THE EFFECTS OF FLOATATION-REST ON INSOMNIA

by

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Dedication

I dedicate this research to those in search of improving the ability to self-reflect and sleep.

Acknowledgements

I would like to acknowledge all who have supported me throughout this journey. My parents, loved ones, and academic advisors. Without you, I wouldn’t have reached the current level of success.

Secondly, Infinity Float Center, the wellness center that has allowed me access to the amazing benefits of floatation therapy. Thank you for the support and relaxation.

ABSTRACT

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University of Houston-Clear Lake, 2020

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We spend roughly half our lives asleep. We understand that we cannot live without sleep. Sleep therapies come in differing forms and effects. Floatation therapy, also known as sensory deprivation or Floatation REST (restricted environmental stimulus therapy), has been shown to improve sleep quality. However, it is unclear if a single, first-time float session could also have beneficial effects. Improving sleep quality in insomniacs by means of floating for 60 minutes in 1200 pounds of Epsom saltwater solution in a soundless, light-free tank for the first time is of interest for this study. Eleven participants with insomnia were recruited from clients at a flotation center and through snowball referral recruitment. Insomnia was measured before the float session and two weeks after, and sleep quality was monitored using a sleep diary during the 2 weeks after the float session. Results indicate that the effects of one 60-minute float session significantly improved sleep quality in participants with insomnia. Mindfulness did not reveal a significant change two weeks after floating.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I:

INTRODUCTION

All mammals, birds, and reptiles require sleep to properly function, though the amount of time of sleep varies throughout different species. The average length of sleep required for humans to function effectively changes between individuals and different age groups. Most people require an average of 7.5 hours of sleep per night (Bear, Connors & Paradiso, 2016). There are two main theories that attempt to explain why we sleep: restoration theory and adaptation theory. Restoration theory states that sleep is necessary to allow for recovery to better function while awake (Bear et al., 2016). Sleep allows the body time to rest from movement and mental activity to permit mental and physical recovery. Adaptation theory proposes that sleep is intended to conserve rather than restore (Bear et al., 2016). By sleeping, we spend a period of the day burning the least amount of energy necessary to stay alive, thus conserving energy. Adaptation theory also considers the predator and prey relationship. It is beneficial for prey that struggle in certain environments to seek shelter to hide from better-adapted predators (Bear et al., 2016). For example, humans do not have well-adjusted night vision, hearing, large teeth or claws to defend themselves from larger predators. Therefore, early humans would seek out shelter at night and not conduct activities that could lead to death. By this theory, humans conserve energy by reducing movement and external stimulus to improve rates of survival.

Sleep is not a uniform state. Sleep progresses through different stages during the night, which is known as sleep architecture (Kamel & Gammack, 2006). As a person sleeps, they start with stages 1 and 2, which is light sleep. As sleep time progresses, a person enters stage 3 or deep sleep, which is also known as delta sleep or slow-wave sleep (SWS). SWS seems to be most responsible for the restorative aspect of sleep.

Following SWS, a person can enter rapid eye movement (REM) sleep, indicated by increases in brain activity. Proper sleep architecture is important to get the recovery benefits that only sleep can provide. Many people have a disrupted sleep architecture, which can have deleterious effects on health.

Insomnia

One-third of the general population shows symptoms of insomnia, and about ten percent of the general population meets all criteria of insomnia disorder (Ohayon, 2002). According to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR),* insomnia is defined as difficulty with sleep initiation or sleep maintenance, early morning awakenings, or nonrestorative sleep (IsHak et al., 2012). In addition, other symptoms include sleep-associated daytime impairments, such as sleepiness, fatigue, cognitive difficulties, mood disturbances, and occupational and social impairment. Also, as explained in the text *Insomnia: Epidemiology and Risk Factors* by Lichstein and colleagues (2010), patients who experience these symptoms are more likely to seek treatment compared to those who report sleep symptoms alone (Kryger, Dement, & Roth, 2010). While there have been many ways to define insomnia, it is important to have a consensus definition to improve standardization. For the present study, the criteria used will be based on the Insomnia Severity Index, which assesses the components of both nighttime and daytime insomnia severity impacts (Morin, Belleville, Bélanger, & Ivers, 2011).

Impacts of Insomnia

Poor sleep quality is associated with negative health outcomes (Medic, Wille, & Hemels, 2017) and cognitive difficulties (Curcio, Ferrara, & De Gennaro, 2006). Insomnia is a highly prevalent disorder causing clinically significant distress and impairment. Furthermore, insomnia is associated with high societal and individual costs.

Researchers have identified short sleep duration as a predictor for obesity (Tajeu & Sen, 2017). A patient who has insomnia is also at greater risk of developing comorbid health problems, such as anxiety, depression, cardiovascular disease, and increased mortality risk (van der Zweerde et al., 2016).

A common comorbid disease associate with insomnia is anxiety. Chronic insomnia disorder (CID) is an extreme form of insomnia that has an extended impact on amygdala function. The amygdala is part of the emotional network of the brain, and evidence indicates this network is abnormal in those with insomnia. There is a positive correlation between the functional connectivity of the amygdala and premotor neurons and insomnia symptom severity (Gong et al., 2019). Further research by Gong and colleagues (2019) reveals that the amygdala has a role as a mediator in the association between anxiety and insomnia. Brain atrophy is also associated with insomnia, showing reduced hippocampal volume and a reduction of gamma-aminobutyric acid (GABA) levels. Other changes in neurotransmitters were found using positron emission tomography, revealing a lack of glucose metabolism during non-rapid eye movement sleep (NREM) in the brainstem, diencephalic, prefrontal, and limbic arousal systems (Buyyse, n.d.).

Poor sleep correlates with many negative consequences to daily functioning. Inhibited focus and concentration are associated with poor sleep, resulting in reduced effort and outcome. This is true with students of all ages, as well as adults in differing career fields. DiBonaventura and colleagues (2015) found that individuals being treated for insomnia reported significantly more absenteeism, presenteeism, overall work impairment, activity impairment, and healthcare resource than those without treatment.

Safety is another important aspect that can be affected due to insomnia, and the correct precautions must be taken when engaging in acts that can be considered high risk or dangerous. Research conducted on construction workers showed that those who had higher insomnia symptoms engaged in fewer safety measures compared to controls (Brossoit et al., 2019). Those who had insomnia symptoms were also less likely to engage in required and voluntary safety behaviors and had a greater risk of injury. Some people with insomnia may work longer hours at irregular times to follow through with work commitment. Jobs that require a night shift or jobs that require an extended hour work shift may interrupt the preferred sleep cycle of the individual resulting in Shift Work Sleep Disorder (SWSD) for which insomnia can be a symptom. Beyond the hours a job may require, there is also the differing stress and focus necessary to complete a job. For example, surgeons dealing with life and death or a pilot required to focus on controlling heavy equipment can both have major consequences if not their jobs are not performed properly. Recent research has shown that when surgeons have four or fewer hours of sleep, they show a decline in cognitive ability (O'Brien et al., 2012). Furthermore, performance is significantly decreased in military jet pilots after 36 hours of sleep deprivation (Van Dongen, Caldwell, & Caldwell, 2006). These are two different tasks, but both mentally demanding. When insomnia is inflicted on those with such important job roles, combating deprivation of sleep becomes of most concern.

Insomnia diagnosis and treatment show a disproportionate pattern related to socioeconomic status. Those with lower socioeconomic status are more likely to be diagnosed with insomnia. However, drug treatment of insomnia with hypnotics is more likely to be associated with higher socioeconomic status (Scalo, Desai, & Rascati, 2015). Therefore, those who need treatment the most often do not have the means to obtain treatment. This further implies that affordable alternative treatments to expensive pharmaceuticals are needed. Drug therapy for insomnia is not always the best form of treatment for insomnia. However, drug therapy provides more immediate gratification than treatments such as cognitive-behavioral therapy. Unfortunately, drug therapy may also have side effects that outweigh the benefits of decreased sleep latency and increased time spent asleep. Additionally, drug therapies may focus more on quantity of sleep over quality, as sleep architecture is altered by the drug.

Causes of Insomnia

According to the Seep Foundation (2020), insomnia can be caused by psychological and physical medical conditions. Insomnia can also occur due to unhealthy sleep habits, as well as substance use. These conditions can also worsen insomnia. The psychological conditions that are often associated with insomnia are anxiety, depression, grief, and trauma, and the physical symptoms can be biological, such as restless leg syndrome, Parkinson's disease, chronic pain, nasal congestion, asthma, endocrine problems (e.g., hyperthyroidism), and gastrointestinal problems, such as reflux. Unhealthy sleep habits and lifestyle, such as taking naps late in the day, sleeping in late each morning, overly bright sleep environments, or working late and staring at a bright computer screen, can cause insomnia. Substance use, including alcohol, caffeine, nicotine, and prescription medications, is another potential contribution to insomnia. Insomnia can sometimes be solely caused by a biological chemical imbalance. Some symptoms may be due to a neurotransmitter interaction in the brain that is beyond simply improving sleep habits. Research has shown that a combination of pharmaceutical intervention and cognitive behavioral therapy for insomnia can be effective in these cases (*What Causes Insomnia*, 2020).

An important aspect of obtaining improved sleep quality is maintaining a positive deception of the self. A recent study shows that when workers have a negative self-reflection of a workweek, they tend to have a poor sleep trajectory compared with those with less negative self-reflection (Haun & Oppenauer, 2019). It may be difficult to obtain positive self-reflection with the constant distractions so easily available today. It is now easier than ever to be distracted with stimulant rich substances, such as technology and media. Recent studies have begun to discover the addictive design of technology, which produces a dopamine response like the high produced while gambling (Nicholas et al., 2019). With the use of this formula, a design is created that is addictive, and those who create the stimulus are creating a vulnerable buyer (Nicholas et al., 2019). This vulnerability has consequences, and, without proper self-control and discipline, the practice towards self-reflection may be overtaken with addictive and unhealthy coping mechanisms.

It is important to understand why insomnia occurs and who is impacted. Recent evidence has shown associations between insomnia and sex, low income, and comorbidity (Scalo, Desai, & Rascati, 2015). These are an example of the potential target groups who would most benefit from therapies designed to improve. Given the large population of insomniacs, it is necessary to further study the disease and explore new methods towards diminishing its invasive impact on daily function.

Insomnia Treatment

Sleep aids come in many forms, from pharmaceuticals to cognitive behavioral therapy (CBT). Drug therapy is a popular form of relief from insomnia, with profits in the billions (McCall, 2004). Drug therapy medications that are approved to treat insomnia include benzodiazepines, nonbenzodiazepine hypnotics, melatonin agonists, doxepin, and suvorexant (Bonnet & Arand, 2018). Although all of these medications have shown greater effects on short term sleep scores when compared to a placebo, the potential benefits on sleep quality and daytime function are heavily weighed against the risk of the possible side effects that can derive from drug therapy. These side effects often outweigh the benefits due to unwanted physical and psychological addiction, as well as other unwanted effects (Bonnet & Arand, 2018).

Melatonin is an over the counter drug that has become a popular sleep-promoting drug in recent years. Evidence suggests that melatonin helps initiate and maintain sleep, but its precise role in natural sleep-wake cycles is not clear (Bear, Connors, & Paradiso, 2015). We do know that melatonin is released by the pineal body in the brain and is a derivative of the amino acid tryptophan. Levels of melatonin increase in the brain when in a dark environment and decrease when in a light environment (Bear et al., 2015). Although taking melatonin orally may seem feasible to aid in improving sleep, data does not seem to support its effects compared to other therapies (Bear et al., 2015).

There is data beyond the scope of drug therapy that reveal other forms of treatment to aid in sleep quality. The American Academy of Sleep Medicine (2011) explains that both pharmacological and behavioral treatments prove to be effective in the short term, but evidence supports behavioral treatments as a more effective long term solution towards improving sleep quality (Bootzin & Epstein, 2011). This data implies that behavioral therapies, such as mindfulness, meditation, hypnosis, and relaxation therapies, may allow for improvements without the possible side effects that are common in pharmaceuticals. Mindfulness-based interventions for insomnia and sleep disturbances have received increased interest in recent literature. A systematic review of treatments shown to improve sleep measures in college students indicated that a combination of CBT with relaxation techniques, mindfulness, and hypnotherapy shows the greatest beneficial effects (Schlarb, Friedrich, & Claßen, 2017). Relaxation therapy is a cognitive-behavioral treatment for insomnia that comes in many forms, and a review of the literature has indicated that mindfulness-based intervention is an effective treatment for insomnia and sleep disturbances, especially if the intervention is aimed at improving sleep (Garland et al., 2016).

Progressive muscle relaxation is an effective form of behavioral treatment that has been shown to decrease the latency to fall asleep (Demiralp, Oflaz, & Komurcu, 2010). Progressive muscle relaxation has also been shown to reduce fatigue during the day, which is also a daytime symptom of insomnia (Dayapoğlu & Tan, 2012). Progressive muscle relaxation consists of contracting and releasing all 16 muscle groups starting from your feet and ending with your head. By combining breathing and progressive muscle relaxation, the intent is to realize the different feelings between tense and relaxed muscles (Bernstein & Borkovec, 1980). Often, people are unaware of the tension that they are carrying in different muscle groups throughout their day. This exercise gives further understanding of how to relax all muscle groups in the body which can allow for improved sleep quality (Bernstein & Borkovec, 1980).

Floatation REST

Floatation therapy, also known as sensory deprivation, is a form of relaxation therapy that has been around since the 1960s (Driller & Argus, 2016). Dr. John C. Lilly is the creator of the float tank where sensory deprivation takes place. The isolation tanks, or float tanks, are filled with Epsom salt and dissolved in water that is heated to external body temperature to allow for reduced environmental reception (Van Dierendonck & Nijenhuis, 2005). The buoyancy of Epsom saltwater allows for an effortless ability to float. The sound is reduced with earplugs and, by closing the tank door, all outside light emission disappears (Bood et al., 2006). The float tanks have many forms and sizes to allow for a comfortable, stress-free environment that is intended to reduce external stimulation.

In 1980, the term Restricted Environmental Stimulation Therapy (REST) was used in continued research by Dr. Peter Suedfeld, and the name remains throughout today's exploration of the benefits of REST (Suedfeld & Borrie, 1999). Researchers began to receive numerous anecdotal claims of benefits produced by floatation as they explored its effects on pain disorder, anxiety disorder, and insomnia (Suedfeld & Borrie, 1999). There is evidence to suggest both mental and physical improvements with the use of floatation therapy.

Some of the mental or psychological improvements shown with the use of REST therapy are improved well-being, mild euphoria, increased originality, improved sleep, and reduced stress and anxiety (Bood et al., 2006). Recent results studying Floatation REST therapy suggest that occasionally unplugging from technology and allowing the nervous system relief from outside stimulation might actually be beneficial for mental health (Feinstein et al., 2018). The physical benefits reported by Turner and colleagues (1989) from REST include significant reductions in blood pressure, as well as reducing muscle tension, muscle pain (Bood, Sundequist, Kjellgren, Nordström, & Norlander, 2007), and muscle soreness (Driller & Argus, 2016).

Many studies, such as the one by Wallbaum and colleagues (1991), examine the effects of multiples sessions of Floatation REST over a length of time, some lasting up to six months (Wallbaum, Rzewnicki, Steele, & Suedfeld, 1991). This research raises questions about the effects of a single REST session, including its effect on sleep quality. A recent study compared the effects of 33 float sessions to 12 float sessions and found no significant changes on stress-related muscle pain (Bood et al., 2007). This indicates that improvements in reducing muscle pain are achieved without needing multiple sessions. Furthermore, the study by Bood and colleagues (2006) found that sleep quality was improved in both the control group and experimental group that suffered from high-stress load and burnout syndrome. Sleep quality was best immediately after the float session and went back to original levels without any float sessions. Those who had been diagnosed with burnout syndrome continued to have improved sleep quality after four months (Bood et al., 2006). This may indicate that desired outcomes could be obtained with limited access to float tanks.

Anxiety has also been of interest in recent studies with Floatation REST. Anxiety has been shown to negatively impact sleep quality and can result in insomnia (Gong et al., 2019). A study examining the use of floatation therapy as an intervention for generalized anxiety disorder (GAD) found a significant reduction in sleep difficulties compared to a control group (Jonsson & Kjellgren, 2016). Floatation REST has demonstrated that it can provide improvements on differing ailments. There is room for future research with the use of Floatation REST as a combined treatment with other interventions in treating other comorbid symptoms (Kjellgren, Buhrkall, & Norlander, 2011). With insomnia often consisting of comorbid symptoms, Floatation REST may prove effective in providing relief in those who suffer.

Aims and Hypothesis

The aim of this study was to find a relationship between improved sleep in those who suffer from insomnia after floating for one 60-minute float session. Research in the past has focused on depression and anxiety and yielded significant improvements in clinical subjects. With the understanding that anxiety and depression can have a negative influence on sleep quality, we hope to achieve similar improvements for those suffering with insomnia. Research with Floatation REST has also been focused on multiple sessions, with each session lasting 45-60 minutes. The evidence of the benefits of a single 60-minute session is limited and warrants increased data. Furthermore, we hope to provide knowledge about the effects of the first float experience and if sleep improvements are possible. Epsom salt, or magnesium sulfate, has been shown to have many health benefits, and this study aims to reveal more positive results to both mental and physical wellbeing.

Meditation, self-reflection, relaxation, and exercise are all important and proven methods to improve sleep quality. We hypothesize that the float tank is a perfect environment to aid in improving mindfulness, which can be difficult in a stimulant-rich world. We predict that engaging in one 60-minute session of Floatation REST will significantly improve sleep quality in participants with insomnia for two weeks following the session.

CHAPTER II:

METHODOLOGY

Participants

Participants were recruited from clients at a flotation center and through snowball referral recruitment. Participants were screened to determine eligibility. Participants were asked to self-report conditions that would exclude them from participating in the flotation sessions (i.e., younger than the minimum required age of18 years, presence of skin disease, diabetes, large open cuts or wounds, heart disease, unable to get off the ground by themselves, and recently dyed hair). Additionally, participants were given the Insomnia Severity Index (ISI; Morin et al., 2011). Only participants with an ISI score greater than 7 (indicating subthreshold insomnia) were asked to continue in the study.

11 participants, 6 men and 5 women, between the ages 26 and 61 years old (mean age 38.9 years) took part in the study. There was no significant difference in age between males (37.7 years) and females (39.2 years). Five participants were White/non-Hispanic, 5 were Hispanic, and 1 was Other: half White and half Hispanic. All participants reported the highest level of education completed was “at least some college,” with 4 women reporting “completing an undergraduate degree”. Nine participants described their health as “Good,” and the remaining 2 described their health as “Very Good”.

Measures and Materials

The following validated measures were given to participants: Pittsburgh Sleep Quality Index (PSQI, Grandner, et al., 2006); Epworth Sleepiness Scale (ESS; Johns 1991); Insomnia Severity Index (ISI; Morin et al., 2011); Mindful Attention Awareness Scale (MAAS; Brown et al., 2003); and Consensus Sleep Diary (CSD-M; Carney et al., 2012).

The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire which assesses sleep quality and disturbances over a one-month period (Grandner, Kripke, Yoon, & Youngstedt, 2006). The PSQI is a 24-item scale that measures sleep disturbances along 7 dimensions. The PSQI questionnaire is designed to be easy to answer while also assessing a wide range of aspects of sleep quality. A global score is calculated from the question over the 7 dimensions to differentiate between a good and poor sleeper.

The Epworth Sleepiness Scale (ESS) is an 8-item self-report measure of excessive daytime sleepiness (Johns, 1991). A four-point Likert-type scale addresses the likelihood respondents may ‘‘doze off or fall asleep’’ in eight different conditions of normal daytime activity. A score of 0 to 24 is possible, with higher scores equating to increased levels of poor sleep quality. The ESS is a valid marker in distinguishing respondents with normal rates of sleepiness to those with significantly high rates of sleepiness often caused by insomnia.

The Insomnia Sleep Index (ISI) has been shown to be a reliable and valid instrument to screen for insomnia (Morin et al., 2011). The ISI is a 7-item scale that typically takes less than 5 minutes to complete. Participants rate items on a 5-point Likert scale related to issues of clinical relevance to people seeking treatment for insomnia. A total score of 7 or less is interpreted to mean the absence of insomnia. A score above 7 indicates sub-threshold insomnia, above 14 indicates moderate insomnia, and above 21 indicates severe insomnia.

The Mindful Attention Awareness Scale (MAAS) assesses individual differences in the frequency of mindful states over time (Brown & Ryan, 2003). The MAAS is a 15-item scale that is based on mindfulness, attention, and various states of consciousness.

The MAAS includes a 6-point Likert-type response scale ranging from 1 (almost always) to 6 (almost never).

The Consensus Sleep Diary (CSD-M) is a subjective evaluation of a week of sleep for patients with insomnia (Carney et al., 2012). The diary contains 9 items that address different factors that make up each night's quality of sleep. Questions are filled out every morning upon waking. Participants rated their quality of sleep on a 1 to 5 scale, from "Very poor" to "Very good." Participants also rated how rested or refreshed they felt in the morning on a 1 to 5 scale, from "Not at all rested" to "Very well-rested."

The flotation tank is large (6 ft width x 8 ft long x7 ft height) and contains 1200 pounds of Epsom salt that is dissolved in 300 gallons of water that is heated to 93.5 degrees Fahrenheit. When Epsom salt and warm water are combined, approximately ten inches of saltwater results in a specific gravity of 1.26 and allows effortless floatation for each human subject. Participants are free to leave the flotation cabin at any point if they become uncomfortable. Additionally, there is an emergency call button and light button in the cabin, as well as a water squirt bottle with fresh water if saltwater gets into participants' eyes.

Procedures

Participants that met inclusion criteria scheduled a time to come to the flotation center (Infinity Float Center, 479 Bay Area Blvd, Houston). Upon arrival, participants were asked to give informed consent and perform the standard check-in procedures as required by the floatation center. All participants were then given several questionnaires, including the PSQI, ESS, ISI, and the MAAS. An automated blood pressure cuff was used to measure blood pressure and heart rate. Participants were then given a tour of the flotation cabin, given instructions regarding how to use the cabin, and then left alone in a private area. Participants took a short shower and then entered the cabin without clothes.

Participants then had a 60-minute floatation session. Music and lights cued the participant that the time was over, and they got out of the cabin and showered again before getting dressed.

Participants were asked to record their sleep over the next 2 weeks using the Consensus Sleep Diary (CSD-M; Carney et al., 2012). Participants were reminded daily through email or text message to complete the diary. After 2 weeks, participants returned the sleep diary and were given the same questionnaires as before. An automated blood pressure cuff was used to measure blood pressure and heart rate. Participants were then debriefed about the purpose of the study.

Data Analysis

Data collected from the pre-test / post-test administration of the sleep scales were analyzed utilizing a repeated measures ANOVA or paired sample t-test. The ISI, ESS, PSQI, and MAAS were analyzed using a paired sample t-test. Time in bed, sleep efficiency, awakenings, sleep quality, and restfulness were obtained from the sleep diary and analyzed using a repeated measures ANOVA. Data were analyzed using jamovi (version 1.2.2) and used an alpha of 0.05 to determine statistical significance.

CHAPTER III:

RESULTS

Sleep Results

Insomnia Sleep Index (ISI)

Participants were given the ISI at baseline and two weeks later (see Figure 1). Scores were compared using a paired samples t-test. ISI significantly decreased from baseline ($t(11) = 2.52$, $p = .031$, $d = 0.76$).

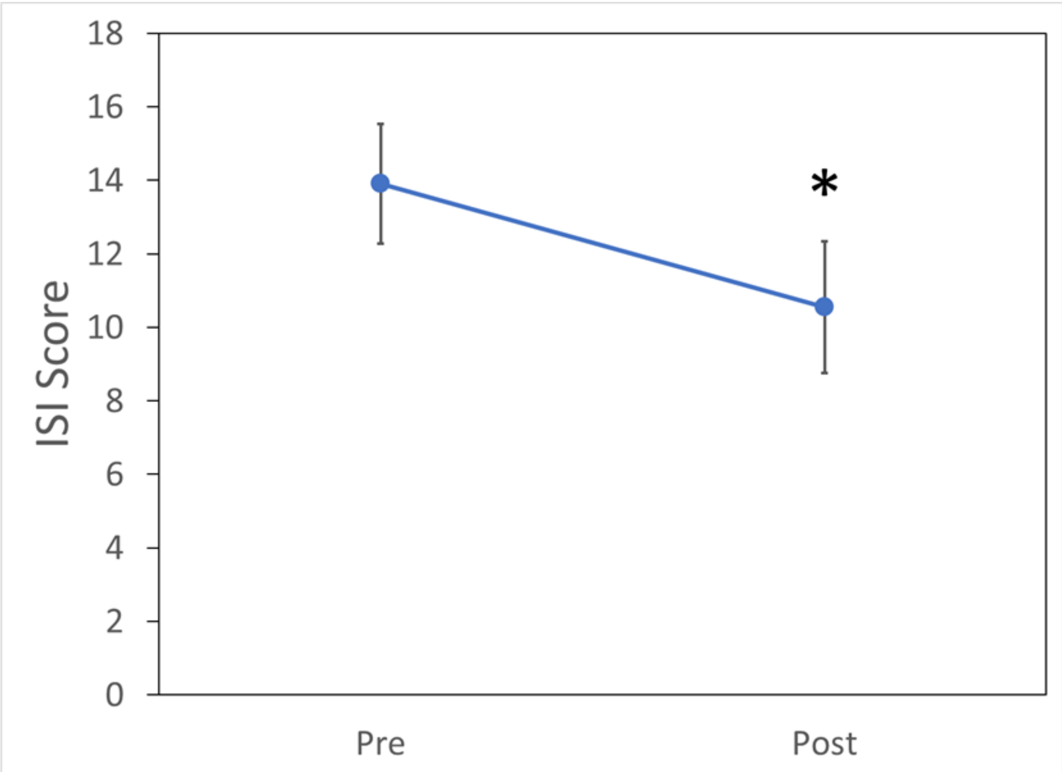

Figure 1. Mean ± SEM ISI scores for participants at baseline and two weeks after float.
$* p < .05$

Pittsburgh Sleep Quality Index- (PSQI)

Participants were given the PSQI at baseline and two weeks later (see Figure 2). Scores were compared using a paired samples t-test. PSQI significantly decreased from baseline ($t(11) = 3.26$, $p = .009$, $d = 0.98$).

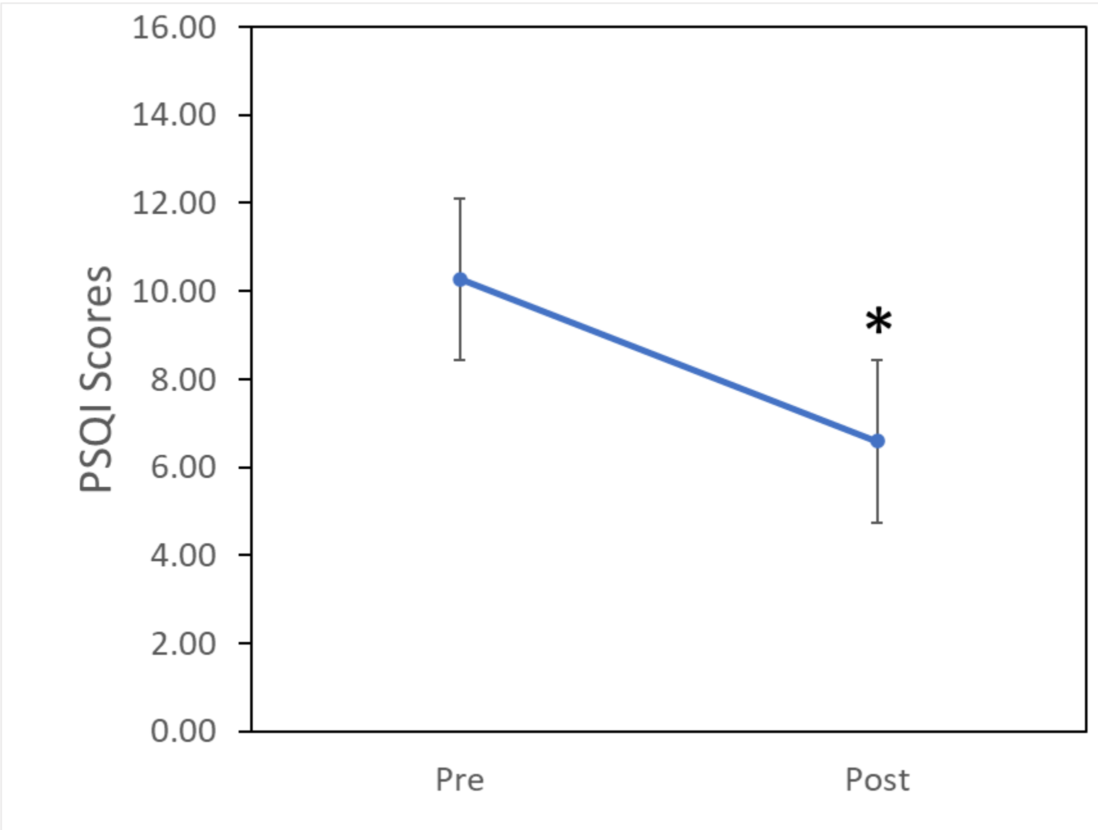

*Figure 2. Mean ± SEM PSQI scores for participants at baseline and two weeks after float. * p < .05*

Epworth Sleepiness Scale- (ESS)

Participants were given the ESS at baseline and two weeks later (see Figure 3). Scores were compared using a paired samples t-test. ESS significantly decreased from baseline ($t(11) = 4.14$, $p = .002$, $d = 1.25$).

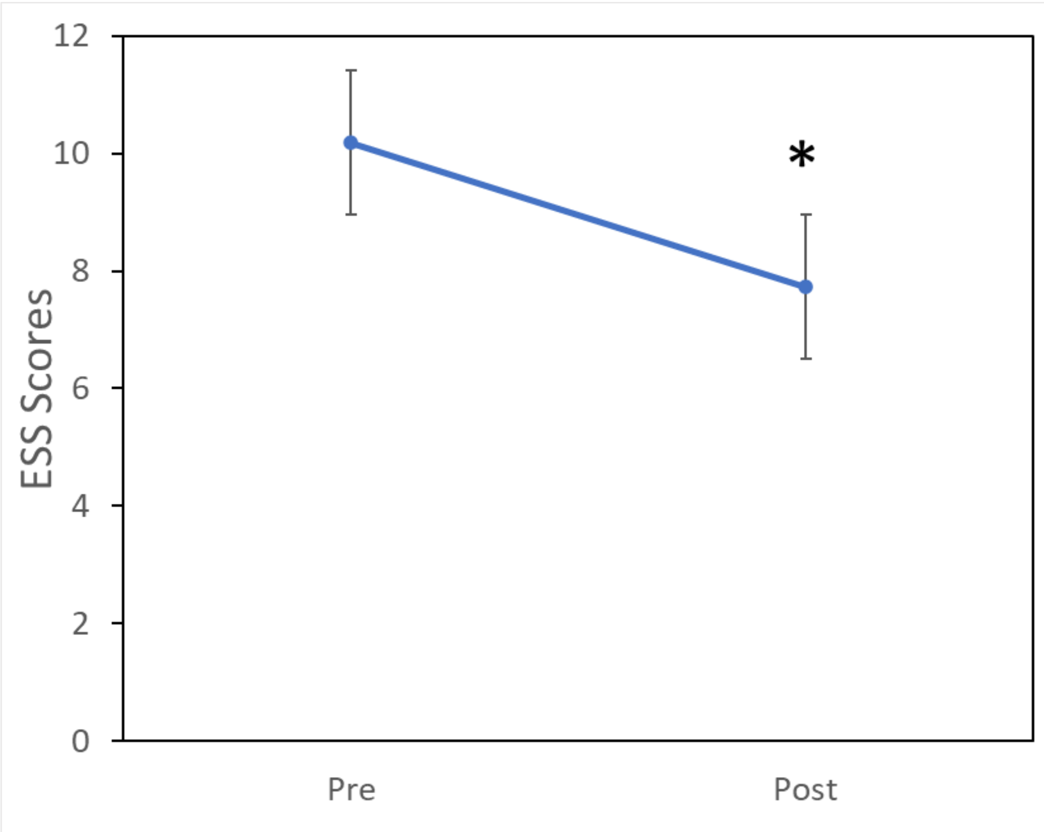

Figure 3. Mean ± SEM ESS scores for participants at baseline and two weeks after float.
** p < .05*

Sleep Diary

Sleep Latency

Participants recorded the time spent to fall asleep each night for two weeks in a sleep diary (see Figure 4). Scores were analyzed using a repeated measures ANOVA. There was no significant change in latency to fall asleep during the two weeks following the floatation session ($F(13,117) = 1.21$, $p = .278$).

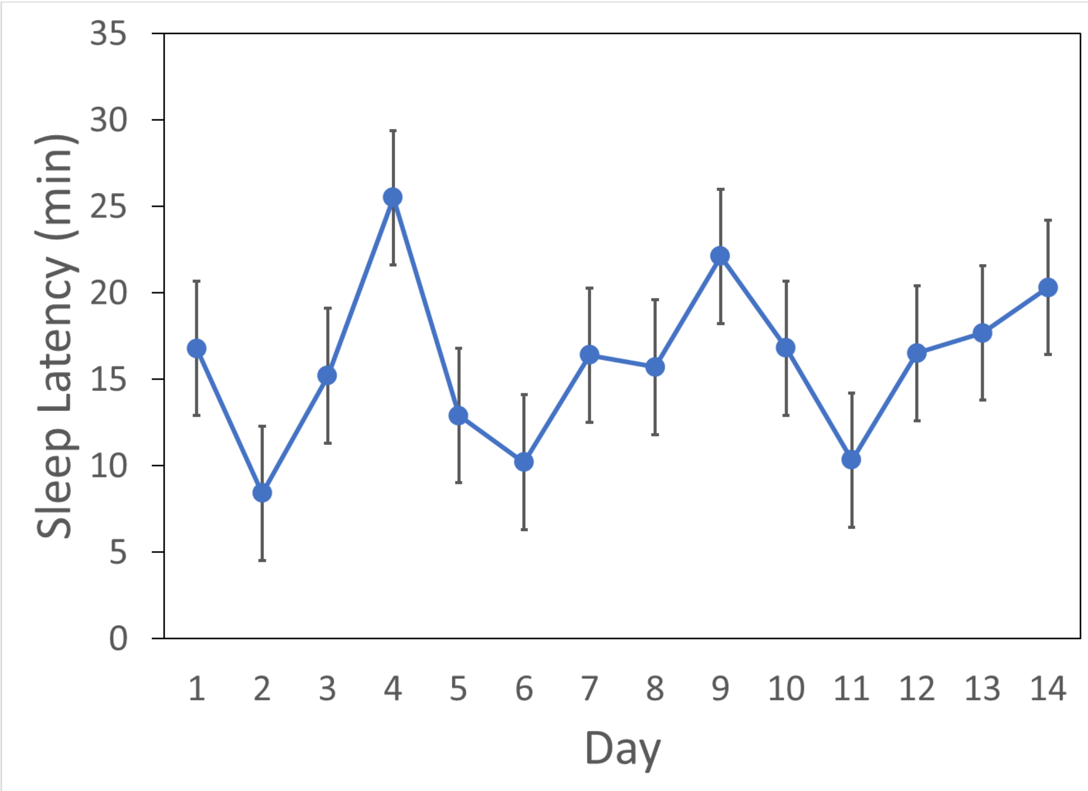

Figure 4. *Mean* ± *SEM latency to fall asleep for 14 days as recorded by a sleep diary.*

Total Sleep

Participants recorded the total time asleep each night for two weeks in a sleep diary (see Figure 5). Scores were analyzed using a repeated measures ANOVA. There was no significant change in total sleep throughout the two weeks following the floatation session ($F(13, 117) = 0.40$, $p = .967$).

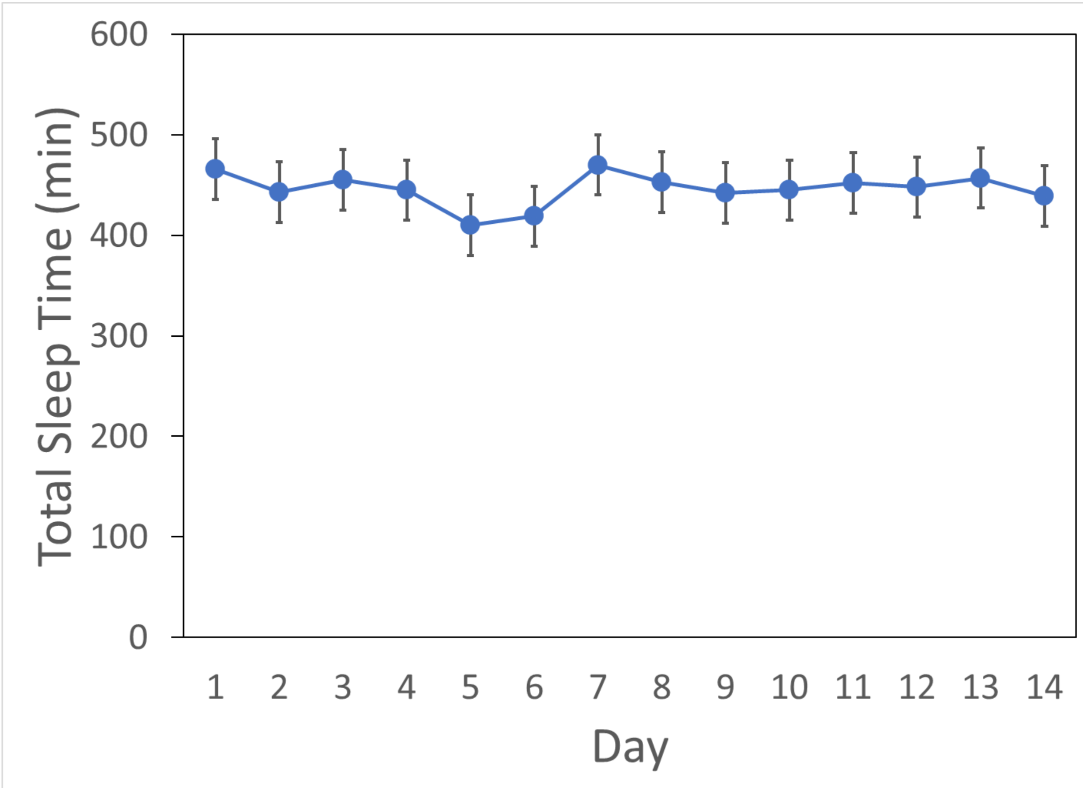

Figure 5. *Mean ± SEM total sleep time for 14 days as recorded by a sleep diary.*

Sleep Quality

Participants recorded the sleep quality each night for two weeks in a sleep diary (see Figure 6). Scores were analyzed using a repeated measures ANOVA. There was no significant change in sleep quality throughout the two weeks following the floatation session ($F(13, 117) = 0.37$, $p = .977$).

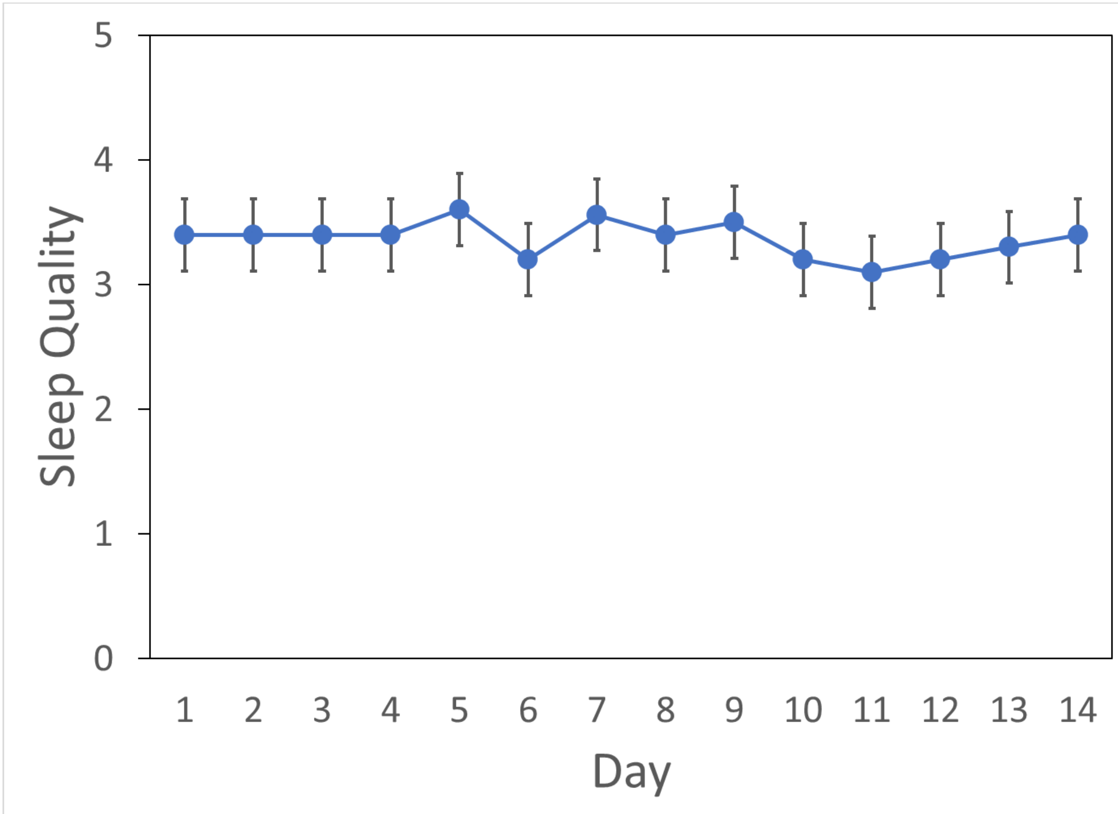

Figure 6. *Mean ± SEM sleep quality for 14 days as recorded by a sleep diary.*

Restfulness

Participants recorded restfulness each night for two weeks in a sleep diary (see Figure 7). Scores were analyzed using a repeated measures ANOVA. There was no significant change in restfulness throughout the two weeks following the floatation session ($F(13, 117) = 0.43$, $p = .955$).

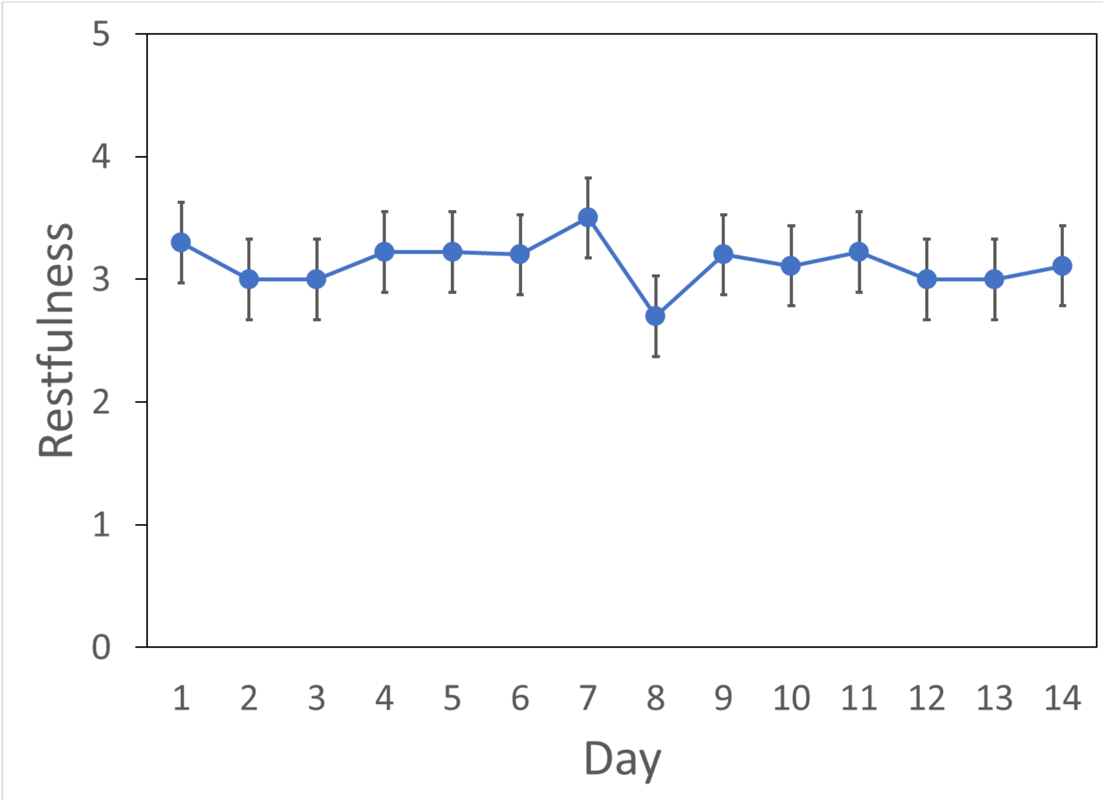

Figure 7. *Mean ± SEM restfulness for 14 days as recorded by a sleep diary.*

Mindfulness Results

MAAS

Participants were given the MAAS at baseline and two weeks later (see Figure 8). Scores were compared using a paired samples t-test. The standard error of the mean was not large enough to show in the graph. MAAS did not significantly increase from baseline ($t(11) = 0.39$, $p = .704$, $d = 0.19$).

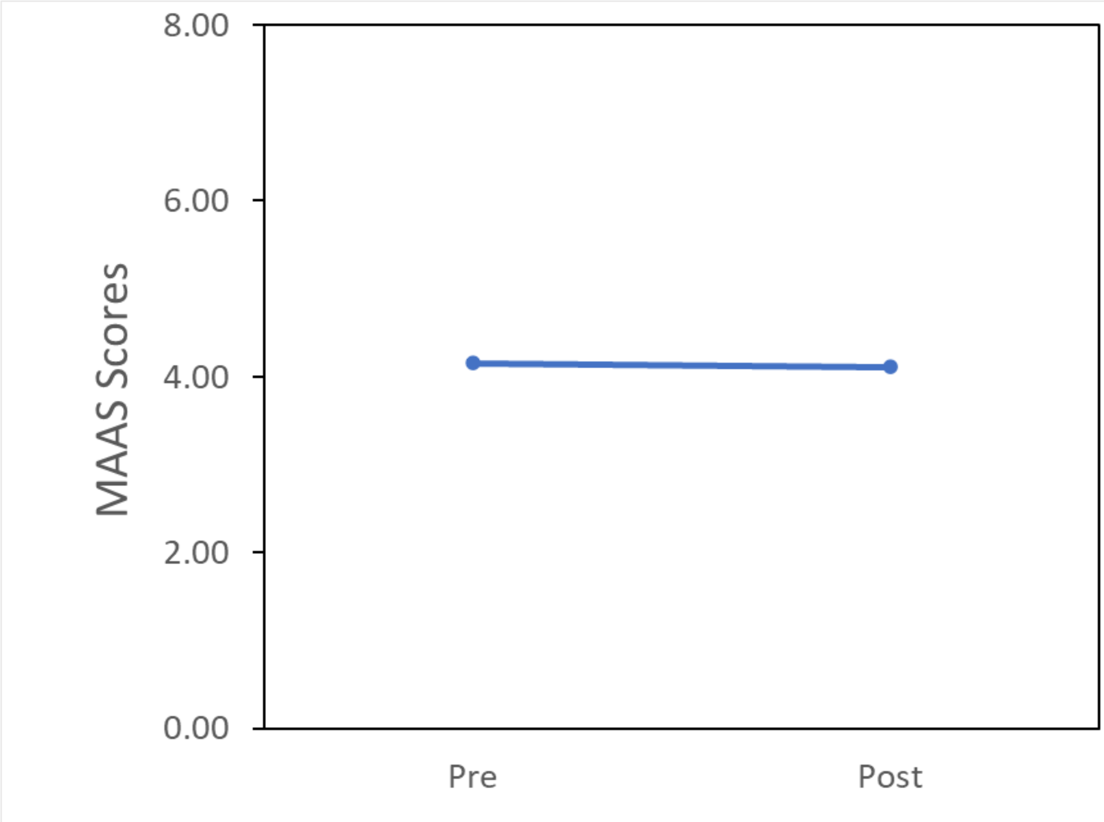

Figure 8. Mean ± SEM MAAS scores for participants at baseline and two weeks after float.

CHAPTER IV:

DISCUSSION

Participants in this study had never experienced Floatation REST. The results of this study provide evidence that even one float experience can have beneficial effects, as one 60-minute float session significantly improved sleep quality, decreased daytime sleepiness, and decreased symptoms of insomnia in participants with at least sub-threshold insomnia. Even though it was theorized that this relationship could have been mediated by Mindfulness, a measure of Mindfulness did not significantly change two weeks after floating. Additionally, sleep diaries indicated that the changes in sleep were immediate and long-lasting following the float session.

Research in the past has explored a multitude of effects with the use of Floatation REST. Sleep quality has been considered in past research, and this research has found significant improvement in participants suffering from stress (Bood et al., 2006), general anxiety disorder (GAD; Jonsson & Kjellgren, 2016), burnout syndrome (Kjellgren et al., 2011), and depression (Feinstein et al., 2018). Until now, research has yet to monitor the effects of Floatation REST in participants suffering specifically with insomnia. Insomnia has been shown to have many comorbid disorders that have been significantly improved with Floatation REST, and the results from this study indicate that insomnia may similarly improve with Floatation REST. Flotation REST has the potential to be a beneficial therapy for the reduction of insomnia symptoms. These results indicate that improvements in sleep quality are attainable from a single float session, indicating that it may be a more cost-effective alternative compared to current sleep aid options.

A limitation of this study was a lack of a control group used to compare results to the experimental group. Furthermore, self-report data was the only form of evidence used to monitor sleep quality before and after floating. A larger sample size would have been more representative of the general public and is another limitation of this study. Additionally, it would have been beneficial to collect sleep diary data prior to the float session. While this study was able to recruit over half non-white participants, some racial/ethnic groups were not represented in this study. Strengths of the present study include utilizing a repeated measures design so that each participant is their own control. Additionally, even with a small sample size, there is a similar number of males and females in this study.

Future studies should consider using qualifiable data, such as a wearable sleep monitoring device like a Fitbit, to further improve the validity of the data. A control group should also be considered to compare results. Other cognitive-behavioral therapy techniques should also be considered to combine with Floatation REST in hopes to further improve sleep quality. Future research may also want to measure the possible beneficial effects for longer than two weeks.

Overall, data from this study suggest that Floatation REST can significantly improve sleep quality in participants suffering with insomnia. Furthermore, sleep quality improvements are attainable for a first-time floater and may indicate that repeated sessions are not necessary. This study provides a proof of concept that future research is warranted to explore how Floatation REST can provide beneficial changes in sleep.

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