unexplained symptoms, such as FM, as both somatic and psychological benefits are often seen (Masi, 2002).

Mindfulness is one aspect of the meditation experience that reflects the basic and fundamental human capacity to attend to relevant aspects of experience in a nonjudgmental and non-reactive way, which in turn cultivates clear thinking, equanimity, and compassion (Fortney et al., 2010). Some conceptualize mindfulness as a set of skills that can be learned and practiced in order to reduce psychological symptoms and increase health and well-being (Baer, 2006). Emerging evidence suggests that mindfulness may alter one's processing of emotional information. Compared to control conditions, a course of mindfulness training has shown to both increase the efficiency of positive memory recall in healthy students (Roberts-Wolfe et al., 2012) and strengthen positive associations among those suffering from recurring depression (van Vugt et al., 2012).

In the last 20 years, mindfulness has become the focus of considerable attention for a large community of clinicians and, to a lesser extent, empirical psychology (Bishop et al., 2004). Mindfulness has been described as a process of bringing a certain quality of attention to moment-by-moment experience (Kabat-Zinn, 1990).

The word mindfulness is derived from the Pali word sati, meaning "to remember", with secondary meanings of "attention" and "awareness" (Young, 2011). Mindfulness in Buddhist traditions occupies a central role in a system that was developed as a path leading to the cessation of personal suffering (Silananda, 1990). In more contemporary understanding, mindfulness has been adopted as an approach for increasing awareness and responding skillfully to mental processes that contribute to emotional distress and maladaptive behavior (Bishop et al., 2004).

Some of these approaches to mindfulness are taught clinically in an eight-week course entitled Mindfulness Based Stress Reduction (MBSR). MBSR is found in much of the literature on the topic of mindfulness. The MBSR program employs components of meditation, the body scan, and Hatha yoga. One learns mindfulness meditation in order to emphasize moment-to-moment awareness as a means of working with stressful events. The body scan is a form of self-awareness practice in which attention is directed from one area of the body to another, with an acknowledgement and acceptance of whatever sensations enter the mind (Lush et al., 2009). The MBSR program also includes some gentle stretching movements of Hatha Yoga intended to encourage awareness and acceptance of the body in motion (Lush et al., 2009).

Applying the simple practice of non-judgmental present-moment awareness and experiencing how this process influences one's relationship with life stressors is one way that meditation practice addresses the epidemic of afflictions that are expressed physically, such as FM (Fortney et al., 2010). According to Beck (1989), the practice of meditation provides a tool that gives one a greater sense of self-determination and the ability to cultivate and draw upon inner resources to help meet life circumstances with more clarity.

If mindfulness were to be found to be a determinant of FM symptom severity, many lives may improve as a result of enhanced treatment plans incorporating mindfulness techniques. Mindfulness is a popular, accessible, cost-effective therapy and that can be measured with a validated scale.

This study has three specific aims. The first aim is to determine the level of mindfulness in patients with FM recruited from an online survey. There is no hypothesis for this aim as this is an exploratory aim for which obtained estimates of the variability within the FM population.

The second aim sought to determine if one or more of each of the five subscale facets of mindfulness was negatively impacted in people with FM. We hypothesized that patients with FM would score lower on each of the five subscales compared to published norm reference scores.

The third aim was to explore the relationship between FM impact as measured by the FIQR with mindfulness as measured by the FFMQ. We hypothesized that the FIQR total and subscale scores would correlate with the FFMQ total and subscale scores.

Review of the Literature

A large body of evidence, of varying quality, have linked mindfulness to improvements in stress, anxiety, and depressed mood (Astin, 1997; Jain et al., 2007). Mindfulness has also been found to be effective and promoting positive mood states in patients with chronic health conditions such as cancer (Carlson et al., 2003; & Ledesma, 2009). Furthermore, data are emerging that support the concept that mindfulness may ameliorate physiologic changes that accompany chronic mental and emotional stress, including improving diurnal cortisol secretion levels and anatomic changes in brain regions associated with emotional regulation (Matousek et al, 2010; & Chisa, 2010).

Mindfulness as a treatment has been used along with mind-body therapies such as Qigong (Astin et al., 2003). Mounting evidence supports the usefulness of mindfulness to alleviate pain and symptom severity for people with FM (Grossman et al., 2007; Septhton et al., 2007; Kaplan et al., 1993; Lush et al., 2009). Despite encouraging results using mindfulness as a

stand-alone intervention (Grossman et al., 2007; Septhton et al., 2007), the largest trial to date investigating the relationship between FM and mindfulness was negative (Schmidt et al., 2011). The next section critically reviews these studies that most closely inform this proposal.

Kaplan et al. (1993) sought to measure the impact of a MBSR program on FM. They constructed an open label trial in which fifty-one percent of their patient population showed moderate to marked improvement and all subjects showed some improvement in the measured instruments of visual analog scales, the FIQ, a medical symptom checklist of thirty-one items, the general severity index as a measure of psychological distress, the coping strategies questionnaire, the FM attitude index, and the overall assessment of outcome questionnaire after completing an eight week MBSR course. The attrition rate was 18 subjects out of 77 that began the trial. The authors (Kaplan et al., 1993) concluded that MBSR is an effective treatment of FM symptoms but did not have a control group for comparison purposes. Furthermore, there was also no follow-up data on patients completing the program (Kaplan et al., 1993).

In a two-armed non-randomized trial with observational follow up for three years, Grossman et al. (2007) found that mindfulness has potential long-term benefit for FM patients. Specifically the authors found that the MBSR courses provided significantly greater benefits than control intervention of an active social support procedure on most dimensions. These measured dimensions included visual analog pain, quality of life subscales, coping with pain, anxiety, depression, and somatic complaints for FM patients (Grossman et al., 2007). Three-year follow-up analyses of MBSR participants indicated sustained benefits for these same measures, although the authors concluded that more study would be beneficial for further understanding of how MBSR benefits participants with FM (Grossman et al., 2007). This study has several limitations. The study was not randomized. Also, the findings were restricted to the female population.

Lastly, the control group of thirteen participants was small in relation to the MBSR intervention group of thirty-nine participants (Grossman et al., 2007).

Lush et al. (2009) conducted a small open labeled study of MBSR to explore psychophysiological changes that may relate to mindfulness. The authors found that following an eight-week MBSR course, basal sympathetic nervous system activity was significantly reduced (Lush et al., 2009), which is consistent with reduced sympathetic nervous system activation.

Septhton et al. (2007) completed a randomized controlled trail in which they investigated if mindfulness meditation alleviated depressive symptoms in women with FM. Ninety one subjects were randomized into a waitlist or eight week group-based MBSR course. The authors found that MBSR promoted self-observation, acceptance, and thoughtful responses to pain. They also concluded that depressive symptoms improved significantly in MBSR treatment versus control participants (Sephton et al., 2007). Limitations include the bias that is inherent in a self-selected sample. Sephton et al. (2007) admit that these results are only applicable to patients with FM without severe functional impairment who have the interest and ability to participate in a meditation-based support group intervention. Also, they did not control for contact time with group leaders and other participants to separate the effects of medication from those of attention and social support. This study analyzed only depressive symptoms and did not look into physical effects of the meditation-based intervention.

In the largest and most controlled study to date, Schmidt et al. (2011) conducted a randomized controlled trial with one hundred and seventy-seven female participants. The participants were randomized to one of the following: MBSR, an active control procedure controlling for nonspecific effects of MBSR, or a wait list. They sought to determine if treating

FM patients with an eight-week MBSR course was effective compared to two control groups. The authors found primary outcome analysis did not support the efficacy of MBSR in FM, although patients in the MBSR group demonstrated the greatest improvement. Schmidt et al. (2011) posited that several methodological aspects could have caused these negative results such as excessive patient burden and treatment preference influencing patient motivation.

It remains to be known if certain aspects of MBSR correlate with specific FM symptom severity and functional limitations. Given conflicting outcomes, it is evident that more research is needed in this area. It is possible that the heterogeneity of FM symptomatology may influence study outcomes. For example, one component of mindfulness may improve pain whereas another component may influence another symptom such as insomnia.

With a growing interest in the clinical applications of mindfulness and mindfulness-based approaches, a concomitant increase in attention directed toward rigorous specified research in this area is needed (Bishop et al., 2004). Specifically, it would be useful to know what areas of mindfulness may contribute most to FM symptoms and their severity. If this information is determined, treatment modalities can be modified and tailored accordingly and may become more effective.

Considering that decreased quality of life is common among those with FM and given the generally benign nature of this behavioral intervention, it is surprising that mindfulness training is not recommended more often by health care providers (Young, 2011). This is possibly due to the consideration that even among many studies, fundamental questions regarding mindfulness still linger unanswered. Specifically, the mechanisms through which mindfulness decreases stress and increases well-being are not well understood (Young, 2011).

This project seeks to address some of these questions that still remain. Specifically, we aimed to determine if mindfulness is related to FM impact. We also seek to investigate what part of mindfulness practice has the most impact. In order to do this, we will first determine the level of mindfulness in patients with diagnosed FM. Then, we will seek to determine if one or more of each of the five subscale facets of mindfulness is negatively impacted in people with FM. The third aim is to explore the relationship between FM impact as measured by the Fibromyalgia Impact Questionnaire Revised (FIQR) with mindfulness as measured by the Five Facet Mindfulness Questionnaire (FFMQ). This will give us information on what areas or facets of mindfulness may be the most effective for treatment of FM patients.

Approach to the Conduct of the Project

Design

A cross-sectional survey study was conducted on-line using a database of stored contact information for potential participants. This database is maintained by a FM support and advocacy non-profit organization. Potential participants included all persons aged 21-89 with self-report of a provider diagnosis of FM, regardless of previous experience with mindfulness practices. Potential participants responded to a link embedded in an e-mail from the non-profit that described the study purpose, informed consent and led them to a confidential SurveyMonkey link with a unique identifier. The link coded Internet provider addresses so that only one survey per computer user was accepted. Data were collected November 2012-January 2013. This study

was approved by the Institutional Review Board of Oregon Health and Science University, Portland, Oregon.

Setting and Participants

The setting for the clinical inquiry was online. We used a database of approximately 15,000 patients with confirmed FM as our subject population. Each subject must have been previously diagnosed with FM by a provider in order to participate.

The database is owned by the FM Information Foundation (FIF). Each subject in this database has knowingly offered his or her contact information in order for investigators to contact him or her about future studies relating to FM.

Each subject received an email with an explanation of the study, its purpose, and a link to a *surveymonkey* survey. In the survey, we determined FM symptom severity using the Fibromyaglia Impact Questionnaire- Revised (FIQR). We investigated one's degree of mindfulness using the Five Facet Mindfulness Questionnaire (FFMQ). We also included an investigator-designed demographic and clinical questionnaire. Earlier studies have shown that people often reveal more about themselves and their illness via an internet interface than through bodily face-to-face interaction (Houston et al., 2004).

Demographic information was also included in the survey. Specifically, we asked about age, gender, geographic location by state or country, highest level of education, occupation, co-morbidities, marital status, annual income level, years with FM symptoms, year diagnosed with FM, current meditation practices, other activities tried in order to alleviate symptoms, and if

subject had a regular meditation or mindfulness practice. International Review Board (IRB) approval was granted.

The inclusion criteria included a previous diagnosis of FM given by a provider and the age of 21-88. All genders and geographic locations were included. In order to protect our participants, all data was collected using no names, dates of birth or other identifiable information. Access to the raw data was limited to the primary investigator (PI) and committee on the OHSU Portland campus only.

Measures

The Five Facet Mindfulness Questionnaire (FFMQ) measures mindfulness as a multifaceted attribute relating to one's present moment experience of thoughts, perceptions, sensations, and feelings (Baer et al., 2008). The scale contains thirty-nine items that measures five different facets of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. The items are each rated on a five level likert scale with anchors from "never or rarely true" to "very often or always true". Higher scores indicate a greater degree of mindfulness. The FFMQ is currently the most promising mindfulness measure because of its inclusion of more factors of the mindfulness construct (Neuser, 2010).

The FM Impact Questionnaire Revised (FIQR) is 21-item self-report instrument developed by Bennett et al. (2009) in order to assess FM primary symptoms, physical function deficits and quality of life. This is an updated version of an extensively validated measure with comparable scoring between the FIQ (FM Impact Questionnaire) and FIQR. The FIQR is scored

as a Total Score as well as a total for each of three subscales: physical function, overall wellbeing and symptoms. Higher scores indicate a more negative impact of FM symptoms.

As this is an exploratory study with planned multiple correlations and regressions, we aimed for a sample size of up to five thousand subjects. A minimum of six-hundred participants were required based on the need for ten subjects per potential correlation for a total of thirty-nine items (FFMQ) plus twenty-one items (FIQR) equaling sixty. Sixty multiplied by ten equals six hundred subjects.

The study design is a cross sectional survey with no intervention or follow-up. The data we gathered is displayed in reports generated by *surveymonkey* and calculated by our statistician. For aim one, *determine level of mindfulness in patients with diagnosed fibromyaglia*, we used descriptive statistics reporting means, standard deviations, and ranges.

For aim two, d*etermine if one or more of the five subscale facets of mindfulness, measured in the Five Facet Mindfulness Questionnaire (FFMQ), is negatively impacted in people with fibromyaglia*, we used two group T-test analysis (unless the data is not normally distributed, in which case we will use a non-parametric analysis).

For aim three, *explore the relationship between fibromyaglia impact as measured by the Fibromyaglia Impact Questionnaire Revised (FIQR) with mindfulness as measured by the Five Facet Mindfulness Questionnaire (FFMQ*), we used Pearson Product Moment Correlations.

Outcome Evaluation

Analysis Implementation Process

It is our hope that this will help to lead future research in the field of FM and mindfulness into a direction that is useful to many practitioners and those that suffer from FM in their day-to-day lives.

If mindfulness is found to correlate with FM symptoms, function and quality of life, interventions could be tailored to individualize mindfulness therapy for FM patients. Moreover, we may identify higher or lower risk groups that could be targeted or excluded from future interventions. Ultimately, our findings will be disseminated in poster and podium presentations and peer reviewed journals, with the goal of offering clinicians a broader and more effective repertoire for treating FM patients. A report of de-identified study findings, mindfulness resources and mindfulness practices will be available on the non-profit website to reach persons with FM.

Statistical Analysis

All statistical analyses were conducted on Stata/MP 11.2 (College Station, TX). Correlations were calculated on relationships between demographics, FFMQ subscales, FIQ-R subscales, and FIQ-R total. Data was prepared for regression by transforming non-normal data. Standard regression analysis was conducted to explain the relationship between FIQ-R total (dependent variable) and FFMQ subscales, mindfulness therapy use, and minutes meditating (log

transform). Post regression diagnostics were conducted to test for homoscedasticity, normal distribution of residuals.

We hypothesized that those with low FFMQ subscale scores (less mindful) would have more severe FM (higher FIQR). We further hypothesized that those with high FFMQ observe subscale score but low minutes meditating would have more severe FM, while those with a high FFMQ observe subscale score and a high minutes meditating would have less severe FM. Finally we sought to determine if selected clinical characteristics (young age, less education, more sever FM and little or no meditation practice) predicted FFMQ subscale scores. An a priori interaction analysis was conducted looking at the interaction between minutes meditating and the FFMQ-observe subscale. An exploratory interaction analysis was conducted between the other FFMQ subscales, mindfulness therapy use, minutes meditating and the demographic variables.

Outcome Results

The survey was discontinued when the IRB approved number of respondents was reached. Of the 5,000 respondents, 14 were removed from analyses due to missing or out of range data leaving a final sample of 4,986. Respondents represented all 50 states in the United States and 30 countries (Australia, Canada, Argentina, Belgium, Brazil, Cyprus, Cayman Islands, Chile, Denmark, Ecuador, England, Finland, France, Germany, Hungary, Puerto Rico, Israel, Iceland, Jamaica, Mexico, New Zealand, Panama, Philippines, South Africa, Scotland, Singapore, Sweden, Taiwan, Uruguay, and Jamaica).

The majority of participants were married, middle aged women. Most (74%) were symptomatic with FM for over 10 years. 53% reported not working outside the home due to their FM, despite being highly educated (47% college graduates and post graduate degrees).

The majority of the participants (76%) took prescription medications for FM. Of the 1,040 who did not use medications for FM, 84% indicated that medications were associated with too many side effects while 62% indicated that they did not alleviate symptoms. 47% endorsed using at least 3 non-drug methods to alleviate their FM symptoms. The most commonly selected modalities were rest, ice/heat and "other" exercise. Less than 15% indicated that they practiced mindful movement therapies such as Tai chi or yoga. 25% specifically reported having a regular meditation practice with an average of 118 minutes per week (standard deviation of 139.3). FIQR scores demonstrated moderate to severe FM in the majority of subjects (59% with scores over 60). Scores on the FFMQ subscales ranged from 20.8-27.3, with highest scores for the observe subscale.

The FIQR total and subscales had small to medium correlations to the FFMQ subscales (see table 2). Variability in the FFMQ subscales accounts for 25.8 percent of the variability in the FIQR symptoms subscale. Compared to demographic information accounting for only 11.24 percent of the FIQR symptoms subscale, this is a substantial correlate.

None of the demographics explained as much variance in the FIQR total as the mindfulness subscales. The single variable that accounts for the most variance in the FIQR is the FFMQ Total, closely followed by FFMQ awareness subscale, accounting for 11.8% and 11.1% variance respectively. Of the demographics, the single variable that accounts for the most variance in FIQR total was education, counting for 5.7%. There was very little variance of the

FIQR total by age and gender (1.07% and 0.0% respectively). No FIQR symptom differentially influenced FFMQ scores (pain, tenderness, fatigue, stiffness, anxiety, depression).

The Observe subscale of the FFMQ accounts for 2.3% of the total variance in FIQR and is the only subscale that is positively correlated (r=0.1518; p=0.000). This mean that the higher the observe score is (more observant one is), the higher one's FIQR score tended to be (higher FM symptom severity).

Discussion

Context

We did not find that that selected demographics and clinical characteristics predicted mindfulness in this on-line sample. Yet, FFMQ subscales predict 25.8 percent of the variability in the FIQR symptom subscale compared to just 11.24 percent predicted by demographics.

The observe subscale of the FFMQ indicted higher mindfulness compared to the other subscales. This may be confounded by non-mindful observations related to the physical symptoms of FM. For example questions such as feeling water on the skin during a shower or sensations of the body while walking. The higher score on this subscale may be related to enhanced awareness of sensory stimuli as is reported to be amplified in FM.

The cross sectional manner in which this study was conducted affords no evidence of direction or causality. Our sample was more highly- educated that most reported FM samples. This may have been influenced by the on-line nature of the data collection or unique

characteristics of the subjects that influenced their decision to participate in the non-profits. As our sample was 97% female, we cannot generalize our findings to men with FM.

Lastly, we did not define meditation in the survey. Comments after this question explained that many of our subjects viewed meditation in a liberal way. Indeed, narrative comments from the participants indicated that they considered meditation to include a variety of activities such as prayer, reading, watching television, and formal sitting meditation.

Possible barriers included that no reward or incentive was given to the subjects for their time and participation. The average time of ten minutes that it took to complete the survey may have been too long for some to complete without any incentive. Given the rapid enrollment and large sample, this risk is minimal. Also, it should be mentioned that there were some potential discrepancies between how mindful individuals believe themselves to be versus how mindful they truly are (Grossman, 2008). These tradeoffs are viewed as small in terms of risk versus benefits to be gained.

Implementation in Relation to Literature

The five-facet conceptualization of mindfulness appears to be clinically useful in the literature because it encompasses the qualities of mindfulness thought to be important by leading scholars in this field (Baer, 2010). These authors stress the importance of observing and describing experiences occurring in the present moment in a nonjudgmental, nonreactive manner and participating with awareness in the activities of daily life. Each of these qualities of mindfulness can be reliably and separately measured using the FFMQ (Baer, 2010).

Non-reactivity to thoughts, rather than judging and being absorbed, cultivates the skill of decentering, in which cognitions are observed and labeled as transitory mental events rather than important truths that must dictate behavior or send someone spiraling in rumination (Baer, 2010). In developing these skills, participants are often able to become less fearful of their own inner experience.

Furthermore, mindfulness skills help to enable one to recognize sad moods when they occur and encourage decentering from depressive thoughts. This prevents escalation into rumination and allows time for choosing more adaptive responses to the occurrence of sadness. It encourages acceptance and curiosity toward experiences even when unpleasant or unwanted.

Outcomes in Relation to Literature

The observe subscale of the FFMQ indicted higher mindfulness compared to the other subscales. This may be confounded by non-mindful observations related to the physical symptoms of FM and is likely related to enhanced awareness of sensory stimuli as is reported to be amplified in FM. The observe subscale of the questionnaire measures how deliberately one notice's sensations in one's body such as when walking or showering. Also, this subscale measures how mindful one is with noticing how food and drinks affect ones thoughts, bodily sensations, and emotions.

Those that rated highly on the awareness subscale tended to have lower FIQR symptom severity. This may be due to one's ability to decrease rumination or getting lost in one's thoughts and becoming less present. Baer (2010) states that the ability to stop rumination allows

one to instead choose more adaptive responses to the occurrence of unpleasant or unwanted experiences and encourages acceptance and curiosity toward those experiences instead.

Clinical Implications and Recommendations

With the positive correlation of the observe subscale, one is led to wander if one is more observant, does this awareness actually make actual pain greater? Would it therefore be beneficial to focus on mindfulness treatment for FM patients in only four out of the five facets, encouraging FM patients to be more mindful, yet somehow NOT practice an increased observance of tactile sensations such as pain? One might argue that this is not possible. Future researchers may choose to delete the observe subscale from the 5 facet measures, as it may not be reliably sensitive to change in a mindfulness intervention. Our data indicate that regardless of reported meditation practice that persons reported more observations that are hypothesized to be mindful, also had more severe FM. Instead, it is likely that participants were reporting non-mindful observations. These data do give direction for interventions to tailor an MBSR program for FM to include specific mindful observation practices.

With the 11.1% negative correlation of the awareness subscale to the FIQR total, it would be interesting to see if one was taught the skill of increasing one's awareness facet of mindfulness if one's FM symptom severity may decrease. The awareness facet measures one's ability to stay in the present moment. One's score will be lower in this facet if one's mind wanders off, is distracted easily, or daydreams frequently.

Further research is needed to better understand how mindfulness or specific mindfulness-based stress reduction programs may influence FM symptoms and physical function. With these

data scientists and clinicians are able to know if one or more facet of mindfulness should be targeted for people with FM or may be more sensitive to change as a result of intervention.

It would be useful to look at mindfulness and FM symptom severity pre and post intervention. Also, it would be interesting to tailor treatment toward each of the facets of mindfulness and see what kind of effect each had on the FIQR.

Conclusion

In conclusion, our findings suggest that more research is needed to better grasp the constructs of mindfulness and how mindfulness may influence FM severity. In combining a thorough review of the literature with this project's results, one is led to wonder if there truly is a connection between the ability to be present and describe experiences occurring in the current moment in a nonjudgmental, nonreactive manner and the amount of FM symptoms one experiences.

As it is believed that non-reactivity to thoughts, rather than judging and being absorbed, cultivates the skill of decentering, perhaps this enables one to become less fearful of their own inner experience and encourages an acceptance of one's chronic disease. With these data scientists and clinicians will be better able to know if one or more facet of mindfulness should be targeted for people with FM or may be more sensitive to change as a result of intervention.

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Appendix A

Patient Characteristics and Questionnaire Scores

Age, years (n= 4,986)	52.2 (10.6)
Gender (% female) (n= 4,986)	97
Current Marital Status (n=4,986)	
Married/Domestic Partnership (%)	68.71
Divorced/Separated (%)	18.95
Never Married (%)	8.62
Widowed (%)	3.71
Educational Level (n= 4,986)	
High School or Less (%)	11.87
Some College &/or Trade School (%)	40.71
College or Post-Graduate Education (%)	47.71
Years Diagnosed with FM (n=4,986)	11.41(7.27)
Years With FM Symptoms (n=4,986)	
Less than 5 years (%)	7.44
6-10 years (%)	18.57
Greater than 10 years (%)	73.99

Presently Working Outsdie Home (%)	34.22
Annual Household Income (USD)	
Under 30,000 (%)	31.65
30,000-59,999 (%)	29.89
60,000-99,999 (%)	25
100,000+ (%)	13.46
Currently take prescription medication for FM	
Symptoms (%)	78
If don't take rx, why? (n= 1040)	
Too many side effects (%)	84
Cost is too high (%)	36
No one will prescribe for me (%)	8
Did not alleviate my symptoms (%)	62
Other treatment forms to alleviate FM symptoms:	
Yoga (%)	15.88
Physical Therapy (%)	17.31
Tai Chi (%)	14.09
Other exercise (%)	44.34
Rest (%)	78.12
Heat or Ice (%)	61.51
Hypnosis (%)	1.7
Psychological Therapy (%)	16.33
Do you have a regular mindfulness practice?	

Yes (%)	25.04
No (%)	71.47
Don't Know (%)	3.49
FM Symptom Duration (n= 4,986)	
Less than 1 year (%)	0.32
1-5 years (%)	7.12
6-10 years (%)	18.57
More than 10 years (%)	73.99
FM Symptom Severity Questionnaire (FIQR; n=4986)	
Function (0-30)	17.36(6.85)
Impact (0-20)	12.22(5.11)
Symptom (0-50)	33.84(8.00)
Total (0-100)	63.41(17.80)
Mindfulness Questionnaire (FFMQ; n=4986)	
Observe Subscale (0-40)	27.27(3.89)
Describe Subscale (0-40)	24.27(7.24)
Actaware Subscale (0-40)	22.07(6.00)
Nonjudge Subscale (0-40)	24.32(7.24)
Nonreact Subscale (0-35)	20.77(4.90)
Total (0-155)	118.69 (18.14)

FM FM, FIQR FM Impact Questionnaire Revised, *FFMQ* Five Facet Mindfulness Questionnaire

Appendix B

Correlations

	fiqr_f~n	fiqr_i~t	fiqr_s~m	fiqr_t~l	ffmq_o~e	ffmq_d~e	ffmq_a~s	ffmq_n~tf	fmq_n~e	ffmq_t~l
fiqr_funct~n	1.0000									
fiqr_impact	0.7009	1.0000								
	0.0000									
fiqr_symptom	0.6574	0.7187	1.0000							
	0.0000	0.0000								
fiqr_total	0.8814	0.8797	0.9087	1.0000						
	0.0000	0.0000	0.0000							
ffmq_observe	0.1293	0.1172	0.1523	0.1518	1.0000					

| 0.0000 0.0000 0.0000 0.0000

|

ffmq_descr~e | -0.1636 -0.2219 -0.2803 -0.2526 0.2392 1.0000

| 0.0000 0.0000 0.0000 0.0000 0.0000

|

ffmq_aware~s | -0.2151 -0.2600 -0.3930 -0.3340 -0.0045 0.4046 1.0000

| 0.0000 0.0000 0.0000 0.0000 0.7486 0.0000

|

ffmq_nonre~t | -0.1000 -0.1829 -0.2395 -0.1986 0.2570 0.3885 0.2849 1.0000

| 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

|

ffmq_nonju~e | -0.2044 -0.3101 -0.4115 -0.3526 -0.0649 0.3480 0.4827 0.4272 1.0000

| 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

|

ffmq_total | -0.1984 -0.2970 -0.4057 -0.3439 0.3243 0.7126 0.7141 0.7003 0.7590 1.0000

| 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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