

Original research

Mindfulness Meditation in College Students to Advance Health Equity

Stephanie Bryan ^{1,*}, Maryellen Hamilton ², Elizabeth Finn ³

1. PhD, Health and Physical Education Department, Saint Peter's University, Jersey City, New Jersey; E-Mail: Sbryan@saintpeters.edu
2. PhD, Psychology Department, Saint Peter's University, Jersey City, New Jersey; E-Mail: Mhamilton@saintpeters.edu
3. PhD, Adjunct Professor in Mathematics, Saint Peter's University, Jersey City, New Jersey; E-Mail: Efinn@saintpeters.edu

* **Correspondence:** Stephanie Bryan; E-Mail: Sbryan@saintpeters.edu

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Abstract

Purpose: High levels of mindfulness correspond with some positive health behaviors such as exercise participation, fruit and vegetable intake, and effective stress management. This study provided mindfulness meditation during an academic semester to a group of predominantly minority college students derived from a population in which 77.9% of the students are considered economically disadvantaged, to assess the effects of mindful meditation on various health behaviors and mindfulness to combat avoidable health inequalities.

Methods: The meditation occurred for eight weeks, twice per week for 30 minutes; the control group did no meditation. Data collection tools included Five Facet Mindfulness Questionnaire (FFMQ), Mindful Eating Scale (MES), 7-Day Physical Activity Questionnaire and a self-reported daily fruit and vegetable intake. Two open-ended questions were posed post-test.



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Results: 43 undergraduate students completed the pre and post-test data, with 81.4% self-identifying as non-white. Analysis revealed a significant within and between subjects increase in mindfulness with FFMQ ($p < 0.002$) and ($p < 0.000$) respectively; a significant between-subjects cross-over effect with MES, ($p < 0.023$); a significant between and within group effect with fruit and vegetable intake ($p < 0.040$); and a nonsignificant trend in physical activity: the intervention group's physical activity increased and control group's decreased ($p < 0.057$). Qualitative data revealed that participants were sleeping better, eating better, exercising more, reacting less, knowing themselves better, and enjoying an elevated mood.

Conclusions: Mindfulness meditation is an effective intervention in a group of primarily non-white college students and may be an effective strategy in the fight against avoidable health inequities.

Keywords:

Mindfulness meditation; mindful eating; health equity; health behaviors

1. Introduction

Mindfulness meditation is broadly recognized as a “brain-training” practice of bringing non-judgmental awareness to the present moment. [1] Techniques such as body scan, breath awareness and visualization are commonly used during a bout of mindfulness meditation. Research suggests that mindfulness meditation can result in structural and functional changes in areas of the brain that are associated with cognition and well-being, [2] while also supporting improvements in emotional regulation. [3] Essentially, areas of the brain have been identified as increasing in size [4] and connectivity as a result of mindfulness meditation. [5]

A meta-analysis investigating the effects of practicing mindfulness meditation found that it impacts the ability to be more mindful in daily life and, perhaps through the mechanism of self-regulation, has contributed to improvements in health-related behaviors [6] such as feeding patterns, exercise participation and stress management practices. [7-9] A theoretical model on the mechanisms by which mindfulness may impact behavior was created by Holzel and colleagues [10] and includes four efficacious facets: (1) attention regulation, (2) body awareness, (3) emotion regulation and (4) change in perspective on the self.

Improvements in mindfulness have been demonstrated through a group structured program called Mindfulness-Based Stress Reduction (MBSR) created by Jon Kabat-Zinn. [11] The program lasts for eight to ten weeks and includes a number of mindfulness-based activities and instructional sessions, while also including mindfulness meditation both as a group and as a running, daily home-assignment. [12] Mindfulness meditation is being utilized as a form of social and emotional learning for children in grade school as part of a mindfulness program and has demonstrated improvements in stress responses and emotional arousal. [13]

To measure the use of complementary and alternative practices for health enhancement, an American National Health Survey was conducted over three time periods and meditation was reportedly only utilized by 8% of the adults. [14] Mindful meditation can be a low- cost, relatively brief intervention that may contribute to improvements in mindfulness, health behaviors and cognition. College students in the United States are uniquely positioned to potentially experience both the challenge and strain of their academic pursuits, while also experiencing the stress of the tremendous financial burden accrued as a result of staggering tuition costs. Additionally, today's millennials—born between 1980 and 2005--may be the first generation of Americans who are predicted to have a shorter lifespan than their parents as a result of poor health behaviors that contribute to, among other maladies, the obesity epidemic. [15]

In the United States, racially and ethnically-associated health disparities are a persistent issue; for example, African American and Latino youths have significantly higher rates of overweight and obesity than age-matched White youth. [16] In the CDC's report, *The Power of Prevention*, it states that lifestyle-related chronic diseases account for 75% of health care costs, while health disparities result in higher mortality rates in minority groups across many disease-incidence-categories. [17]

In this current study, a 30 minute, twice-weekly mindfulness meditation session was provided for a period of eight weeks to a population of college students, of which, 81.4 % were non-white. The primary purpose of this research was to assess the effects of mindfulness meditation on measures of mindfulness, eating practices, and exercise practices in a primarily non-white population. Further, our aim was to provide mindfulness meditation exclusive of any other mindfulness-related stimulus, and to assess the utility of that program on a college campus during an academic semester.

2. Methods

2.1 Subjects

The research was conducted at a small private University on the East Coast of the United States with the participants drawn from the currently enrolled undergraduate students. The overall undergraduate population at the University includes students who are 40% Hispanic, 27% African-American/Black, 8% Asian, 20% White, of which, many are of Middle Eastern descent. In addition, 51% of the students would be the first in their families to complete college and, overall, 77.9% are considered economically disadvantaged.

Following Institutional Review Board (IRB) approval, the research team recruited participants for the meditation through email and campus flyers, offering mindfulness meditation twice per week for thirty minutes for a period of eight weeks. Each student who self-selected to participate in the meditation completed an informed consent and all baseline measures, which were subsequently coded to protect participant anonymity. The control group was comprised of students from two of the University's introductory-level psychology classes who agreed to fill out the pre and post-test data measures at the beginning and end of the eight- week test period.

2.2 Research Design and Variables

This study utilized a quasi-experimental mixed methods, repeated measures design.

The baseline and post-intervention measures included The Five Facet Mindfulness Questionnaire (FFMQ), [18] The Mindful Eating Scale (MES), [19] The 7-day Physical Activity Recall [20] and a self-reported number of half-cup servings of fruits and vegetables ingested daily. Post-test, the meditation group also filled out two open-ended questions to further collect data on the treatment group's perceptions of their meditation experience. The FFMQ captures what is currently conceptualized as the facets of mindfulness which include non-judging, describing, non-reacting, acting with awareness and observing. The MES is a self-report scale that assesses mindfulness as it relates to eating behaviors and is comprised of six facets that include acceptance, awareness, non-reactivity, act with awareness, routine and unstructured eating. The 7-day Physical Activity Recall quantifies in hours the amount of moderate and vigorous activity in which a person has participated in the past seven days.

The two open-ended questions were developed by the primary investigator to capture the participant's perceptions of how, if at all, the mindfulness meditation impacted any aspect of their life or health behaviors. Question one was, "Has your experience in mindfulness meditation affected your health behaviors in any way; please explain in detail? Examples of health behaviors include sleep patterns, eating patterns, exercise patterns, stress management, emotional health etc." Question two was: "Can you explain what, if any, benefits or changes you may have experienced during and/or after the mindfulness meditation sessions; please explain in detail." The demographic and personal data collected included age, sex, race/ethnicity, and height and weight.

2.3 Mindfulness Meditation Intervention

The mindfulness meditation sessions were 30 minutes in length and held twice per week for a period of eight weeks. The mindfulness meditation leader was the principal investigator who had over 15 years of experience in leading mindfulness meditation. The mindfulness meditation progressed in equal parts through the same progression each session, starting with breath awareness, moving to body scan, then to visualization, affirmation and finally to a period of silent, nonjudgmental, compassionate self-awareness. There was no formal dialogue before, during, or after the mindfulness meditation sessions other than the aforementioned mindfulness meditation cues that were delivered. Participants entered the dimly lit meditation room where soothing music was being played and chose to either recline on one of the mats that were set up throughout the room, or prop themselves against a wall with a mat beneath them.

3. Results

The research team used SPSS version 23 to perform the quantitative analysis, tabulating the summary scores for FFMQ, MES and 7-Day Physical Activity Recall before inputting them in to SPSS for analysis. The qualitative data were analyzed for emerging themes and coded using Dedoose.

3.1 Personal Data

A total of $n = 43$ undergraduate students (63.6% female), aged 18 to 27 years old ($M = 19.33$, $SD = 1.73$) completed the pre- and post-test data. Participants self-identified as African American (37.2%), Hispanic (34.9%), White (18.6%) Native Hawaiian (4.7%), West Indian (2.3%) and other (2.3%). Among this sample, both gender and ethnicity were distributed equally among the group that completed the mindful meditation class sequence ($n=17$) and those who served as the control group ($n=26$). There were another 32 college-age students who self-selected to fill out the pre-test data to participate in the meditation; however, they attended less than six meditation sessions and did not complete the post-test data. The nature of self-selection and the absence of any college-credit-related-requirement to participate, allowed for the students to continue or discontinue their participation at will. In addition, a number of the athletics coaches may have encouraged their athletes to participate in the mindfulness meditation to perhaps help them with their overall well-being. Unfortunately, this may not have been enough motivation for them to fully participate in the sessions and complete the post-test data. Table 1 shows the demographic data for those who completed the study.

Table 1 Demographic Data.

| | Age | Sex Female | Male |
|-------------------------|--------|------------|------|
| Mean | 19 | | |
| Mode | 18 | | |
| Range | 18-27 | | |
| Number | | 28 | 15 |
| Percentage | | 65.1 | 34.9 |
| Race/Ethnicity | | | |
| | Number | Percentage | |
| Hispanic | 15 | 34.9 | |
| African American | 16 | 37.2 | |
| White | 8 | 18.6 | |
| Native Hawaiian | 2 | 4.7 | |
| West Indian | 1 | 2.3 | |
| Other | 1 | 2.3 | |

3.2 Outcomes

There were no significant group differences in any of our baseline measures; see table 2. Repeated measures multivariate analysis was conducted on the FFMQ, the MES, the number of half-cup servings of fruits and vegetables ingested, and the 7-Day Physical Activity Recall. Table 2 presents an overview of baseline data and dependent variables. The FFMQ analysis revealed that there was a significant within subjects increase in mindfulness in the intervention group ($p < 0.002$) and a significant between subjects difference when comparing the intervention to the control group ($p < 0.000$); see figure 1. The MES analysis revealed that there was a significant between-subjects cross over effect with the mindful eating score increasing in the intervention group, while decreasing in the control group ($p < 0.023$); see figure 2. There was a significant between and within group effect when

analyzing the amount of fruits and vegetables ingested ($p < 0.040$); see figure three. The analysis of the 7-day Physical Activity Recall did not demonstrate any significant changes; however, there was a trend that showed an increase in the intervention group's physical activity and a decrease in the control group's ($p < 0.057$). All of these findings can be found in table 2, along with their means and standard deviations.

Table 2 Results.

| Variable | Baseline mean & (SD) | Post-test mean & (SD) | Group | p-value | |
|----------|----------------------|-----------------------|--------------|---------|---------|
| | | | | Within | Between |
| FFMQ | 129.88 (19.40) | 148.06 (18.12) | Intervention | 0.002 | 0.000 |
| FFMQ | 121.96 (13.86) | 118.73 (16.16) | Control | | |
| MES | 83.50 (10.18) | 89.56 (7.16) | Intervention | | 0.023 |
| MES | 83.69 (9.21) | 82.19 (10.52) | Control | | |
| FVC | 1.97 (1.55) | 3.00 (2.07) | Intervention | 0.04 | 0.040 |
| FVC | 2.12 (2.42) | 2.12 (1.68) | Control | | |
| 7PAR | 9.34 (5.49) | 13.71 (8.12) | Intervention | | 0.053 |
| 7PAR | 8.09 (8.63) | 7.34 (8.22) | Control | | |

SD-standard deviation, FFMQ-Five Facet Mindfulness Questionnaire, MEQ-Mindful Eating Scale, FVC- Number of Fruit and Vegetable half-cup servings per day, 7PAR- 7 day Physical Activity Recall

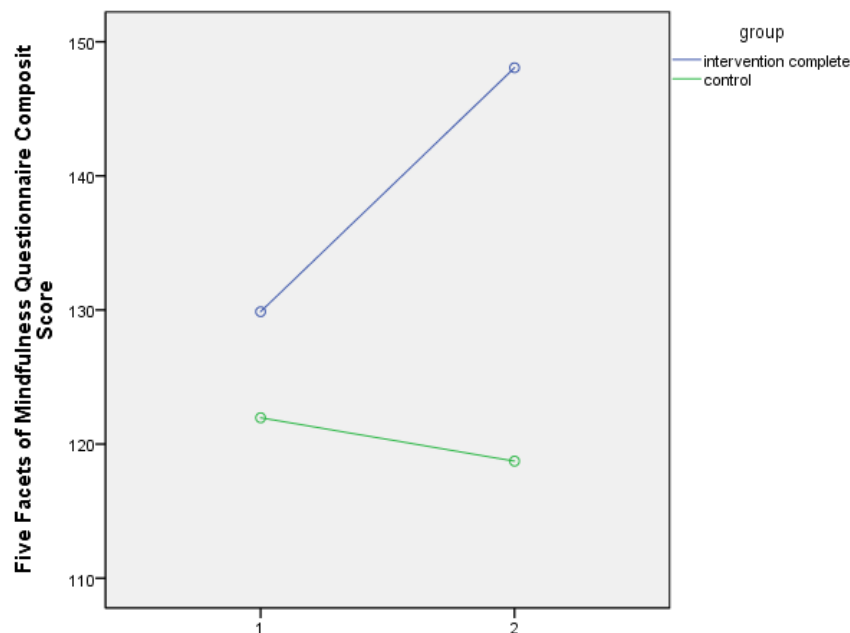


Figure 1 Five facts of mindfulness score increased for intervention group and decreased for the control group form pre-test to post-test.

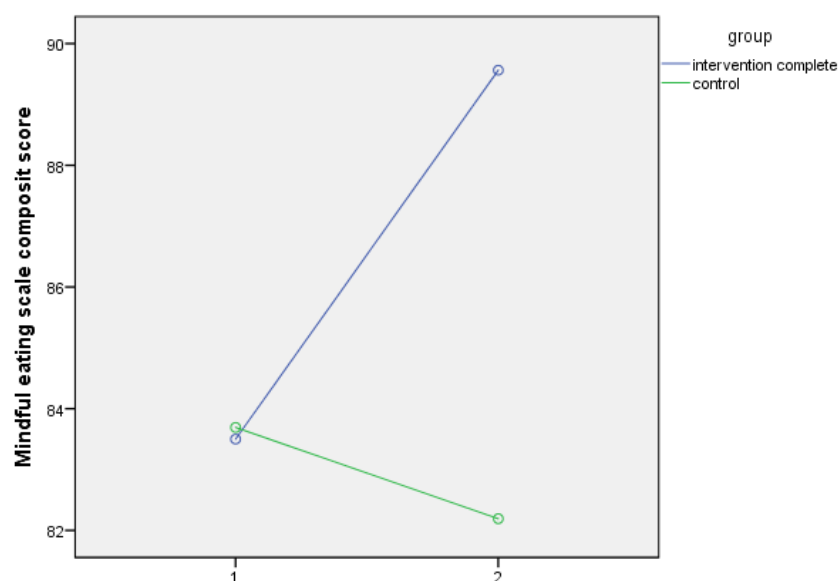


Figure 2 Mindful eating score increased in the intervention group and decreased in the control group from pre-test to post-test.

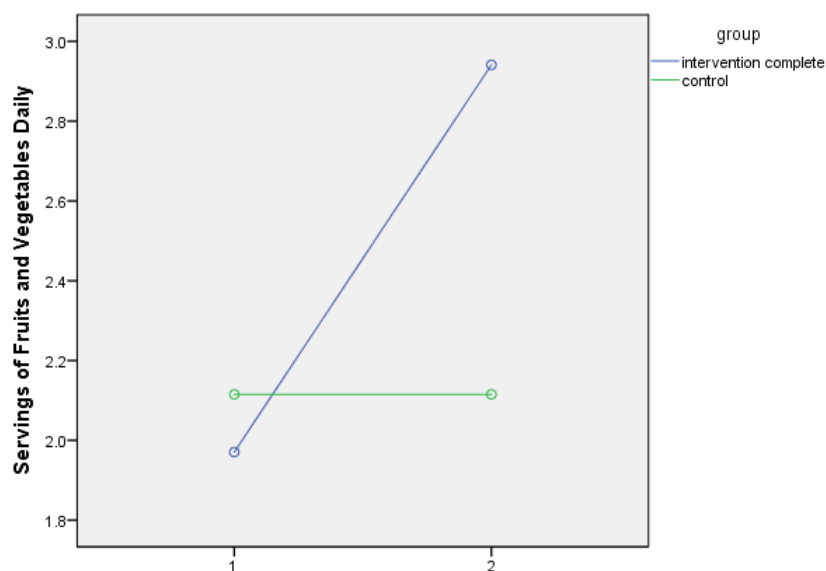


Figure 3 Fruit and vegetable intake increased for the intervention group from pre-test to post-test and was significantly different than the control group.

3.3 Qualitative Data

The two open-ended questions were analyzed for emerging themes and coded. Table 3 provides an overview of the themes with the corresponding number of excerpts per theme and samples of data for each theme. The three prevailing themes were 1) Aspects of Mindfulness 2) Stress Management Improvements and 3) Less Reactive/More Relaxed.

Table 3 Emerging Themes with the Number of Excerpts per Theme from Open Ended Questions.

| Question One: Has your experience in mindfulness meditation affected your health behaviors in any way, please explain in detail? Examples of health behaviors include sleep patterns, eating patterns, exercise patterns, stress management, emotional health etc. | | | | |
|---|----------------------------------|----------------------------------|-------|--|
| Question Two: Can you explain what if any benefits or changes you may have experienced during and or after the mindfulness meditation sessions; please explain in detail | | | | |
| Emerging Themes and Sub Categories Coded | Question One (Q1) Excerpts Coded | Question Two (Q2) Excerpts Coded | Total | Examples of Excerpts |
| Use of the word peace | 1 | 4 | 5 | Q1 "I'm feeling great and at peace with myself." Q2 "During meditation I just let everything go and feel so at peace." |
| Behaviors related to eating | 4 | 1 | 5 | Q1 "I have been eating more vegetables and fruits." Q2 "My fruit intake has increased." |
| Change in exercise behaviors | 3 | 2 | 5 | Q1 "Exercise and stress both have changed. In exercise, I feel more energized, longer energy duration, stress has gone out." Q2 "I take time to exercise." |
| General health improvements | 3 | 1 | 4 | Q1 "Every night, I try to meditate for five minutes and it really helps me reduce stress." Q2 "Feeling more awake during the day." |
| sub category: emotional health improvements | 2 | 9 | 11 | Q1 "Mindful meditation has affected my emotional health." Q2 "I allow myself to feel things I wanted to pretend never happened." Q2 "This experience has brought a lot of love and peace into my life that I was able to experience just by going within myself." Q2 "I am known for having a temper at times, however, this has helped me grow." |
| Total excerpts general health improvement | | | 15 | |
| Improved mood state | 2 | 5 | 7 | Q1 "After sessions I feel as though I have a boost of energy or I can conquer any and all of my troubles." Q2 "Directly following meditation sessions I would be filled with such bliss that would |

| | | | | |
|---|----|---|-----|---|
| | | | | carry on throughout the day.” |
| Less reactive/more relaxed | 9 | 7 | 16* | Q1 “I have been less impulsive. Before reacting to something, I am better able to think things through.” Q1 “I was a lot more conscious of my actions and reactions.” Q2 “Less stressed, unbothered by things I have no control over.” |
| Increase in aspects of mindfulness | 5 | 4 | 9 | Q1 “I became more focused on what is present around me.” Q2 “It has reminded me to be mindful at moments where I am usually not and that is very powerful within myself.” |
| sub category 1: Increase in body awareness | 2 | 1 | 3 | Q1 “I would also crave to exercise more if I felt my body was telling me it needed it.” Q2 “Made me aware of my body.” |
| sub category 2: Increase in breath awareness | 1 | 2 | 3 | Q1 “Meditation also allows me to control my breathing and to relax my mind of all stress.” Q2 “When I am stressed doing homework, instead of complaining I just take a few deep breaths.” |
| sub category 3: More focused/mind clear | 1 | 5 | 6 | Q1 “I have mental clarity and better focus throughout the day.” Q2 “My mind rested for that moment needed.” |
| Total excerpts mindfulness | | | 21* | |
| Sleep improvements | 9 | 5 | 14 | Q1 “I can sleep at night more calmly, without movement and without waking up in the middle of the night.” Q1 “Yes it has! After sleeping I wake up feeling more refreshed and well-rested.” Q2 “I tend to fall asleep faster than usual; I sleep better.” |
| Stress management improvements | 15 | 5 | 20* | Q1 “The biggest effect that mindful meditation had was stress management, whether it had to do with a heavy load of school work and studying or stressful situations at home.” Q2 “Free from all stress.” |
| Enhanced spirituality | 0 | 1 | 1 | Q2 “Meditation also brings me closer to feeling the divine presence of God.” |

4. Discussion

The quantitative data findings revealed that the mindfulness meditation practice resulted in improvements in mindful eating, in an increased intake of fruits and vegetables, and in increased levels of mindfulness in general. Mindful eating has been associated with optimal BMI; therefore, increases in mindful eating may have far reaching implications in the fight against overweight and obesity. Further, the meditators in this research shifted a feeding behavior, fruit and vegetable intake, which is known to improve immune function and decrease disease-incidence. [21] The meditators also demonstrated a trend toward the participation in more physical activity; this too is associated with a decreased disease-incidence in the literature. [22]

The qualitative data adeptly captured information through the recorded words of the participants that corresponds well with the quantitative data findings. The participants' comments suggest that mindfulness meditation may provide a mechanism of change through which participants become more self-aware and less reactive. The dramatic improvements in the facets of mindfulness, as measured by the FFMQ, have broad implications and are likewise well depicted in the most prevalent qualitative-data-theme, which was "Increase in aspects of mindfulness". The 2nd and 3rd most prevalent themes, "Stress management" and "Less reactive/more relaxed", are critical findings that suggest the mindfulness meditation may have reduced stress for the college students and perhaps helped them to "cope" through a more relaxed, less reactive state of being. The mindfulness meditation sessions took place in the middle of the semester, yet overall, the participants reported sleeping better, eating better, exercising more, reacting less, knowing themselves better, and enjoying an elevated mood.

One of the more significant aspects of these findings is that the study population was comprised of predominately non-white college students who were derived from a population of students of whom, 77.9% are considered economically disadvantaged. This is important because health inequities in the United States place the economically disadvantaged citizens of minority status at the highest risk for disease occurrence and early death. [23] An academic environment is an ideal venue through which mindfulness meditation can be provided to enhance the well-being of all students, but most especially those who, through no fault of their own, have been born into a state of health inequality.

Mindfulness meditation can be a low-cost, accessible, internally-focused intervention that may have a place in the fight against lifestyle-related and stress-related disease incidence, while also curbing the effect of health disparities. This research did not include a dialogue or teaching component; therefore, these data demonstrate that significant changes can occur through the simple act of regular mindfulness meditation. With the use of technology, mindfulness meditation can be introduced in elementary, middle and high schools across the nation that could have a dramatic impact on the well-being of all future adults, but most especially those at highest risk for lifestyle and stress-related disease.

In the current study, the large attrition rate among the college-age meditators highlights several issues, while also informing future research and evidence-based practice. It is well known that it is difficult to adopt a new health-related behavior or practice; [24] consequently, providing an incentive or perhaps a course for credit might help the college-age population to maintain the meditative

practice in order to receive the reward or course credit, and incidentally enjoy the benefits. Once new meditators begin to experience the many benefits of the mindfulness meditation, they may be more likely to continue; further research is necessary to see if this is indeed the case across populations. In addition, mindfulness meditation may be an unfamiliar mode of health enhancement for the majority of young people; therefore, rolling out the intervention may require a period of initiation and general acceptance among college students. Again, integrating this relatively simple, low-cost practice across all public school systems as a regular part of the school day will enable us to educate the whole child, and all of the children, by providing them with more tools to achieve optimal health and well-being, while impacting some avoidable health inequalities.

Competing Interests

No competing financial interests exist for all authors.

Authors' contributions

Dr. Hamilton worked on data collection, the control group management, manuscript development, proof reading and editing.

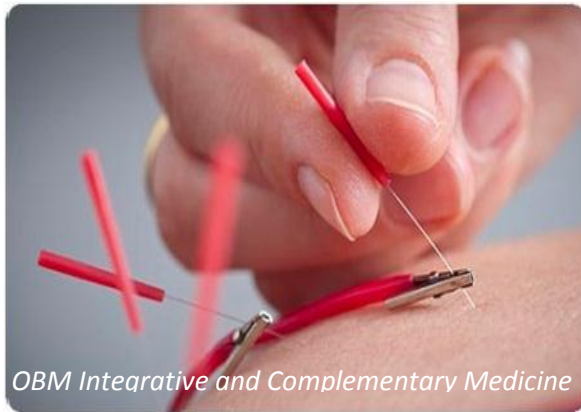
Dr. Finn provided all statistical analysis and table and figure development and manuscript development.

Dr. Bryan was the lead researcher for the project and contributed to all aspects of the project from inception to fruition.

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