The Association between the Use of Mind-body Therapies and U.S. Adults with Depressive Symptoms, National Health Interview Survey 2012

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and U.S. Adults with Depressive Symptoms,
National Health Interview Survey 2012

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ABSTRACT

BACKGROUND

The use of complementary and alternative medicine (CAM) has dramatically increased over the years since 1990. It is one of the fastest growing fields in healthcare and it is widely used today in the United States. Most people utilizing CAM approaches are seeking ways to improve overall health and well-being to relieve symptoms associated with body aches such as neck and back pain, stiffness, chronic illnesses, anxiety and depression, and side effects of conventional medicine. Symptoms of depression can lead to major depression, which is consequentially a major public health problem in the United States. In 2014, more than 1 out of 20 Americans have been reported to have moderate/high depressive symptoms. While depression is treatable with western medication, many have found that the use of mind and body approaches such as mediation, chiropractic/osteopathic manipulation, and yoga show great benefit in improving the cognitive symptoms of depression without medication side effects.

OBJECTIVES

The objective of this study was to assess the association between the use of mind-body therapy and depressive symptoms. The analyses presented focus on determining whether mind-body therapy users are more or less likely to be depressed.

METHODS

This study used a secondary and cross-sectional data from the 2012 National Health Interview Survey, a nationally representative household interview survey. The Adult Sample and the Adult Alternative datasets were used, and consisted of 34,525 participants. The sample
was exclusive to adults ≥ 18 years of age. Analyses were conducted with 11,143 adults with depressive symptoms. The dependent variables were defined as self-reported response of emotional distress, the independent variable as Mind-Body Therapies users. SAS 9.4 was used to conduct descriptive, binomial, multinomial logistic regression analyses, and generalized linear mixed model. The level of significance of 0.05 was used to determine statistical significance.

RESULTS

In the weighted unadjusted model, the association between the use of at least one mind-body therapy and depressive symptoms was statistically significant, with an odd ratio of 1.51 and 95% CI (1.26, 1.81). The number of mind-body therapies used [OR= 1.13, 95% CI (1.09, 1.17)] and the most commonly used mind-body therapies [OR= 1.51, 95% CI (1.27, 1.81)] also yielded statistically significant association with depressive symptoms. In the weighted adjusted binomial logistic regression model, only the number of mind-body therapies used [OR=1.09, 95% CI (1.06, 1.18)] yielded a statistically significant association with depressive symptoms.

CONCLUSION

A negative association was found between the use of mind-body therapy and mental health among U.S. adults in all unadjusted models. Mind-body therapies users were found to be more depressed individuals. These results support the literature reviews that mind-body therapies users are more likely to be depressed.

KEYWORDS

Complementary and Alternative Medicine; Mind-Body Therapies; Mindfulness Intervention; Depressive Symptoms; Depression; Psychological distress; Mental Health; Mental Treatment; Multilevel Modeling; NHIS 2012
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INTRODUCTION

Complementary and Alternative Medicine (CAM) is a group of diverse medical and healthcare systems and products, referred to as a non-mainstream Western (NIH, 2016). It is often categorized into two subgroups: mind and body practices such as meditation, yoga, chiropractic/osteopathic manipulation, and natural products such as supplements and herbs (NIH, 2016).

The first nationally representative survey on the use of CAM was first conducted in 1990, where prevalence, costs, and patterns of the use of CAM were analyzed (Institute of Medicine, 2005). Results from the survey indicated that Americans spent an annual approximate of $10.3 billion out of pocket on CAM, in comparison with an annual approximate cost of $12.8 for all hospitalizations in the United States (Institute of Medicine, 2005). A follow-up survey was conducted and indicated an increase in the prevalence of CAM usage by 25% from 1990 to 1997 (Institute of Medicine, 2005). In 2002, the National Health Interview Survey, which conducts a study on the health of the nation since 1957, started including questions regarding CAM usage (NIH, 2017). Today, NHIS survey includes questions regarding CAM usage every five years.

CAM is one of the fastest growing fields in healthcare and is widely used today in the United States. The use of CAM has become prevalent over the past years with approximately 38.3% of adults in the United States reported using CAM in 2007 (Hernandez-Reif, Horton, Vaughn, Pollard, Juarez, Kendrick, & Burns-Nader, 2015; NIH, 2017). Most people utilizing CAM approaches are seeking ways to improve overall health and well-being to relieve symptoms
associated with body aches such as neck and back pain, stiffness, chronic illnesses, anxiety and depression, and side effects of conventional medicine (Barnes, & Bloom, 2008).

The popularity of mind and body practices has significantly grown over the years, especially yoga, where the number of people practicing yoga doubled in 2012 (NIH, 2016). The 2012 NHIS define mind-body practices as yoga, meditation, chiropractic and osteopathic manipulation, meditation and massage therapy as the most popular mind and body practices used by adults (NIH, 2016). Other mind-body therapies include acupuncture, guided imagery, tai chi, qi gong, Pilates, progressive relaxation, Alexander techniques, and Trager psychophysical integration (NIH, 2016). Although the amount of research varies depending on the type of CAM, there have been many studies which have documented the health benefits of practices such as yoga, meditation and acupuncture (NIH, 2016). CAM users were found to practice mind-body therapies, especially meditation for mental health, behavioral self-regulation, and integrative medical care (Burke, Lam, Stussman, & Yang, 2017). Today, many accredited medical schools have begun introducing mindfulness-based interventions in their academic curriculum (Barnes, Hattan, Black, & Schuman-Olivier, 2016). Incorporating mind-body integrative medicine within medical training and residency programs not only increases options for patients care but also medical field’s research and practices, which can potentially benefit physician and patients in the future (Barnes, Hattan, Black, & Schuman-Olivier, 2016).

Most people seek out CAM modalities due to mental health problems such as depression, anxiety, and stress (Pilkington, Kirkwood, Rampes, & Richardson, 2005). Depression is one of the most common but serious mental disorders in the United States (NIH, 2016). In 2014, more than 1 out of 20 Americans were reported to have moderate to high depressive
symptoms (CDC, 2014). An individual who suffers from depression is also more likely to suffer from anxiety disorder or vice versa. Anxiety disorders affect approximately 18.1% of the U.S. population every year (Anxiety and Depression Association of America, 2017). Although both depression and anxiety are highly treatable, many individuals do not seek treatment (ADAA, 2017). While there is growing scientific evidence about CAM, it is often recommended to use CAM as a complement to conventional medicine to treat mental illnesses such as depression and anxiety disorder (ADAA, 2017). While CAM is often recommended as a complement to conventional medicine, physicians often do not recommend using St. John’s Wort with certain antidepressants as it can lead to life-threatening increase of serotonin (NIH, 2017). A major concern with CAM usage is that many people do not consult with a mental health provider or primary care physician before selecting CAM modalities or discontinuing conventional medicine (ADAA, 2017).

Most findings in the literature with respect to the effect of mind and body practices on depressive symptoms consistently report potential benefits for mental health. However, questions remain about which therapies and/or which combination of therapies are most effective, and what intensity and frequency a therapy needs to be used in order to see effect on mental health related symptoms. The analysis presented focuses on selected mind and body approaches in NHIS 2012 and its relationship with depressive symptoms.
REVIEW OF THE LITERATURE

Depressive Symptoms

Depressive symptoms are defined as the feeling of sadness, emptiness, hopelessness, and anxiety (Mirowsky & Ross, 2002). These feelings are often a normal response to life’s stressors, and most people have sad mood at some point in life (National Institute of Mental Health, 2016). However, a persisting emotion of sadness or loneliness that interferes with daily life may become a severe condition. Many prior studies use the terms “depressive symptoms” and “depression” interchangeably as depressive symptoms are part of the feelings of depression. Depression is a serious medical illness that causes inability to function at work and home (National Institute of Health, 2016). Major depressive disorder is the leading cause of disability, affecting approximately 6.7% of the U.S. population age 18 and older (ADAA, 2017). Studies suggested that genetic, biological, environmental, and psychological factors are the main causes of depression (NIH, 2016). Depression can occur at any age; however, studies have found that the prevalence of depression increases with age (NIH, 2016; Fekadu, Shibeshi, & Engidawork, 2017). Women are also more likely to be diagnosed with depression than men. One of the reasons is that men and women may perceive “depression” differently. Men often feel depressed based on tiredness, irritability, and anger; while women define depressed as sadness, worthlessness, and guilt (National Institute of Mental Health, 2016). The leading cause of depression is often associated with other conditions and behaviors, including other mental disorders such as anxiety disorder, and chronic conditions such as arthritis and asthma. (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015; American Psychiatric Association, 2013).
When depression is not adequately treated, it can become a severe chronic disease (Greenberg, et al., 2015; American Psychiatric Association, 2013).

**Depression in Older Adults**

The risk of depression increases with age (CDC, 2017), in part because of the psychological/emotional impact of one’s to deteriorating condition of health. The prevalence rate of depression varies considerably depending on several factors. For example, the prevalence of depression in community sampled adults age 65 and older ranges from 1% to 5%, and increases for those living in home healthcare and hospital to 13.5% and 11.5% respectively (CDC, 2017). Although major depression is not prevalent in late life, recent meta-analyses showed that the prevalence of clinical depressive symptoms is high in older adults, with rates for sub-threshold depressive symptoms (those failing to reach diagnostic criteria) ranged from 4.5% to 37.4%. (Rodda, Walker, & Carter, 2011). It appears that older adults are more likely to experience depression with less independence or a greater medical assistance need environment.

There are two types of age of onset of disorder: early-onset depression and late-onset depression. For individuals who have already experienced mental illness earlier in life, this is referred to as early-onset depression; while those whose first encounter with mental illness in old age is called late-onset depression (Fiske, Wetherell, & Gatz, 2009). More than half of the older adults are diagnosed with depression in old age, and less than half are diagnosed before old age (Brodaty, Luscombe, Parker, Wilhelm, Hickie, Austin, & Mitchell, 2001). Early onset depression was found to be related to family history of depression (Heun, Papassotiropoulos, Jessen, Maier, & Breitner, 2001). The leading cause of late-life depression consists of a complex
multidirectional interaction of biologic, psychological and social factors (Rehan, & Steffens, 2014).

Depression in older adults has become a serious public health concern as the number of older adults increased by 15.1% between 2000 and 2010 (Rehan, & Steffens, 2014). Treatments for depression in old age include behavioral therapy, cognitive-behavioral therapy, cognitive bibliotherapy, problem-solving therapy, brief psychodynamic therapy, and life review/reminiscence therapy (Fiske, et al., 2009).

**Chronic Conditions and Depressive Symptoms**

Depression can occur along with other serious illness, such as diabetes, cancer, heart diseases, etc. Depression can make these conditions worse and vice versa. Studies showed that individuals with chronic diseases and comorbid depression reported significantly higher numbers of medical symptoms compared to those with only chronic illness alone (Katon, Lin, & Kroenke, 2007). The risk of depression increases between 25-33% with chronic illnesses (Morewitz, 2006). Depression is difficult to diagnose in clinical diagnosis because feeling depressed is often assumed to be normal for an individual dealing with a serious chronic disease (Morewitz, 2006). In addition, physical symptoms of depression such as disturbed sleep, impaired appetite, and lack of energy may be a result of an already existing disease (Turner, & Kelly, 2000). The most common chronic conditions associated with depression include arthritis, asthma, diabetes, cancer, coronary heart disease (CHD), chronic obstructive pulmonary disease (COPD), stroke, and obesity/BMI (Chapman, Perry, & Strine, 2005). While all these chronic conditions are manageable with medications, side effects are a concern as it may affect patients’ mood and trigger depression (NIH, 2017). These chronic illnesses’ therapeutic
treatment may be beneficial to target a specific condition, but with comorbid depression, the treatment may harm the patients.

Arthritis

Arthritis is a leading cause of disability in the United States, affecting 54.4 million of adults (CDC, 2017). It is one of the most common chronic condition and a common cause of chronic pain. According to CDC’s definition, arthritis includes more than 100 disease and conditions, including osteoarthritis, rheumatoid arthritis, fibromyalgia, gout, and lupus. Patients may experience joint pain, aching, stiffness, and swelling. Rheumatoid arthritis (RA) seem to be the most common type of arthritis associated with depression (Dickens, McGowan, Clark-Carter, & Creed, 2002; Covic, Cumming, Pallant, Manolios, Emery, Conaghan, & Tennant, 2012). Depression was found to be highly prevalent in RA and associated with poorer RA outcomes such as increased pain, more comorbidities, and increased mortality levels (Matcham, Rayner, Steer, & Hotopf, 2013).

Asthma

Asthma is a chronic lung disease that inflames and narrows the airways and affects more than 22.2 million people in the US (NIH, 2014; Anupama, Bollinger, & Teodor, 2008). Asthma has often been considered an illness in which mood and emotions contribute to symptom exacerbation (Zielinski, Brown, Nejtek, Khan, Moore, & Rush, 2000). Although mood disorders are common among asthma patients, these symptoms are often unrecognized and untreated (Nejtek, Brown, Khan, Moore, Wagner, & Parantie, 2001). Asthma is often controlled through pharmacotherapy: controller medication, which is taken on a daily basis, and rescue medication, which is used for acute exacerbations (Kewalramani, Bollinger, & Postolache,
2009). Although these treatments are useful for treating asthma, adverse events such as exacerbations of depression or anxiety symptoms need to be monitored closely (Kewalramani, Bollinger, & Postolache, 2009). The prevalence of depressive disorders among individuals with asthma is not well determined, however, several studies have found that depression may increase the risk of death among asthma patients or that depression is associated with an increase of asthma symptoms. These results are not consistent as other studies have found no correlation between diagnosis of depression and asthma (Zielinski, et al., 2000).

**Cancer**

Cancer is life-threatening and a feared diagnosis. A cancer diagnosis is a stressful, and life-changing event that can impact most patients, family, and friends, emotionally. Feelings of depression such as hopelessness, helplessness, sadness, anger are very common among cancer patients (ACS, 2016). Depression affects more than 10% of patients among cancer patients (Smith, 2015). Therapeutic treatment such as antidepressant medication and psychological treatments can be used to manage depressive symptoms. However, these treatments may have different harms and benefits for cancer patients (Walker, Sawhney, Hansen, & Ahmed, 2013).

**Diabetes**

The increased prevalence of depression among diabetes is reported in several community studies. Comorbid diabetes and depression are clinically challenging to treat as both conditions are worsened by one another (Holt, de Groot, & Golden, 2014). Diabetic patients have twice the risk of having depressive symptoms (Vickers et al., 2006), which can cause other complications such as diabetic retinopathy, skin complication, and swollen feet (American Diabetes Association, 2017). Type 2 diabetes patients who uses insulin were found to have a
higher rate of depression amongst those who takes noninsulin medication or dietary and lifestyle intervention only (Li, Ford, Strine, & Mokdad, 2007). Depression is frequently disregarded in people with diabetes due to the fact that both conditions may be driven by shared underlying biological and behavioral mechanism such as hypothalamic-pituitary-adrenal axis activation, inflammation, sleep disturbance, inactive lifestyle, poor dietary habits, and environmental and cultural risk factors (Holt, de Groot, & Golden, 2014). Treatment for depression such as psychological intervention and antidepressants are effective in treating depression but have mixed effects on glycemic control in diabetic patients (Holt, de Groot, & Golden, 2014).

**Coronary Heart Disease (CHD)**

Heart disease is the leading cause of death in the United States with 1 out 4 people dying from it (CDC, 2017). Coronary Heart Disease is the most common type of heart disease, where plaques build up inside the coronary arteries and prevent oxygen-rich blood to the heart (NIH, 2016). Depression is a highly prevalent risk factor for CHD with 9.3% of individuals with cardiac disease compared to 4.8% with no comorbid disease (Edgede, 2007). A systematic review reported that 20% of CHD patients met criteria for a major depressive disorder, and 47% experienced depressive symptoms (Bush, Ziegelstein, Patel, Thombs, Ford, Fauerbach, & Bass, 2005). Depression was also found to be three times as high after an acute myocardial infarction (AMI), especially among women (Thombs, Bass, Ford, Stewart, Tsilidis, Patel, Fauerbach, Bush, & Ziegelstein, 2006; Kessler, 2003; Pilote, Dasgupta, Guru, Humphries, McGrath, Norris, Rabi, Tremblay, Alamian, Barnett, Cox, Ghali, Grace, Hamet, Ho, Kirkland, Lambert, Libersan, O’Loughlin, Paradis, Petrovich, & Tagalakis, 2007).
Chronic Obstructive Pulmonary Disease (COPD)

Chronic Obstructive Pulmonary Disease is a very common lung disease that affects over 30 million of Americans (COPD Foundation, 2017). COPD has a significant impact on the quality of life such as restriction of activities, sleeping problems, and limitation of social life (Yohannes, & Alexopoulos, 2015). These restrictions highly affect mental health. Around 40% patients are affected by depressive symptoms or major depression (Stage, Middelboe, Stage, & Sorensen, 2006). Depression contributes to a substantial burden to reduce adherence to treatment due to overlapping symptoms (Yohannes, & Alexopoulos, 2015; Stage, et al., 2006).

Stroke

Although the comorbidity of stroke and depression has been understudied, post-stroke depression (PSD) is a concern that has often been overlooked and untreated (Narushima, & Robinson, 2002). Post-stroke depression is a common psychiatric disorder as a consequence of stroke, and it can greatly reduce the quality of life of a patient. According to epidemiological studies, one-third of patients experience early- or late-onset of depression (Gaete, & Bogousslavsly, 2014). Studies showed that 30% of patients experience minor depression and 25% experience major depression following stroke (Alajbegovic, Djelilovic-Vranic, Alajbegovic, Nakicevic, Todorovic, & Tiric-Campara, 2014). Stroke patients with PSD suffer from higher mortality rate and slower functional recovery (Paolucci, 2008). PSD is often not diagnosed appropriately due to somatic symptoms caused by medical illness and cognitive impairment (Paolucci, 2008). PSD is potentially treatable; however, there has not been enough antidepressant agent or nonpharmacological interventions’ benefits observed (Gaete, & Bogousslavsly, 2014).
Underweight, Overweight and Obesity/ BMI

Obesity has long been a public health concern. It is a complex health issue that is associated with poor mental health, reduced quality of life, and it is the leading cause of death in the United States (CDC, 2017). It also contributes to diabetes, heart disease, stroke, and cancer (CDC, 2017). According to CDC, 43% of adults with depression are obese, and as the obesity rate increases, the severity of depressive symptoms also increases (CDC, 2014). In all age groups, women with depression were more likely to be obese than women without depression (CDC, 2014). Treatments and interventions are available for both conditions, and it was found that weight loss may improve mood (Society for the Study of Ingestive Behavior, 2009).

Studies show that BMI classification (underweight, normal, overweight and obesity) and depression demonstrate a U-shaped relationship, where there is a higher prevalence of depression among underweight and obese patients (Carey, Small, Yoong, Boyes, Bisquera, & Sanson-Fisher, 2014).

Physical and Strength activities and Depressive Symptoms

There is a substantial number of studies showing the positive effects of physical activity on mood, anxiety, and general well-being. Most depressed patients first seek treatment from their primary health care provider, where they receive pharmacologic therapy alone (Craft, & Perna, 2004). Behavioral interventions such as exercising has shown to reduce the risk of developing depression, and to alleviate symptoms of depression (O’Neal, Dunn, & Martinsen, 2000). While most studies focused on the relationship between aerobic physical activity and depression, resistance-training has also been assessed and has shown to reduce symptoms of
depression as well (Craft, & Perna, 2004). Both aerobic exercise and strength training was found to be sufficient to reduce symptoms of depression (Craft, & Perna, 2004). Also, exercising was found to be comparable to standard care approaches, where individuals who met CDC’ s recommendation had a similar beneficial effect on depressive symptoms as antidepressant treatments (Dinas, Koutedakis, & Flouris, 2010).

**Mind-Body Therapies and Depressive Symptoms**

CAM modalities such as acupuncture, yoga, meditation, and stress and relaxation techniques have shown to decrease psychological distress, like depressive symptoms and anxiety (Deckro, Ballinger, Hoyt, Wilcher, Dusek, Myers, Greeberg, Rosenthal, & Benson., 2002). With the increased use of CAM, it was found that 24% adults who have anxiety/ depression use mind-body medicine therapies among the 34 million mind-body therapy users (D’Silva, Poscablo, Habousha, Kogan, & Kligler, 2012). Women are often found to practice mind-body therapies more often than men. Women with higher levels of education and higher income were found to use CAM at the greatest (NIH, 2017). Mind-body therapies include progressive muscle relaxation, meditation, hypnosis, guided imagery, yoga, and biofeedback. These approaches have been shown to be effective in reducing stress and anxiety, as well as chronic pain. However, levels of evidence vary (Hassed, 2013). The mind, emotions, and attention play an important role in patients experiencing chronic pain, stress, and fear (Hassed, 2013). The use of mind-body therapies can alleviate depression severity by improving one’s emotional state and mental health (Hassed, 2013). It helps patients focus their physical movement to train attention or produce mental relaxation (Hassed, 2013). A well-known and often popular mind-
body therapy is yoga. Studies have found that yoga has improved mood and well-being by helping people master anxiety through self-care (Brown, Gerbarg, Philip, & Muskin, 2009).

**Gaps in Knowledge and Limitations of Previous Studies**

As the popularity of the use of mind-body therapies continues to grow, additional research is needed to determine the number of mind-body therapies necessary to see an effect on depressive symptoms. Previous studies have consistently reported that mind-body therapies help improve mental health. However, very few studies have specified how frequent mind-body therapies are used. Most studies analyzed the efficacy of mind-body modalities for stress reduction and pain reduction with a chronic condition. Moreover, existing reviews tend to focus their research on the prevalence use of CAM in a specific clinical population (Bishop, & Lewith, 2010). This study assessed the association between the use of mind-body therapy and depressive symptoms, where the number of mind-body therapies one has ever practiced was considered in the analyses.
OBJECTIVE

The objective of this study was to assess the association between the use of mind-body therapy and depressive symptoms. The analyses presented focus on determining whether mind-body therapy users are more or less likely to be depressed.

Research Questions and Hypotheses

Questions:

1. Is there an association between the use of mind-body therapy and depressive symptoms?
2. Is the frequency of the use of mind-body therapy associated with depressive symptoms?

Hypotheses:

1. There is a positive association between the use of mind-body therapy and depressive symptoms.
2. There is a positive association between the frequency use of mind-body therapy and depressive symptoms
METHODS

Data source

This study used the 2012 National Health Interview Survey (NHIS), a cross-sectional interview survey. The NHIS is part of the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention (CDC). The NHIS is a source of information on the health of the noninstitutionalized population of the United States that began in 1957 as the result of the National Health Survey Act of 1956. It is an ongoing, nationwide, household interview survey about the overall health and health behaviors of a sampled population in the United States.

The NHIS sampling plan consists of a multistage sampling, stratification and clustering of addresses located in the primary sampling units (PSU’s), which represents county and small neighboring counties, or a metropolitan statistical area. Individuals are randomly selected, and information is collected with the Sample Adult Core and the Sample Child Core questionnaire. Questionnaires consist of Core questions and Supplemental questions. Core questions addresses basic demographic information and health status on each household member. Supplemental questionnaire addresses new public health data such complementary and alternative medicine (CAM), Healthy People 2020, Children’s Mental Health, and Healthcare Utilization. NHIS has an oversampled population of Black, Hispanic, and Asian aged 65 or older, which means that they have a higher chance to be selected, so that these population groups are adequately representative as the population in the United States.

NHIS datasets are available to the public on the CDC website in ASCII format. These datasets are downloadable and output files available for use in several statistical software...
packages. Sample syntax are also available for SAS, SPSS, and Stata. For this study, the Sample Adult file and the Adult Alternative Medicine file were used and analyses were conducted using SAS 9.4.

NHIS is a secondary data and is a pre-approved public data source that did not require the Institutional Review Board (IRB) approval determined by Georgia State University IRB policy.

**Study Population**

The study population of interest are adults in the United States who use mind-body therapies.

**Study Sample and Variables**

The study sample includes all participants in the Sample Adults and the Adult Complementary and Alternative Medicine datasets. The total study consisted of 34,525 participants aged 18 years and older. Only individuals who responded to all questions regarding having depressive symptoms and using at least one mind-body therapy: “During the past 30 days, how often did you feel so sad that nothing could cheer you up, nervous, restless or fidgety, hopeless, that everything was an effort, and worthless?” and “Have you EVER practice/use chiropractic or osteopathic manipulation, yoga, meditation (mantra meditation, mindfulness meditation, spiritual meditation), massage, guided imagery, progressive relaxation, tai chi, qi gong, acupuncture, biofeedback, hypnosis, or Alexander Technique?” were included in the analyses. The total eligible sample adults for the present analysis consisted of 11,143 participants. Among the 11,143 participants, 62% reported moderate to high symptoms of
depression and 52% reported having none to low symptoms of depression while indicating the use of at least one mind-body therapy.

**Outcome of Interest**

NHIS used the Kessler 6 (K6) screening scale, which is a standardized and validated measure of non-specific psychological distress, to assess depressive symptoms, the dependent variable in this study. K6 is composed of 6 questions asking, “During the past 30 days, how often did you feel so sad that nothing could cheer you up, nervous, restless or fidgety, hopeless, that everything was an effort, and worthless?” Responses were categorized as 0 (All of the time), 1 (Most off the time), 2 (Some of the time), 3 (A little of the time), 4 (None of the time). Individuals who answered “Refused” or “Don’t know” were excluded in the analyses. The scores were reversed in the study and were summed up to produce the outcome variable of interest. The lower the score indicates a better mental health. Scores ranges from 0 (No psychological distress) to 24 (Severe distress). The scores are classified into three distress groups: (0 - 12) none or low distress, (13 - 18) moderate distress, and (19 - 24) serious distress (Andrews & Slade, 2001; Kessler et al., 2010; Prochaska, Sung, Max, Shi, & Ong, 2012). Due to the lack of statistical power, depressive symptoms were also categorized as a dichotomous variable (Yes/No). Participants with a score lower than 7 were considered as not having psychological distress and higher than 7 as having psychological distress.

**Mind-Body Therapies**

The independent variable, the used of Mind-Body therapies, was determined using questions such as “Have you EVER practice/use chiropractic or osteopathic manipulation, yoga, meditation (mantra meditation, mindfulness meditation, spiritual meditation), massage, guided
imagery, progressive relaxation, tai chi, qi gong, acupuncture, biofeedback, hypnosis, or Alexander Technique?" Individuals who responded “Mentioned” were assumed to have used at least one type of mind-body therapy, and “Not Mentioned” as never used mind-body therapy. Responses were gathered and were classified by the number of mind and body therapies used (0, 1, 2, ..., 10). All responses of “Refused”, “Not Ascertain”, and “Don’t Know” were excluded from the analysis due to small number of responses. Mind-Body modalities therapies such as Biofeedback, Hypnosis, Qi Gong, Alexander Technique, and Trager Psychophysical Integration were excluded from the binomial and multinomial logistic regression analyses due to small sample size. Three variables were created with these questions, a dichotomous variable (yes/no): whether an individual has practiced mind-body therapy; the number of mind-body therapies practiced per individual; and whether an individual practiced selected mind-body therapies. Selected mind-body therapies include yoga, meditation, chiropractic/osteopathic manipulation, and massage therapy. These therapies are the four most commonly used practices according to NHIS (NIH, 2017). Due to the lack of statistical power, only the four-selected mind-body therapies were included in the logistic regression analysis and generalized linear mixed model analyses. The number of mind-body therapies practiced was considered as both a continuous and categorical variable. The number of mind-body modalities was not part of the NHIS survey questions, however, in the analyses, the number of mind-body modalities was combined into four categories. These four categories consist of zero, one, two, and more than three types of mind-body therapies used.
Sociodemographic Variables

Sociodemographic variables were categorized as follows: gender (male, female), race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian, Other/Non-Hispanic Multiple race), and region was categorized as Northeast, Midwest, South, and West. The value of age was considered as a continuous variable in its measured form. The sample size was exclusive to adults 18 years of age and above. The response of “Not Released” for race was excluded from the analyses due to small number of individuals who refused to release their race/ethnicity.

Chronic Conditions

Chronic diseases such as Coronary Heart Disease, Stroke, Emphysema, Chronic Obstructive Pulmonary Disease (COPD), Asthma, Cancer, Diabetes, Arthritis, and BMI were included in the study as possible factors contributing to depressive symptoms. Question such as “Have you ever been told by a doctor or other health professional that you have Coronary Heart Disease, Stroke, Emphysema, Chronic Obstructive Pulmonary Disease (COPD), Asthma, Cancer, Diabetes, or Arthritis” were asked to determine if an individual has certain chronic conditions. Responses such as “Yes” were considered in the analyses. All responses of “Refused”, “Not Ascertain”, and “Don’t Know” were excluded from the analyses. NHIS calculated BMI based on the height and weight variables using the equation: BMI= [Weight (kg)/ [Height (m) squared]] rounded to 2 decimal places. The value of BMI was considered as both continuous and categorical variable. BMI is categorized as underweight for a BMI below 18.5, Normal for a BMI of 18.5 to 24.9, Overweight as 25.0 to 29.9, and Obese for 30.0 and above (Centers for Disease Control and Prevention, 2017). Due to the lack of statistical power,
Emphysema was excluded from the logistic regression analysis and generalized linear mixed model analysis due to small sample sizes with some of the covariates used in these analyses.

**Physical and Strength Activities**

The frequency and duration of light/moderate activity and vigorous physical activity were assessed with questions “How often do you do LIGHT or MODERATE leisure-time physical activities for AT LEAST 10 MINUTES that cause ONLY LIGHT sweating or a SLIGHT to MODERATE increase in breathing or heart rate?” and “How often do you do VIGOROUS leisure-time physical activities for AT LEAST 10 MINUTES that cause HEAVY sweating or LARGE increases in breathing or heart rate?” According to the 2008 Physical Activity Guidelines (PAG) for Americans, adults should do at least 150 minutes a week of moderate-intensity (such as brisk walking or tennis), 75 minutes a week of vigorous intensity aerobic physical activity (such as jogging or swimming laps), or an equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity (Office of Disease Prevention and Health Promotion, 2017). Light/Moderate and vigorous physical activity were combined and categorized into two levels: inactive and active. Adults who met the PAG guidelines of engaging in physical activity for at least 10 minutes per week were classified as “active,” and those who did not meet the criteria were classified as “inactive.” Strength activity was assessed with the question: “How often do you do physical activities specifically designed to STRENGTHEN your muscles such as lifting weights or doing calisthenics?” Weekly frequency was used to measure respondents’ level of physical and strength activities. Strength activity was also categorized into two levels: inactive and active. Adults who did muscle strengthening activities (such as lighting weights or using...
resistance bands) for all major muscle groups on 2 or more days a week were classified as “active.” Adults who did not do any muscle strengthening activity were classified as “inactive.”

**Statistical Analyses**

All analyses were conducted using the statistical software SAS 9.4. NHIS datasets responses were weighted accordingly based on the 2010 U.S. Census data to ensure that the sample was nationally representative.

Descriptive statistics were conducted to summarize the characteristics of the overall study sample. The weighted and unweighted frequencies for all demographics variables, covariates and depressive symptoms are summarized in Table 1 and Table 4. Table 1 includes the frequencies of individuals with depressive symptoms categorized by three levels: Low, Moderate, and High. Table 4 presents the frequencies of individuals with depressive symptoms as a dichotomous variable. PROC FREQ and PROC SURVEYFREQ were used to estimate the unweighted and weighted frequencies for depressive symptoms and each categorical variable. PROC MEANS and PROC SURVEYMEANS were used to produce the unweighted and weighted means for continuous variables (Age, BMI, and Number of mind-body therapies). Stratification, clustering, and sampling weight variables were utilized in PROC SURVEYFREQ and PROC SURVEYMEANS to indicate the structure of the data, and NOMCAR was specified to treat missing data as “not missing completely at random.”

Ordinal Logistic Regression was first performed to predict the probability of depressive symptoms given the use of mind-body therapies. In the ordinal logistic regression analysis, the three levels of depressive symptoms (No to Low depressive symptoms, Moderate depressive symptoms, and High depressive symptoms) were used. PROC LOGISTIC and PROC
SURVEYLOGISTIC with the default logit link were used to test the proportional odds assumption. The score test and p-value were observed in order to determine whether the proportional odds assumption was violated in the cumulative logistic regression model. If the assumption does not hold, the more general multinomial logistic regression model will be used.

Multinomial Logistic Regression was used to predict the probability of the categorical outcome of interest given the independent variables. Multinomial Logistic Regression used the three categories depressive symptoms variable (No to Low depressive symptoms, Moderate depressive symptoms, and High depressive symptoms). PROC LOGISTIC and PROC SURVEYLOGISTIC were used to produce the unadjusted and adjusted odds ratio, 95% confidence interval, and the p-value. The summary can be found in Tables 2 and 3. The STRATA, CLUSTER, and WEIGHT statement options were specified in the same manner as PROC SURVEYFREQ and PROC SURVEYMEANS. To fit the model using a generalized logit function, the LINK=GLOGIT option was specified in the MODEL statement.

Due to estimation error in the generalized linear mixed model with the three levels of depressive symptoms, the outcome was categorized into a dichotomous variable. Depressive symptoms was categorized as No/Low depressive symptoms, and Moderate/High depressive symptoms. Binomial Logistic Regression was then used to predict the probability of the categorical outcome of interest given the independent variables. In order to run the binomial logistic regression analysis, PROC LOGISTIC and PROC SURVEYLOGISTIC were used to produce the unadjusted and adjusted odds ratio, 95% confidence interval, and the p-value. The summary can be found in Tables 5 and 6. The STRATA, CLUSTER, and WEIGHT statement options were specified in the same manner as PROC SURVEYFREQ and PROC SURVEYMEANS. To
fit the generalized logit models, the LINK=GLOGIT option was specified in the MODEL statement.

Generalized linear mixed models were used to predict the probability of depressive symptoms given the use of mind-body therapy while accounting for clustering of observations by region. PROC GLIMMIX was used to produce the unweighted unadjusted and adjusted odds ratio, 95% confidence interval, and the p-value. The WEIGHT statement was not used due to the nature of the data. Due to estimation error, the dichotomous variable of depressive symptoms was used in this model. A binomial distribution with a logit link function was specified. Region was specified as a random effect. The summary of the generalized linear mixed model analysis can be found in Table 7.
RESULTS

Descriptive Statistics

Characteristics of the study sample are presented in Table 1 and 4. Table 1 presents individuals with depression symptoms, where depressive symptoms are categorized by three levels. Table 4 presents individuals with depressive symptoms, where depressive symptoms are categorized by two levels. All statistical interpretations observed use the weighted models, and the depressive symptoms categorized by two levels. Approximately 6% of this study sample reported having moderate and 2% reported having high depressive symptoms. Among these individuals, 50.79% were women and 49.21% were men. The mean age for those reported having experienced depressive symptoms was 38.38 years of age. Most of the study sample who reported moderate/high depressive symptoms was non-Hispanic White (68.78%) compared to Hispanic (14.20%), non-Hispanic Black (9.62%), non-Hispanic Asian (2.71%), and other race (4.68%). Individuals the South region of the United States (33.05%) were more likely to be depressed compared to West (28.51%), Midwest (23.18%), and Northeast (15.26%). A map of the U.S. with NHIS grouping of regions can be seen in Figure 1. Among all chronic conditions (arthritis, asthma, diabetes, cancer, CHD, COPD, stroke, emphysema, and BMI classification) explored in this analysis, individuals with arthritis, asthma, and overweight/obesity had the highest prevalence of depressive symptoms with 21.54%, 20.38%, 31.47%, and 32.37% respectively. When asked if individuals with moderate/high depressive symptoms had practiced at least one of the mind-body therapies (yoga, chiropractic/osteopathic manipulation, massage, meditation, Pilates, acupuncture, tai chi, progressive relaxation, guided imagery, hypnosis, qi gong, biofeedback, alexander technique, or
Trager psychophysical integration), 62.18% responded “Yes” and 37.82% responded “No.”

Among those who reported moderate/high depressive symptoms, 37.78% reported never used any type of mind-body modalities, 24.11% reported using one type of mind-body modalities, 11.87% reported using two types of mind-body modalities, and 26.23% reported using more than 3 types of mind-body modalities. Out of the most commonly practiced mind-body therapies (yoga, meditation, massage, and chiropractic/osteopathic manipulation), 58.97% of respondents reported moderate/high depressive symptoms compared to 48.69% who reported no/low depressive symptoms. For physical and strength activities, 87.92% reported having moderate/high depressive symptoms compared to 92.39% who reported no/low depressive symptoms when exercising for at least 150 minutes a week of moderate-intensity activities or 75 minutes a week of vigorous-intensity aerobic physical activities. Among individuals who reported moderate/high depressive symptoms, 36.96% reported engaging actively in weight training at least once a week compared to 63.04% of individuals who did not report engaging in weight training.

**Ordinal Logistic Regression**

Ordinal logistic regression analysis was performed to examine how the variable of interest and the covariates were associated with depressive symptoms. The score test and p-value were observed to assess the proportional odds assumption test. Results showed a significant p-value for all variables. For example, age had a chi-square value of 8.38 and a p-value of 0.0038, and the use of at least one mind-body therapy had a chi-square value of 13.09 with a p-value of 0.0003. These results showed a violation of the proportional odds assumption test, therefore, a multinomial logistic regression model was best used.
**Multinomial Logistic Regression**

Multinomial logistic regression analyses were conducted to examine how the variable of interest and the covariates were associated with depressive symptoms. Tables 2 and 3 present odds ratio, 95% confidence interval (95% CI), and p-value for demographic characteristics, physical and strength activities, and mind-body modalities among those who have reported experiencing no/low depressive symptoms, moderate depressive symptoms, and high depressive symptoms.

In the weighted unadjusted multinomial logistic regression model, for each additional year of age, the odds of having moderate or high depressive symptoms as compared to a none/low level of depressive symptoms was close to 1 [OR= 0.99, 95% CI (0.98, 1.00)]. The results were similar for BMI [high vs low: OR= 1.01, 95% CI (1.00, 1.02)], [moderate vs low: OR= 1.01, 95% CI (1.00, 1.02)]. Females were more likely to have moderate vs low [OR= 1.04, 95% CI (0.85, 1.28)] or high vs low [OR=1.68, 95% CI (1.19, 2.39)] depressive symptoms than males. Hispanic participants were more likely to have moderate vs low [OR= 1.13, 95% CI (0.84, 1.52) or high vs low [OR= 1.69, 95% CI (1.08, 2.65)] depressive symptoms compared to Non-Hispanic Whites. Non-Hispanic Black participants were equally likely to have moderate depressive symptoms as compared to low depressive symptoms [OR= 0.97, 95% CI (0.71, 1.34)], but had increased odds for high vs low depressive symptoms [OR= 1.44, 95% CI (0.85, 2.42)]. Non-Hispanic Asians were less likely to have moderate vs low [OR=0.63, 95% CI (0.42, 0.93)] or high vs low [OR=0.33, 95% CI 0.10, 1.10)] depressive symptoms as compared to non-Hispanic Whites. Arthritis, asthma, diabetes, COPD, and BMI classification were statistically significantly associated with depressive symptoms in this multinomial logistic regression model. Participants
with arthritis had increased odds for both moderate vs low [OR=1.37, 95% CI (1.09, 1.73)] and high vs low [OR=2.38, 95% CI (1.59, 3.55)] depressive symptoms. Similarly, for participants with asthma, participants had increased odds for moderate vs low [OR=1.93, 95% (1.50, 2.49)] and high vs low [OR= 2.21, 95% CI (1.46, 3.34)] depressive symptoms. Participants with diabetes and stroke also showed increased odds for moderate vs low and high vs low depressive symptoms. Diabetic participants were more likely to have moderate vs low depressive symptoms [OR= 1.61, 95% CI (1.09, 2.40)] and high vs low depressive symptoms [OR= 1.99, 95% CI (1.19, 3.34)] as compared to non-Diabetic participants. Participants diagnosed with COPD were more likely to have moderate vs low [OR=1.60, 95% CI (0.90, 4.26)] or high vs low [OR= 7.94, 95% CI (3.61, 17.46)] depressive symptoms than those who had never been diagnosed with COPD. Those who reported using at least one mind-body therapy were more likely to experience moderate vs low depressive symptoms [OR= 1.60, 95% CI (1.30, 1.98)] and high vs low depressive symptoms [OR= 1.19, 95% CI (0.86, 1.64)]. Participants who reported using the most common mind-body therapies (yoga, meditation, acupuncture, and chiropractic/ osteopathic manipulation) also showed an increased odd for moderate vs low [OR= 1.57, 95% CI (1.27, 1.93)] and high vs low [OR= 1.33, 95% CI (0.97, 1.83)] depressive symptoms. Individuals who reported using multiple mind-body therapies were more likely to experience moderate vs low [OR= 1.13, 95% CI (1.08, 1.17)] or high vs low [OR= 1.14, 95% CI (1.07, 1.22)] depressive symptoms. Individuals who reported physical activity and strength activity were less likely to have moderate vs low depressive symptoms [OR=0.62, 95% CI=0.42, 0.92] and were less likely to have high vs low [OR=0.52, 95% CI= 0.30, 0.90] depressive symptoms, and individuals who reported weight
lifting were similarly less likely to have both moderate vs low [OR= 0.78, 95% CI= 0.65, 0.95] and high vs low [OR= 0.56, 95% CI (0.38, 0.81)].

In the weighted adjusted multinomial logistic regression model, age [moderate vs low depressive symptoms: OR= 0.97, 95% CI (0.97, 0.98); high vs low depressive symptoms: OR= 0.97, 95% CI (0.97, 0.98)], race [moderate vs low depressive symptoms: Hispanic: OR= 1.13, 95% CI (0.82, 1.56), NH-Black: OR= 0.93, 95% CI (0.66, 1.31), NH-Asian: OR= 0.73, 95% CI (0.49, 1.09); high vs low depressive symptoms: Hispanic: OR= 1.68, 95% CI (1.05, 2.70), NH-Black: OR= 1.34, 95% CI (0.77, 2.36), NH-Asian: OR= 0.36, 95% CI (0.11, 1.19]), arthritis [moderate vs low depressive symptoms: OR= 1.49, 95% CI (1.14, 1.96); high vs low depressive symptoms: OR= 2.96, 95% CI (1.76, 4.92)], asthma [moderate vs low depressive symptoms: OR= 1.56, 95% CI (1.20, 2.02); high vs low depressive symptoms: OR= 1.49, 95% CI (0.96, 2.31)], diabetes [moderate vs low depressive symptoms: OR= 1.78, 95% CI (1.15, 2.76); high vs low depressive symptoms: OR= 1.87, 95% CI (1.04, 3.37)], COPD [moderate vs low depressive symptoms: OR= 1.72, 95% CI (0.74, 4.04); high vs low depressive symptoms: OR= 7.05, 95% CI (2.95, 16.97)], the use of at least one mind-body therapy [moderate vs low depressive symptoms: OR=1.41, 95% CI (0.85, 2.33); high vs low depressive symptoms: OR= 0.21, 95% CI (0.06, 0.77)], number of mind-body therapies used [moderate vs low depressive symptoms: OR= 1.11, 95% CI (1.05, 1.18); high vs low depressive symptoms: OR= 1.14, 95% CI (1.05, 1.24)], and strength activity [moderate vs low depressive symptoms: OR= 0.75, 95% CI (0.62, 0.91); high vs low depressive symptoms: OR= 0.56, 95% CI (0.37, 0.83)] remained statistically significant with the association of moderate or high vs low depressive symptoms when controlling for all other variables. BMI,
physical activity, and selected mind-body therapies became statistically insignificant when controlling for all other variables in this model.

**Binomial Logistic Regression**

Binomial logistic regression analyses were conducted to examine how the variable of interest and the covariates were associated with depressive symptoms as a dichotomous variable. Tables 5 and 6 present odds ratios, 95% confidence interval (95% CI), and p-values for demographic characteristics, physical and strength activities, and mind-body modalities among those who have reported experiencing no/low depressive symptoms and moderate/high depressive symptoms.

In the weighted unadjusted binomial logistic model, age and race were demographic characteristics that yielded a statistically significant association with depressive symptoms. For each additional year of age, the odds of being depressed had a 0.99 decrease in odds [OR= 0.99, 95% CI (0.98, 0.99)]. Hispanic [OR= 1.23, 95% CI (0.96, 1.58)] and non-Hispanic Blacks [OR= 1.06, 95% CI (0.79, 1.42)] had increased odds of experiencing depressive symptoms as compared to non-Hispanic Whites. Non-Hispanic Asians [OR= 0.58, 95% CI (0.39, 0.85)] had decreased odds of experiencing depressive symptoms. Sex [OR= 1.14, 95% CI (0.95, 1.37)] and region [South: OR=0.88, 95% CI (0.70, 1.10); Midwest: OR= 0.87, 95% CI (0.67, 1.13); Northeast: OR= 0.89, 95% CI (0.69, 1.16)] did not yield statistically significant associations with depressive symptoms. Most chronic conditions including arthritis [OR= 1.55, 95% CI (1.27, 1.89)], asthma [OR=1.98, 95% CI (1.59, 2.48)], diabetes [OR=1.69, 95% CI (1.22, 2.34)], and COPD [OR=3.09, 95% CI (1.76, 5.410)] yielded statistically significant associations with depressive symptoms. Other chronic conditions such as cancer [OR= 1.19, 95% CI (0.88, 1.62)], CHD [OR=1.36, 95% CI (0.79, 2.32)],
and stroke [OR=1.39, 95% CI (0.82, 2.35)] did not yield statistically significant associations with depressive symptoms. Underweight as compared to normal weightparticipants were more likely to be depressed [1.58, 95% CI (0.69, 3.62)] and overweight vs normal weight participants were slightly more likely to be depressed [OR=1.05, 95% CI (0.83, 1.33)]. Obese as compared to normal weight individuals were more likely to be depressed [OR= 1.52, 95% CI (1.19, 1.94)]. Both physical activities [OR= 0.60, 95% CI (0.43, 0.84)] and strength activities [OR= 0.73, 95% CI (0.62, 0.87)] were negatively associated with depression. The use of at least one mind-body therapy [OR= 1.51, 95% CI (1.26, 1.81)], the use of selected mind-body therapies [OR=1.51, 95% CI (1.27, 1.81)], and the number of mind-body therapies used [OR=1.13, 95% CI (1.09, 1.17)] all yielded statistically significant association with depressive symptoms. The odds of being depressed increased with the use of mind-body therapies. This could also be interpreted as depressed individuals were more likely to be using mind-body therapies. This interpretation aligned with findings in some studies in the literature.

When comparing the unweighted and weighted unadjusted binomial logistic regression results, sex was found to be statistically significant in the unweighted model [OR= 1.24, 95% CI (1.09, 1.43)] but became statistically insignificant when accounting for sampling weights [OR= 1.14, 95% CI (0.95, 1.37)]. When region was included as a fixed effect, region [South: OR= 0.82, 95% CI (0.70, 0.97), Midwest: OR= 0.76, 95% CI (0.62, 0.92), Northeast (OR= 0.87, 95% CI (0.70, 1.07)] was also statistically significant in the unweighted model but statistically insignificant in the weighted model.

In the weighted adjusted logistic model, sex [OR=0.99, 95% CI (0.81, 1.21)], region [South: OR=0.94, 95% CI (0.75, 1.17); Midwest: OR= 0.87, 95% CI (0.67, 1.12), and Northeast:
OR = 0.95, 95% CI (0.71, 1.27)], BMI [OR = 1.01, 95% CI (1.00, 1.01)], CHD [OR = 1.54, 95% CI (0.85, 2.79)], stroke [OR = 1.03, 95% CI (0.56, 1.92)], the use of at least one mind-body therapy [OR = 1.12, 95% CI (0.69, 1.83)], and most common used mind-body therapies [OR = 1.09, 95% CI (0.69, 1.75)] all failed to reach statistically significant level associations with depressive symptoms while controlling for all other variables in this model. Age [OR = 0.97, 95% CI (0.96, 0.98)], race [Hispanic: OR = 1.23, 95% CI (0.94, 1.61), non-Hispanic Black: OR = 1.01, 95% CI 0.74, 1.38), non-Hispanic Asian: OR = 0.66, 95% CI (0.44, 0.97, and non-Hispanic Other: OR = 1.88, 95% CI (1.12, 3.18]), arthritis [OR = 1.72, 95% CI (1.36, 2.17)], asthma [OR = 1.55, 95% CI (1.23, 1.95)], diabetes [OR = 1.81, 95% CI (1.26, 2.59)], the number of mind-body therapies used [OR = 1.12, 95% CI (0.69, 1.83)], physical activity [OR = 0.67, 95% CI (0.47, 0.95)], and strength activity [OR = 0.71, 95% CI (0.60, 0.84)] remained significantly associated with depressive symptoms when controlling for all other variables in this model. Cancer [OR = 1.23, 95% CI (1.02, 2.01)] and COPD [OR = 2.70, 95% CI (1.45, 5.03)] were found statistically significant when controlling for all other variables compared to the unadjusted logistic regression model.

**Generalized Linear Mixed Model**

Generalized Linear Mixed Model results account for clustering by region are presented in Table 7. In the unadjusted multilevel modeling model, for each additional year of age, the odds of having depressive symptoms decreased by 0.97 [OR = 0.97, 95% CI (0.97, 0.98)]. Hispanics [OR = 1.26, 95% CI (1.03, 1.55)] had higher odds of having depressive symptoms, while non-Hispanic Blacks [OR = 0.18, 95% CI (0.95, 1.47)] and non-Hispanic Asians [OR = 0.82, 95% CI (0.57, 1.18)] were less likely to have depressive symptoms. Similarly, to binomial and multinomial logistic regression models, arthritis [OR = 1.80, 95% CI (1.49, 2.18)], asthma [OR =
1.65, 95% CI (1.38, 1.97)], diabetes [OR= 1.82, 95% CI (1.39, 2.38), COPD [OR= 2.38, 95% CI (1.48, 3.82)], and stroke [OR= 1.87, 95% CI (1.14, 3.07)] were statistically significantly associated with depressive symptoms. Cancer [OR=1.47, 95% (1.13, 1.92)] was found to be statistically significant in this model. Physical activity and strength activity had 0.76 and 0.73, respectively, the odd of being more likely to have depressive symptoms. Weight categorization results were similar, with slightly different odds ratio point estimates. As for mind-body modalities, only the number of mind-body therapies used was found to be statistically significant with a negative association with depressive symptoms.

In the adjusted multilevel model, sex [OR= 1.08, 95% CI (0.93, 1.25)], BMI [OR= 1.00, 95% CI (0.99, 1.01)], CHD [OR= 1.37, 95% CI (0.88, 2.13)], the used of at least one mind-body therapy [OR= 1.04, 95% CI (0.70, 1.55)], and selected mind-body therapies [OR= 1.07, 95% CI (0.72, 1.59)] all failed to yield statistically significant with depressive symptoms. All other variables: age [OR=0.97, 95% CI (0.97, 0.980); race: Hispanic [OR= 1.26, 95% CI (1.03, 1.55)], NH-Black [OR= 0.18, 95% CI (1.18, 95% CI (0.95, 1.47)], NH-Asian [OR=0.82, 95% CI (0.57, 1.18)], NH-Other [OR= 1.60, 95% CI (1.13, 2.27)]; arthritis [OR= 1.80, 95% CI (1.49, 2.18)]; asthma [OR= 1.65, 95 CI (1.38, 1.97)]; diabetes [OR= 1.82, 95% CI (1.39, 2.38)]; cancer [OR= 1.47, 95% CI (1.13, 1.92)]; CHD [OR=1.37, 95% CI (0.88, 2.130); COPD [OR= 2.38, 95% CI (1.48, 3.82)], BMI Classification: underweight [OR= 1.11, 95% CI (0.61, 2.01)], overweight [OR= 1.16, 95% CI (0.97, 1.39)], obese [OR= 1.45, 95% CI (1.16, 1.80)]; number of mind-body therapies used [OR= 1.12, 95% CI (1.07, 1.16)]; physical activity [OR= 0.75, 95% CI (0.60, 0.94)]; and strength activity [OR= 0.69, 95% CI (0.60, 0.80)], yielded statistical significance when controlling for all other variables.
Multilevel modeling with clustering observation by region added a layer of complexity that was likely adding to the complexity of the modeling process, with marginal added benefit.
DISCUSSION

The aim of this study was to investigate the association between the use of mind-body therapies and depressive symptoms. The results from this analysis are consistent with previous finding. Results of this study showed a negative association between the use of mind-body therapy and mental health. Results in the analyses were quite contradictory, where in the unadjusted multinomial logistic regression, the use of at least one mind-body therapy, the number of mind-body therapies used, and the most common used mind-body therapies all yielded statistically significant association with depressive symptoms, but in the adjusted multinomial logistic regression, the most common used mind-body therapies were not associated with depressive symptoms. Moreover, the binomial logistic regression analyses show the same pattern, where in the unadjusted binomial logistic regression, the use of at least one mind-body therapy, the number of mind-body therapies used, and the most common used mind-body therapies all yielded statistically significant association with depressive symptoms. However, in the adjusted binomial logistic regression, only the number of mind-body therapies used remained statistically significant. This contradiction makes the interpretation of the results difficult. All unadjusted models indicate that there were a statistically significant association between the association of the use of mind-body therapy and depressive symptoms, but become statistically insignificant when controlling for all other variables. This means that there is an effect modifier, where different groups of individuals (e.g., region) may affect depressive symptoms differently. For example, people living in the West of the United States are often found to be less depressed than people living in the South of the United States (CDC, 2010).
When only observing the statistically significant association between the use of mind-body therapy and depressive symptoms, results suggest that individuals who use mind-body therapies are more likely to be depressed individuals. These results support the research literature, where depressed individuals are more likely to seek out additional treatment to reduce stress or to find a cure (Bishop, & Lewith, 2010). In the context of CAM usage, individuals who suffer from chronic conditions or have a life-threatening disease were more likely to use mind-body modalities (Bishop, & Lewith, 2010). Moreover, individuals who are not satisfied by conventional medicine and who are experiencing psychological distress were also more likely to turn to CAM modalities (Lee-Treweek, 2005). Mind-body therapies have shown to be beneficial for the improvement of mental health. Although this study does not allow for assessing the causal relationship of mind-body therapies and depressive symptoms due to the nature of the data, an experimental study may be beneficial to assess the causal relationship between mind-body therapies and depressive symptoms.

The logistic regression analyses results reflect and correspond to epidemiological data about chronic conditions and depressive symptoms. The findings support research literature that arthritis, asthma, diabetes, cancer, and COPD affect individuals’ mental health and well-being. Many studies evaluate the use of CAM modalities due to chronic conditions. Studies have found that the use of CAM modalities increased with a higher numbers of chronic health conditions (Bishop, & Lewith, 2010). An UK-based study analyzed CAM use with arthritis, cancer, and diabetes (Bishop, & Lewith, 2010). In their bivariate tests, 53% of individuals with arthritis, 30% of individuals with cancer, and 24% of individuals with diabetes were found to be using CAM modalities due to having anxiety or depression (Bishop, & Lewith, 2010). In this
analysis, the association between chronic conditions and the use of mind-body therapies was not assessed but it was found that mind-body therapies users were more likely to be depressed individuals. Thus, the assumption that individuals with comorbid chronic conditions and depression were also more likely to use mind-body modalities. It was found that individuals with diabetes (7.65%), cancer (7.39%), CHD (3.09%), COPD (2.77%), stroke (1.46%), and emphysema (1.63%) were less likely to report depressive symptoms compared to arthritis (21.54%) and asthma (20.38%). In the analyses, COPD was found to have a large confidence interval, this may be due to small sample size of individuals reported having COPD while indicating the use of at least one mind-body therapy. In all the analyses conducted, BMI classification showed a U-shape relationship, where individuals who were underweight or obese were more likely to experience moderate to high depressive symptoms. This finding supports the literature reviews that many factors can contribute to or be related to depressive symptoms. Many studies have found this U-shape relationship between depression and BMI. The Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) defined depression with an association with both an increased and decreased intake of food, or an increased and decreased of physical activity (American Psychiatric Association, 2013). According to DSM-IV’s definition of association between BMI and depression, it seems logical to state that increased levels of depression is associated with either obesity or underweight. In this analysis, comorbidity of chronic conditions, physical and strength activities were considered, however, other factors such as socioeconomic level and education level were not included in this study. Unfortunately, it was not possible to include all possible confounding variables to assess the relationship with depressive symptoms.
Findings regarding physical activity and strength activity support research literature that physical activity and strength activity can improve mental health. One study conducted with the adult population in Brazil indicated that people who do not engage in physical activity were two times more likely to exhibit symptoms of depression and anxiety compared to those who exercise regularly (De Mello, Lemos, Antunes, Bittencourt, Santos-Silva, & Tufik, 2013). Additional studies exploring whether adults with major depression and who are physically active differ in their depression symptoms profile also found that physically active individuals were less likely to endorse suicidality compared to those who are physically inactive (McKercher, Patton, Schmidt, Venn, Dwyer, & Sanderson, 2013). Individuals who are actively exercising, even light intensity physical activity, whether it is aerobic physical activity or strength training, was found to have positive mental health effects (Loprinzi, 2013). In this analysis, similar results were found, where individuals who are physically active were less likely to experience depressive symptoms. However, there were no descriptions of the types of exercise practiced, and physical and strength activities were only classified as active or inactive according to CDC’s recommendation of exercise.

Limitations

Several limitations of this study were due to the design of NHIS survey data. First, the NHIS is cross-sectional data, where only the association between the use of mind-body therapies and depressive symptoms could be examined. The causal relationship of these measures cannot be determined so we were unable to assess whether the use of mind-body therapies increases depressive symptoms, or whether individuals with depressive symptoms are more likely to use mind-body therapies. The NHIS survey is based on self-reported
responses, which are subjected to recall bias. The sample size of this study could not include all the participants in NHIS due to missing data. Only those who responded to both questions regarding depressive symptoms and the use of mind-body therapies were included in the analyses. This is important for the analyses because the calculation of sample size makes use of the expected proportion with the specified outcome of interest. Individuals who did not respond to both questions would not be relevant in the study, and would not give a precise and accurate conclusion. Moreover, the question “Have you EVER practice/use chiropractic or osteopathic manipulation, yoga, meditation (mantra meditation, mindfulness meditation, spiritual meditation), massage, guided imagery, progressive relaxation, tai chi, qi gong, acupuncture, biofeedback, hypnosis, or Alexander Technique?” may not accurately portray whether individuals have recently practiced mind-body therapies, or practiced mind-body therapies a few years back. Also, there was no indication of the frequency or the duration of mind-body therapies practiced. This type of information is important for future studies when examining whether mind-body therapies do improve mental health.

An additional limitation is that the ordinal nature of the outcome was lost when the multinominal logistic regression analysis was conducted in place of ordinal logistic regression with depressive symptoms as the response variable. Because the ordinal nature was not used in the analysis, this added layer of information about the outcome was not accounted for in the analyses. Missing values were also a limitation, especially for mind-body therapies. All participants were given the questions about the alternative supplement, however, those who did not complete the supplement were given the value of “Not Ascertained,” or some answers were missing.
Future Studies

As the complementary and alternative supplement survey questions are assessed every five years, new data on mind-body therapies should be available soon and may have additional questions to clarify the use of mind-body therapy. For example, giving an actual time frame to the use of mind-body therapies may improve the accuracy of the measurement of the use of mind-body therapies. Although, the question “Have you practiced (a type of mind-body therapy) in the past 12 months” was available from the survey data, the respondents were limited to those who had responded “yes” to the question “Have you EVER practiced (a type of mind-body therapy), which created an extensive number of missing values. Although this study used a cross-sectional data, where all responses were self-reported, there were no details of the intention of practicing mind-body therapies. It is not clear why participants practiced mind-body treatments. Thus, it was not possible in the present study to determine whether respondents were using these therapies specifically as a treatment for their mental health issues, for other health problems or for reasons unrelated to health problems. A pilot qualitative study may be beneficial to understand better the health behavior relevant to participating in a type of mind-body therapy.

Conclusion

A negative association was found between the use of mind-body therapy and depressive symptoms among U.S. adults in all unadjusted models. When controlling for all covariates, certain variables regarding the use of mind-body therapy became statistically insignificant with the association of depressive symptoms. The negative association results support findings reported in previous studies that mind-body therapies users are more likely to be depressed
individuals. Findings suggest that people with at least one chronic condition were more likely to seek out additional treatment, other than the conventional medicine, and that promoting physical activity and strength activity may help improve mental health. Although the methodology in the present study does not allow assigning a relation of cause and effect, the association between mind-body modalities and depressive symptoms was observed.
FIGURES AND TABLES

Figure 1: Map of the U.S. with NHIS-Defined Regions
Table 1: Frequency of Individuals with Depressive Symptoms (Three Levels of Depression Symptoms) by Sample Characteristics, 2012 National Health Interview Survey (NHIS) (N=11,143)

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* Survey Questions for meditations and guided imagery had missing value
Table 2: Unadjusted Multinomial Logistic Regression of Depressive Symptoms and the Use of Mind-Body Therapies, 2012 National Health Interview Survey (NHIS)

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<th>Weighted Unadjusted Odds Ratio (OR)</th>
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<td>High vs. Low Depression Symptoms</td>
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Table 3: Multinomial Logistic Regression of Depressive Symptoms and the Use of Mind-Body Therapies Adjusted by covariates, 2012 National Health Interview Survey (NHIS)

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### Table 4: Frequency of Individuals with Depressive Symptoms (Two Levels of Depression Symptoms) by Sample Characteristics, 2012 National Health Interview Survey (NHIS) (N=11,143)

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<td>Unweighted (%)</td>
<td>Weighted (%)</td>
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* Survey Questions for meditations and guided imagery had missing value
### Table 5: Unadjusted Binomial Logistic Regression of Depressive Symptoms and the Use of Mind-Body Therapies, 2012 National Health Interview Survey (NHIS)

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Table 6: Binomial Logistic Regression of Depressive Symptoms and the Use of Mind-Body Therapies Adjusted by covariates, 2012 National Health Interview Survey (NHIS)

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<tr>
<td><strong>Strength Activity</strong></td>
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<td>0.60, 0.80</td>
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Table 7: Generalized Linear Mixed Models with Depressive Symptoms and the Use of Mind-Body Therapies with Clustering by Region, 2012 National Health Interview Survey (NHIS)

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<tr>
<th>Variables</th>
<th>Unweighted Unadjusted Generalized Linear Mixed Model</th>
<th>Unweighted Adjusted Generalized Linear Mixed Model</th>
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<td>Odds Ratio 95% Confidence Interval P-Value</td>
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