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Calm and Focused: Reducing Test Anxiety Among Elementary Students

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Calm and Focused: Reducing Test Anxiety Among Elementary Students

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Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Education

California State University, Monterey Bay

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REDUCING TEST ANXIETY

Calm and Focused: Reducing Test Anxiety Among Elementary Students

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REDUCING TEST ANXIETY

Abstract

Elementary school students are experiencing heightened levels of test anxiety which is blocking their access to learning. Practices such as art therapy, meditation, and mindfulness are rising in popularity as means for controlling and reducing anxiety. Recent studies have found success in using these practices with students to reduce test anxiety (Putwain et al., 2014; Cho, Ryu, Noh, & Lee, 2016). This study used a pre- and post-test quantitative quasi-experimental design to compare the levels of test anxiety between the treatment group ($n = 21$) who received an intervention of coloring while listening to a guided meditation before a math test, and the control group ($n = 18$), who received the math test without any intervention. After data were gathered in a six-week study, independent and paired samples t-tests were performed to determine if statistically significant differences arose between the two groups. The results showed the treatment group had slightly lower levels of test anxiety following the intervention, but not enough to prove that the intervention was directly related to lowering test anxiety. Recommendations for further work include using a larger sample size with more students who have test anxiety to increase statistical power.

Keywords: Test Anxiety, Stress, Meditation, Art therapy, Mindfulness, CBT, MCBT-C

REDUCING TEST ANXIETY

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Calm and Focused: Reducing Test Anxiety Among Elementary Students

Literature Review

Test anxiety among elementary school children is heightened due to the increase of high-stakes testing the students are experiencing (Larson, Ramahi, Conn, Estes, & Ghibellini, 2010). The United States uses high-stakes testing as an important factor in educational success and accountability (Segool, Carlson, Goforth, VonDer Embse, & Barterian, 2013). Parents and teachers alike witness the struggle students with test anxiety experience, but not many know what steps to take to help students reduce test anxiety and instead focus on test performance. Anxiety disorders in children falls short in research compared with adult anxiety, even though anxiety disorders have the earliest age of onset of all mental health disorders (Dubi & Schneider, 2009). High-stakes standardized tests are required by all states in the United States. As such, addressing test anxiety is a necessity for both students and teachers to ensure students have better access to their education.

Anxiety is described as a perceived notion of psychological distress, which occurs due to the expectation of a disconcerting and potentially threatening event (Larson et al., 2010). Test anxiety is a condition where an individual experiences anxiety in a situation, such as an exam and views it as threatening (Putwain, Chamberlain, Daly, & Sadreddini, 2014). Test anxiety is not an anxiety disorder, but rather an emotional reaction to the perceived threatening situation of taking a test; however, if students are not taught the skills needed to overcome the perceived threat, they are at risk of developing an anxiety disorder later in life (Cho, Ryu, Noh, & Lee, 2016). Students suffering from test anxiety experience psychological (e.g., emotions, beliefs), physiological (e.g., muscle tightness, shortness of breath), and behavioral (e.g., skimming through items) reactions (Segool et al., 2013). Approximately one third of elementary school

students are impacted by test anxiety and as a result may experience low self-esteem, lower grades, depression and other anxiety disorders (Carsley, Heath, & Fajnerova, 2015).

Test anxiety is often accompanied by autonomic arousal resulting in body changes such as having to go to the bathroom, sweating, and nausea. Those who have high levels of test anxiety are aware of these physical responses, whereas those with low test anxiety pay little or no attention to these body changes (Schnell, Tibubos, Rohrmann, & Hodapp, 2013). Schnell and colleagues (2013) found that females experienced a higher degree of test anxiety than males and that those with high test anxiety not only had poorer ability, but poorer study skills. This higher degree of test anxiety could potentially impact women's ability to enter into fields of study equal to their male colleagues. Lippa, Preston, and Penner (2014) studied occupational sex segregation in the fields of science, technology, engineering and mathematics (STEM) and found that women's participation was much lower than men. In their study that spanned occupations from 1972-2010, they found consistencies in male dominated occupations such as lawyers and physicians (Lippa et al., 2014), both test heavy professions. In a Canadian study of women and mathematics, Beaton, Tougas, Rinfret, Huard, and Delisle (2007) found that while the number of women pursuing post-secondary education was up, women who were going into fields of math or math-intensive fields such as engineering was down and continuing to decline. Results indicated that women had difficulty performing well on mathematical tasks when asked to answer questions in front of men. Thus, addressing test anxiety, specifically in math, will be valuable to improve the diversity in the field. However, the push for high-stakes testing remains and it starts in the early elementary grades.

Beginning in 2002 with the No Child Left Behind Act, states were required to formally test students beginning in third grade. This early introduction to high-stakes testing has

increased the anxiety of students beginning in elementary school (Hurley & Padro, 2006). Students in today's highly tested education system are experiencing pressure to perform and have fears about performing adequately (Larson et al., 2010). Furthermore, Segool and colleagues (2013) found that state testing programs increase student anxiety and stress and lower student motivation. Students experience an impairment of emotional stability and are unable to focus on the exam (Larson et al., 2010).

Students suffering from test anxiety may have difficulty overcoming adverse circumstances, experience an increased use of avoidant goals and academic self-handicapping in an attempt to avoid outcomes such as performing worse than peers (Putwain et al., 2014). Justicia-Giliano, Martin-Puga, Linares, and Pelegrina (2017) noted a negative correlation between math anxiety and math performance. They found that students with high anxiety may believe they do not have the skills to succeed in math; therefore, they might avoid math or put in less effort overall. Students experiencing test anxiety also experience impaired working memory capacity, which negatively impacts test performance (Cho, Ryu, Noh, & Lee, 2016; Justicia-Galiano et al., 2017). Working memory is the memory that the body is currently processing (Wright, 2013). Working memory is essential for problem solving and complex tasks and so if impaired through stress or worry, will directly affect a student's ability to solve mathematical problems (Justicia-Galiano et al., 2017). Furthermore, Carsley and colleagues (2015) warn that test anxiety left untreated may lead to future academic challenges for those students.

With the onset of test anxiety beginning as young as age seven, test anxiety prevention programs are encouraged to begin at school before fourth grade, when the anxiety truly affects the student's work (Yeo, Goh, & Liem, 2015). However, Yeo and colleagues (2015) found that there was limited research on the impact of intervention programs with elementary school-aged

children with test anxiety. Therefore, Yeo and colleagues (2015) set out to find if school based interventions could reduce test anxiety in children aged 9-12. Results revealed that over time, behavioral skills such as relaxation exercises significantly reduced test anxiety. The importance of Yeo and colleagues (2015) results reside in the ability to overcome test anxiety by teaching students to identify, and then cope with, the negative emotional reaction the body experiences due to test anxiety. Cho and colleagues (2016) found that it does not take much time to teach students the skills to overcome test anxiety. In their research, they found evidence that only three weekly mindfulness trainings were enough to reduce stress and test anxiety in students. In addition, Cho and colleagues (2016) noted that repetition could help build stronger synaptic connections in the brain, allowing one to rewire how the brain responds to stressors. Essentially, repetition in mindful breathing or other mindfulness expressions can change the way the brain responds to stressful situations such as test anxiety.

Studies show that general test anxiety can serve as a predictor to overall school performance (Carsley et al., 2015; Cho et al., 2016; Schnell et al., 2013). In the past decade, multimodal approaches including cognitive and behavioral approaches to reduce test anxiety have proven effective (Putwain et al., 2014). Relaxation training, a form of mindfulness, has been used to combat the effects of anxiety. Deep breathing and muscle relaxation are two specific forms of relaxation training that have proven to be useful in relaxing individuals in anxious situations (Larson et al., 2010).

Mindfulness

Mindfulness is a practice that allows participants to pay attention to their breathing, body sensation, emotion and cognition (Cho et al., 2016). A focus on deep breathing and muscle relaxation can help students steer their focus away from anxious thoughts and direct it to the task

at hand (Larson et al., 2010). When students are taught how to breathe effectively, they can train their bodies to respond to anxious situations with calmness and clarity (Larson et al., 2010).

Teaching students to self-monitor when they begin to feel anxious is necessary in order for self-relaxation techniques to be effective.

Practicing mindfulness helps people tolerate and deal with negative emotions effectively (Cho et al., 2016). Being the platform for test anxiety, schools are the place where relaxation techniques to reduce anxiety should be taught (Carsley et al., 2015; Yeo et al., 2015). Yeo and colleagues (2015) refer to an unpublished study in Singapore where sixth graders who were taught homework planning, breathing exercises, and systematic desensitization had reduced test anxiety. Additionally, Carsley and colleagues (2015) implemented a 24-week study on mindfulness where students and teachers were taught yoga, body scan, and attention to senses. Results indicated that student anxiety decreased and attention increased. In a study on student stress and mood, Scrimin, Mason, & Moscardino (2014) noted that negative emotions can impair learning performance. Scrimin and colleagues (2014) found that giving students a positive guided imagery following a negative experience resulted in reduction in stress and an increase in student performance. These findings reinforce the connection between mindfulness and reduction in anxiety and stress. Furthermore, Putwain and colleagues (2014) emphasize the use of multimodal approaches to reducing test anxiety as a way to increase the range of anxiety management approaches that can be offered to students. One approach that allows the student to focus on his/her emotions, which may lead to their anxiety, is called Cognitive Behavioral Therapy (CBT).

Cognitive behavioral therapy

CBT is a form of psychological treatment that helps the patient become aware of his or

her thinking and behaviors in order to change (American Psychological Association, 2019). CBT combines teaching relaxation techniques and exposure tasks, an activity that triggers the anxiety, with the cognitive processes tied to the anxiety (Yeo et al., 2015). This approach relies heavily on self-awareness of the anxiety a student is experiencing in order for it to be effective. For example, Larson and colleagues (2010) found that students could train their bodies in relaxation techniques rather quickly (i.e., five weeks). In addition, Cho and colleagues (2016) found that because test anxiety is not a disorder, but rather an emotional reaction to a threatening situation, it does not require long-term therapy or treatment to effectively reduce test anxiety. Results indicated that after three weeks of mindfulness training, students experienced a reduction of symptoms of anxiety and stress (Cho et al., 2016).

Short-term intervention is important for students because it can be taught in the beginning of the school year to be used throughout the year and in preparation for high-stakes testing. Relaxation techniques included deep breathing and guided relaxation for children (Larson et al., 2010). A different approach was a school-wide virtual attempt to reduce test anxiety (Putwain et al., 2014). In this study, the students participated in an online intervention that taught them to identify the anxiety and then offered relaxation techniques that could be used independently to reduce the anxiety as it occurred (Putwain et al., 2014). The intervention was effective and proved to be an alternate delivery method for school based relaxation and anxiety reduction that would not cost the school as much money as it would with face-to-face interventions with specialists (Putwain et al., 2014). Many of the test anxiety programs are aimed at students in higher education due to the amount of time and commitment needed for the intervention to be successful (Carsley et al., 2015). Children may be more open than adults when focusing on mindful activities as their attention is focused on, living in the moment (Carsley et al., 2015).

CBT or mindfulness alone may prove effective, yet some argue that together the results are increasingly powerful.

Mindfulness-based Cognitive Therapy (for) – Children

In an effort to combine mindfulness and CBT and focus the therapy on school-aged children, Cotton and colleagues (2016) conducted a study on the use of mindfulness-based cognitive therapy for children (MBCT-C), to determine if MBCT-C could serve as an alternative to the use of antidepressants. CBT focuses on changing the thinking of the students; however, including mindfulness would also help students become aware of thoughts, feelings and sensations in their bodies, viewing them as things that may or may not need to be acted upon. Cotton and colleagues (2016) also noted that there are limited tests that address combining mindfulness and cognitive therapy for use with children; most successful studies were done using adults suffering from anxiety and depression. However, studies that have been completed on children do show positive signs of success using MBCT-C on reducing anxiety in children by regulating emotions and teaching mindfulness (Cotton et al., 2016). Furthermore, Carsley and colleagues (2015) discuss a specific mindfulness activity that is recently being explored called *mindful art making*. This approach incorporates the physical and creative manipulation of materials of art making with the benefits of mindfulness meditation (Carsley et al., 2015).

Art therapy. Mindful art making is a specific type of mindfulness that incorporates the materials of art making with meditative aspects such as deep breathing and relaxation (Carsley et al., 2015). One form of art therapy is the coloring of mandalas, circular shapes that have a meditative use (Carsley et al., 2015). Coloring these symmetrical shapes combines both art therapy with mindfulness relaxation. Furthermore, art therapists believe that different art materials can bring out specific and significant feelings and behaviors in patients (Pesso-Aviv,

Regev, & Guttman, 2014). For example, pencils are considered the most controlled material, allowing creativity without emotional depth; whereas oil chinks are tied with high emotional involvement, which can either be positive or negative (Pesso-Aviv et al., 2014). Furthermore, oil chinks have been known to bring out behavior problems in children with special needs and can lead to a decline in self-esteem (Pesso-Aviv et al., 2014). While art therapy has proven to be a successful form of mindfulness, one should look to the experts in the field when choosing forms of art therapy to improve or change student behavior or anxiety rates.

Summary

Research shows connections between mindfulness, relaxation and art as means to reducing anxiety and stress in children; however, there is a lack of research that directly ties test anxiety reduction to the combination of mindfulness, relaxation, and art (Larson et al., 2010; Pesso-Aviv et al., 2014; Putwain et al., 2014). Students with test anxiety are preoccupied thinking about failing to perform well on assessments (Cho et al., 2016). If school is the place where test anxiety is conceived, and school is the place where test anxiety must be reduced; the classroom teacher must be equipped with the skills and tools necessary to help students reduce test anxiety daily so that they can perform appropriately on classroom, district, and statewide tests (Yeo et al., 2016). Reducing test anxiety in students can prevent students from performing poorly academically and can also prevent them from developing lasting anxiety disorders in their future (Cho et al., 2016).

Method

The purpose of this study was to see if test anxiety in elementary school students could be reduced through art therapy and mindfulness meditation. Research focused on anxiety in general is abundant, but there is limited research on the specific sub group of test anxiety (Larson et al.,

2014). In the United States, the push for academic success and higher graduation rates is soaring. Studies show that general test anxiety can serve as a predictor to overall school performance (Schnell et al., 2013). Being the platform for test anxiety, schools are the place where relaxation techniques to reduce anxiety should be taught (Carsley et al., 2015; Yeo et al., 2015).

Research Question

Does test anxiety in fourth grade students reduce over six weeks when given five minutes to color a mandala outline while listening to a guided meditation, “Peaceful Butterfly,” prior to taking a daily math quiz?

Hypothesis

Based on prior research (Carsley et al., 2015; Yeo et al., 2015), the current study hypothesized that coloring a mandala while listening to a guided meditation prior to taking a math quiz would reduce levels of test anxiety.

Research Design

For this experiment, a quantitative, quasi-experimental, two-group, pretest posttest design was implemented. Both the control group and the intervention group took a pretest. The experimental group received a guided meditation and coloring intervention before a daily math quiz. The control group received the standard instruction with no meditation intervention before taking a daily math quiz. Both the experimental group and the control group took the posttest on the last day of the study.

Independent variable. In this study, the independent variable (IV) was coloring the mandala (see Appendix A), an abstract circular design, for 5 minutes while listening to the guided meditation of “Peaceful Butterfly” (see Appendix B), a guided meditation created to relax

children. Support for this intervention was found in a Canadian study of coloring as a form of mindfulness in 4th-6th grade students (Carsley et al., 2015). Additional support was found in a study of mindful breathing practices for students with test anxiety (Cho et al., 2016).

Dependent variable. Test anxiety, defined as a psychological condition in which people experience extreme distress and anxiety in testing situations (Cho et al., 2016; Larson et al., 2010) was the dependent variable. Student test anxiety was measured using the Test Anxiety Questionnaire (Nist & Diehl, 1990), a 10-question test anxiety questionnaire (Appendix C). This self-reporting tool was used as the pretest and posttest in both the control group and intervention group to measure student anxiety levels.

Setting & Participants

The study took place in a suburban elementary school in Central California consisting of kindergarten through 5th grades (California Dashboard, 2018). At the time of the study, the median home price for this district was \$1.33 million (Zillow, 2019). According to the Student Accountability Report Card (SARC, 2018) the school had 27 teachers all of whom were fully credentialed in the area they were teaching. The school had zero expulsions and .5 suspensions from 2015-2018 (SARC, 2018). The average class size for grades 3-5 was 26.4 students and the average class size for grades k-2 was 21.4 students (SARC, 2018). There were approximately 550 students in the school of which 19% were categorized as socio-economically disadvantaged and 15% were categorized as English language learners. Additionally, 12.6% of students were students with disabilities, .04% of students were identified as homeless and .02% of students were foster youth. The school was 41.7% White, 23.4% Hispanic, 14% Asian, 2.7% African American, 2.2% Filipino, 0.7% American Indian, 0.5% Pacific Islander and the remaining 13.3% was a mix of two or more races (California School Dashboard, 2018). Two fourth-grade classes

were used for this study. This study utilized a convenience sampling, as the researcher was familiar with the school site, teachers, and the students assigned to the fourth grade classes. In total, 46 students participated in the study.

Treatment group. The experimental group consisted of 22 participants. The experimental group included 14 boys and 8 girls. Additionally, the experimental group included four English language learners, and two students with Individualized Education Plans (IEP's).

Control group. The control group consisted of 23 fourth-grade students. The control group included 12 boys and 11 girls. The control group included two English language learners, and four students with IEP's. One entire class received the intervention and the other entire class served as the control group, not receiving any intervention. All students took the pretest and posttest.

Measures

Test anxiety was measured using the Test Anxiety Questionnaire (Nist & Diehl, 1990) given as a pretest and posttest. This 10-item self-report scale was designed to measure if students experienced mild to severe test anxiety. Each item was scored on a 5-point Likert scale ranging from *never* to *always*: Never (1), Rarely (2), Sometimes (3), Often (4), and Always (5). Total Scores ranged from 10 – 50. Scores ranging from 10 to 19 showed low student test anxiety. A score ranging from 20 to 35 showed a moderate level of student test anxiety. A score ranging from 36 to 50 reflected a student with high test anxiety.

Validity. The pretest and posttest used for the study was the Test Anxiety Questionnaire (Nist & Diehl, 1990). It contained questions such as “I panic before and during a test” and “I have butterflies in my stomach before a test.” The Test Anxiety Questionnaire has been used in studies across several fields including measuring test anxiety among college level nursing and

technology students, as well as among adolescents at the secondary school level (Mathur & Khan, 2011; Hassani & Rajab, 2012; Abd el-Aziz, Eid, & Safan, 2012). Nist & Diehl's (1990) questionnaire was also used in a Nigerian study on test anxiety in students ages 14-18 (Olaseni & Olomosaye, 2018) as well as a second Nigerian study with participants ages 12-19 (Okundokun, 2011). Even though the test has not been used with elementary school children (usually aged 5-10), items are written using clear language and easy to understand vocabulary that students can relate to.

Reliability. Several factors prove the reliability of the questionnaire used for the study. The Test Anxiety Questionnaire (Nist & Diehl, 1990) shows internal consistency through a reported Cronbach's alpha value of .9 (Ogundokun, 2011) which indicates good reliability. Other studies have used the questionnaire and report high internal reliability $alpha=.86$ (Banka & Hyland, 2016). Additionally, the questionnaire was given to the students in their regular classroom setting, as they would be given any other test. The scale for the questionnaire were predetermined so there was no possibility of bias in scoring the questionnaire (Nist & Diehl 1990).

Intervention

Students in both the experimental group and the control group took daily math quizzes Tuesdays through Fridays. They had been taking these quizzes since the beginning of the school year. The intervention took place 10 minutes before the math quiz. Students in the intervention group were given a black line mandala page (see Appendix A). Students were directed to take out either crayons or colored pencils to use for coloring. They were instructed to color the mandala however they wanted, focusing only on the colors and shapes on the page. While coloring, students listened to a guided meditation called, "Peaceful Butterfly" (see Appendix B),

a short guided meditation written specifically to calm children. They were given 5 minutes to color and follow the guided meditation. At the end of 5 minutes, the timer chimed and they were asked to stop coloring and put their coloring materials away. Directly following the coloring activity, the math quiz began.

Procedures

Two separate classrooms participated in this study. One fourth grade class served as the treatment group and another fourth grade class served as the control group. Prior to a daily math quiz, both the intervention and control group were introduced to the Test Anxiety Questionnaire (Nist & Diehl, 1990; see Appendix B). They were informed that this questionnaire was not a test, rather a series of questions to see how they felt about taking tests. They were instructed that there was no right or wrong answer. Following the questionnaire, students in the control group continued with the scheduled math quiz without an intervention. Students in the intervention group were given their mandala to color while listening to the guided meditation before the math quiz. The timer was set and students had five minutes to color. Students were able to color as little or as much as they like and keep or recycle the mandala when the time was up. After the five minutes had passed, a bell chimed and the coloring and guided meditation stopped. Once materials were cleaned up, the math quiz began. Students continued this routine four days a week over the course of six weeks for a total of 24 interventions. After the completion of 24 coloring interventions, students in both the intervention group and the control group took the Test Anxiety Questionnaire (Nist & Diehl, 1990) again.

Data collection. During the first week of the study, both the treatment and control groups were given the 10- question pretest. Both groups participated in math instruction and took the same math content quizzes for six weeks. At the end of week six, both groups participated in

the posttest. The assessment had a potential high score of 50. Students answered 10 questions on a scale of 1-5 where 1 was a low measure of anxiety and 5 was a high measure of anxiety.

Students who scored under 30 were considered to experience normal levels of anxiety. Students who scored above 30 were considered to have higher than normal levels of anxiety and those near 50 were considered to experience high levels of anxiety.

Fidelity. The fidelity checklist (see Appendix D) ensured that the intervention group was coloring the mandala and listening to the guided meditation before every math quiz, four days a week for five minutes. The researcher observed the two classrooms, the intervention room and the control room, to ensure that the math quiz was given and that the intervention was being done correctly and that the control group was not doing an intervention.

Ethical Considerations

This study was conducted with teachers at a school site. Confidentiality was of the utmost importance and therefore student names were kept confidential and anonymous by using a coding system for both groups. Another ethical consideration was the impact on the students by doing this intervention. Students may have felt that taking time to color could have distracted them from the mathematical concepts. Following the study, materials were made available to the teacher of the control group so that she could offer the intervention to her group as well.

Validity threats. Some potential extraneous variables could have been that students might not have taken the pre- post- test seriously. Some might have thought that there was a “right” or “wrong” way to answer the test and sought out that answer instead of being honest. Time spent discussing that this pre- post- test was simply a way to identify how one feels about test taking hopefully reduced validity threats. Other potential validity threats could include the nature of the weekly math quiz as a low stakes test. High-stakes testing such as the California

Assessment of Student Performance and Progress (CAASPP) are publicly reported and tied to school funding and could cause higher levels of anxiety than classroom assessments (Segool et al., 2013). Another potential validity threat would be if the math unit was one that many students felt confident about the content and would naturally have less anxiety and therefore the results would not be valid. Additionally, teaching style and level of teaching experience could affect the student understanding of the concepts and could cause or reduce anxiety naturally.

Data Analyses

All data was entered into the Statistical Package for the Social Sciences® (SPSS®) for Windows, version 24.0.0 (SPSS, 2016). No names or identifying information was included in the data analysis. Before analyses were conducted all data was cleaned to ensure no outliers were present (Dimitrov, 2012). After cleaning the data, independent samples t-tests (control and treatment groups) and dependent samples t-tests (pretest and posttest) were conducted to determine the significant difference in test anxiety between the two means of the scores on the Test Anxiety Questionnaire (Nist & Diehl, 1990) from the pretest to the posttest. Further, before interpreting the analytical output, Levene's Homogeneity of Variance was examined to see if the assumption of equivalence had been violated (Levene, 1960). If Levene's Homogeneity of Variance was not violated (i.e., the variances were equal across groups), data was interpreted for the assumption of equivalence; however, if the variances are not equal across groups the corrected output was used for interpretation.

Results

Two independent samples t-test were conducted on the whole sample ($n = 45$ of total participants) for both the pre and post assessment scores. Results for the pre-test were: Levene's Homogeneity of Variance was not violated ($p > .05$), meaning the variance between groups was

not statistically different and no correction was needed and the t-test showed non-significant differences between the mean scores on the pre-tests between the two groups $t(37) = 1.31, p > .05$. This means there was no significant difference between the means on the pre-test for both the treatment and control group and they could be compared (see Table 1). Results for the post-test were: Levene's Homogeneity of Variance was not violated ($p > .05$), meaning the variance between groups was not statistically different and no correction was need and the t-test showed significant/non-significant differences between the mean scores on the post-tests between the two groups $t(37) = .789, p > .05$. This means there was no significant difference between the means on the post-test for both the treatment and control group and they could be compared (see Table 1).

Table 1

Results of Independent Samples T-Tests

	Mean	SD
Pre Test		
Treatment	22.43	8.65
Control	19.00	7.52
Post Test		
Treatment	21.29	8.34
Control	19.28	7.40

Note. SD = Standard Deviation

After determining the differences between pre and post assessment scores between groups, two paired t-tests were run for both groups (i.e., treatment and control) to determine if participants mean scores from pre to post were significantly different within each group (see Table 2). Results for each group were as follows: treatment group, $t(20) = 1.365, p > .05$; control

group, $t(17) = -.138, p > .05$. This means that the change from pretest to posttest was not statistically significant. Additionally, the negative t-value for the control group indicates an increase in scores from pre to post assessment. This indicates that the level of test anxiety went up slightly in the control group. While the mean decreased by 1.14 from the pretest to the posttest in the treatment group; however, the treatment group scores did not decrease enough to be statistically significant and provides only partial support that the intervention was successful (see Table 2).

Table 2

Results of Paired T-Tests

	Mean	SD
Treatment Group		
Pre	22.43	8.65
Post	21.29	8.34
Control Group		
Pre	19.00	7.52
Post	19.28	7.40

Note. SD = Standard Deviation.

Discussion

Public school has become a place of high stakes testing and students are experiencing heightened levels of test anxiety (Larson et al., 2010). Beginning in third grade, students spend several weeks taking tests that become the report card for student success in the country (Segool et al., 2013). Students who develop test anxiety are not adequately able to show what they know and find themselves consumed with worry, blocking their minds from retaining new information (Justicia-Galiano et al., 2017). Furthermore, test anxiety left untreated can allow true anxiety disorders to form in students (Cho et al., 2016). Several researchers have sought to find ways to

reduce anxiety in school aged children through activities including relaxation techniques such as yoga and meditation as well as using art such as coloring, painting and drawing. Research suggests that it is possible to train the body and mind to react positively to traditionally stressful situations such as taking a test (Cotton et al., 2016; Scrimin et al., 2014). Studies on overcoming test anxiety in elementary school students is limited; therefore, further research must be conducted to see if students could learn how to overcome test anxiety in school.

The purpose of this study was to see if coloring and listening to a guided meditation prior to taking a math test would reduce anxiety about the test. This study included 23 fourth grade students who took a daily math quiz traditionally (i.e., control group) and 22 fourth grade students who took a daily math quiz following a coloring activity and listening to a guided meditation (i.e., treatment group). Based on previous research (Carlsley et al., 2015; Pessó-Aviv et al., 2013; Yeo et al., 2015) the current study hypothesized that listening to a guided meditation and coloring prior to taking a math test would reduce test anxiety.

The results in Table 2 reveal that the treatment group did experience an overall lower level of test anxiety; however, the difference between the mean of the pretest and posttest is not statistically significant. Thus, the results do not fully support the intervention as a means to reduce test anxiety. Furthermore, the control group had a slight increase in test anxiety from pre to post test. These results were not consistent with the literature as the literature showed greater decreases in levels of test anxiety (Cho et al., 2016; Yeo et al., 2015).

In each group there were less than three students who scored above 35, the indicator of high anxiety on the questionnaire (Nist & Diehl, 1990). The results indicate that students in both the control group and the treatment group did not have high levels of test anxiety to begin with.

Individual results show a significant reduction in test anxiety for the treatment group in those few students who started out above 35, showing possible support for the intervention.

The findings were not consistent with the literature. Yeo and colleagues (2015) found significant reduction in test anxiety after three weekly sessions on mindfulness training in students aged 9-12. This study incorporated 24 interventions over six weeks. While the current study hints that the intervention could prove beneficial, future studies should be cognizant of limitations to the study.

Limitations and Future Studies

There were several noteworthy limitations in this study. First, the results revealed that the students involved in both the control group and the treatment group did not start out with significant levels of high test anxiety. In each group there were only three or less students who could be classified as “high” on the test anxiety questionnaire scale. Future studies should consider working with a larger sample size of students with high test anxiety, which would make results of the study more meaningful.

Another limitation was the fact that the researcher was a guest in both classrooms. The students did not have the rapport with the researcher that they would have with the regular classroom teacher. Teachers who consistently used the mindfulness techniques with their students might see more significant results than reported in this study. Additionally, the duration of the intervention would be a factor to consider as well. Consistent implementation of the intervention over an extended period of time (months rather than weeks) might produce relatively stable findings.

The last two limitations are teaching style and student need. As seen in the results, most students in this study did not have test anxiety to begin with and therefore did not need an

intervention. The two classes used in this study had two different teachers with different teaching styles and practices of interaction with students. Teacher stress was not measured, nor was the teacher's comfort level with the content she was teaching. Both are factors that could influence student self-reporting of anxiety.

Some students reported that the size of the mandala outline was troublesome; stating that they found themselves frustrated trying to color inside the lines. In their study on art mediums, Pessó-Aviv and colleagues (2013) discussed the different results they found in effectiveness of art mediums from pencil to paint. Future studies could offer more than one mandala and a blank paper as well that students could choose from for coloring, as well as different options for coloring materials (ie: crayons, pencils, pens) as to not increase anxiety over coloring in the lines and to offer more options for materials to use. Furthermore, by offering students choices the meditative practice may be more motivating to the students.

Ultimately the findings are positive for the field of education. As long as high-stakes testing continues to be a barometer for school system efficacy, students will suffer the impacts of test anxiety. Reducing test anxiety in the classroom creates opportunity for students to have better access to learning. While the results were not significant enough to report a direct relationship between the intervention and reduced test anxiety in students, the students discussed enjoying the coloring activity and the teacher reported that the students asked to color at other times during the day outside of the intervention. The intervention is simple and a strategy all teachers could incorporate into their daily routines; giving students who suffer from test anxiety one more tool to help reduce and potentially alleviate their struggle and provide full access to their education.

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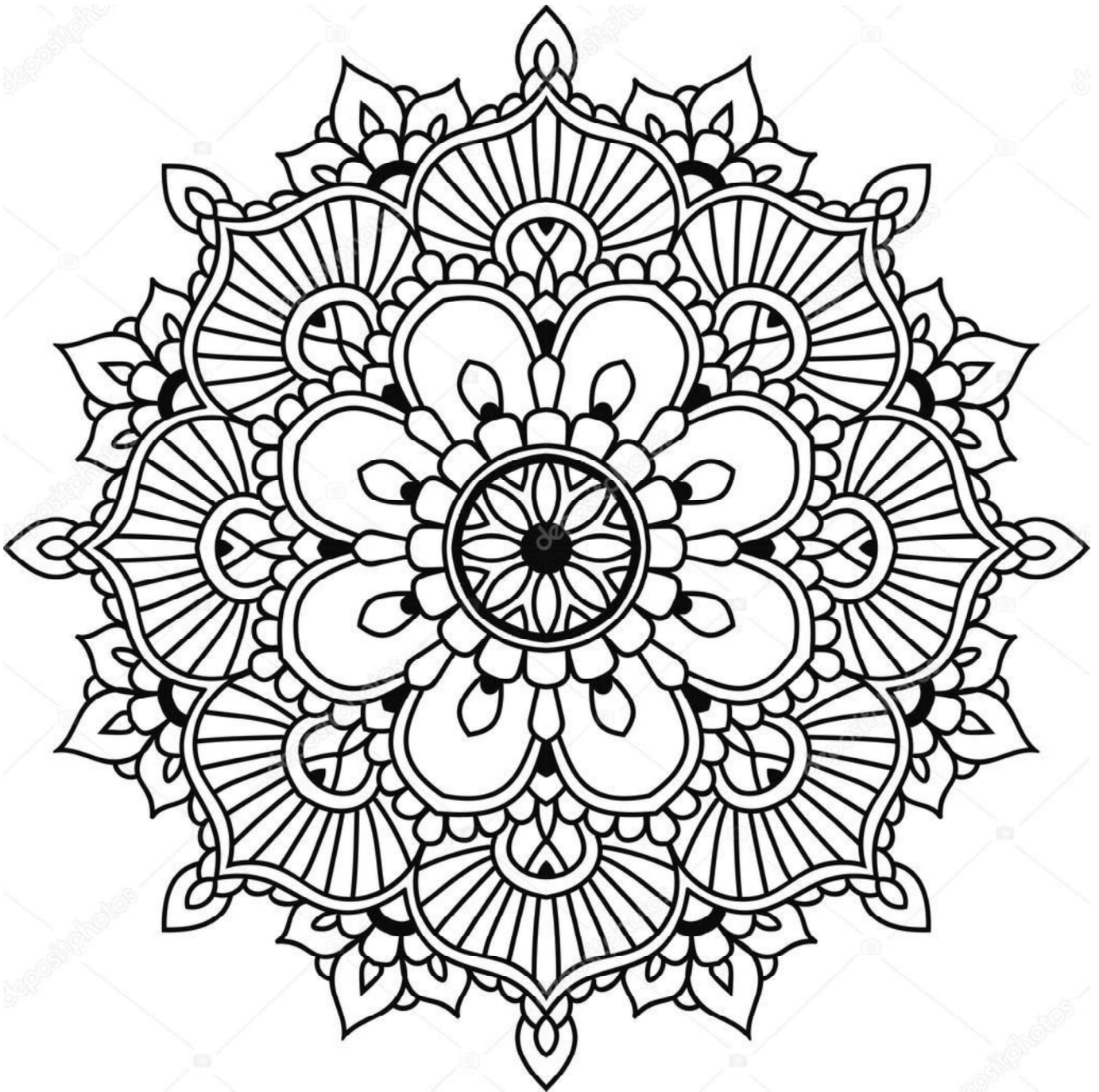
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Appendix A

This blackline mandala was given to the students to color.



Appendix B

This guided meditation was read to the students out loud while they colored. References to going to sleep were omitted.



"Peaceful Butterfly"

A nighttime relaxation for your child is ideal after an active day. Guided relaxation calms little bodies and minds. They'll fall asleep easily and sleep soundly. Simply read the following words in a loving, soothing voice with a gentle pace, pausing often. Watch how your child visibly relaxes and engages the imagination in this meditative story. The more this script is used, the easier your child will relax and be able to concentrate.

Close your eyes and take in a nice deep breath. Allow your tummy to fill up like a balloon, and then exhale slowly. Do this five times to really relax your whole body completely. (Pause for breathing.)

Your body begins to feel deeply relaxed and sinks down further and further into your nice, soft bed. Your legs begin to feel very heavy. Your arms begin to feel heavy and relaxed. You enjoy every moment as your body continues to relax with each word I say.

Now as your body relaxes, imagine you're a beautiful butterfly fluttering high in the sky. You see the lovely green valley below you with lots of colorful flowers, just waiting for you

to enjoy. You feel the wind blow against your delicate wings. As the wind touches you, it gently blows away any worries, any stress you feel. Feel how wonderful it feels to be so free. Your mind is clear and calm. You have left any worries far behind now. You are completely peaceful. You are beautiful as you allow your true happiness to shine through.

The sun touches your body and warms you. The big, puffy clouds floating in the sky remind you how relaxed and calm you can be whenever you want, just by thinking about it. The earth is a patchwork of color and you enjoy each moment here, gliding along feeling so joyful and peaceful. You spread your wings far and stretch. It feels so good. Your body is calm and your mind is peaceful. You are ready for wonderful peaceful sleep tonight.

Take in a deep breath now and exhale slowly. When you are ready, give your body a big stretch. With a clear, calm mind, say these words to yourself: I am peaceful and I am calm, ready for a wonderful adventure in dreamland.

Good night little one.

Appendix C

TEST ANXIETY QUESTIONNAIRE

Nist and Diehl (1991) developed a short questionnaire for determining if a student experiences a mild or severe case of test anxiety. To complete the evaluation read through each statement and reflect upon past test experiences. You may wish to consider all testing experiences or focus on a particular subject (history, science, math, etc.) one a time. Indicate how often each statement describes you by choosing a number from one to five as outlined below.

Never	Rarely	Half-time	Often	Always
1	2	3	4	5

___ I have visible signs of nervousness such as sweaty palms, shaky hands, and so on right before a test.

___ I have "butterflies" in my stomach before a test.

___ I feel nauseated before a test.

___ I read through the test and feel that I do not know any of the answers.

___ I panic before and during a test.

___ My mind goes blank during a test.

___ I remember the information that I blanked on once I get out of the testing situation.

___ I have trouble sleeping the night before a test.

___ I make mistakes on easy questions or put answers in the wrong places.

___ I have difficulty choosing answers.

Now add up your score on all the statements. Scores will range from 10 to 50. A low score (10-19 points) indicates that you do not suffer from test anxiety. In fact, if your score was extremely low (close to 10), a little more anxiety may be healthy to keep you focused and to get your blood flowing during exams. Scores between 20 and 35 indicate that, although you exhibit some of the characteristics of test anxiety, the level of stress and tension is probably healthy. Scores over 35 suggest that you are experiencing an unhealthy level of test anxiety. You should evaluate the reason(s) for the distress and identify strategies for compensating.

