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UTILIZATION OF MIND-BODY PRACTICES FOR ADULTS WITH FIBROMYALGIA: 2017 NATIONAL HEALTH INTERVIEW SURVEY

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UTILITAZION OF MIND-BODY PRACTICES FOR ADULTS WITH FIBROMYALGIA: 2017 NATIONAL HEALTH INTERVIEW SURVEY

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Fibromyalgia (FM) is a medical condition characterized by chronic pain and tenderness. Individuals with FM may experience burdensome symptoms, which impact their health-related quality of life. Treatment for FM includes pharmacological and non-pharmacological practices. Non-pharmacological treatments for FM include dietary management, routine exercise, and physical and mind-body therapies. There is growing evidence that the utilization of mind-body practices is increasing in the United States, but there have been limited investigations done to observe the use of mind-body practices in the FM population. The purpose of this study is to identify predictors of the use of meditation and/or meditative movement in individuals with FM. The secondary aims are to describe the percentage of adults with and without FM that use mind-body practices and compare the demographic traits of people with FM who use meditation versus meditative movement. Using data from the 2017 National Health Interview Survey, descriptive statistics were used to determine the percentage of adults that use mind-body practices between those with FM and those without FM. To compare demographic and medical characteristics of individuals with FM that use meditation, meditative movement, both or neither practices, χ^2 tests were performed. Lastly, a multinomial logistic regression model was used to examine predictors of using meditation, meditative movement, neither or both practices. The analyses revealed that

that people without FM were significantly more likely to use mantra and spiritual meditation, yoga, and tai chi compared to people with FM. Predictors of using mind-body practices include being young, female, and college educated.

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BACKGROUND

Literature Review

Fibromyalgia (FM) is a chronic medical condition that is characterized by widespread pain and tenderness. Individuals with FM may experience fatigue, sleep disturbances, cognitive dysfunction, and psychological distress.[1-4] Diagnosis of FM is associated with increased utilization of healthcare services that result in a high economic strain to patients. [5-8] Aside from the economic strain FM patients experience, they may be burdened by the symptoms of the condition, which unfortunately affect their overall quality of life (QOL). [9-10] For example, FM symptoms make it difficult for people to perform activities of daily living, such as doing household chores, going to work, and exercising.

According to population studies, FM affects 2% of the US population, of approximately 4 million US adults[11] and occurs more frequently in women. The possible risk factors for FM are a diagnosis of rheumatic conditions, such as osteoarthritis, rheumatoid arthritis, lupus, or ankylosing spondylitis.[12] Sometimes symptoms of fibromyalgia can occur together with these conditions.[12] Even though FM can affect individuals across all ages, most people are diagnosed at middle age. [2, 13] There are other factors associated with FM, such as stressful or traumatic events, repetitive injuries, obesity, and family history.[14] However, more research is needed to understand them. FM-related symptoms are also associated with rheumatic pathologies and psychiatric or neurological disorders.[15]

There are several gaps in the scientific literature on the etiology of FM. Research suggests that several factors are involved with FM, such as dysfunction of the central nervous system (CNS) and neurotransmitters.[15] Recent studies have highlighted abnormalities in FM

patients in processing pain, including central sensitization, which is when the entire CNS becomes sensitized to certain stimuli.[16] When central sensitization occurs, the nervous system goes through a process called wind-up, or increased tenderness of spinal cord neurons after a painful stimulus.[17] Although this may be true for the general population, wind-up is experienced differently for individuals with FM,[18] which could explain the heightened pain sensitivity they experience compared to the general population. Previous studies that used functional magnetic imaging (fMRI) have illustrated the enhanced pain sensitivity among individuals with FM. Overall, the findings from the fMRI investigations suggest that the enhanced pain sensitivity that people with FM experience is because of central augmentation of sensory input to the brain.[19] Consequently, this contributes to abnormal and persistent pain sensitivity for people with FM. Various neurotransmitters are also involved in central sensitization, especially serotonin.[20] Serotonin regulates mood and sleep,[21] which could explain the association between FM and sleep disturbances and psychological distress.

Some evidence suggests that genetic risk factors may be a contributing factor to FM diagnosis. For example, Arnold and colleagues conducted a genome-wide linkage scan to identify susceptibility for FM. Based on the authors' findings, first-degree relatives of FM patients are 8.5 times more likely to have the disorder than the general population.[22] Other family studies have also suggested that FM might aggregate with major mood disorders (MMD), such as major depressive disorder and bipolar disorder in families.[22] For example, studies by Hudson and colleagues, showed that MMD were significantly more common in the relatives of FM than in the relatives of those without FM.[23,24] However, there are

limitations to these studies, so more research is needed to understand the relationship between family history and diagnosis of FM.

Fibromyalgia diagnosis

Diagnosis of FM is a lengthy and expensive process. Before 2010, the criteria for FM diagnosis from the American College of Rheumatology (ACR) included a history of widespread pain and pain in 11 of 18 tender point sites.[1] Today, a patient is diagnosed with FM when three conditions are met: 1) a widespread pain index (WPI) score of 7 or greater and a symptom severity scale (SS) score of 5 or greater, or WPI between 3-6 and SS scale score of 9 or greater, 2) symptoms present at a similar level for at least 3 months, and 3) no other disorder that would otherwise explain the pain.[25] All three conditions constitute the 2010 ACR Preliminary Diagnostic Criteria for FM.

Treatment for fibromyalgia

At the moment, there is no cure for FM, but FM-related symptoms can be managed through pharmacological and non-pharmacological treatments. The clinical guidelines for the recommended pain medication for newly diagnosed FM patients include tricyclic antidepressants, anti-epileptic drugs, selective serotonin reuptake inhibitor, serotonin and norepinephrine reuptake inhibitors, amitriptyline, and cyclobenzaprine.[26] In some instances, individuals with FM are also prescribed weak opioids such as tramadol. However, only three pharmacologic treatments are approved by the US Food and Drug Administration (FDA). These medications include AED pregabalin (Lyrica), SNRIs duloxetine (Cymbalta), and milnacipran (Savella).[25] Advocates for FM patients state that patient self-care is vital in improving symptoms and ability to perform daily activities.[27] Their recommendations

include adaptation to routine healthy behaviors like physical exercise, deep-breathing exercises, and meditation.

Mind-body practices

Mind-body practices are interventions in mind-body medicine—a field of medicine that focuses on the relationship between the mind and body and on their effects in changing the physiology and behavior on illness and injuries.[28] Mind-body practices are applications of Eastern principles that primarily involve paying attention to the present and nonjudgmental acceptance of physical pain or psychological distress. [29-30] Examples of mind-body practices include meditation, yoga, tai chi, and qi gong. Meditation, yoga, and other similar practices are also called mindfulness-based interventions (MBIs).

In recent years, the use of mind-body practices has grown in the general population. According to a data brief by the National Center for Complementary and Integrative Health (NCCIH) and the National Center for Health Statistics (NCHS), from 2012 to 2017 utilization of mind-body practices by US adults increased.[30] Of all the mind-body practices, meditation and yoga had the most considerable increase in utilization. Individuals that used mind-body practices were more likely to be non-Hispanic White and female, however the use of each practice varied by age. For example, individuals aged 45 to 64 years were more likely than other age groups to use meditation.[31]

The three most popular and modern forms of meditation are mantra, mindfulness, and spiritual meditation.[32] The word mantra comes from the Sanskrit, meaning sacred text.[30] Mantra meditation involves the meditator mentally repeating a word or phrase, with the intention to maintain focus. A popular form of mantra meditation is transcendental

meditation. Unlike mantra meditation, mindfulness meditation involves the meditator becoming openly aware of their surroundings. Since the 1990s, mindfulness meditation has been integrated in evidence-based practices in conventional medicine. Those practices include mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT).[30] The objective of spiritual meditation is to develop a greater understanding or connection with a higher power.

Studies have shown that meditation is associated with changes in brain structure,[33,34] improved emotional self-regulation,[35] and better mental health outcomes.[36] Consequently, this has led to meditation practices being integrated into several different settings, such as hospitals for disease management.[37,38] Other MBIs have been integrated in hospitals to help patients with chronic conditions manage their symptoms. For example, yoga has been shown to be an effective intervention implemented in cancer centers to help improve the QOL of their patients. Yoga and two similar practices —tai chi and qi gong—are sometimes called "meditative movement" practices.[39] These three practices include both meditative and physical elements.

Fibromyalgia symptom management and mind-body practices

A growing body of literature has documented the potential benefits of mind-body practices in symptom management for individuals with FM. In a randomized controlled trial (RCT) that compared the effectiveness of a tai chi intervention to an aerobic exercise program in improving the health-related QOL and symptom severity in FM patients, findings suggest that individuals that completed the tai chi intervention had significant improvements in their perceived anxiety. Compared to the aerobic exercise group, the individuals assigned

to the tai chi intervention had significant reductions in the severity of FM-related symptoms.[40] In another RCT, female fibromyalgia patients practiced MBSR to assess the effects the intervention had on the patients' symptom severity and their overall QOL.[41] Participants that practiced MBSR had their symptoms of stress and sleep disturbance decrease, which resulted in significantly reduced symptom burden and improved QOL. In general, there is increased evidence that the use of mind-body practices is growing in the general population with musculoskeletal pain.[42] However, there are few studies done to observe the use of mind-body therapies in the FM population, or examine predictors of using meditation, meditative movement, both or neither.

In a cross-sectional study by Pure and colleagues, use of mind-body practices was examined in the arthritis population. The researchers used adult data from the 2012 National Health Interview Survey (NHIS) and a survey supplement on complementary health practices. Their study aimed to describe the characteristics and predictors of mind-body therapies on individuals with arthritis. The researchers also examined the QOL outcomes of the practices. The mind-body therapies they examined (yoga, tai chi, and chiropractic manipulation, and massage) were grouped into two categories, which were movement and manual therapies.[43] The movement therapies included yoga and tai chi, whereas manual therapies were chiropractic manipulation and massage. The study findings suggest that users of movement therapy were more likely to be female, physically active, and have and education of college or greater.[43] The study also revealed that movement therapies produced better health-related QOL outcomes compared to manual therapies. Although the results indicate that mind-body practices like yoga and tai chi have the potential to be efficacious in

improving the QOL, there is a need to explore if these particular practices are more effective compared to meditation.

Public Health Significance

This study is significant to the field of public health for three primary reasons. First, individuals with FM generally use more healthcare services, and mind-body practices have the potential to help this population in managing their symptoms. Overall, mind-body practices have been demonstrated to be effective in managing symptom burden for adults with FM.[39-41] Mind-body practices have also been shown to be relatively inexpensive and cost-effective for the general population and individuals with musculoskeletal pain.[44-46] Second, there is a lack of relevant evidence on the utilization of MBIs, such as meditation by adults with FM. Previous research on MBIs has primarily focused on the efficacy of the interventions. Previously, the study by Pure and colleagues described the percentages and predictors of people with arthritis that use complementary and alternative medicine (CAM) practices. However, they did not include meditation, but in 2012, approximately 18 million US adults used meditation,[47] and the practice continues to increase. Subsequently, there is a need to provide an updated description on the use of meditation, as well as other mind-body practices. This knowledge will inform the field on the characteristics of individuals that use certain types of mind-body practices. With this information, researchers will potentially understand acceptability of MBIs in people with FM, or similar chronic pain conditions. Lastly, more research needs to be done to address the gaps in the literature regarding the utilization of MBIs by adults with FM.

Research Questions

More research is needed to examine the relationship between potential predictors and the use of mindfulness-based interventions. With updated data available from the complementary health supplementary survey from the NHIS, we can examine potential predictors for using mind-body practices. Some factors that will be examined are demographic characteristics as well as other traits like health.

This study represents formative research with the purpose to inform the field on the utilization of MBIs in the adult FM population. Another goal of this study is to educate clinicians on the anticipatory demographic and medical characteristics of patients with FM that use MBIs. The research questions for this project aim to fill significant gaps in the scientific literature on the use of mind-body interventions among individuals with FM. The analyses that were completed in this master's project will be essential for the field to develop specific hypotheses in future research. The research questions are as follows:

1. What percentage of people use mindfulness-based interventions, such as meditation, yoga, tai chi, and qi gong?
2. What are the similarities and differences in demographic and medical characteristics of adults with FM who use meditation, meditative movement, both or neither?
3. What are the predictors of using meditation, meditative movement, both or neither for adults with FM?

METHODS

Data analyses for this study were primarily descriptive and exploratory in nature. Descriptive statistics such as frequencies and proportions were computed, along with 95%

confidence intervals (CI) for distributional parameters of interest. Other statistics included χ^2 tests and a multinomial logistic regression model on adult (age > 18) data from the 2017 NHIS and its survey supplement on complementary health practices. The purpose of the data analyses was to describe the demographic characteristics and predictors of adults with FM using mind-body practices like meditation and meditative movement.

Study Sample

The study sample consisted of adult data from the 2017 NHIS and its supplement on complementary health practices. The NHIS is a continuously collected cross-sectional household interview survey from NCHS and the CDC. The NHIS includes a nationally representative sample that produces annual estimates of the health of the U.S. civilian non-institutionalized population.[48] The data are collected through home interviews by a trained NHIS surveyor. The purpose of NHIS is to collect data on medical illness, disability, and the use of health services in residents of the United States.

The 2017 survey employed a multistage cluster sample design that allows for the representative sampling of households. Oversampling procedures were used for minorities (black, Hispanic, and Asian individuals) to allow for more accurate national estimates of health status and disparities. The survey contains four components, which are household, family, sample child, and adult. The household and family components of the survey collected data on health and socio-demographic information on each family member residing under one household. Within each family, additional data is collected from one randomly selected adult aged 18 years or older. The adult selected from which to acquire more information is included in the sample adult component of the NHIS. The adult data that was

used in this study has been de-identified by the NCHS. The risk to harm human subjects in this study is little to non-existent. The overall response rate for the 2017 survey was 66.5% (n= 78,132).[49]

Respondents that answered "yes" to the question "Have you ever been told you had arthritis/rheumatoid arthritis/gout/lupus/fibromyalgia?" are identified as individuals with FM (n = 7,033). In the 2017 NHIS, different types of meditation practices were included, but only three types of meditation practices were included in these analyses, which were mantra, mindfulness, and spiritual meditation. Meditation use was determined if respondents answered "yes" to the questions "During the past 12 months, did you use … mantra meditation, mindfulness meditation, or spiritual meditation?" Use of meditative movement was determined if respondents answered "yes" to the question "During the past 12 months, did you practice… yoga, tai chi, or qi going for yourself?" Use of meditation or meditative movement was not mutually exclusive, and a respondent could use both meditation and meditative movement practices. In this instance, respondents with FM that used both types of mind-body practices were grouped in the "Both Practices" group. Finally, people with FM that did not use any of the mind-body practices were groped in "Neither Practice".

Demographic characteristics in these analyses included sex (male or female), race (White, Black, American Indian, Asian, multiple race, or other), ethnicity (not Hispanic or Hispanic), current marital status (married, widowed, divorced, separated, or never married), education (high school or less, some college, or bachelor's degree or greater), and age. Compared to the majority of the variables, responses for age were recorded on a continuous scale, but I modified age as a categorical variable. Age was divided into three categories,

which were ages between 18-44, 45-64, and ≥ 65. Other demographic factors that were observed were income and health insurance coverage status. Income was broken into five categories, which were ≤ $20,000; $20,000–$34,999; $35,000–$64,999; $65,000-$99,999; ≥ $100,000). Health insurance status was a dichotomous category of "has insurance coverage" or "does not have coverage" based on whether the respondent has or lacks health insurance coverage.

The respondents' health characteristics for this study were based on self-reported data and individuals were dichotomized as having or not having obesity and comorbidities, as well as smoking status. An individual was described as not obese if the body mass index (BMI; weight in kg/height in m^2) was ≤ 29.9, and obese if ≥ 30.0. Responses for BMI were on a continuous scale but were dichotomized for the categorical analyses. For comorbidities, a count tallied the number of "yes" responses from the following chronic conditions to establish the total number of comorbidities (0, ≥ 1): hypertension, heart conditions (coronary heart disease, angina, myocardial infarction, and other heart disease), cancer, diabetes mellitus, and weak/failing kidneys. Respondents were classified as "smoker" or "non-smoker" based on their response to the question "Have you smoked at least 100 cigarettes in your entire life?" Any cases with responses of "refused", "don't know", or "not ascertained" to the variables of interest were removed from the dataset.

Data Analysis

All the statistical analyses were performed on Stata version 15.1 with a significance level of $\alpha \leq 0.05$. The data were acquired from Integrated Public Use Microdata Series (IPUMS) NHIS, and were delivered through their data extraction system.[49] Descriptive

statistics were used to determine the percentage of adults that use mind-body practices between those with FM and those without FM. I performed χ^2 tests for categorical variables and t-tests for continuous variables to compare demographic and medical characteristics of individuals with FM that use meditation, meditative movement, both meditation, and meditative movement, or neither. I used 95% confidence intervals to examine intervals for overlap to study characteristics of individuals with FM and without FM using mind-body practices. I performed a multinomial logistic regression to explore the predictors of adults with FM that use meditation, meditative movement, both meditation, and meditative movement, or neither while controlling for demographic and medical characteristics. Sample weights provided by NHIS were added to the analyses to adjust for the multistage sample selection design of the survey. I applied the "sample adult weight" before running the analyses.

Human Subjects

This investigation involves the analysis of existing data from a publicly available, national dataset. The NCHS has removed any identifiable information of the respondents in the 2017 NHIS. As a result, the Committee for the Protection of Human Subjects has granted the principal investigator exempt status according to 45 CFR 46.101(b).

RESULTS

The percentage of people who use mantra, mindfulness and spiritual meditation, yoga, tai chi, and qi gong between those with FM and those without FM are included in Table 1. The largest number of respondents with FM and without FM reported practicing yoga (no FM= 15.7%; FM= 10.1%), spiritual meditation (no FM= 10.7%; FM= 14.5%) and

mindfulness meditation (no FM= 6.1%; FM= 5.6%), representing approximately 14.5, 11.5, and 5.9 million adults respectively. After performing a Pearson's χ^2 test, it was revealed that there were significant differences in use of mind-body practices between people with FM and without FM in the following categories: mantra meditation (p <0.01), spiritual meditation (p<0.001), yoga (p < 0.001), and tai chi (p < 0.001).

In this sample, the highest percentage of people with FM that were younger used meditation (20.9%), meditative movement (19.6%), or both (8.6%). The demographic characteristics with the highest percentage of people with FM that use meditation or meditative movement, or both practices was female (meditation= 20.5%; meditative movement= 19.6%; both= 8.6%), non-Hispanic (meditation= 18%; meditative movement= 11.5%; both= 5.3%), had a bachelor's degree or greater education (meditation= 24.1%; meditative movement= 21.1%; both= 10%), had no comorbidities (meditation= 21.6%; meditative movement= 12.9%; both= 7.1%), and were not obese (meditation= 18%; meditative movement= 13.8%; both= 6.3%), (Table 2). The demographic characteristics with the highest percentage of individuals with FM that used meditative movement was being American Indian/Alaska Native (13.6%), never married (14.7%), having insurance coverage (11.4%), and has never smoked cigarettes (12.1%).Our sample demonstrates that the highest percentage of respondents with FM that did not use and mind-body practices were 65 years or older (79.5%), male (82.7%), were Hispanic (77.2%), were Black (77.4%), and were widowed (80.5%). Other characteristics of respondents in the "Neither Practice" group include having a household income less than $20,000 (78.8%), having insurance coverage

(75.9%), an education attainment of high school or less (85.3%), currently smoke (79.9%), had comorbidities (76%) and being obese (78%).

I performed a multinomial logistic regression analysis to examine predictors of using meditation, meditative movement, or both in people with FM (Table 3). Meditation included a number of significant predictors. For example, demographic variables strongly associated with meditation use were being female (OR=1.5, 95% CI 1.2-1.7, $p < 0.001$), and having attended college (OR= 1.6, 95% CI 1.3-1.9, $p < 0.01$; OR=1.7, 95% CI 1.4-2.1, $p < 0.01$). For meditative movement, users were significantly less likely to be 45 years or older (45-64: OR= 0.5, 95% CI 0.4-0.7, $p < 0.001$; 65 or older: OR= 0.5, 95% CI 0.3-0.6, $p < 0.001$). Users of meditative movement were also more likely to have an income higher than $20,000 ($20,000-$34,999: OR= 2.0, 95% CI 1.4-3.1, $p < 0.001$; $35,000-64,999: OR= 01.9, 95% CI 1.3-2.8, $p < 0.001$; $65,000-$99,999: OR= 2.8, 95% CI 1.9-4.2, $p < 0.001$; $100,000 or more: OR= 3.7, 95% CI 2.5-5.4, $p < 0.001$), not be obese (OR= 0.5, 95% CI 0.4-0.7, $p < 0.001$), and have a history of smoking (current smoker: OR=2.4, 95% CI 1.6-3.6, $p < 0.001$; OR= 2.7, 95% CI 1.8-4.0, $p < 0.001$). Overall, being female and having education greater than high school were factors that predicted use of meditation and meditative movement. Predictors of using both practices were similar to the meditation and meditative movement groups; however users of both practices were significantly less likely to be non-Hispanic.

Predictors of using neither of the mind-body practices were strongly associated with being 45 years or older (45-64: OR= 1.3, , 95% CI 1.1-1.5, $p < 0.05$; OR= 1.8, , 95% CI 1.5-2.2, $p < 0.001$), male (OR= 0.5, 95% CI 0.5-0.6, $p < 0.001$), have an education of high school or less, be obese, and have never smoked.

DISCUSSION

In 2017, the highest reported mind-body practice for people without FM was yoga. In comparison, for people with FM the mind-body practice with the highest percentage of use was spiritual meditation. Our analyses show that there are significant differences in use of mind-body practices between people without and with FM. There is the likelihood there is a difference in popular mind-body practices due to the functional limitations people with FM experience. However, more research needs to be done to understand the reasons as to why people with FM may choose one type of mind-body practice over another.

In this sample, respondents with FM that used meditation, meditative movement, or both were younger, female, non-Hispanic, were college educated education, had no comorbidities, and were not obese. These demographic characteristics are similar to that of the previous studies that examined NHIS data from 2002, 2007, and 2012.[45] Because I included people with FM that did not use any mind-body practices in our analyses, I am able to fill in gaps in the literature regarding the characteristics of individuals with FM that did not use any mind-body practices. Overall, these individuals were essentially the polar opposite of users of meditation and meditative movement. The highest reported demographic characteristics of people with FM that were in the neither practice group were more often older, male, Hispanic, Black, and widowed respondents. Respondents in the neither practice group had a low socio-economic status, had insurance coverage, and an education attainment of high school or less. Some of the health characteristics of this group were that they currently smoke, had at least one comorbidity and were obese.

Factors that predicted the use of meditation, meditative movement, or both practices for people with FM had similarities between the groups. For example, predictors of using mind-body practices include being young, female, and college educated. These findings are similar to other studies that examined NHIS data from 2017 and previous years.[29, 30] People who were obese were less likely to engage in meditative movement and both practices, although it was not predictive for meditation.

There were limitations to this study. For example, some of the observations of people with FM were lost during the multinomial regression analysis. Data from respondents with coded answers of "refused", "don't know", and "not ascertained" were not included in the analyses. Most importantly, the identification of FM was through a question that included multiple rheumatologic conditions that have similar symptoms. In this study, we characterized the resulting sample as having FM, as it is the most common cause of chronic widespread musculoskeletal pain.[51,52] As mentioned earlier, other rheumatologic conditions have symptoms that mimic FM symptoms, which results in some cases of misdiagnosis. Additionally, there are no diagnostic tests for FM, although X-rays or blood tests are used to rule out other conditions that can be confused with fibromyalgia.[27] There is the potential that different types of rheumatic conditions may change the type of mind-body practice that is used. However, the study had several strengths. One of the strengths of this study is the large sample size, which allows for population estimates on the use of mind-body practices. Because NHIS data provides a nationally representative sample of US adults, the results of this study can be generalized to people with FM or other rheumatologic conditions in the United States.

CONCLUSION

This investigation suggests that people with chronic conditions, such as FM are using mind-body practices. Overall, the analyses reveal that people with FM that use mind-body practices tend to be younger, female, and college-educated, which is consistent with the literature. The observed characteristics of individuals with FM presented in this study provide a unique perspective on current users of mind-body practices with chronic health conditions in the United States. The symptoms of FM are associated with serious pain which impact the individuals' QOL. People with FM could be potentially using mind-body practices to manage their symptoms, as the evidence of the effectiveness of MBIs is emerging. Across the nation many hospitals are integrating mind-body practices like meditation and yoga in clinical care to help manage symptoms for their patients with chronic conditions.

The analyses performed in this study allow the field to understand who currently uses mind-body practices, especially in individuals with rheumatic conditions. As the medical field continues to implement complementary health practices as part of clinical practice, more research is need to understand the motivations and outcomes of using mind-body practices for individuals with chronic and acute health conditions.

Table 1: Comparison of mind-body practices use among individuals with and without fibromyalgia: 2017 National Health Interview Survey

	No Fibromyalgia			Fibromyalgia		
Mind-body practice used	N	Weighted N	% (95% CI)	N	Weighted N	% (95 % CI)
Mantra meditation**	702	2,889,141	3.9 (3.7-4.2)	341	1,261,978	4.7 (4.2-5.2)
Mindfulness meditation	1,083	4,409,185	6.1(5.7-6.4)	407	1,537,384	5.6 (5.1-6.5)
Spiritual meditation***	1,912	7,686,077	10.7 (10.3-11.2)	1056	3,767,597	14.5 (13.7-15.4)
Yoga***	2,807	11,800,000	15.7 (15.2-16.3)	727	2,729,481	10.1 (9.4-10.8)
Tai Chi***	269	1,079,881	1.5 (1.3-1.7)	171	687,894	2.4 (2.1-2.8)
Qi gong	94	368,128	0.5 (0.4-0.6)	50	180,523	0.7 (0.5-0.9)

n = Number in sample; % = percent of sample; CI = Confidence Interval; Note: We did not include 3 other responses (“Refused” “Not ascertained” and “Don't know”) in the analysis. As a result, variations in the total response rate for each category are due to data missing from these categories.
*p< 0.05, **p< 0.01, ***p< 0.001

Table 2: Characteristics of people with fibromyalgia practicing meditation, meditative movement, neither or both: NHIS, 2017 (n= 7,033)

	Meditation			Meditative Movement			Neither Practice			Both Practices		
	N	Weighted N	% (95% CI)	N	Weighted N	% (95% CI)	N	Weighted N	% (95% CI)	N	Weighted N	% (95% CI)
Age												
18-44	163	666,449	20.9 (18.2-24.0)	153	617,440	19.6 (17.0-22.6)	531	2,178,496	68.1 (64.7-71.3)	67	262,576	8.6 (6.8-10.8)
45-64	551	2,111,615	20.4 (18.9-22.0)	334	1,280,261	12.4 (11.2-13.7)	1980	7,659,148	73.3 (71.6-75.0)	165	635,445	6.1 (5.3-7.1)
65+	542	2,111,615	15.3 (14.1-16.5)	309	1,172,494	8.7 (7.8-9.7)	2826	10,200,000	79.5 (78.2-80.8)	124	450,860	3.5 (2.9-4.1)
Sex												
Male	377	1,426,122	13.7 (12.5-15.1)	170	665,255	6.2 (5.3-7.1)	2274	8,520,202	82.7 (81.3-84.1)	345	268,443	2.6 (2.1-3.3)
Female	879	3,296,867	20.5(19.3-21.8)	626	2,404,940	14.6 (13.6-15.7)	3063	11,500,000	71.5 (70.1-72.8)	716	1,080,438	6.6 (5.9-7.4)
Race												
White	1042	3,889,821	17.6 (16.7-18.6)	694	2,638,989	11.7 (10.9-12.6)	4487	16,700,000	75.9 (74.8-76.9)	309	1,154,348	5.2 (4.7-5.8)
Black	129	493,423	17.6 (15.0-20.5)	59	258,424	8 .0 (6.3-10.2)	569	2,265,285	77.4 (74.2-80.3)	22	92,428	3.0 (2.0-4.5)
American Indian	16	58,491	24.2 (15.4-36.0)	9	37,665	13.6 (7.2-24.2)	45	165,263	68.2 (56.1-78.2)	4	17,546	6.1 (2.3-15.1)
Asian	34	140,755	19.3 (14.1-25.8)	17	70,895	9.7 (6.1-15.0)	136	501,832	77.3 (70.5-82.9)	11	45,051	6.3 (3.5-10.9)
Other	35	140,499	24.6 (18.3-32.4)	17	64,222	12.0 (7.6-18.4)	100	369,105	70.4 (62.4-77.3)	10	39,508	7.0 (3.8-12.6)
Ethnicity												
Non-Hispanic	1175	4,401,160	18.0 (17.1-18.9)	753	2,873,576	11.5 (10.8-12.3)	4957	18,400,000	75.8 (74.7-76.8)	344	1,305,289	5.3 (4.7-5.8)
Hispanic	81	321,829	16.5 (13.4-20.0)	43	196,619	8.7 (6.5-11.6)	380	1,588,181	77.2 (73.3-80.7)	12	43,592	2.4 (1.4-4.2)
Marital status												
Married	501	1,942,746	16.1 (14.9-17.5)	358	1,370,662	11.5 (10.5-12.7)	2385	8,861,697	76.9 (75.3-78.3)	141	541,790	4.5 (3.9-5.3)
Widowed	200	733,492	15.1 (13.3-17.1)	101	398,408	7.6 (6.3-9.2)	1066	3,927,092	80.5 (78.3-82.6)	43	170,358	3.2 (2.4-4.4)
Divorced	320	1,133,702	20.9 (18.9-23.0)	188	701,868	12.3 (10.7-14.0)	1115	4,164,899	72.8 (70.5-75.0)	92	318,841	6.0 (4.9-7.3)
Separated	49	197,896	22.1 (17.1-28.0)	24	110,349	10.8 (7.4-15.6)	161	583,999	72.5 (66.3-78.0)	12	64,791	5.4 (3.1-9.3)
Never married	186	715,153	21.8 (19.2-24.7)	125	488,908	14.7 (12.4-17.2)	610	2,469,904	71.5 (68.4-74.4)	68	253,101	8.0 (6.3-10.0)
Income												
Less than $20,000	287	1,064,163	18.3 (16.5-20.3)	111	439,852	7.1 (5.9-8.5)	1234	4,629,056	78.8 (76.7-80.8)	66	258,303	4.2 (3.3-5.3)
$20,000-$34,999	209	752,790	16.4 (14.4-18.5)	117	449,441	9.2 (7.7-10.9)	997	3,702,868	78 (75.7-80.2)	45	151,894	3.5 (2.6-4.7)
$35,000-$64,999	328	1,227,010	18.2 (16.5-20.1)	198	731,887	11.0 (9.6-12.5)	1371	5,033,316	76.1 (74.1-78.0)	96	359,213	5.3 (4.4-6.5)
$65,000-$99,999	183	729,795	17.4 (15.2-19.8)	133	532,030	12.6 (10.7-14.8)	788	2,961,769	74.8 (72.1-77.3)	50	203,318	4.7 (3.6-6.2)
≥ $100,000	249	949,231	18.7 (16.7-20.8)	237	916,985	17.8 (15.8-19.9)	947	3,680,582	71 (68.5-73.4)	99	376,153	7.4 (6.1-9.0)
Health Insurance												
Not insured	58	1,287,360	20.7 (16.4-25.9)	27	460,352	9.6 (6.7-13.7)	212	9,054,747	75.7 (70.3-80.4)	17	154,262	6.1 (3.8-9.5)
Insured	1198	1,664,575	17.7 (16.8-18.7)	769	1,012,579	11.4 (10.7-12.2)	5125	6,057,145	75.9 (74.9-76.9)	339	445,969	5.0 (4.5-5.6)
Education												
High school or less	338	1,287,360	12.0 (10.9-13.3)	117	460,352	4.2 (3.5-5.0)	2401	9,054,747	85.3 (83.9-86.5)	40	154,262	1.4 (1.0-1.9)
Some college	445	238,818	19.7 (18.1-21.4)	266	107,794	11.8 (10.5-13.2)	1666	809,009	73.8 (72.0-75.6)	120	67,091	5.3 (4.5-6.3)
Bachelor's or greater	473	4,484,171	24.1 (22.2-26.1)	413	2,962,401	21.1 (19.3-22.9)	1270	19,200,000	64.8 (62.7-66.9)	196	1,281,790	10.0 (8.7-11.4)
Smoking status												
Current	199	782,176	17.0 (14.9-19.2)	92	366,499	7.8 (6.4-9.5)	938	3,498,559	79.9 (77.5-82.1)	55	232,712	4.7 (3.6-6.1)
Former	438	1,601,578	18.3 (16.9-20.0)	283	1,078,768	11.9 (10.6-13.2)	1798	6,706,605	75.4 (73.6-77.0)	133	484,784	5.6 (4.7-6.6)
Never smoker	619	2,339,235	17.8 (16.6-19.1)	421	1,624,928	12.1 (11.1-13.3)	2601	9,802,427	74.9 (73.4-76.3)	168	631,385	4.8 (4.2-5.6)

Comorbidities												
None	64	229,297	21.6 (17.3-26.7)	38	135,390	12.9 (9.5-17.2)	215	807,367	72.6 (67.3-77.4)	21	65,485	7.1 (4.7-10.6)
≥ 1	1192	4,493,692	17.7 (16.8-18.6)	758	2,934,805	11.1 (10.5-12.0)	5122	19,700,000	76.0 (75.0-77.0)	335	1,283,396	5.0 (4.5-5.5)
Obese												
No	753	2,870,550	18.0 (16.8-19.2)	580	2,230,030	13.8 (12.8-14.9)	3119	11,700,000	74.5 (73.1-75.8)	263	991,015	6.3 (5.6-7.1)
Yes	503	1,852,439	17.7 (16.3-19.1)	216	840,165	7.6 (6.7-8.6)	2218	8,295,015	78.0 (76.4-79.5)	93	357,866	3.3 (2.7-4.0)

N = Number in sample; % = percent of sample; CI = Confidence Interval; Note: We did not include 3 other responses (“Refused” “Not ascertained” and “Don't know”) in the analysis. As a result, variations in the total response rate for each category are due to data missing from these categories.

Table 3: Multinomial logistic regression predicting practice of meditation, meditative movement, or both for individuals with fibromyalgia while using neither practice the reference outcome: NHIS, 2017

	Meditation	**Meditative Movement**	**Both Practices**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age			
18-44	Ref		
45-64	1.1 (0.8 -1.4)	0.5 (0.4-0.7) ***	0.8 (0.5-1.1)
65+	0.8 (0.6-1.1)	0.5 (0.3-0.6) ***	0.4 (0.3-0.6) ***
Sex			
Male	Ref		
Female	1.5 (1.2-1.7) ***	2.7 (2.1-3.5) ***	3.2 (2.4-4.3) ***
Race			
White	Ref		
Black	1.1 (0.9-1.4)	0.8 (0.6-1.2)	0.7 (0.4-1.1)
American Indian	1.5 (0.7-3.1)	1.3 (0.5-3.6)	2.2 (0.8-6.6)
Asian	1.2 (0.7-1.9)	0.6 (0.3-1.4)	1.3 (0.6-2.7)
Other	1.7 (1.0-2.7)*	0.8 (0.3-1.8)	1.6 (0.8-3.4)
Ethnicity			
Non-Hispanic	Ref		
Hispanic	1.0 (0.8-1.4)	1.1 (0.7-1.7)	0.5 (0.3-1.1) **
Marital status			
Married	Ref		
Widowed	0.9 (0.7-1.1)	0.6 (0.4-0.8) ***	0.7 (0.5-1.1)
Divorced	1.2 (1.0-1.4)	0.9 (0.7-1.2)	1.2 (0.9-1.6)
Separated	1.3 (0.9-2.0)	0.7 (0.4-1.3)	1.5 (0.7-2.9)
Never married	1.1 (0.9-1.4)	0.8 (0.6-1.1)	1.3 (0.9-1.9)
Income			
Less than $20,000	Ref		
$20,000-$34,999	0.9 (0.7-1.2)	2.0 (1.4-3.1) ***	0.6 (0.4-10.9)
$35,000-$64,999	1.0 (0.8-1.2)	1.9 (1.3-2.8) ***	1.8 (0.6-5.2)
$65,000-$99,999	1.0 (0.8-1.3)	2.8 (1.9-4.2) ***	1.3 (0.7-2.7)
$100,000 or more	0.9 (0.7-1.2)	3.7 (2.5-5.4) ***	1.6 (0.8-3.1) ***
Education			
High School or less	Ref		
Some college	1.6 (1.3-1.9)**	2.8 (2.1-3.8) ***	4.2 (2.8-6.2) ***
Bachelor’s degree or greater	1.7 (1.4-2.1)**	5.3 (4.0-7.2) ***	8.6 (5.8-12.7) ***

Health insurance			
Not insured	Ref		
Insured	0.8 (0.5-1.1)	1.5 (0.7-3.0)	0.7 (0.4-1.3)
Obesity			
Not Obese	Ref		
Obese	1.1 (1.0-1.3)	0.5 (0.4-0.7) ***	0.5 (0.4-0.7) ***
Comorbid conditions			
Zero comorbidities	Ref		
≥ 1 comorbid conditions	0.8 (0.6-1.2)	1.0 (0.6-1.8)	0.9 (0.5-1.4)
Smoking status			
Never smoker	Ref		
Current smoker	1.1 (0.8-1.3)	2.4 (1.6-3.6) ***	1.1 (0.8-1.6)
Former smoker	1.1 (0.9 -1.4)	2.7 (1.8-4.0) ***	1 (0.7-1.4)

OR = Odd Ratios; CI = Confidence Interval; Ref = Referent; Note: We did not include 3 other responses (“Refused” “Not ascertained” and “Don't know”) in the analysis. As a result, variations in the total response rate for each category are due to data missing from these categories.
*p< 0.05, **p< 0.01, ***p< 0.001

APPENDICES

Appendix A: List of abbreviated terms

ACR: American College of Rheumatology

CAM: Complementary and alternative medicine

CDC: Centers for Disease Control and Prevention

CNS: Central nervous system

FDA: U.S. Food and Drug Administration

FM: Fibromyalgia

MBCT: Mindfulness-based cognitive therapy

MBIs: Mindfulness-based interventions

MBSR: Mindfulness-based stress reduction

MMD: Major mood disorders

NCCIH: National Center for Complementary and Integrative Health

NCHS: National Center for Health Statistics

NHIS: National Health Interview Survey

QOL: Quality of life

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