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ABSTRACT

Many undergraduate college students report high levels of anxiety, which can negatively impact their academic performance. Meditation is currently being explored as a method to reduce anxiety, with the duration and frequency under investigation to optimize outcomes. Therefore, this pilot study examined whether the severity of generalized anxiety disorder affected the influence of a brief, one-time, guided meditation on undergraduate academic performance. This study also investigated student perceptions of meditation and test anxiety. Students completed the GAD-7 to assess levels of anxiety, participated in a brief meditation, completed a lab quiz, and evaluated their meditation experience through a post-survey. We hypothesized that students with high GAD scores would perform similarly to those with low GAD scores on a quiz following a brief meditation. We also hypothesized that students with a more positive view of meditation would score higher on the quiz compared to those who did not find the meditation to be helpful. There was no significant difference in quiz scores based on anxiety level. Students who reported that the meditation reduced test anxiety and students who reported that they do not experience test anxiety tended to score better on the lab quiz. Even though there was not a statistically significant correlation between lab quiz scores and GAD-7 scores, there does appear to be a strong trend: as GAD-7 scores increase (higher anxiety), lab quiz scores decrease. This pilot study provides the foundation for future research exploring brief meditation on test anxiety in undergraduate students.

LITERATURE REVIEW

Generalized Anxiety Disorder (GAD) is characterized by excessive, multifocal, and persistent worry or anxiety that interferes with daily activities and is difficult to control (Stein et al., 2015). According to the *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition, the criteria for GAD diagnosis requires excessive anxiety and worry to have occurred more days than not for at least 6 months. In the United States, the estimated prevalence of GAD in the general population is approximately 3% (Patel and Fancher, 2013). The age of onset for GAD is variable, and it is nearly twice as prevalent in females as males (Stein et al., 2015). Because GAD is one of the most prevalent anxiety disorders, Spitzer et al. (2006) developed a brief self-report scale known as the GAD-7 in order to identify probable cases of GAD. Researchers have validated GAD-7 for screening in clinical practice and research (Spitzer et al., 2006) and in the general population (Löwe et al., 2008). Therefore, the GAD-7 was used to measure severity of anxiety in our population of undergraduate students.

It is well documented that college students face many challenges and stress during their academic career, with 56.9% of college students reporting "overwhelming anxiety" and 21.9% stating that anxiety had a negative impact on their academics (Bamber and Schneider, 2016). In particular, test anxiety is a significant source of stress for students.

Test anxiety involves "significant emotional, physiological, and cognitive reactions to evaluative situations that can negatively impact both students' psychological well-being and scholastic performance" (Rajiah et. al 2014). The prevalence is estimated to be as much as 35% among college students, and test anxiety has been linked to lower academic performance (Hjeltnes et al., 2015). If left untreated, test anxiety may

lead to "poor academic performance, pessimistic attitude about the future, low self-confidence, and amotivation" (Rajiah et al., 2014).

One of the fastest growing ways to address anxiety issues in academia is by introducing meditation. Meditation is a "mental practice based on focusing on the sensations of the breath/body while maintaining a relaxed state of mind" (Zeidan et al., 2010). People who have undergone short-term meditation training have shown improvements on cognitive performance and mood (Zeidan et al., 2010). Several studies have shown that meditation can actually alter brain structure and function. For example, long-term meditators have increased activation on fMRI in brain areas related to monitoring and attention (Davidson et al., 2008). Therefore, mindfulness meditation programs are being developed and studied in order to encourage neuroplasticity that may help reduce anxiety. One commonly used program is Mindfulness-Based Stress Reduction (MBSR), which trains individuals in mindfulness through eight 2-hour weekly sessions (Kabat-Zinn, 1990). MBSR has been demonstrated to reduce anxiety in GAD patients and improve stress reactivity and coping compared to an active control group (Hoge et al., 2013). Within academia, MBSR helped students cope with test anxiety as well as find an inner source of calm, stay focused in learning situations, move from fear to curiosity in academics, and feel more self-acceptance when facing difficult situations (Hjeltnes et al., 2015). Even a shorter (5-week) MBSR program led to increased measures of psychological well-being and self-compassion in undergraduate students (Bergen-Cico et al., 2013).

Although there is compelling evidence that mindfulness programs may reduce anxiety, the time commitment involved for program completion may prevent undergraduates from participating fully. Therefore, researchers are exploring the duration and frequency of meditation to optimize outcomes and accommodate students' academic schedules. A few are starting to explore the immediate effects of a one-time, brief meditation on undergraduate students, but they are producing mixed results (Bamber and Schneider, 2016; Saoji et al., 2017). We are interested in contributing to this area of active research. Therefore, the current pilot study addresses whether the severity of GAD affects the influence of a brief, one-time, guided meditation on undergraduate academic performance.

The current study also investigates undergraduate students' perception of meditation and test anxiety. A study by Gryffin et al. (2014) surveyed college students about their interest and understanding of meditation. The goal of the study was to identify potential barriers to meditation practice and suggest opportunities for promoting meditation in college students. In particular, 45% of students reported time as a major barrier to meditation practice and corresponding suggestions were made to try brief (5 minute) meditation sessions a few times a day in response. Additionally, 86% of students reported calmness/relaxation/stress reduction as a perceived benefit of meditation, which only addresses one aspect of meditation outcomes. Our current pilot study posed similar questions in a post-survey on perceptions of meditation and test anxiety to help contribute to this growing body of research.

Because of the success of MBSR and other meditation programs on reducing anxiety, we hypothesized that students with high GAD scores would perform similarly to those with low GAD scores on a quiz following a brief meditation. We also hypothesized that students with a more positive view of meditation would score higher on a quiz compared to those who did not find the meditation to be helpful.

METHODS

Participants

This study was reviewed by Winthrop University's Institutional Review Board and received exemption status. The participants were undergraduate students recruited from an Anatomy and Physiology course (n=24). Two students did not attend class the day of the study. All other students participated in the study after providing informed consent (n=22). All but one student who participated in the study completed the post-survey (n=21).

Procedure

The study was announced one week prior to a regularly scheduled lab. On the day of

the study, students who provided informed consent (n=22) completed a 7 question anxiety survey known as the GAD-7 (Spitzer et al., 2006) to assess levels of anxiety prior to a lab quiz on cranial nerves. Students then participated in a 3-minute guided breathing meditation (written permission from the author obtained, Appendix A) played as an audio recording through the application Insight Timer (Insight Network Inc.). Students completed a 12 question matching lab quiz on cranial nerves. Once the lab quiz was submitted, students (n=21) completed a post-survey (Qualtrics, Provo, UT, and Seattle, WA) containing 10 Likert scale questions and 2 short responses regarding their meditation experience (Appendix B).

All students who provided informed consent were assigned an ID number generated through a random number tool in Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA). This ID number was used on all assessment data, including the GAD-7, lab quiz, and post-survey, which allowed the comparison of data across measures while keeping student information confidential. After participation in the study was completed, students were informed that the lab quiz counted as bonus points toward the next lecture test.

Data Analysis

The GAD-7 survey was scored as follows: 0-4 indicates minimal anxiety, 5-9 mild, 10-14 moderate, and 15-21 severe (Spitzer et al., 2006 and Löwe et al., 2008). Data were analyzed using Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA), SPSS Statistics (IBM, Armonk, NY), and Qualtrics (Qualtrics, Provo, UT, and Seattle, WA). A one-way ANOVA compared the average quiz grade based on the severity of GAD where $p < 0.05$ was considered significant. A Pearson correlation compared responses to survey prompts based on GAD severity where $p < 0.05$ was considered significant. All values were reported as a mean ± standard deviation.

RESULTS

Participants

Of the 22 participants in our study, 22.73% were categorized as minimal GAD severity (average GAD-7 of 2.8), 50% were mild (average GAD-7 score of 6.36), 22.73% were moderate (average GAD-7 score of 13), and 4.55% were severe (average GAD-7 score of 16). Because only one participant was categorized as severe, a moderate/severe group was formed combining those who scored higher than a 10 on the GAD-7, which was a cutoff used in previous studies to indicate potential cases of GAD (Spitzer et al., 2006 and Löwe et al., 2008). Therefore, of the 22 participants in our study, 27.27% were moderate/severe (average GAD-7 score of 13.5).

Lab Quiz Results

The class average for the lab quiz completed post-meditation was 74.62% ± 23.21. The range was 25%-100%. The average lab quiz grade was 73.33% ± 27.89 for students with minimal GAD severity, 82.58% ± 16.01 for students with mild GAD, and 61.11% ± 27.72 for students with moderate/severe GAD (Figure 1). There was no statistically significant difference in lab quiz scores based on GAD severity, $F(2,19) = 1.80$, $p = .19$. There was also no statistically significant correlation between lab quiz scores and GAD-7 scores, $r(20) = -.32$, $p = .15$.

Survey Results

21 participants completed a post-quiz survey regarding their meditation experience. 10 Likert scale questions were analyzed by examining the correlation between each survey prompt and GAD-7 scores. There was no statistically significant difference between GAD score and survey results ($p > 0.05$, Tables 1 and 2). Each survey prompt was also correlated with lab quiz scores. For the two prompts, a significant correlation was found (Tables 1 and 2). There was a positive correlation between lab quiz score and the prompt, *The guided meditation reduced my test anxiety* ($p = .002$, Table 1). There was also a positive correlation between lab quiz score and the prompt, *I do not experience test anxiety* ($p = .037$, Table 1).

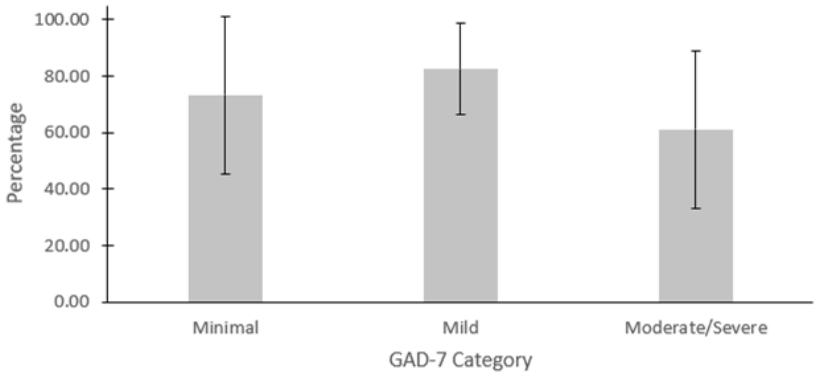

Figure 1. Average Quiz Score Following Meditation Based on Severity of GAD. Students were categorized into three levels of GAD severity based on the GAD-7 score. There was no statistically significant difference in quiz scores based on GAD severity, $F(2,19) = 1.80$, $p = .19$.

Survey Prompt	Mean (SD)	r GAD-7 score	r Lab quiz score
I felt calm during the meditation.	4.00 (1.10)	-.12	.14
I did not enjoy the guided meditation.	2.10 (0.77)	.07	-.08
I would like to regularly participate in meditation in the classroom.	3.29 (0.78)	-.02	.36
Regularly participating in meditation in the classroom would not reduce my test anxiety.	2.86 (0.96)	.07	-.26
The guided meditation reduced my test anxiety.	3.19 (0.81)	-.07	.65**
I do not experience test anxiety.	2.38 (0.92)	-.13	.46*
The guided meditation did not help me feel more focused for my quiz.	2.67 (0.97)	.28	-.31
I would prefer meditation in the classroom over meditation on my own.	2.62 (0.87)	-.11	-.02

Table 1. Correlation Analysis of Student Responses to Meditation. Pearson correlations were analyzed between student responses to survey prompts and 1) GAD-7 score and 2) lab quiz score. Responses to survey prompts were rated on a scale of 1-5 (1 = strongly disagree, 2 = disagree, 3 = neither disagree or agree, 4 = agree, 5 = strongly agree). * indicates $p < .05$ and ** indicates $p < .01$.

Survey Prompt	Mean (SD)	r GAD-7 score	r Lab quiz score
What is your understanding of meditation?	3.29 (0.72)	.01	.24
What is your experience in practicing meditation?	2.38 (0.74)	.08	.17

Table 2. Correlation Analysis of Student Knowledge of Meditation. Pearson correlations were analyzed between student responses to survey prompts and 1) GAD-7 score and 2) lab quiz score. Responses to survey prompts were rated on a scale of 1-5 (1 = none, 2 = a little, 3 = moderate, 4 = high, 5 = professional). There were no statistically significant correlations, $p > .05$.

DISCUSSION

This pilot study addressed whether the severity of generalized anxiety disorder (GAD) affects the influence of a brief, one-time, guided meditation on undergraduate academic performance and student perceptions of meditation and anxiety. Anxiety can negatively impact academic performance and therefore, meditation is being actively explored as an option to reduce anxiety in college students (Bamber and Schneider, 2016). Because of the success in previous studies of MBSR and other meditation programs on reducing anxiety (Hoge et al., 2013 and Zeidan et al., 2010), we hypothesized that students with high GAD scores would perform

similarly to those with low GAD scores on a quiz following a brief meditation. Our findings indicate that there was no statistically significant difference in lab quiz scores based on GAD severity (Figure 1), thus supporting our hypothesis. There was also no statistically significant correlation between lab quiz scores and GAD-7 scores, $r(20) = -.32$, $p = .15$.

Based on prior studies investigating student perceptions of meditation (Gryffin et. al., 2014), we also hypothesized that students with a more positive view of meditation would score higher compared to those who did not find the meditation to be helpful. However, there were no statistically significant correlations between GAD-7 scores and survey responses (Tables 1 and 2). There were two interesting significant correlations between lab quiz scores and the following survey prompts, *The guided meditation reduced my test anxiety* and *I do not experience test anxiety* ($p < .01$ and $p < .05$, respectively, Table 1). Students who agreed that the meditation reduced test anxiety tended to score better on the lab quiz. Students who agreed that they do not experience test anxiety also scored higher on the lab quiz. This may indicate that perceived anxiety can dampen academic performance, since students who think they have anxiety scored worse. This partially supports our hypothesis, although student perception seems to relate more to test anxiety than meditation in this case. For example, we do not know if these correlations exist because students simply thought the meditation reduced their anxiety and therefore they scored better, or if the one-time meditation was actually effective. Future studies will need to investigate these correlations further. When prompted for optional general feedback on their meditation experience, students (n=6) shared mixed results. Some noted that the meditation was helpful, and others stated that they "disliked" the meditation. There was no apparent connection between the comments provided and the lab quiz grades.

Although there was not a statistically significant correlation between lab quiz scores and GAD-7 scores, there appears to be a strong trend: as GAD-7 scores increase (higher anxiety), lab quiz scores decrease. Additionally, the participant categorized as severe (n=1) by the GAD-7 scored the lowest on the lab quiz (25%). This finding should be explored in more detail by adding additional participants to the study and including a control group receiving no meditation (3 minutes of silence or a different active comparison such as listening to classical music for 3 minutes).

Limitations

One limitation of this study was that demographic information was not collected during the survey. Although not a main focus of this pilot study, demographic information could be useful for further analysis and allows numerous opportunities for future work. This study also lacked a control group receiving no meditation. The focus of this particular pilot study was to examine how severity of GAD might impact academic performance after a brief meditation. However, it would also be interesting to assess the impact of brief meditation compared to a control with no meditation. Therefore, future studies will utilize a similar experimental design for an entire class as a control. All students in a class participating in a similar experience allowed us to control for other variables such as consistency in the instructor administering the quiz, consistency in the location of the quiz, and other external factors that may influence memory recall (Unsworth et al., 2012). Assessing data across multiple semesters will increase sample size and strengthen data analysis. Additionally, testing different durations and frequencies of the meditation may be explored, as one student commented in survey feedback that the meditation felt a little "rushed."

CONCLUSION

Undergraduate college students face stress and anxiety daily, affecting academics and quality of life. Meditation offers a way to combat this stress and anxiety. However, many undergraduate students do not have time to commit to a full-time meditation program. This pilot study examined the impact of generalized anxiety disorder on academic performance in undergraduate students following a brief, one-time, guided meditation and found that there was no statistically significant difference in lab quiz scores based on GAD severity. This pilot study laid the foundation for further studies examining

the impact of meditation against a control class of students and examining student perceptions of meditation in greater detail by collecting demographic information.

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APPENDIX A: MindFIT Three Minute Breathing Reset by Richard Goerling

This is a great breath drill that you can do any time to reset your breath, downregulate any stress, and prepare your mind and body for performance. So let's begin, with an upright sitting or standing posture, mind and eyes open, and let's take three slow and deep in breaths and out breaths. And now let's allow our breath to find its natural rhythm for a moment. Next, breathing in, slowly and deeply, count to five. And then hold your breath for a count of four. Then exhale deeply and slowly for a count of seven. And we're really pushing out that air from our lungs forcefully on this deep and slow exhale. Again, breathe in slowly and deeply for a count of five. Then hold our breath for a count of four. And exhale deeply, slowly, forcefully, for a count of seven. Breathe this way for three to five cycles total. And then allow your breath to return to its natural rhythm. Just sit for a moment, breathing with the natural rhythm. On your next task, step into the world with gratitude for your breath.

APPENDIX B: Meditation and Test Anxiety Student Survey

Please select one option below for the following statements.

Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
1	2	3	4	5

1. I felt calm during the meditation.
2. I did not enjoy the guided meditation.
3. I would like to regularly participate in meditation in the classroom.
4. Regularly participating in meditation in the classroom would not reduce my test anxiety.
5. The guided meditation reduced my test anxiety.
6. I do not experience test anxiety.
7. The guided meditation did not help me feel more focused for my quiz.
8. I would prefer meditation in the classroom over meditation on my own.

Please select one option below for the following statements.

None	A little	Moderate	High	Professional
1	2	3	4	5

1. What is your understanding of meditation?
2. What is your experience in practicing meditation?

Please provide feedback on the meditation experience below.

1. Use this space for any additional comments you wish to share regarding the meditation experience.
2. Comment on other methods you use to reduce test anxiety, if applicable.