

Northwestern College, Iowa

NWCommons

Master's Theses & Capstone Projects

Education

Fall 2023

Improving Students' Assessment Performance by Reducing Stress and Anxiety in the Testing Environment

Andrew Soelter

Follow this and additional works at: https://nwcommons.nwciowa.edu/education_masters



Part of the [Education Commons](#)

**Improving Students' Assessment Performance by Reducing Stress and Anxiety
in the Testing Environment**

Andrew Soelter

Capstone Project: An Action Research Project

Northwestern College, Orange City, Iowa

Abstract

The driving focus of this action research was to better understand how teachers and school districts can help with students' anxiety and stress surrounding assessments. This better understanding of anxiety and stress is crucial to improving academic performance not only on assessments but also across their academic life. A quantitative study was conducted with 88 students spread over two unique content types. 30 students were part of the control group, and the rest of the students were split between one of four different interventions which attempted to reduce students' assessment anxiety and stress to lead to performance increases. The results showed mixed results, the interventions over the course of the semester didn't show significant impacts to assessment performance. However, some variables on their own had significance across the semester. Which indicated that certain assessments or classes were significantly different. This action research concludes that more research should be conducted into individual interventions across long periods of time as well as having students research and learn about reappraisal and coping methods of anxiety and stress to better serve them longer term.

Keywords: anxiety, stress, breathing techniques, motivational messages, music, assessment, high school, reappraisal

Table of Contents

Abstract.....	2
Introduction.....	4
Literature Review	6
Defining Assessment Anxiety and Stress	6
Physiological Effects of Assessment Anxiety and Stress.....	8
Coping and Reappraisal of Assessment Stress and Anxiety.....	10
Strategies for Assessment Anxiety and Stress	13
Methodology.....	17
Participants and Research Site	17
Intervention & Timeline.....	19
Anticipated Statistical Analysis	20
Data Collection.....	20
Data Analysis.....	21
Discussion	25
Summary of Major Findings	25
Limitations	27
Future Research.....	29
Conclusion	30
References.....	32

Improving Students' Assessment Performance by Reducing Stress and Anxiety in the Testing Environment

A major problem in education today is the intense levels of stress and anxiety students face in academics but especially around an assessment. Both former and current students know the extreme pressures, stress, and anxiety an assessment can bring. Many students experience mild or severe assessment anxiety. This large student population who suffers from stress and anxiety faces lower academic performance (Almasudi & Elbedour, 2019). Using a survey of 358 teachers in 27 Australian schools, Headly & Campbell (2013) identified how harmful anxiety and stress can be for students beyond just lower academic performance: children suffering from anxiety experience complications with relationships and normal psychological functioning.

This harmful stress and anxiety exists around many aspects of academic life but is ripely situated around assessments. As students progress through the grades, students are made aware of the increasing consequences of assessments. Over two semesters Brady et al. (2018) conducted a study of 431 students in an intro level psych class where 55% of those students were first-year college students. Researchers used questionnaires and a control or intervention message prior to exams to get students to reappraise their anxiety and stress. The researchers identified the awareness of increased pressures faced as students move up the academic ladder and students' desire to do well on tests leads them to experience anxiety.

For too long, teachers have been told to prepare students for in-class assessments and standardized testing using ineffective and even harmful anxiety and stress reduction strategies. Brady et al. (2018) highlighted two ingrained strategies used to reduce stress and anxiety. Students are told or coached to ignore their stress and anxiety or to just "calm down" prior to assessments. These approaches to stress and anxiety reduction around assessments are overly simplistic and perpetuate a view of anxiety and stress that is negative in nature and harmful

towards one's performance. Headley & Campbell (2013) point out that teachers are in a uniquely situated position to address these misinterpretations and harmful reduction strategies of anxiety and stress in academics. However, they acknowledge that currently teachers have little training on anxiety and stress; it will take time for proper training and strategies around addressing assessment stress and anxiety. Meanwhile, students in classroom environments are still negatively experiencing stress and anxiety, which harm students' assessment performance.

The purpose of this action research is to assess several techniques and strategies found in current research aimed at reducing and reframing stress and anxiety in students so positive effects in assessment performance can occur. With plentiful research showing a substantial number of high school students being affected by stress and anxiety around assessments, it is vital to understand the complexities around anxiety and stress. The author, having a student population which consists of this largely affected group of students, conducted this action research to test the impact of several interventions around the area of assessment anxiety and stress.

Research for this literature review used the DeWitt Library at Northwestern College in collecting peer-reviewed research within the last 10 years focused on assessment stress and anxiety. The focus was on finding journal articles that included students who were in upper high school or new to college level due to their proximity in age to the author's students. The targeted age-level review allows acquiring reasonable information and strategies appropriate to the age level of the author's students. Twenty research articles have been selected based on these considerations, information discussed in the following literature review.

Review of the Literature

Defining Assessment Anxiety and Stress

The impact of anxiety and stress on student assessment performance has been professionally researched. Research seeks to clarify and understand what anxiety and stress is. Brady et al. (2018) began their research by acknowledging many students and teachers are aware of the existence of anxiety and stress on a basic level; however, many do not understand current ingrained beliefs and attitudes towards anxiety and stress have been flawed and in many cases, cause harm to students and their performance. They focused on what they saw to be the two main components to assessment anxiety: emotionality and worry.

This aspect is a narrower version of anxiety than what Headly & Campbell (2013) defined as the components of assessment anxiety, while also finding similarities in the issues of current attitudes and actions towards student anxiety. The components Headly & Campbell (2013) highlighted are beyond the cognitive aspect of anxiety, namely behaviors, emotions, physiological responses, and relational aspects. Even with this broader definition, teachers in Headly & Campbell's study recognized only the emotional aspects of anxiety in students; the other components were much lesser known or acknowledged.

A broader definition of anxiety is further supported and expanded on by Myrto et al. (2020), who identified the same components as Headly & Campbell (2013). In a study of 68 primary students in a school in New South Wales, Australia, an intervention group took part in ten minutes of group physical activity prior to an assessment. Examining components of anxiety, the researchers found that there was more than just an emotional component of anxiety; the broader definition was supported. They focused on the physiological component of anxiety and assessments. Whereas with their limited population they could not find a correlation of their intervention strategy with improved student performance, they did show students could be

classified as low or high anxiety. The students who were in the high anxiety group showed negative outcomes on assessments compared to those in the low anxiety group. These findings allow for a broadening of the definition of anxiety beyond an emotional component.

Other studies confirm that student anxiety levels affect their assessment performance and grades. In their review of 60 years of anxiety and stress research, Almasudi & Elbedour (2019) found several studies noting that anxiety and working memory are closely related when it comes to performance. They noted several non-emotional interventions affecting student anxiety. They also established several components of anxiety and stress can become worse during an assessment, often decreasing performance as an assessment wears on. Student anxiety and stress can lead some students to engage in avoidance behaviors prior to an assessment, behaviors that can further raise a student's anxiety about their performance David et al. (2023). This avoidance can place them in a situation where their own anxiety creates a vicious feedback loop into the future.

David et al. (2023) found in their 30-year review of anxiety and stress research many of the researchers' and teachers' focus has been placed on anxiety and not enough has been placed on stress. Researchers and teachers must not forget the pressures and stress of the upcoming assessment where we need to rethink anxiety and stress as one but rather stress can be considered separately from anxiety. The researchers argue anxiety is merely a component of stress; the words are often used interchangeably without understanding that relationship. People use stress as a catch all for negative emotions, but these individuals also need to include the positive emotions of the situation (David et al., 2023). Stress occurs under potential moments of pressure or harm, offering the potential for a positive or negative response to the situation. They argue individuals experience stress as either challenge or threat: challenge is seen when the individual believes they have the resources to respond, and the individual becomes threatened when the

opposite is true. It should also be said that beyond anxiety there are other emotions at play for individuals, such as hopelessness or even disappointment. Anxiety as an emotion is usually in reference to an individual perceiving a threatening outcome (David et al., 2023).

The ability for teachers to write good assessments and accurately assess student progress is critical as school systems need data not affected by anxiety. This accurate data and information can help school systems respond appropriately to student learning and make decisions that allocate scarce resources to their best use (Almasudi & Elbedour, 2019). Teachers need to be attentive to students' anxiety and stress all while being increasingly aware of and capable of understanding and responding to the many components beyond emotionality, finding and reviewing strategies to address the many components of anxiety and stress during assessments.

Physiological Effects of Assessment Anxiety and Stress

The research surrounding assessment anxiety and stress has long documented the many effects anxiety and stress can cause on the individual. When students face an assessment, they are determining the risk to themselves due to the assessment. Aranberri-Ruiz et al. (2022) studied 585 primary students using weekly 15-minute breathing sessions over the course of five weeks, data that supplied insight into the body's physiological response caused by anxiety and stress created from the upcoming assessment. Stress causes the body to jump into action automatically. This effect has a greater intensity in the young because they have less ability to control their reactions and response to the body's actions. Aranberri-Ruiz et al. (2022) show this response affects the heart. While the body's responses to stress and anxiety are automatic, individuals still can have a direct effect on their (HR). Heart rate and variability of the heart rate (HRV) have been found in research to hold an inverse relationship. This inverse relationship allows individuals to directly affect their heart rate through HRV by promoting through purposeful actions a longer period between heart beats. Individuals can promote HRV change when they can

react to stress and anxiety in a more positive way, thereby reducing the body's response to anxiety and stress. Several studies, including Eyüboğlu et al. (2021), shows the body's anxiety response to an assessment includes not only significant heart rate changes, but also a rise in students' blood pressure. These effects on the heart and blood pressure could be lowered through interventions.

Nihal et al. (2019) discusses how students' overall health can be affected by stress and anxiety revolving around academic assessments. This health effect can stunt academic success while also severely affecting students' mental health. Stress from assessments also led subjects to experience severe fatigue. Stress was also found to affect the capacity of the working memory and speed of cognitive processing in students as more of their thoughts revolved around stress and anxiety.

In a review of over 20 years of research in the medical field, Muzychenko et al. (2018) confirm the experiences from above and describe additional detrimental health effects from stress and anxiety, such as cardiovascular disease, asthma, and depression. In a Yale School of Medicine study of 93 second-year students taking three separate surveys and anxiety scales, the participants reported sleeping difficulties and appetite loss. Some developed unhealthy habits due to the anxiety and stress developed around assessments (Encandela et al., 2014).

There are also long-term health effects of stress that occur under more chronic conditions. Stress leads to higher risk of mental and physical detrimental effects such as depression and chronic pain. Nihal et al. (2019) conducted a longitudinal study involving 200 first-year and second-year university students. These students filled out several questionnaires one month prior and one month following university assessments. The researchers argue because of the multitude of research finding wide-ranging detrimental health and academic effects to students because of stress, teachers and researchers need to develop a multitude of strategies and interventions that

can lower students' levels of anxiety and stress, thereby minimizing possible mental health and academic damage (Mojarrab et al., 2020). In a quantitative one-year-and-three-month long study of 76 nursing students at an Iranian university, an anxiety and stress questionnaire was administered along with six separate coping strategy sessions and post-assessment surveys. The researchers found a relationship between anxiety levels and academic performance on assessments. This finding was paired with finding a way to reduce anxiety in students to improve their performance. The ability to reduce anxiety, as found by Mojarrab et al. (2020) and Eyüboğlu et al. (2021), showed the body's responses to stress and anxiety can be influenced. This ability to reduce the stress and anxiety caused to students gives promise to Nihal et al.'s (2019) findings that reduction in stress and anxiety while boosting academic performance is achievable.

Coping and Reappraisal of Assessment Stress and Anxiety

The goal of assessments is to give teachers a highly valid and reliable way to gauge student learning. Given the documented effects of stress and anxiety on students' wellbeing and academic performance, it is reasonable to conclude that assessment results may be negatively affected by stress and anxiety. The ability to reduce the harmful effects of stress and anxiety while boosting academic performance has been shown in many studies. Two methods well studied for reducing assessment anxiety and stress prior to the assessment date are student reappraisal and coping techniques.

Having individuals look at something in a new light or reexamine an idea is reappraisal. Brady et al. (2018) found when students were given a message prior to the test dedicated to student reappraisal, first-year college students performed better than their non-intervention peers. This academic performance gain held true when the end-of-the-year grade was compared between the two groups of students. Those receiving the reappraisal message showed significant

gains in performance and drops in students' levels of worry. Hyunju et al. (2016) studied 36 highly anxious students from a psychology class in South Korea. They had these students over the course of three weeks go through six separate self-reappraisal sessions. The students who went through reappraisal had significantly decreased levels of anxiety compared to the control group, results that support the findings of Brady et al. (2018). Furthermore, in research done in a large midwestern high school over the course of one full academic year, involving 1175 ninth grade science students, researchers tested four types of expressive writing and reappraisals of anxiety and stress (Rozek et al., 2019). This research concluded reappraisal intervention for students helped students regulate emotions better but also improved performance on tests as well as passing rates in classes. With how much emphasis today is placed on closing achievement gaps, it is important to note the research of Rozek, Ramirez et al. (2019), who focused on improving the socioeconomic and racial gaps through reappraisal. Harris et al. (2019) studied 1140 introductory biology students at the University of Washington using reappraisal homework. An expressive pre-test question studied reappraisal of anxiety to close the gender gap in STEM. In contrast to other studies, Harris et al. (2019) found reappraisal through homework did not change how students post intervention self-identified anxiety compared to prior to the intervention. However, they showed no matter the gender, students who received the reappraisal intervention performed better on assessments. This performance increase is an important finding, showing how students who can reappraise their anxiety and stress surrounding assessments can perform better than peers who let anxiety and stress weigh them down. Reappraisal's ability to reduce anxiety and stress has been mixed in research studies, but reappraisal of anxiety and stress in students has shown repeatedly students improving their assessment scores and overall academic performance.

The second method used prior to assessments to reduce anxiety and stress while increasing academic performance is the use of coping strategies. Coping requires students to adopt certain behaviors and/or physiological strategies to reduce anxiety and stress. Nihal et al. (2019) identified two types of coping strategies, active and avoidant. The use of active strategies were used by students more often than avoidant. Because all coping strategies were significant in their academic impacts, active strategies should be prioritized for students while students warned of the avoidant strategies (Nihal et al., 2019). Building on these findings, Mojarrab et al. (2020) studied an active coping program where multiple active strategies were used with students. Students who were part of the coping intervention group had both reduced levels of anxiety around assessments and better performance on said assessments. While there is plenty of evidence showing active coping strategies' worthiness for students when it comes to reduction of anxiety, stress, and improvement of academic performance, Encandela et al. (2014) found several coping strategies students employed in response to assessment anxiety had mixed results. Students with no training or education around several of these techniques may not have implemented them properly or may not have picked proven strategies. How much education and training students have on these significant strategies is of concern. Students facing assessment anxiety and stress are unlikely to spend significant and valuable time looking for research-based strategies and how to implement them properly. A teacher can have a role in the facilitation, training, and education around significant coping strategies for students' consideration during and around assessments.

Strategies for Assessment Anxiety and Stress

The impact that teachers can have in affecting their students' assessment environment and the related anxiety, stress, and performance is both crucially important and potent. Many strategies have been studied for reducing anxiety, stress, and improving outcomes. Three

strategies, in particular, can positively influence students' assessment environment: breathing techniques, music, and self-efficacy/encouragement/motivation.

Researchers studying the body's responses to breathing techniques are quick to point out how the heart rate (HR) can be affected by many things, such as anxiety, stress and even heart rate variability (HRV). Researchers have linked anxiety and stress with heart rate while separately linking a change in (HRV) to (HR) change. The next question the researchers tackled was if an adjustment to (HRV) can affect students' anxiety and stress levels. According to several studies, an adjustment to HRV can reduce student anxiety and stress just like (HR). Aranberri-Ruiz et al. (2022) showed primary students who took part in controlled breathing exercises could impact their HRV, consequently reducing the anxiety and stress students' were experiencing. Training students to control their breathing down to six breaths per minute changed their state environment and allowed them to better cope with the stress and anxiety that had set off the autonomic responses in their bodies. The findings are in line with Hyunju et al. (2016), whose study showed the same significant positive effects of breathing control on students' assessment anxiety and stress. It was also shown that breathing control significantly raised students' positive self-thoughts more so than cognitive reappraisal.

To show that not only primary students would be affected by controlled breathing exercises, there needs to be evidence that a wider range of ages can be affected. In a clinical environment, nine medical patients with a large age range with treatment-resistant clinical anxiety were trained in breathing control to reduce anxiety. Over twelve weeks, these patients were seeing significant improvement in their levels of anxiety even though they reported being skeptical at times of simple breathing techniques impacting their anxiety (Nupur et al., 2019). Breathing techniques are easy enough to teach medical patients, college students, and young

primary students. The benefits in reducing anxiety through breathing techniques are shown across all age levels.

Finally, what is the most effective way to train students to reduce their anxiety in an assessment environment? Bouny et al. (2023) found guided breathing was most significantly effective through both visual and haptic feedback given to subjects. Unfortunately, schools are constantly in a funding crunch and would not be able to invest in visuo-haptic feedback devices for breathing techniques to reduce stress and anxiety during or prior to assessments. However, Bouny et al. (2023) showed the traditional visual feedback methods of guided breathing are still significant in their impact, which for schools and their tight budgets is still a net positive for addressing students' assessment stress and anxiety.

Music has been touted as a way that people can emotionally connect as it provides focus and reduction in stress. Researchers looking into music's effects on individuals have found variable effects. Eyüboğlu et al. (2021) followed 125 Turkish nursing students over the course of one semester. They researched music therapy sessions prior to assessments, finding students' anxiety levels were not significantly impacted when comparing intervention and control students. Both groups had higher levels of anxiety directly following the assessment, showing that the music therapy had not reduced anxiety. However, students who engaged with music and breathing prior to the assessment had lower blood pressure. A portion of these students reported feeling more comfortable and less stressed prior to and during the assessment due to the music therapy sessions.

Music research was also conducted on athletes because many individuals consider sports an assessment of skills. Decreasing the anxiety and stress of the athlete could increase performance. Wang et al. (2020) conducted a study of 20 participants at a sports training facility in Taiwan. These golfing participants took surveys and were randomly assessed on three

different interventions around music and performance in sessions two to three days apart. The researchers found golfers listening to music before being assessed had a lower level of anxiety than golfers who did not have music before being assessed. Even though Wang et al. (2020) were not able to find significant performance gains in golfers, this study creates more understanding about individuals and how they are somewhat affected by music. To build further understanding and show the effect of music on individuals, Hennessy et al. (2021) surveyed 589 people in four separate countries while also using five public questionnaires around health, music, and the Covid pandemic. The researchers found individuals who use music were able to alter their mood in a positive direction. Those feeling most at risk in their current state showed greater mood improvement following the use of music. So, while performance gains are not as clear or significant as controlled breathing when it comes to regulating stress and anxiety with music, it is shown that music can improve the emotional state and anxiety levels of individuals.

Students need to be encouraged and motivated both externally and internally. Students may start to develop self-efficacy when given the right encouragement from others. Putwain et al. (2023) uses the definition of academic buoyancy not as resilient to academic adversity but rather the proactiveness of students to manage their upcoming adversities. This internal motivation has been shown to reduce assessment anxieties (Putwain et al., 2023). Furthermore Encandela et al. (2014) had several students discuss how anxiety took over their thoughts and emotions prior to and during assessments. The ability for students to harness self-efficacy and academic buoyancy is crucial to reduce anxieties surrounding assessments and free up their cognitive and emotional capacities. Academic buoyancy and self-efficacy go hand in hand: not only would students be more aware of upcoming challenges and sources of anxieties but would be more confident in their skills and abilities to overcome those challenges.

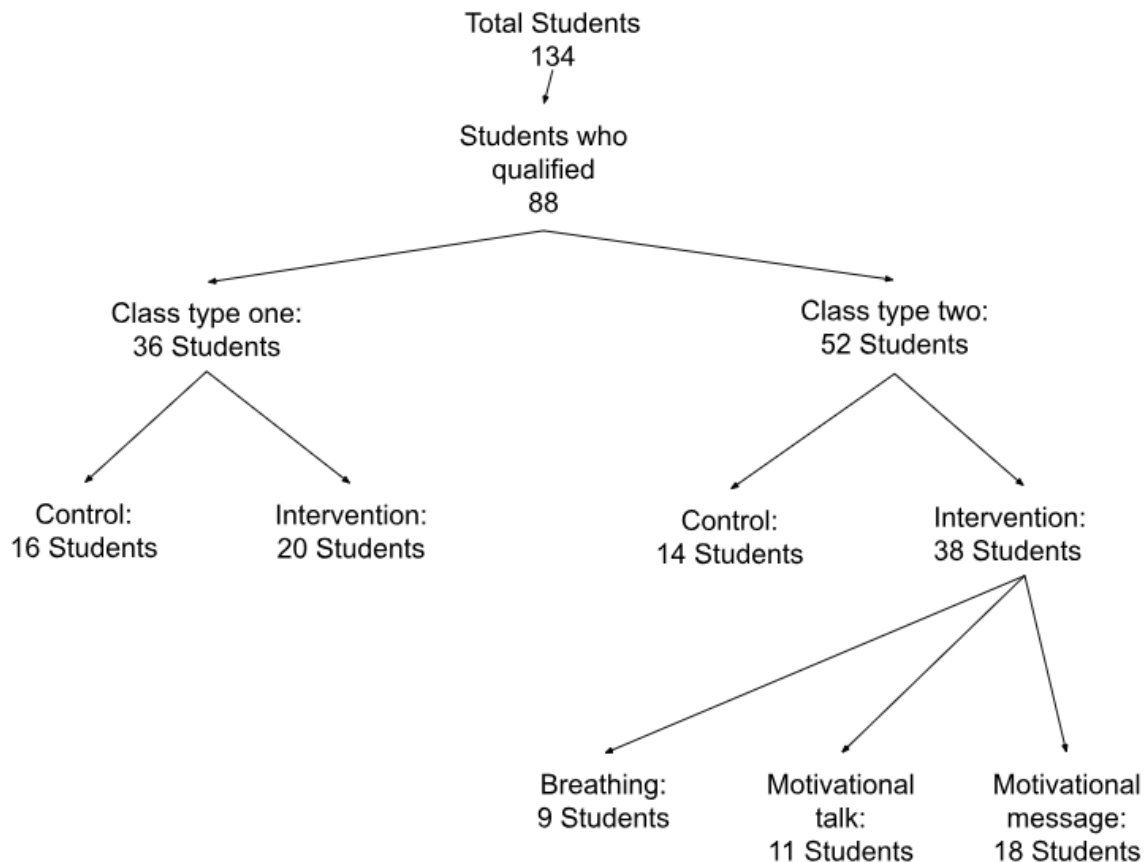
Looking specifically at self-efficacy, how can motivational messages impact students? When researchers split a university with 15,539 students into near 50-50 control and experimental groups, the experimental students were sent an encouragement message prior to the exam. The message was shown to boost their self-efficacy, and students had a temporary boost to their motivation levels (Tamás, & Péter, 2021). The ability for even a simple encouragement message to not only boost motivation but self-efficacy in students shows an opening to explore. Can a motivation message on assessment day provide a boost to students in their motivation and self-efficacy while potentially reducing their assessment anxieties? Tamás, & Péter (2021) suggest motivation messages by teachers could contribute to a more buoyant and self-efficacious environment for students.

Methodology

Participants

This action research was conducted in a large midwestern high school, The students involved in this study ranged from tenth through twelfth grade. There were 134 students across six different classes separated into two unique content types that were studied in this research (see Figure 1). However, only 88 students took all three assessments within the baseline environment or intervention properly. Within this group of students there were 57 males, 32 females, two ninth graders, 34 tenth graders, 43 eleventh graders, and nine twelfth graders. All students with IEPs, 504 assessment specific accommodations, or EL designations were removed from the research group as they do not take the assessments in the classroom environment where the interventions were being tested. Four students caught cheating on one of the assessments were also removed from the data set.

Figure 1

Student participants breakdown**Procedures**

Each assessment used in this action research took most students 35-45 minutes to fully complete. The three assessments of each class type used in this action research covered different units of material making each assessment unique from the others: each of the six total assessments across the two class types were designed and refined over the last eight years of teacher collaboration and data tracking to produce the most reliable and valid assessment of each of the course types standards possible.

This research took place over the course of just under three months with data being collected from each of the three assessments during that time. Data was stored in the Learning Management System that the school district supports for student information safety until it could be determined which students qualified for data analysis. Then student assessment data was anonymized and put into a pre-made spreadsheet for analysis. This process followed the plan developed and approved in an IRB Exemption to protect the students.

Interventions

There were four interventions tested across the approximately three-month period of the action research. The first intervention was a teacher-led breathing exercise lasting one to two minutes in length about five minutes prior to beginning the assessment. Students would also pick one of three breathing shapes to use to help keep their breathing at the correct pacing. The second intervention was the addition of light background classical music during the assessment. The music faded in from mute over the course of five minutes at the beginning of the class period; by the time the assessment instruction had been given and students were beginning their assessments, the volume was at its set level. The third intervention was an interactive motivational message given to the students about five minutes prior to the assessment. Each motivational message given was approximately one minute in length and consisted of a quick reappraisal of the anxiety and stress students might be feeling at that moment and also an upbeat section full of belief and success. The final intervention was similar to the motivational message; however, it was written and sent out the day before an assessment to students via the learning platform their class is active on. The motivational message focused mostly on reappraising the anxiety and stress they would be feeling on assessment day or even at that moment. That reappraisal part of the message mentioned research showing anxiety and stress could be used as a positive for performance rather than a negative. Lastly the message also had a positive message

about the author's belief in each of them. Each of these interventions was limited to a single class for the final two of three assessments taken in the period.

Anticipated Statistical Analysis

The data collected during this action research was analyzed using an unbalanced multifactorial ANOVA test. The ANOVA test lets the researcher explore associations between the multiple variables at play during the action research. An ANOVA results in a p-value output that allows the researcher to determine the significance of the interaction in the data. The researcher used a significance level of .05 and outliers included in the ANOVA tables. Unfortunately, the researcher had to use an unbalanced test because the data set was uneven. It became uneven after the removal of students who did not qualify for the research.

Data Collection

The data collection for this action research project focused on collecting quantitative data. This process entailed creating spreadsheets for proper organization of student assessment data in a method that would protect their identities. The author used these spreadsheets to record student assessment data according to student group, the control group or one of the intervention groups. This centralized all data from the multiple student assessments that were taken over the course of the action research as well as organized all authors notes and observations associated with each assessment taken or individual students. The spreadsheets included data detailing which students were not present for the interventions and/or baseline assessment or had disqualified themselves from the data set in other ways to reduce the amount of data needed to be added and anonymized into the spreadsheet.

Data was collected on three assessments that students took during the first three months of the fall 2023 semester. The first of these assessments established a baseline for each student. The two following assessments taken about one month apart starting at about one month post the

baseline assessment were collected for analysis against the baseline. Each assessment consisted of several multiple-choice questions and a written response. The third assessment in class type two shortened the written response to accommodate a graphing response section. There was no other data collected beyond the students' scores on the three assessments.

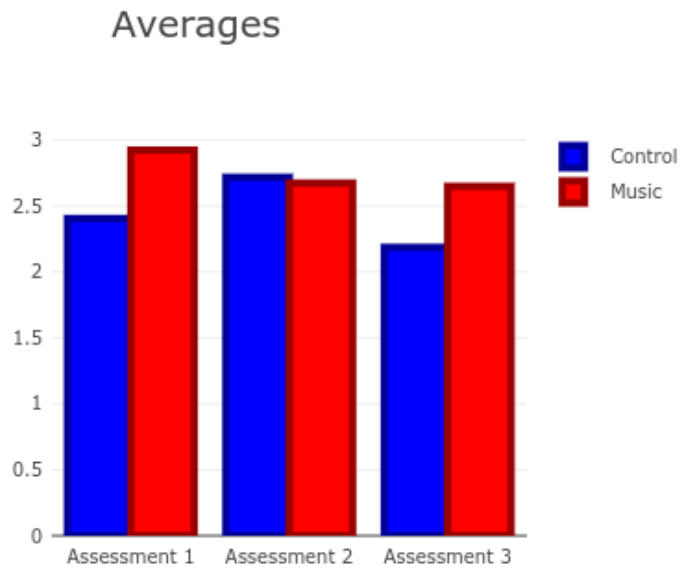
Findings

Data Analysis

Of the initial 134 students who started in this study, only 88 qualified to be included in the data analysis. The first content type class had assessment score averages of 2.93 and 2.41 (for the intervention and control group) on assessment one, 2.68 and 2.72 on assessment two, and 2.65 and 2.19 on assessment three. There does not appear to be a pattern with the control groups averages, but it does appear that the intervention group stayed more consistent throughout the multiple assessments. Figure 2 shows these assessment scores over the course of the three assessments.

Figure 2

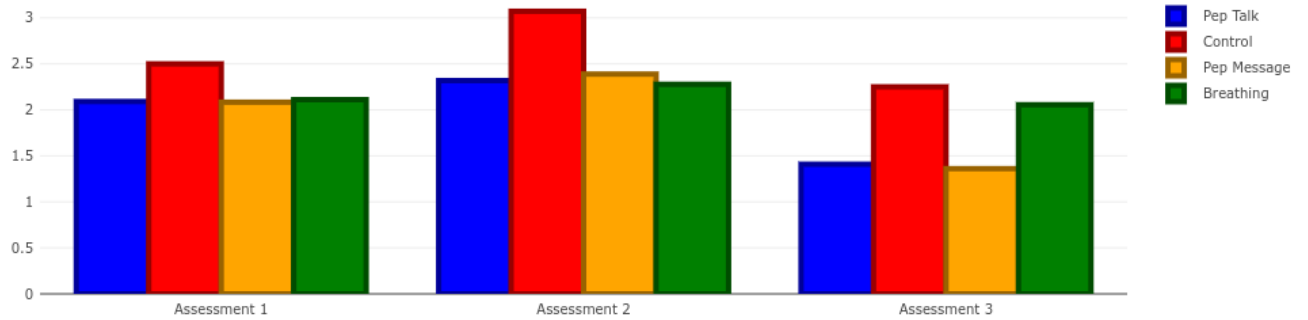
Class content type one averages across three assessments



The second content type class had assessment score averages of 2.09, 2.50, 2.08, and 2.11 (motivational speech, control, motivational message, and breathing) on assessment one, 2.32, 3.07, 2.39, and 2.28 on assessment two, and 1.41, 2.25, 1.36, 2.06 on assessment three. The class content type two had a closer clustering of initial baseline and assessment two scores than on the third assessments, where they became more erratic. The control classes in both content groups had higher averages across five of the six assessments. Figure 3 shows the average scores of class type two over the course of the three assessments.

Figure 3

Class content type two averages



When looking at the scores with standard deviation, there are only three total outliers that are significant. Two of those outliers exist in the data for class type one. Figure 4 shows the box plot of class content type one range of scores. In the author's notes one of those outliers was a particular student who was suffering severe anxiety attack and had to talk with onsite counselors following the assessment. The anxiety was not started due to the assessment but from outside of school family and peer interactions. One outlier exists in the data for class type two; Figure 5 shows the box plot of class content type two range of scores. The scores of all assessments were graded using the same methods and rubrics to calculate raw scores of students. Each assessment, however, was unique to the content type class.

Figure 4

Class content type one score ranges

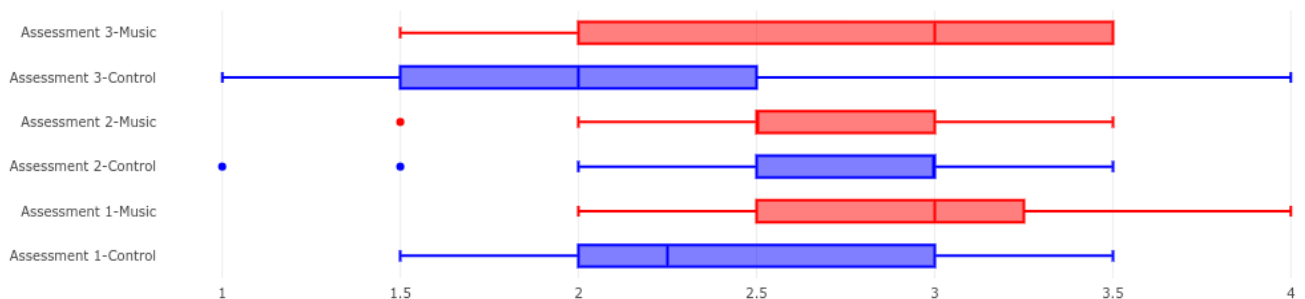
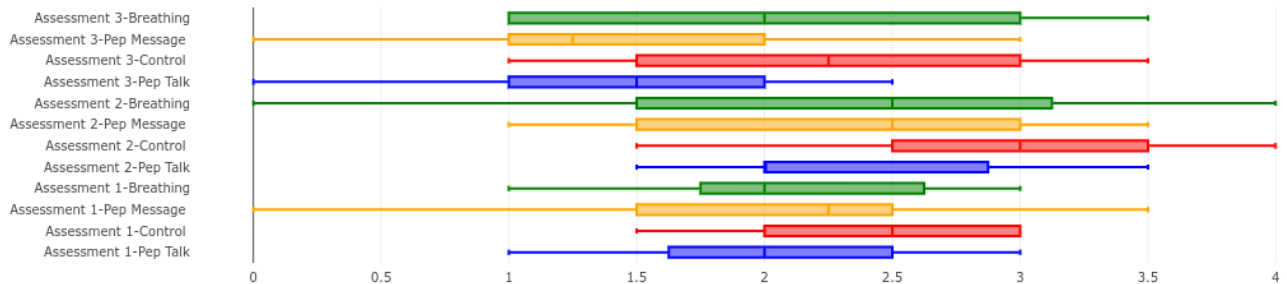


Figure 5*Class Type two range of scores*

For both class content types, ANOVA data shows the effect of the interventions compared to the control groups over all unit assessments was not significant. However, the data shows some significance to each class being significantly different in their test averages. For each class being significantly different in their class averages, the magnitude of significance for class content type one was small, but for class content type two was medium. The ANOVA for class content type 1 was performed to evaluate the effects of the interventions over unique assessments on student scores. The results indicated no significant main effect for unit assessments, $F([2], [102]) = [1.65]$, $p = [.197]$, partial $\eta^2 = [.031]$; a significant main effect for the class intervention, $F([1], [102]) = [5.73]$, $p = [.019]$, partial $\eta^2 = [.053]$; and no significant main effect for the interaction between intervention and unique assessments on student scores, $F([2], [102]) = [1.88]$, $p = [.158]$, partial $\eta^2 = [.036]$. This data shows that the difference between the sample averages of all groups is not big enough to be statistically significant to reject the null hypothesis and that the η^2 magnitude is small.

In the ANOVA for class content type two, the results indicated a significant main effect for unit assessments, $F([2], [144]) = [13.585]$, $p = [.00000394]$, partial $\eta^2 = [.16]$; a significant main effect for class interventions, $F([3], [144]) = [6.621]$, $p = [.00032]$, partial $\eta^2 = [.12]$; and

no significant interaction between unit assessments and class interventions, $F([6], [144]) = [.804]$, $p = [.569]$, partial $\eta^2 = [.032]$. This result shows yet again the difference between the sample averages of all groups is not big enough to be statistically significant to reject the null hypothesis and that the η^2 magnitude is small. While these results do not confirm the hypothesis the researcher had articulated for this action research, it does supply some evidence that there were differences in classes and their scores. This result creates further opportunities for research.

Discussion

Summary of Major Findings

This action research could not conclude that across all assessments during this semester the multiple interventions focused around reducing assessment anxiety and stress and improving student performance had significant impact. However, there is some evidence that individual classes performed significantly differently on individual assessments as the data was not equal across variable two in both content types and variable one in just content type two.

Individual students expressed to the researcher that they enjoyed the environments created by three of the four interventions. Whereas this feedback was not collected, and the results cannot confirm any intervention impact on overall performance, students' environmental comfort level during an assessment should not be ignored.

The results found by the researcher are similar to Brady et al. (2018) where it was found students only temporarily improved their performance as upper-year college students showed no significant impact on performance. The reappraisal and motivational message sent to students may not have been significant because the students given the motivational message intervention were upper-level. While the researcher's upper-level high school students are younger than the students in Brady et al. (2018), they fit the same mold of being established in their educational setting. While the impact of the interventions could not be considered significant, there is an

interesting trend in the two classes that had motivational messages as their interventions. They improved from assessment one to two and then dropped in the third, which was the most difficult assessment of the semester. This result is interesting because of the findings of Tamás & Péter (2021), which also found low-performing students' assessment performance was not raised by encouraging messages alone. These two classes of students might have needed much more than a reappraisal and encouraging message to perform better on that assessment.

In the research of both Aranberri-Ruiz et al. (2022) and Eyüboğlu et al. (2021), the music therapy and breathing therapy interventions used were done over several sessions. This action research had only singular large-group sessions on the day of each assessment that would not qualify as therapies. This lack of multiple sessions or additional non-assessment related practice might explain why the findings of stress and anxiety were not recreated in this action research. Having multiple sessions associated not only with assessments could increase the effectiveness of the interventions on students' assessment stress and anxiety, interventions that could improve students' assessment performance.

Lastly, the students involved in this action research have now experienced several years of the unique grading system implemented in the district. Drew (2022) conducted surveys with students and tracked over 14,000 students over a year in a major public university where it was found students experience less assessment stress and anxiety when engaged in classes that use standards-based grading, which has been implemented in the researcher's district for several years now. Another benefit of standards-based grading is that students know that the assessment does not represent the entirety of their grade; multiple pieces of evidence are being used. Research conducted by Yusefzadeh et al. (2019) with 45 medical students showed when students have knowledge that the assessment was not the only significant component of their grade, students experienced far less stress and anxiety around assessments. Students may be

experiencing lower levels of anxiety and stress around assessments due to this change in grading over the years.

Limitations of the Study

There were several limitations to the action research that was conducted. First, the elimination of over one third of the students from the initial pool of students to the final data set that could be analyzed is a major loss of subjects and their data from this action research. This is a substantial number of students who were eliminated from the study; their disqualification likely affected the outcome. Most disqualified students became ineligible for the data analysis due to being gone for sickness or major school activities that caused them to miss the assessment day. In two of the content type two classes, only 52% of students remained eligible for the data analysis.

The second major limitation was the passage of a new state law that came into effect near the end of the planning phase of this action research. This law puts new restrictions and requirements on the researcher. Under time restraints, the researcher had to remove all anxiety and stress collection plans in favor of assessment data collection.

A third limitation is that each class of students experienced the content of the class at slightly different paces. In one particularly challenging behavior class, the researcher was forced to make seating chart changes twice during the period that this action research was being conducted. This environmental change could have had some impact on the students' assessment scores as each assessment environment was now slightly different than the baseline assessment and a second variable that wasn't accounted for with the control group.

Lastly, in class content type two, one class's intervention was a message before the assessment day in which they were given information about reappraising anxiety and stress centering around assessments and motivation for the upcoming assessment. One thing the

research could not confirm was how many students opened the message. The researcher could only confirm that each student in that intervention class received or could access it. Anecdotally, the researcher heard from two of 25 students that they appreciated the message. Those two students were the only students over the action research who acknowledged the message in the researcher's presence. This lack of acknowledgment by students leads the researcher to question how many students read the message or even knew its existence, The possibility that limited students read the message would indicate the intervention didn't have an effect.

Further Study

The findings from this action research leave many opportunities for further exploration. A further exploration of the same interventions in this study is necessary to gather more findings to those discussed in the literature review. In light of the literature review, the strongest evidence of significant reductions in assessment anxiety and stress seemed to be from the reappraisal and coping research. Another action research surrounding reappraisal and coping methods to see if students' performance could be improved in the same way that the lit review is suggested. Lastly, another action research could be conducted where the inclusion of data collected on students' anxiety and stress over time could be matched with assessment interventions to determine if anxiety and stress is changing over time and the relationship with assessment performance.

As evident by the limitations, this study perhaps tried too many different interventions simultaneously. A stronger set of data could be achieved with a greater number of students taking part in just one intervention. Focusing on just one intervention would allow for a tailor-made questionnaire. The possibility of setting up a schedule of several sessions of breathing or music usage prior to the assessment along with right prior to the assessment like several other studies researchers have done would allow for a more complete intervention to study. This action research and literature review raises the question of if students need added support beyond just

environmental change to make any interventions effective. Having students learn and explore several coping strategies and reappraising assessment anxiety and stress could open the door for teachers, students, and parents to better understand how to best approach reducing stress and anxiety. This investigation and learning of anxiety and stress could help students increase performance over the long term rather than just on one or two assessments.

Lastly, tracking students' stress and anxiety through any of the several methods or trackers would allow the investigation of any interventions to become more thorough and deepen the teachers' understanding of when students' anxiety and stress around assessments is in the most critical moment. This understanding could open further avenues for finding when interventions are more effective or even for whom they are most effective. This knowledge would be powerful for both teachers and students in how to approach assessments, coping strategies, and environmental factors around assessments.

Conclusion

This action research sought to determine if students' assessment anxiety and stress could be lowered, and their performance improved over multiple assessments using certain interventions. A quantitative study was performed to determine if there were significant increases in student performance. General researcher notes were also collected in the event that unexpected information came to light during the research.

The literature review revealed several strategies and tools that teachers can implement to reduce student assessment anxiety and stress. Those include music, breathing techniques, motivational messages, student reappraisal, and coping strategies. These are important to investigate as teachers and districts have limited resources to help students. This action research in conjunction with the literature shows that there is still much to examine and clarify when it comes to understanding student anxiety and stress.

Data analysis in this action research did not prove if any of the interventions in this study led to performance increases over the multiple assessments. However, the findings did keep the door open for further research and clarification as there were some limitations and data significances in individual variables. The author recommends further research be conducted in several areas to add to the knowledge of how assessment anxiety and stress can be best reduced and increase students' performance.

References

- Almasudi, M. H., & Elbedour, S. (2019). Looking anew at test anxiety. *Journal of Alternative Medicine Research*, 11(1), 19–25.
- Aranberri-Ruiz, A., Aritzeta, A., Olarza, A., Soroa, G., & Mindeguia, R. (2022). Reducing anxiety and social stress in primary education: A breath-focused heart rate variability biofeedback intervention. *International Journal of Environmental Research and Public Health*, 19(16), 10181–10181.
- Brady, S. T., Hard, B. M., & Gross, J. J. (2018). Reappraising test anxiety increases academic performance of first-year college students. *Journal of Educational Psychology*, 110(3), 395–395.
- David, W. P., Joost, J. in de W., & Thijmen, van A. (2023). Academic buoyancy: Overcoming test anxiety and setbacks, *Journal of Intelligence*, 11(42), 42–42.
- Drew, L. (2022). Impacts of standards-based grading on students' mindset and test anxiety, 22(2). <https://doi.org/10.14434/josotl.v22i2.31308>.
- Eyüboğlu, G., Göçmen Baykara, Z., Çalışkan, N., Eyikara, E., Doğan, N., Aydoğan, S., Uçaner Çifdalöz, B., Özyıldız, A., Gündüz, C. S., Cihan Erdoğan, B., Sucu Çakmak, N. C., & İstek, N. (2021). Effect of music therapy on nursing students' first objective structured clinical exams, anxiety levels and vital signs: A randomized controlled study. *Nurse Education Today*, 97, 104687.
- Harris, R. Grunspan, D. Pelch, M. Fernandes, G. Ramirez, G. and Freeman, S. (2019). Can test anxiety interventions alleviate a gender gap in an undergraduate stem course? *CBE Life Sciences Education*, 18(3), 35.

- Headley, C. & Campbell, M. (2013). Teachers' knowledge of anxiety and identification of excessive anxiety in children. *Australian Journal of Teacher Education*, 38, 48-66.
- Hennessy, S. Sachs, M. Kaplan, J. Habibi, A. (2021). Music and mood regulation during the early stages of the COVID-19 pandemic, *PLoS one* 16(10).
- Hyunju, C., Seokjin, R., Jeeae, N., & Jongsun, L. (2016). The effectiveness of daily mindful breathing practices on test anxiety of students, 11(10).
<https://doi.org/10.1371/journal.pone.0164822>.
- Encandela, J. Gibson, C. Angoff, N. Leydon, G. & Green, M. (2014). Characteristics of test anxiety among medical students and congruence of strategies to address it, 19, 1-3.
<https://doi.org/10.3402/meo.v19.25211>.
- Mojarrab, S., Bazrafkan, L., & Jaber, A. (2020). The effect of a stress and anxiety coping program on objective structured clinical examination performance among nursing students in Shiraz, Iran. *BMC Medical Education*, 20(1).
- Muzychenko, I. N., Zhang, L., Apollonova, I. A., Nikolaev, A. P., Pisareva, A. V., & Malikova, S. G. (2018). Development of a method for assessing the effects of chronic stress on the human body. *Journal of Physics: Conference Series*, 1118(1).
- Myrto, F. M., Kim, O., Nicholas, R., Paul, C., & Fred, P. (2020). Effects of an acute physical activity break on test anxiety and math test performance, 17(5), 1523-1523.
<https://doi.org/10.3390/ijerph17051523>.
- Nihal, K. B., P, S. M., D, N. K., & Suprakash, C. (2019). Perceived stress, anxiety, and coping states in medical and engineering students during examinations, 28(1), 86-97.
https://doi.org/10.4103/ipj.ipj_70_18

- Nupur, T., Michelle, S., Matthew, G., & David, S. B. (2019). Yogic breathing instruction in patients with treatment-resistant generalized anxiety disorder: pilot study, 12(1), 78–83. https://doi.org/10.4103/ijoy.IJOY_22_18
- Rozek, C. S., Ramirez, G., Fine, R. D., & Beilock, S. L. (2019). Reducing socioeconomic disparities in the stem pipeline through student emotion regulation. *Proceedings of the National Academy of Sciences*, 116(5), 1553-1558.
- Tamás, K., & Péter, S. (2021). Not just words! Effects of a light-touch randomized encouragement intervention on students' exam grades, self-efficacy, motivation, and test anxiety, 16(9). <https://doi.org/10.1371/journal.pone.0256960>
- Wang H-T, Tai H-L, Yang C-C, Chen Y-S. Acute Effects of Self-Selected Music Intervention on Golf Performance and Anxiety Level in Collegiate Golfers: A Crossover Study. *International Journal of Environmental Research and Public Health*. 2020; 17(20):7478.
- Yusefzadeh, H., Amirzadeh, I. J., & Nabilou, B. (2019). The effect of study preparation on test anxiety and performance: a quasi-experimental study. *Advances in Medical Education and Practice*, 10, 245–251.