Sitting Meditation (Mindfulness) and Music Meditation Effects on Overall Anxiety and Test Anxiety in a College Student Population

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ABSTRACT

Background: Research shows that mindfulness interventions for test anxiety in a college student population are beneficial (Lothes, Mochrie, Wilson, & Hakan, 2021). This study expands on the existing literature by examining how distance learning mindfulness practices may affect anxiety in college students.
Aim: This study assessed the effects of online mindfulness practices over a five-week period on test anxiety in college students.
Method: Participants included 31 college students that were randomly assigned to either a sitting meditation or music meditation condition. The two groups were also split in half to add a wait list control condition. A weekly schedule of mindfulness practices was given to participants to complete on their own.
Results: Participants in the sitting meditation condition showed significant within-group reductions in test anxiety, overall anxiety, and mindfulness from start to finish. The music meditation group showed no changes in test anxiety. However, overall anxiety showed decreases in scores, and overall mindfulness did show significant increases for this group.
Conclusion: Mindfulness may play a role in the reduction of anxiety and test anxiety. Further research is needed to more definitively assess how music meditation may impact anxiety.

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INTRODUCTION

Studies on anxiety have shown that it affects people both psychologically and physiologically (Spielberger, 2010; von der Embse, Jester, Roy, & Post, 2018). Spielberger and Vagg's (1995) Transactional Process Model was proposed as a conceptual framework for analyzing and evaluating the effects of examination stress on test anxiety and the adverse effects of worry and emotionality on information processing and academic achievement. These researchers were some

of the first to study test anxiety's physiological effects on the body including symptoms such as elevated heart rate, racing thoughts, increased perspiration, restlessness, and negative thinking and affect. Research has shown that the symptoms of anxiety may not always manifest externally. For example, a student taking a test in a classroom may appear calm from an outside observer perspective, however internally they are experiencing racing thoughts, negative self-talk, and a disrupted ability to concentrate or process information. Spielberger and Vagg (1995) defined state anxiety as "an emotional state of fear, discomfort, nervousness, and an arousal of the autonomic nervous system, which is induced by a situation that presents a perception of danger or threat" (p. 6). Spielberger (1983) defined trait anxiety as anxiety that is an enduring personality characteristic to feel stress, worry, and discomfort consistently across the lifespan. State and trait anxiety among individuals may present with similar symptoms. However, the maintaining factors are different. Students likely experience a combination of these anxiety types, as seen in test anxiety. There is a gap in the literature concerning test anxiety, which has only recently become research focus (Akshaya, Ninan, & Thomas, 2021). One possible explanation for this gap in test anxiety research could be test anxiety not meeting the Diagnostic and Statistical Manual criteria of disorder. Most disability service centers on campus require a diagnosis for students to be able to receive assistance or accommodations. Thus, because test anxiety is not a diagnosable disorder, it does not meet the required criteria for assistance. However, that does not diminish the anxiety that students feel or how it affects them while studying for tests, going into a test, and while taking a test.

Duesek (1980) defined test anxiety as "an emotional state that has psychological and behavioral concomitants, and that is experienced in formal testing or other evaluative situations" (p. 88). Sarason (1984) explained test anxiety as "A widely studied personality variable in part because it provides a measure of the personal salience of one important definable class of threating situations in which people are evaluated" (p. 292). Understandably, many students may experience some form of anxiety while taking tests. However, this does not necessarily mean they meet the criteria used when it is operationalized. Speilberger and Vagg (1995) have explained test anxiety as being comprised of cognitive attention processes that interfere with students' academic situations, performance, and examinations. Zeinder (1998) described test anxiety as being comprised of a set of phenomenological, physiological, and behavioral responses that are accompanied by worries about possible negative outcomes or failures on a test or some type of similar evaluative experience. These definitions throughout the last couple of decades have started to try to clarify and understand the experience of test anxiety through assessments. Over the last 10 years there have been reported elevations in anxiety, depression, non-suicidal self-injury, suicide ideation and suicide attempts in college students (Duffy, Twenge, & Joiner, 2019).

Research has shown that test anxiety can have debilitating effects on college students' test scores and academic performance (Vitasari, Wahab, Othman, Herawan, & Sinnadurai, 2010). Individuals suffering from test anxiety may be at risk of poor academic performance and increased dropout rates (Lang & Lang, 2010, Vanstone & Hicks, 2019). Vitasari et al. (2010) found that test anxiety can lead to poor academic performance on exams and assignments.

The potential impact that test anxiety could have on academic performance may present unique challenges for the college student population. Vitasari et al. (2010) found that among engineering students (N = 205 [females = 109, males = 96]) test anxiety showed a relationship between those with elevated test anxiety and academic performance, where the students with elevated scores of test anxiety showed overall poorer academic performance. The relationship between anxiety and academic performance, if not addressed, could have long standing detrimental effects on college students' academic achievement. The outcomes may negatively interfere with other areas of life functioning. Tekta,

Paulsen, and Sel (2013) found that elevated anxiety levels in students may result in self-medicating behaviors and addiction.

It is well known that general symptoms of anxiety are related to problems in functioning, including academic performance among college students, but what about test anxiety? Some research has specifically examined the negative impact of test anxiety on college student academic functioning. Chapell et al. (2005) assessed students' test anxiety levels through self-report before, during, and after testing. They found that there was a significant inverse relationship between elevated levels of test anxiety and overall undergraduate and graduate grade point average (GPA). Test anxiety has been shown to have a negative impact on academic functioning for college students (von der Embse et al., 2018). However, little is known about how to effectively treat this group. One might intuitively believe that practicing mindfulness could be a useful intervention in reducing test anxiety.

Mindfulness has been defined as the ability to bring personal inner attention to the experience of the present moment with non-judgmental awareness (Kabat-Zinn, 1990). According to Linehan (2014), "Mindfulness is the act of consciously focusing the mind in the present moment, without judgment and without attachment to the moment. A person who is mindful is aware in and of the present moment. Mindfulness is the opposite of being on 'automatic pilot' or being lost in habit" (p. 39). Mindfulness is the process of being able to experience thoughts, feelings, emotions, and mental processes without getting caught up in them or overwhelmed by them. The process of mindfulness helps to reduce the potential of becoming overwhelmed by emotions, thoughts, and body sensations. Therefore, a mindfulness practice would seem appropriate as a possible intervention to reduce test anxiety symptoms.

There is evidence that the use of mindfulness-based interventions in college counseling centers may reduce symptoms of different mood disorders (Byrne, Bond, & London, 2013). Mindfulness has been shown to be an effective intervention for anxiety and other clinical disorders (Hofmann, Sawyer, Witt, & Oh, 2010; Malik & Perveen, 2021). Hofmann et al. (2010) found that mindfulness practices and training can help to alleviate anxiety symptoms. Dialectical Behavior Therapy (DBT) is a skills-based therapy that has been shown to help reduce clinical levels of anxiety (Gratz, Tull, & Wagner, 2005; Lothes, McCool, Mochrie, Guender, & St John., 2021). Most research incorporating DBT's mindfulness skills have been associated with clinical levels of anxiety. However, Nasizadeh, Babapour, and Moheb (2015) studied DBT's skills (Emotion Regulation, Distress Tolerance, and Mindfulness) on high school students (N = 412, all females) with high achievement anxiety. Results showed that the DBT intervention effectively reduced test anxiety in high school females. However, research is still limited regarding the implementation of a mindfulness practice to reduce anxiety, in particular test anxiety.

Mindfulness and music listening is a relative novel field of research that is just starting to be investigated (Lecuona de la Cruz & Rodriquez-Carvajal, 2014). Music, when structured appropriately, may support mindfulness meditation (Dvorak & Hernandez-Ruiz, 2021). Dvorak and Hernandez-Ruiz (2021) identified three ways that music may be utilized in mindfulness practice: (1) music as a support for mindfulness meditation, (2) music as a focus for mindful listening, and (3) music as a focus for mindful active engagement. Music as a support for mindfulness meditation is when music is specifically designed, composed, or selected, based on the best available research, to support internal and external responses for a mindfulness meditation practice. Participants focus on the meditation while the music supports and enhances their experience without distracting attention from their focus objective (e.g., breathing, verbal instructions). Music as a focus for mindful listening is when individuals listen to the music mindfully, observing sounds and silences, and paying attention to specific musical elements present in the moment. During this practice the music becomes the object of meditation or source of contemplation. Music as a focus for mindful, active

engagement is when the act of playing, singing, moving, or creating music in which the participants observe, describe, or participate mindfully, nonjudgmentally, and effectively (Dvorak & Hernandez-Ruiz, 2021).

Gadberry (2011) has shown that music may have an effect on reducing overall anxiety. However, no one has examined how meditation music may affect test anxiety in college students. This study examined how a traditional sitting mindfulness meditation group and a music meditation group affected mindfulness scores, text anxiety, and overall anxiety in college students.

Hypothesis

H_1: The sitting meditation group will show significant increases in overall mindfulness scores.
H_2: The sitting meditation group will show significant decreases in overall anxiety scores.
H_3: The sitting meditation group will show significant decreases in overall test anxiety scores.
H_4: The music meditation group will show significant increases in overall mindfulness scores.
H_5: The music meditation group will show significant decreases in overall anxiety scores.
H_6: The music meditation group will not show significant decreases in overall test anxiety scores.

There were no comparison questions developed for the hypotheses of this study (e.g., did sitting meditation perform better than music meditation?), as the study was developed to see if sitting meditation and music meditation played a role in anxiety reduction. Since there are many different mindfulness practices that people can do, this study examined if two different interventions produced promising results on anxiety and test anxiety reduction.

METHODS

Two weeks prior to the study, students were recruited during classes for a study on using mindfulness with test anxiety. The students that self-reported as having test anxiety were considered eligible for the study.

This study was approved by the university's Institutional Review Board (17-0088). This study was conducted during a COVID-19 semester that was fully online. Thirty-one students (male n = 3, female n = 28, average age in years = 19) in undergraduate classes were recruited to participate in the study (Table 1).

Table 1. *Descriptive Statistics by Condition*

	Sitting Meditation (N = 16)		Music Meditation (N =15)	
	Mean	*Range*	*Mean*	*Range*
Age	20	18-21	19	18-20
	Male	Female	Male	Female
Gender	2	14	1	14
Class Rank	Freshman	Sophomore	Junior	Senior
Mindfulness	6	5	5	0
Music Meditation	5	8	2	0

Orientation and debriefing with participants during this study was delivered via Zoom. During orientation (week 1) all volunteers signed written consents to participate in the study. Participants were not compensated for their participation. Students that did not complete all three assessments (start, mid-point, and end) were excluded from the study and considered as withdrawn from the study (N = 6).

The participants filled out an online assessment that included a demographic questionnaire, the Test Anxiety Inventory (TAI; Spielberger, 1980), State-Trait Anxiety Inventory (STAI; Speilberger, 1983), and Five Facets of Mindfulness Questionnaire Short Form (FFMQ-SF; Bohlmeijer, Klooster, Fledderus, Veehof, & Baer, 2011). During the week 1 meeting, students were oriented to what was expected of them in the study and given a five-week schedule of different mindfulness practices (Figures 1 & 2).

Figure 1. Sitting Mindfulness Meditation Schedule Over Five Weeks

Week 1: Sitting Meditation Schedule

WEEK 1	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Sitting Meditation (10 min)	Sitting Meditation (10 min)	Body Scan (20 min)	Sitting Meditation (10 min)	Sitting Meditation (10 min)		Mountain Meditation
Completed							

Week 2

WEEK 2	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Sitting Meditation (10 min)	Sitting Meditation (10 min)	Body Scan (20 min)	Sitting Meditation (20 min)	Sitting Meditation (10 min)		Lake Meditation
Completed							

Week 3

WEEK 3	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Sitting Meditation (10 min)	Sitting Meditation (20 min)	Body Scan (20 min)	Sitting Meditation (10 min)	Sitting Meditation (20 min)		Body Scan (20 min)
Completed							

Week 4

WEEK 4	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Sitting Meditation (10 min)	Sitting Meditation (20 min)	Body Scan (20 min)	Sitting Meditation (20 min)	Sitting Meditation (20 min)		Body Scan (20 min)
Completed							

Week 5

WEEK 5	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Sitting Meditation (10 min)	Sitting Meditation (20 min)	Body Scan (20 min)	Sitting Meditation (10 min)	Sitting Meditation (20 min)	Mountain Meditation	Body Scan (20 min)
Completed							

Figure 2. Meditation Music Schedule Over Five Weeks

Week 1: Meditation Music Schedule

WEEK 1	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Zen Music Meditation (10 min)	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (10 min)	Zen Music Meditation (10 min)		Zen Music Meditation (20 min)
Completed							

Week 2: Meditation Music

WEEK 2	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Zen Music Meditation (10 min)	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (10 min)		Zen Music Meditation (20 min)
Completed							

Week 3: Meditation Music

WEEK 3	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)		Zen Music Meditation (20 min)
Completed							

Week 4: Meditation Music

WEEK 4	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)		Zen Music Meditation (20 min)
Completed							

Week 5: Meditation Music

WEEK 5	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mindfulness Practice	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (10 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)	Zen Music Meditation (20 min)
Completed							

Once students were randomly assigned to either the mindfulness sitting meditation or the music meditation group, they were then again randomly assigned to round one of mindfulness (n = 14) or round two of mindfulness (n = 17; wait list control group [WLC]). Participants assigned to round one (Group 1) immediately started doing the mindfulness practices (Figures 1 & 2). The WLC group (i.e., round two participants – Group 2) was told that this part of the study was full and they needed to wait until the next round of the mindfulness study. They were instructed not to perform any mindfulness practices for five weeks while the first group completed their mindfulness intervention. After five weeks, an assessment was conducted where all participants filled out the assessments again. After this five-week period, group 1 had completed their mindfulness practices and the group 2 started the same schedule. At the end of that second five-week period (10 weeks), all participants again completed the surveys and were debriefed on the study.

Participants were given access to a website (Wix page) created by the researcher where they could access all the mindfulness practices that were assigned each week. Students were also given a schedule of mindfulness practices to complete and check off after completing each day's practice. Participants that missed more than one day of

mindfulness were sent reminder emails to complete their practices and were reminded that a lack of participation could result in them being removed from the study.

Intervention

During the first week, all participants met with the principal investigator (PI) via zoom to address questions about the study. The PI also explained study expectations. The WLC group (Group 2) was told that the first round of the study was full and that they were going to start in five-weeks after the first group (Group 1) of participants completed their session of mindfulness. Participants were emailed a link to the Wix page, created by the PI, where they could access all the assigned mindfulness practices.

Sitting meditation is done by sitting in a chair or on the floor (Kabat-Zinn, 1990). Posture in sitting meditation is a very important part of the practice. The main concepts of sitting meditation are to keep good posture (where the back, neck, & head align vertically), relax the shoulders, and do something comfortable with the hands. Hands are usually placed on the knees or rested on the person's lap with fingers of the left hand over fingers of the right hand and thumbs tips gently making contact with each other. When the sitting posture has been established for meditation, the practitioner is to bring their attention to their breathing. During this study, guided meditation practices (Kabat-Zinn, 1990) were provided for participants to listen to and follow in their mindfulness practice.

Participants were given access to a virtual mindfulness log to fill out each day when they completed (or did not complete) the assigned mindfulness practices. On the weeks where participants were given six practices to do in a week, they were told that if they missed a day, they could make it up on the off day for that week. All assessments were completed online and stored on the PIs cloud behind password protection. Only the PI and the research assistants had access to the data file.

Measures

The study used four self-report questionnaires to assess constructs of test anxiety, general anxiety, and mindfulness. The TAI (Spielberger, 1980) is a 20-item questionnaire that gives an overall assessment of test anxiety with two subscales: Worry and Emotionality. The TAI uses a four-point scale: (1) *Never*, (2) *Sometimes*, (3) *Often*, (4) *Almost always*. Participants rated questions such as "I feel calm," "I feel tense," and "I feel indecisive," depending on their feelings in that moment. The TAI is one the most widely used assessments for the measurement of test anxiety in college students (Chapell et al., 2005). The TAI has shown strong internal consistency, ranging from 0.86 to 0.95, and test-retest reliability, ranging from 0.65 to 0.72 (Spielberger et al., 1983). Construct and concurrent validity of the scale ranges from 0.69 to 0.89 (Spielberger, 1989).

The STAI (Spielberger, 1983) is a 40-item questionnaire that gives an overall assessment of general anxiety with two subscales: State anxiety and Trait anxiety. The STAI uses a four-point scale to assess state anxiety: (1) *Not at all*, (2) *Somewhat*, (3) *Moderately So*, (4) *Very Much So*. The STAI also uses a four-point scale to assess trait anxiety: (1) *Almost never*, (2) *Sometimes*, (3) *Often*, (4) *Almost always*. The STAI has shown both strong internal consistency and test-retest reliability ranging from 0.78 to 0.83 for trait anxiety, and 0.69 to 0.76 for state anxiety (Barker et al., 1976).

The FFMQ-SF (Bohlmeijer et al., 2011) is a 24-item short form of the FFMQ that provides measurements of five facets of mindfulness (Non React, Observe, Act with Awareness, Describe, and Non-Judge) and was developed and assessed in the same sample and cross-validated in an independent sample. Confirmatory factor analyses showed an

acceptable model that fit with a correlated five-factor structure of the original FFMQ and a good model fit for the structure of the FFMQ-SF. Studies show that the FFMQ and FFMQ-SF are highly sensitive to change (Bohlmeijer et al., 2011). According to Bohlmeijer et al. (2011), both the FFMQ and the FFMQ-SF are reliable and valid instruments for use in adults with clinically relevant symptoms of depression and anxiety.

RESULTS

Data from the surveys were analyzed to determine if a traditional mindfulness intervention or mindfulness music intervention had an effect on test anxiety, overall anxiety, and self-report measures of mindfulness. Table 2 reports means and standard deviations for all scales and both conditions for the overall mindfulness interventions.

Table 2. *Means and Standard Deviations for Meditation Interventions Combined (Pre-Post)*

Measure	Start (0 weeks)				Mid-Point (3 weeks)				Final (5 weeks)			
	MM		*SM*		*MM*		*SM*		*MM*		*SM*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
TAI Emotion	23.47	6.17	22.06	5.57	19.93	7.78	19.31	6.29	19.00**	5.36	16.31**	4.87
TAI Worry	21.07	5.02	20.69	5.61	18.37	6.08	17.38	5.90	16.93***	5.82	15.31**	5.19
TAI Total	56.27	12.40	53.19	13.63	48.47	16.44	45.44	14.47	44.80***	12.88	39.62**	12.08
State Anxiety	51.00	11.94	46.00	12.59	45.80	14.83	41.31	11.70	41.20**	12.47	36.31**	9.01
Trait Anxiety	53.13	11.51	49.44	9.01	48.60	15.09	46.56	9.87	44.33***	12.76	41.00**	10.83
STAI Overall	104.13	22.46	95.44	20.83	94.40	29.37	87.88	20.45	85.53***	24.57	77.31**	18.51
FFMQ Non-React	12.80	3.21	13.56	3.16	13.93	4.08	14.94	2.62	13.40	3.70	16.25**	2.84
FFMQ Observe	13.00	3.09	12.56	3.61	13.40	3.31	13.81	4.00	13.73	3.33	15.06**	4.55
FFQM Act Aware	14.00	3.84	14.25	4.81	14.60	4.00	14.69	4.22	16.13	3.85	16.25	4.61
FFMQ Describe	14.27	3.26	15.38	2.53	14.40	4.00	15.75	4.44	15.33**	3.72	18.06	3.75
FFMQ Non-Judge	14.13	2.77	14.56	2.22	15.07	3.28	14.81	2.20	16.20**	3.57	15.06	2.84
FFMQ Overall	38.20	10.66	70.31	11.54	71.40	13.82	74.00	12.99	74.80**	11.28	80.69**	16.17

Note. *p < 0.05; **p < 0.01; ***p < 0.001. MM = Music meditation; SM = Sitting meditation.

Table 3 reports means and standard deviations for all scales and both conditions for the sitting meditation intervention (first round participants and WLC).

Table 3. *Means and Standard Deviations for Mindfulness Sitting Meditation Intervention*

Measure	Start (0 weeks)				Mid-Point (5 weeks)				Final (10 weeks)			
	M		*SD*		*M*		*SD*		*M*		*SD*	
	SM1 (N=5)	*SM2 (WLC) (N=11)*	*SM1*	*SM2 (WLC)*	*SM1*	*SM2 (WLC)*	*SM1*	*SM2 (WLC)*	*SM1*	*SM2 (WLC)*	*SM1*	*SM2 (WLC)*
TAI Emotion	24.20	21.09	5.36	5.63	16.00*	20.82	4.34	6.54	15.60*	16.37	5.98	4.67
TAI Worry	24.00	19.18	7.68	3.95	14.20**	18.82	4.60	6.03	15.40*	15.27	6.43	4.88
TAI Total	60.00	50.91	16.39	11.73	38.00**	48.82	10.70	15.11	38.20*	40.27	14.31	11.64
State Anxiety	51.60	43.46	14.36	11.51	33.20**	45.00	8.20	11.43	34.40*	37.18**	11.37	8.21
Trait Anxiety	54.40	47.18	12.46	6.46	42.80**	48.37	11.63	8.90	43.80*	37.73*	11.10	11.00
STAI Overall	106.00	90.64	25.80	17.43	76.00**	93.27	17.90	19.92	78.20*	76.91**	20.92	18.39
FFMQ Non-React	12.75	14.00	3.50	3.26	14.75	14.45	0.50	2.51	15.25**	16.64	2.06	3.20
FFMQ Observe	11.00	13.27	2.83	3.93	11.75	14.00	4.27	3.61	13.00	15.36	4.08	4.68
FFQM Act Aware	8.50	15.91	2.38	3.81	13.50	14.36	5.00	3.41	14.50	16.46	4.66	4.68
FFMQ Describe	13.50	15.82	2.38	2.36	15.75	15.18	4.19	4.47	15.75*	18.27*	2.22	3.55
FFMQ Non-Judge	14.75	14.18	1.50	2.32	13.25	15.00	1.26	2.00	13.00	15.54	1.41	2.95
FFMQ Overall	60.50	73.18	8.19	11.23	69.00*	73.00	9.42	10.93	71.50*	82.27*	12.23	16.54

Note. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. SM1 = Sitting meditation group 1; SM2 = Sitting meditation group 2 (Wait list control group). Significant findings indicate significant changes in scores from the start of the intervention to the end of the intervention.

Table 4 reports means and standard deviations for all scales at pre and post for both mindfulness music meditation intervention conditions combined (Group 1 participants and WLC-Group 2).

Table 4. *Means and Standard Deviations for Meditation Music Intervention*

Measure	Start (0 weeks)				Mid-Point (5 weeks)				Final (10 weeks)			
	M		*SD*		*M*		*SD*		*M*		*SD*	
	MM1 (N=9)	*MM2 (WLC) (N=6)*	*MM1*	*MM2 (WLC)*	*MM1*	*MM2 (WLC)*	*MM1*	*MM2 (WLC)*	*MM1*	*MM2 (WLC)*	*MM1*	*MM2 (WLC)*
TAI Emotion	22.11	25.50	5.75	6.78	17.22**	24.00	6.89	7.77	17.33**	21.50	3.74	2.75
TAI Worry	19.33	23.67	3.00	6.53	15.22**	22.83	3.60	6.43	15.33**	19.33	5.15	6.41
TAI Total	52.67	61.67	8.75	15.80	41.67***	58.67	12.60	17.18	40.89**	50.67	10.17	15.18
State Anxiety	45.78	58.83	11.89	7.08	38.78	56.33	13.09	10.95	37.89*	46.17**	12.85	11.04
Trait Anxiety	48.56	60.00	11.97	6.90	42.11*	58.33	14.02	11.55	41.33**	48.83**	12.67	12.59
STAI Overall	94.33	118.83	22.50	13.05	80.89*	114.67	26.38	21.92	79.22**	95.00	25.01	22.58
FFMQ Non-React	13.67	11.50	2.96	3.39	15.44	11.67	3.91	3.45	14.44	11.83	3.88	3.06
FFMQ Observe	13.22	12.67	3.35	2.94	13.67	13.00	4.00	2.19	13.11	14.67	3.98	1.97
FFQM Act Aware	14.56	13.17	4.33	3.13	16.67	11.50	2.55	3.89	16.67	15.33	4.15	3.56
FFMQ Describe	15.11	13.00	3.82	1.79	16.33*	11.50	3.32	3.21	16.78*	13.17	3.60	2.93
FFMQ Non-Judge	14.56	13.50	2.79	2.88	15.89	13.83	3.86	1.84	16.67*	15.50	3.71	3.56
FFMQ Overall	71.11	63.83	11.17	8.95	78.00*	61.50	11.61	11.11	77.67**	70.50*	10.86	11.43

Note. *p < 0.05; **p < 0.01; ***p <0.001. MM1 = Music meditation group one; MM2 = Music meditation group two (Wait list control group). Significant findings indicate significant changes in scores from the start of the intervention to the end of the intervention.

Completion Rates of Mindfulness Practices

Some 98.4% of the round 1 mindfulness meditation group reported completing their practices. Further, 95.5% of the round one music meditation group reported completing their practices. The results indicated that 96.1% of the round two mindfulness meditation group reported completing their practices, and 99.5% of the round two music meditation group reported completing their practices.

Overall Findings

A within-group repeated measures ANOVA was used to assess mindfulness training on overall test anxiety and the test anxiety subscales of Emotionality and Worry for combined results in each condition.

For the mindfulness meditation group there was a significant effect of mindfulness training on decreasing overall test anxiety, $F(15,30) = 6.78$, $p < .004$; on Emotionality, $F(15,30) = 7.86$, $p < .003$; and Worry, $F(15,30) = 5.42$, $p = .01$. There was also a significant effect of mindfulness training on decreasing overall anxiety, $F(15, 30) = 15.32$, $p < .002$; State (Y-1) anxiety, $F(15,30) = 6.93$, $p < .003$; and Trait (Y-2) anxiety, $F(15,30) = 6.77$, $p = .004$.

For the music meditation group there was a significant effect of mindfulness training on decreasing overall test anxiety, $F(14,28) = 10.90$, $p < .0003$, on Emotionality, $F(14,28) = 5.16$, $p < .01$, and Worry, $F(14,28) = 21.10$, $p = .0004$. There was also a significant effect of mindfulness training on decreasing overall anxiety, $F(14, 28) = 9.99$, $p < .0005$, on State (Y-1) anxiety, $F(14,28) = 7.99$, $p < .002$, and Trait (Y-2) anxiety, $F(14,28) = 9.48$, $p = .0007$.

A within-group repeated measures ANOVA was used to assess mindfulness training on the Five Facets of Mindfulness changes: Non-React, Observe, Act with Awareness, Describe, and Non-judge, for both conditions.

For the mindfulness meditation group there was a significant effect of mindfulness training Non-React, $F(15,30) = 5.23$, $p = .01$; Observe, $F(15,30) = 4.96$, $p = .01$; Describe, $F(15,30) = 5.77$, $p = .008$; and overall mindfulness, $F(15,30) = 7.23$, $p = .003$. There were no significant changes for Act with Awareness or Non-Judge for the traditional meditation groups from the start to end of the study.

There was a significant effect of music mindfulness on increasing mindfulness self-report ratings on Non-Judge, $F(14,28) = 5.88$, $p = .007$; and overall mindfulness, $F(14,28) = 4.97$, $p = .01$. There were no significant changes for No-React, Observe, Act with Awareness or Describe for the music meditation groups from start of the study to the end.

Paired *t*-tests were conducted between the time when the groups started their mindfulness practices and when they ended their practices (five-week period) to see if the interventions had an effect on score changes for each condition.

Sitting Meditation – Test Anxiety & Anxiety

Group One. There was a significant decrease in test anxiety scores for the sub-scale of emotionality from the start of the interventions ($M = 24.20$, SD = 5.36) compared to the end of the intervention ($M = 16.00$, $SD = 4.34$), $t(4) = -3.65$, $p < .03$. There was a significant decrease in test anxiety scores for the sub-scale of worry from the start of the intervention ($M = 24.00$, $SD = 7.69$) compared to the end of the intervention ($M = 14.20$, $SD = 4.60$), $t(4) = -4.50$, $p < .01$. There was a significant decrease in overall test anxiety scores from the start of the intervention ($M = 60.00$, $SD = 16.39$) compared to the end of the intervention (M = 38.00, $SD = 10.70$), $t(4) = -4.04$, $p < .02$.

There was a significant decrease in general anxiety scores for the sub-scale of state anxiety (Y-1) from the start of the intervention (M = 51.60, $SD = 14.36$) compared to the end of the intervention (M = 33.20, $SD = 8.20$), $t(8) = -5.56$, $p < .005$. There was a significant decrease in general anxiety scores for the sub-scale of trait anxiety (Y-2) from the start of the intervention ($M = 54.40$, $SD = 12.46$) compared to the end of the intervention ($M = 42.80$, $SD = 11.63$), $t(8) = -4.28$, $p < .01$. There was a significant decrease in overall anxiety scores from the start of the intervention ($M = 106.00$, $SD = 25.80$) compared to the end of the intervention ($M = 76.00$, $SD = 17.90$), $t(8) = -5.21$, $p < .007$.

Group Two (WLC). There were no significant changes from the study start to the mid-way assessment for Group 2 (WLC) group for both test anxiety and overall anxiety. There were no significant changes in test anxiety scores (overall and sub-scales) for the WLC sitting meditation group.

There was a significant decrease in general anxiety scores for the sub-scale of state anxiety (Y-1) from the start of the intervention (M = 45.00, SD = 11.43) compared to the end of the intervention (M = 37.18, SD = 8.21), $t(10)$ = -2.96, $p < .01$. There was a significant decrease in general anxiety scores for the sub-scale of trait anxiety (Y-2) from the start of the intervention (M = 48.37, SD = 8.90) compared to the end of the intervention (M = 37.73, SD = 11.00), $t(10)$ = -2.74, $p < .02$, There was a significant decrease in overall anxiety scores from the start of the intervention (M = 93.27, SD = 19.92) compared to the end of the intervention (M = 76.91, SD = 18.39), $t(10)$ = -3.02, $p < .01$.

Music Meditation – Anxiety

Group One. There was a significant decrease in test anxiety scores for the sub-scale of emotionality from the start of the intervention (M = 22.11, SD = 5.75) compared to the end of the intervention (M = 17.22, SD = 6.89), $t(8)$ = -3.29, $p < .01$. There was a significant decrease in test anxiety scores for the sub-scale of worry from the start of the intervention (M = 19.33, SD = 3.00) compared to the end of the intervention (M = 15.22, SD = 3.60), $t(8)$ = -3.74, $p < .006$. There was a significant decrease in overall test anxiety scores from the start of the intervention (M = 52.67, SD = 8.75) compared to the end of the intervention (M = 41.67, SD = 12.60), $t(8)$ = -3.35, $p < .01$.

There was a significant decrease in general anxiety scores for the sub-scale of trait anxiety (Y-2) from the start of the intervention (M = 48.56, SD = 11.97) compared to the end of the intervention (M = 42.11, SD = 14.02), $t(8)$ = -2.79, $p < .02$. There was a significant decrease in overall anxiety scores from the start of the intervention (M = 94.33, SD = 22.50) compared to the end of the intervention (M = 80.89, SD = 26.38), $t(8)$ = -2.31, $p < .05$. There was not a significant change in general anxiety scores for the sub-scale of state anxiety (Y-1) from the start of the intervention compared to the end of the intervention.

Group Two (WLC). There were no significant changes from the start of the study to the mid-way assessment for the WLC group for both test anxiety and overall anxiety. There were no significant changes in test anxiety scores (overall and sub-scales) for Group 2 (WLC) music meditation group.

There was a significant decrease in general anxiety scores for the sub-scale of state anxiety (Y-1) from the start of the intervention (M = 56.33, SD = 10.95) compared to the end of the intervention (M = 46.17, SD = 11.04), $t(5)$ = -5.91, $p < .002$. There was a significant decrease in general anxiety scores for the sub-scale of trait anxiety (Y-2) from the start of the intervention (M = 58.33, SD = 11.55) compared to the end of the intervention (M = 48.83, SD = 12.59), $t(5)$ = -4.72, $p < .005$. There was no significant change in overall anxiety scores from the start of the intervention compared to the end of the intervention.

Sitting Meditation – Mindfulness

Group One. There was a significant increase in overall mindfulness scores from the start of the intervention (M = 60.50, SD = 8.19) compared to the end of the intervention (M = 69.00, SD = 9.42), $t(8)$ = 2.71, $p < .03$. There were

no significant changes in any of the mindfulness sub-scales for the sitting meditation group from the start of the intervention to the end.

Group Two (WLC). There was a significant increase in the mindfulness sub-scale of Describe from the start of the intervention (M = 15.18, SD = 4.47) compared to the end of the intervention (M = 18.27, SD = 3.55), $t(10) = 2.64$, $p < .02$. There was a significant increase in overall mindfulness scores from the start of the intervention (M = 73.00, SD = 10.93) compared to the end of the intervention (M = 82.27, SD = 16.54), $t(10) = 2.27$, $p < .05$. There were no significant changes in mindfulness sub-scales for Non-React, Observe, and Act with Awareness or Non-Judge for the sitting meditation group 2 (WLC) from the start of the intervention to the end.

Music Meditation – Mindfulness

Group One. There was a significant increase in the mindfulness sub-scale for Describe from the start of the intervention (M = 13.00, SD = 1.79) compared to the end of the intervention (M = 16.33, SD = 3.21), $t(8) = 2.35$, $p < .05$. There was a significant increase in overall mindfulness scores from the start of the intervention (M = 71.11, SD = 11.17) compared to the end of the intervention (M = 78.00, SD = 11.61), $t(8) = 2.71$, $p < .03$. There were no significant changes in mindfulness sub-scales for Non-React, Observe, Non-Judgmental and Act with Awareness for the meditation music group from the start of the intervention to the end.

Group Two (WLC). The overall mindfulness score according to the FFMQ did show a significant increase from the start of the intervention (M = 61.50, SD = 11.11) compared to the end of the intervention (M = 70.50, SD = 10.86), $t(5) = 2.81$, $p < .04$. However, there were no significant changes from the start of the intervention to the end of the intervention for the group 2 (WLC), music meditation group on any sub-scales of mindfulness.

DISCUSSION

The present study investigated how sitting meditation and music meditation may affect anxiety, test anxiety, and mindfulness in college students. These findings suggest that participation in a mindfulness practice, be it sitting meditation or music meditation, is potentially effective in reducing both test anxiety and overall anxiety levels in college students and increasing overall levels of mindfulness. Interestingly, the sitting meditation practices and music meditation practices produced differing significant outcomes in the sub-scales of mindfulness. This is something that should be investigated further in future research.

The current trends in mindfulness utilization for anxiety and test anxiety show promise (Bamber & Morpeth, 2019). These results suggest that mindfulness training could be an effective tool for working with college students to increase mindfulness. In turn, mindfulness may decrease overall anxiety and test anxiety through regimented training. It is recommended that college student counseling centers consider implementing a regimented mindfulness training program for students and utilize the described assessment measures to examine the results of these programs.

Speilberger and Vagg (1995) postulated that due to an interaction of the test takers interpersonal cognitions (i.e., the test takers internal dialogue) and cognitions of information processing (i.e., actively trying to process the information for test questions) that trait anxiety is exacerbated by the state of test taking, which produces test anxiety. Mindfulness practices delivered in a sitting or music meditation format seem to be effective in reducing not only generalized anxiety, but also test anxiety. Regarding effective coping with high levels of anxiety, this study's results

suggest that mindfulness training may be beneficial if used in counseling centers for students experiencing high levels of test anxiety. These practices were all delivered online via a distance learning platform. This format is cost-effective and can allow universities and counseling centers to make mindfulness practices more readily available to a large number of students with the potential benefit of reducing anxiety for their students. These practices could also be utilized in high schools to help students effectively cope with test anxiety before reaching college. The Carsley, Khoury, and Heath (2018) meta-analysis of 24 studies (n = 3977) on mindfulness interventions and adolescents found that overall mindfulness interventions were helpful, with significant small to moderate effects pre-post intervention compared to control groups. However, when Carsley et al. (2018) examined interventions delivered to adolescents (aged 15–18) that consisted of various mindfulness activity combinations, they observed the largest effects on mental health and well-being outcomes.

There is a paucity of research examining how music meditation may affect anxiety or levels of mindfulness in people (Dvorak & Hernandez-Ruiz, 2021). To our knowledge, there is no research on music mediation and test anxiety in college students. The most similar type of research found demonstrated that music being played during test taking may aid in reducing anxiety and test anxiety (Lai et al., 2008), but it was not specific to music meditation. However, influences of continued meditation music practice is lacking. This study is one of the first to utilize a randomized control trial (RCT) model in assigning participants to either a sitting mediation format or a music meditation format while also incorporating a WLC. The overall outcome of sitting and music meditation in reducing anxiety and test anxiety while increasing mindfulness for both groups explicates the promise that mindfulness can be developed or delivered in more than one format. The RCT and WLC format helps to reduce potential selection bias, as participants were not given an option of which type of mindfulness they would prefer. Future studies may want to investigate if mindfulness style preference is more synergistic to anxiety reduction and mindfulness enhancement.

The present study has several limitations. First, the scales used were self-report measures, which could have skewed results from over or under reporting. However, this is common in test anxiety and mindfulness assessments. Since there were no secondary gains from this study (i.e., the study was voluntary with no offered incentives), there were no motivating factors for students to over or under-report anxiety and mindfulness levels. This study's small sample size was a limitation and threatened reliability. However, the results are promising as we did not see changes in the WLC, and significant changes did occur when the WLC was introduced to the mindfulness intervention. Another limitation includes assigned mindfulness practice compliance. A > 95% compliance rate for mindfulness practice or music meditation completion was reported for all four conditions. The results also support that students likely did not lie about their practice completion rates, as there were significant decreases for both anxiety and test anxiety for both conditions. There were also no changes in scores for the WLC groups in anxiety and mindfulness. Significant increases of mindfulness for both groups would also suggest that deception of mindfulness practice was not occurring in these samples. It should also be noted that this one group design does offer threats to internal validity. It is recommended that future studies consider how reductions in test anxiety may actually affect GPA or test performance. Just because a student may be less anxious during an exam, does not necessarily mean they will perform better. However, considering the Yerkes-Dodson law (1908), we might expect to see academic performance increase as anxiety goes down. Future studies could also focus on site-specific test anxiety (e.g., are students more anxious before an exam of a class in their major versus a general education class?).

Despite these limitations, the present study makes important contributions to the literature on test anxiety, mindfulness, and the delivery of mindfulness practices. The results of this study also provide promise that mindfulness

can be manifested in different ways, as is not a one size fits all phenomenon. Future studies should continue to assess differences between a treatment, placebo, and control group in anxiety and mindfulness. In addition, future research might examine follow-up data to assess any lasting effects of mindfulness interventions. Finally, it may prove useful to assess the effect of this intervention on actual test scores and academic performance using GPA. The present results are only a beginning step into examining the effects of mindfulness training, whether through sitting or music mediation, on test anxiety and overall anxiety. Hopefully, these results will encourage more empirical research on mindfulness trainings and how it may benefit students with test anxiety.

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Author's Note

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