Anxiety, Depression, or Insomnia in College Students:
An Evaluation of Cranial Electrotherapy Stimulation (CES) and Mindfulness

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**Introduction:** Worldwide, approximately one-third of first year college students reported a history of at least one or more mental health disorders (Bai et al., 2020). These mental health disorders can lead to major occupational imbalances in their roles as students, impacting all areas including social participation, leisure, work, sleep, and more. Through the treatments of Cranial Electrotherapy Stimulation (CES) and mindfulness, college students may experience a reduction in stress, depression, and/or insomnia.

As students embark on their transition to college, they may be more vulnerable to stress with their newfound responsibilities, academic expectations, and exposure to an unfamiliar environment (Bai et al., 2020). Among college students, approximately 60% of participants in a study reported experiencing high or very high stress levels (Vankim & Nelson, 2013). Along the same lines, college can be a time for students to be at an increased risk for depression (Pedrelli et al., 2020). The symptoms of depression include disturbances in mood regulation, occupational function, self-care, cognitive function, and sleep (Kavirajan et al., 2014). The quality and quantity of sleep are often negatively impacted by the common stressors associated with becoming a college student (Kauffman et al., 2018). Inadequate sleep can lead to the development of insomnia, which causes possible repeated awakenings, difficulty in initiating sleep, or early morning awakenings (Ong et al., 2014). A study consisting of 1074 college students found that roughly 9.5% of students suffered from insomnia (Kauffman et al., 2018). Fortunately for college students, possible prevention strategies are being examined to effectively aid in the prevention of mental health illnesses on campuses (Bai et al., 2020), such as CES and mindfulness, as examined in this paper.

One strategy is CES, which is a treatment that involves a small, battery-operated device that transmits low-intensity electrical currents to the brain. The currents are received through
clips that attach to the earlobes (Rose et al., 2009). The electrical effect of CES on brain activity is found to be consistent throughout the area of stimulation (Kavirajan et al., 2014). Evidence indicates that CES stimulates the vagus nerve and causes the parasympathetic response of relaxation, resulting in an increase in the flow of blood and cerebrospinal fluid, which contains specific neurotransmitters (Rose et al., 2009). The neurotransmitters in the brain that experience alterations in the release or production are serotonin, dopamine, β-endorphin, and norepinephrine (Kavirajan et al., 2014). These biochemical changes may offer synaptic relief of mental health disorders (Rose et al., 2009). This non-pharmacological treatment can be effectively used independently for improving mental health or it can also be used in conjunction with other conservative measures of treatment (De Felice et al., 1999). Rose et al. (2009) concludes that treatment using CES can display positive effects on perceived stress, depression, insomnia, and other disorders.

Another possible treatment that reduces the symptoms of perceived stress, depressive symptoms, and the severity of insomnia is mindfulness. In a different way, mindfulness is another effective treatment that involves attention being brought to current experiences, including physical sensations, feelings, and thoughts with curiosity, openness, and acceptance (Pan et al., 2019). Mindfulness is achieved through two main components. The first component includes the self-regulation of attention and the second contains an orientation toward the present moment (Hofmann & Gómez, 2017). Through these components, mindfulness can be learned and performed at almost any place and time through either formal or informal practices. Formal practices include participating in sitting meditation, yoga, and Tai Chi; whereas informal practices work to incorporate mindfulness into daily life (Pan et al., 2019). Although the task of mindfulness requires the expenditure of cognitive resources, the practice can result in higher
cognitive flexibility, self-regulation abilities, and insight (Hofmann & Gómez, 2017). The practice can also be a mediating factor in relaxation and empathy (Janssen et al., 2018).

Altogether, mindfulness is a technique that can develop into a skill with the practice of self-regulating attention and being present throughout the day. The stronger ability to adopt a mindful state throughout life can result in less agonizing experiences (Hofmann & Gómez, 2017).

When used independently, both CES and mindfulness appear to be able to reduce the onset of stress, anxiety, or insomnia. The researchers wanted to explore these effects further and discover the impact of conjunctive treatments of CES and mindfulness practices as well as examine the impact that treating these mental health symptoms has on college students’ ability to engage in occupation. Through research, this study was developed (1) to explore occupational therapy’s role in mental health and (2) to investigate the effects of Cranial Electrotherapy Stimulation (CES) and mindfulness in reducing symptoms of anxiety and insomnia among college students to increase occupational engagement.

**Design:** This study utilized a pre/posttest design, with participants randomized into 2 groups: CES alone (Group A) and mindfulness meditation and CES alone (Group B). A purposeful sample of 24 students from the campus population were recruited, all with a previous diagnosis or self-report of stress/anxiety. Each participant completed all four assessments at multiple time points.

**Method:** This study measured sleep, anxiety, trait mindfulness, and daily function using the Hamilton Anxiety Rating Scale (HAM-A), Freiburg Mindfulness Inventory (FMI), Functional Status Questionnaire (FSQ), and Pittsburgh Sleep Quality Index (PSQI). These assessments were given at baseline, weeks 5, 8, and 12. Following intake, students began the 5-week treatment protocol. In week 1, participants completed CES or CES/meditations for 7 days. In weeks 2-5,
participants completed CES or CES/meditations for 4-5 times/week. CES treatments ranged from 20-40 mins each, depending on tolerated dosage. The meditation protocol is consistent with other brief mindfulness-based interventions, and ranges in time from 12-15 minutes.

**Results:** Repeated-measures ANOVA revealed a significant effect of time over 8 weeks for HAM-A \[F(1,22) = 19.42, p < 0.05\], FMI \[F(2,21) = 10.41, p < 0.05\], PSQI \[F(2,22) = 19.01, p < 0.05\], and FSQ Social Role Function \[F(2,21) = 5.00, p < 0.05\]. There were no significant differences between groups for all four assessments, nor a significant effect of time for the Physical/Psychological FSQ categories (See Appendix A).

**Discussion:** The results showed that both CES and mindfulness were helpful in reducing anxiety and increasing mindfulness, sleep, and daily function over time. The findings of this study coincide with the findings of Rose et al. (2009) as the treatment of CES displayed positive effects on stress, depression, or insomnia. Along the same lines, the findings of this study indicated the same results as Bai et al. (2020), Hofmann and Gómez (2017), and Pan et al. (2019) as mindfulness was able to reduce the onset of stress, depression, or insomnia.

Limitations of this study included a small sample size, as well as difficulties concerning consistent participation over an eight-week period. Although participants were instructed on daily use of the CES devices and/or mindfulness, there could be potential variations in the amount of overall usage given the population of college students with a busy schedule. Additionally, one participant experienced a syncopal episode during training in the use of CES. This is inconsistent with previous research showing minimal risks of side effects or contraindications using CES (Kirsch & Nichols, 2013). For future research, it is suggested to utilize longitudinal studies to investigate long-lasting effects of CES and mindfulness. The current results reveal that cessation of treatment may lessen progress in terms of anxiety, sleep,
and mindfulness. More quantitative research is needed to further understand the use of these non-pharmacological treatments, particularly with more diversity in demographics of the population.

College students make up a vast amount of the adult population ranging from ages eighteen to twenty-four. Many college students can suffer symptoms related to mental health disorders such as stress, depression, or insomnia due to the changes that can occur in their new chapter of life. Fortunately, research has shown that through the electrical currents changing the biochemicals of the brain, CES is an effective treatment in reducing these symptoms. Along the same lines, mindfulness is another successful treatment, which involves attention being brought forth as one incorporates mindfulness techniques into daily tasks. Therefore, future use of both CES and mindfulness on college campuses may be imperative for the reduction of the onset of stress, depression, or insomnia in college students so they can fully engage in their required and desired occupations. This study was able to identify and demonstrate an important opportunity for OT to play a greater role on college campuses in order to increase occupational balance and mental health.


Appendix A.

Figure 1

Average Results of Four Assessment Outcome Measures Over Time

Note. The graphs above show changes in (a) Anxiety, (b) Sleep, (c) Mindfulness, and (d) Social Role Function from baseline to the end of the five-week protocol, and a follow up at week 8.