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THE EFFECTS OF PRE-EXAM EXPOSURE TO MUSIC ON TEST ANXIETY

Samuel Parashis

A Thesis

Submitted in partial fulfillment of the requirements of the  
Master of Arts Degree  
Of  
The Graduate School  
At  
Rowan University  
May 1, 2007

Approved

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## ABSTRACT

Samuel Parashis

THE EFFECTS OF PRE-EXAM EXPOSURE TO MUSIC ON TEST ANXIETY

2006/07

Dr. Roberta Dihoff

Master of Arts in School Psychology

Students (N = 39) were divided into three groups by the investigator based on a predetermined sign-up block assignment. Eleven students listened to a 7-minute compact disc audio track of Mozart's Piano Sonata K333. Thirteen listened to a 7-minute compact disc audio track of Anima's Spirit of the Southwest. Others (n = 15) sat in silence for a 7-minute period. Following the 7-minute period, all subjects attempted a logic test for 10 minutes. Next, subjects completed the Individual Test Anxiety Assessment by Samuel Parashis. A two-way Analysis of Variance, ANOVA, was conducted on the data collected from the Individual Anxiety Assessment. Although the results were not statistically significant, trends show lower mean anxiety scores being associated with the Classical and the New Age groups. The lowest scores were associated with the Classical music group.

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## CHAPTER I: INTRODUCTION

### Statement of the Problem

People are confronted with difficult challenges throughout their lifetimes. Often, the most anxiogenic, or anxiety generating, challenges are the most impressionable and sometimes, the most discouraging. On the premise that people learn through experience, it is believed that people can learn to fear highly anxiogenic experiences.

Post-secondary level academic examinations are often associated with elevated levels of anxiety. Therefore, exams may become imprinted as negative and interconnected experiences in a student's memory. Fear of tests and anxiety during testing can be overwhelming for students. Test related anxiety can handicap students from achieving maximum success on exams and may result in grades that do not accurately represent actual academic proficiency (Chapell, 2005; Hancock, 2001; Hedl, 1972; Spielberger, 1972; Trent & Maxwell, 1980).

Prior to the start of the exam, test conductors are rarely able to control the amount of external stimuli that exists in a testing environment. This setting can be chaotic, with anxious people shuffling through pages of notes in attempt to learn just one more fact of information while the clock counts down to official test start time. It is not unusual for fellow test takers to display nervous or stress-related behaviors like tapping, pen-clicking, loud or fast breathing, sweating, nail biting, or fidgeting.



Since those who experience severe test anxiety are especially distractible, otherwise non-obvious environmental noises can be anxiogenic. Consequently, the pre-examination environment may become associated with increased anxiety behaviors and frustration as opposed to a pre-exam focus (Smock, 1956). If there were an understanding of methods that may be implemented to transform the pre-exam testing environment into a tranquil setting, test takers may better experience cognitive clarity which, in turn, may lead to more successful test taking. One such intervention may include the use of relaxing music. A thorough evaluation of the effect of music on anxiety in the testing environment is necessary to determine the value of music in the pre-exam setting.

#### Purpose

The purpose of this study was to examine how two styles of music affected test anxiety in the testing environment. One music style was New Age by Anima, and the other style was Classical composed by Mozart.

#### Hypothesis

It was hypothesized that groups who experienced either style music prior to the examination start time would report lower levels of anxiety than the control group that experienced no music.

#### Theory/Background

Early research on test associated anxiety was conducted by George Mandler, professor in the University of California's Department of Psychology, and Seymour Sarason, celebrated professor from the Department of Psychology at Yale University. Mandler and Sarason sought to investigate student emotional and cognitive response to

academic tests. Mandler and Sarason associated symptoms of the response with anxiety, and thus coined the term, “test anxiety”. In their research titled, “A Study of Anxiety and Learning,” Mandler and Sarason defined test anxiety as a neuropsychophysical stress response to testing situations. Modern psychologists currently define test anxiety as “the set of phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences or failure on an exam” (Zeidner, 1998, p17).

Early studies by R.M. Liebert and L.W. Morris (1967), proposed the existence of two dimensions of test anxiety: worry and emotionality. The cognitive element of test anxiety, worry, was theoretically recognized as the expression of concern about failing or doing poorly in respect to other students. The affective element of test anxiety, emotionality, was identified as bodily responses that occur under examination stress (Liebert & Morris, 1967).

In 1984, Irwin Sarason, Ph.D, professor at University of Washington, sought forth to identify yet another dimension of test anxiety. Sarason claimed that cognitive interference was indeed a third dimension separate from worry and emotionality. The interference component encompasses environmental distractions and resulting bodily symptoms that impede on cognitive thought during the exam. These distractions, whether internal (bodily) or external (environmental noise or occurrences), inadvertently induce test-irrelevant cognitive activity that may hinder test success (Hodapp, Glanzmann & Laux, 1995). These theories of dimensionality help to provide an understanding of the inverse relationship that exists between tests and stress. The identification of these dimensions is valuable because it allows science to develop

interventions that specifically affect the individual components of test anxiety (Dibattista & Gosse, 2006). One such intervention may use music to affect the emotionality and cognitive interference components of anxiety.

An extensive history of the therapeutic value of music dates back to the ancient Greeks, Romans and Egyptians. These ancient civilizations utilized music to directly promote harmony and health of the mind and body. Based on the theoretical foundation that a relaxed body and mind promote physical healing, early Egyptian physicians incorporated music into medicine (Cook, 1981). Modern day Chinese researchers T.Y. Lin (1983) and Y. Lai (1999) argue that there exists a cohesive relationship between mind and body, and that this psychosomatic interrelationship is crucial in Chinese Medicine. Lai (1999) specifically believes that through its direct link to emotionality, music provides a noninvasive medium for psychosomatic healing. Other modern research has confirmed this proposition, and explored music's therapeutic effect on autonomic functioning (Berlyne, 1971). Guzzetta (1989) found that music listening decreased heart rate in patients with presumptive acute myocardial infarction. Countless additional world studies have further authenticated the therapeutic value of music.

Two genres of music that receive extensive attention in respect to relaxation are new age music and classical music because they reliably offer psychophysiological and autonomic modification. New age is a modern music style that western culture created in the late 20<sup>th</sup> century. It combines elements of spirituality, religiosity, science, psychology, and ecology to interact directly with the psyche. New Age may include sounds of nature, wind instruments, and drums. It is not uncommon for New Age to be electronically fabricated. Central themes stress the power of the human mind, and its

ability to create its own destiny, to modify reality, and to take control over body. It empowers the brain to be in ultimate control of the environment by way of bodily interaction, and through spirituality, one can create a harmonic balance of action and relaxation (Werkhoven, 1998).

Another style of music that is emotionally involving is Classical. Classical is a complex style of music that originated during the Classical Period in Europe between the years 1750 and 1820 (Kallen, 2002). Classical music is generally created by the piano instrument. Composers of Classical music aspire to create an affective experience for listeners, where listeners actually undergo an emotional response to the music. The ability of a Classical piece to elicit an emotional experience is often a measure of its complexity. This music style is notorious for its ability to promote psychosomatic relaxation, clarity, and harmony (Mornhimweg, 1992; Hanser, 1985; McKinney, Antoni, Tims, Kumar, & McCabe, 1997). For these reasons, Classical music is often played in academic settings such the college student centers and medical offices where cognitive clarity and relaxation is desirable.

#### Definition of Terms

1. Anxiogenic - The ability to cause anxiety.
2. Anxiolytic - The ability to reduce anxiety.
3. Neuropsychophysical - Pertaining to the relationship between the nervous system, mind, and body.
4. Psychophysiological - Pertaining to the relationship between physiological processes and thoughts, emotions, and behavior.
5. Psychosomatic - Pertaining to the relationship between mind and body

## Assumptions

In this study, it was assumed that all subjects gave their full attention and equal involvement to the examination task. It was assumed that the Mental Performance Task created an anxiety response comparable to a real college examination. It was also assumed that the subjects were all of average intelligence and had no sensory, language, or learning disabilities. Finally, it was assumed that the subjects had no psychotic conditions defined by excessive amounts of anxiety.

## Limitations

There were several limitations that should be noted. The study population was mainly representative of first or second year students from an undergraduate psychology course. Random selection of subjects was impossible. Instead, subjects were allowed to sign up for any of the three conditions at their convenience, which, in turn, led to small sample sizes. Another experimental limitation involved the experimental acoustic equipment. The equipment that was used to play music did not ensure that every subject, in every area of the testing environment, heard the music at equal sound levels. The final and most obvious limiting factor was the time constriction which did not allow for me to run a reliability check to see if results were replicable with other groups of subjects.

## Summary

Chapter II includes literature review of research related to test anxiety and music's psychophysiological effects on humans. Chapter III contains information on the design of the current experiment. Chapter IV discusses a review of experimental results.

Chapter V draws a conclusion from experimental results and provides research suggestions for future research.

## CHAPTER II: REVIEW OF THE LITERATURE

### Introduction

The following is structured to present information from most general research to research most closely relevant to the current study. General research involves seminal studies that identify and validate dimensions of test anxiety. Research on the relationship between test anxiety and test performance is analyzed to help determine if test anxiety is indeed an inhibitor of student success. Next, research is presented on New Age and Classical music and the effect of these music styles on test anxiety. Last, specific research is presented on New Age and Classical music and its implementation in testing situations as an intervention for test anxiety.

### Bi-Dimensional Model of Test Anxiety

Early research on the componential structure of test anxiety was conducted by Liebert and Morris in 1967. Liebert and Morris built on the conceptual foundation of Mandler and Sarason, but hypothesized that test anxiety was bi-dimensional. With their bi-dimensional model they proposed two dimensions: worry and emotionality. Worry was identified as negative expectation in respect to a test, and preoccupation with test performance and consequences of failure. Emotionality corresponded with the autonomic arousal or bodily response to examinations such as nervousness, discomfort, and stress (Liebert & Morris, 1967). Liebert and Morris (1967) developed the Worry-Emotionality Questionnaire (WEQ) to measure emotionality and worry dimensions of test anxiety.

Nearly ten years thereafter, C.D. Spielberger (1980) created the Test Anxiety Inventory (TAI). The TAI, served to supplement the WEQ, as it further developed the bi-dimensionality of test anxiety. The TAI is a 20-item scale that consists of two subscales - emotionality and worry, both of which contain eight items to better assess anxiety specific to test situations (Spielberger et al., 1980). “The TAI is one of the most widely used instruments for measuring test anxiety in high school and college students,” (Chapell et al., 2005). Many researchers have found the TAI suitable for use in its original form, but others have revised the scale to suit their individual research needs (Hodapp & Benson, 1997).

#### Multi-Dimensional Model of Test Anxiety

While Liebert and Morris developed a bi-dimensional model, more recent research has suggested that a multi-dimensional model is better at describing the nature of test anxiety. I.G. Sarason and R. Stroops (1978) proposed that Cognitive Interference was another dimension of test anxiety outside of worry and emotionality. In their study, subjects participated in the Test Anxiety Scale (TAS; Sarason, 1978), and those subjects with high anxiety levels displayed lower test performance. Thus, cognitive interference is a third dimension because high levels of interference are correlated with performance deficit (Sarason & Stroops, 1978).

The multi-dimensional structure of test anxiety was further evaluated by Voker Hodapp of Heinrich-Heine University and Jeri Benson of Germany University of Georgia professor. Hodapp and Benson conducted confirmatory factor analysis of the validity of various structural models of test anxiety by Leibert and Morris (1967), and I.G. Sarason (1984). They investigated the areas of worry, emotionality, and other possible



dimensions of test anxiety. The Revised Test Anxiety (RTA; Benson, Moulin-Julian, Schwarzer, Seipp, and El-Zahhar, 1992) and the Test Anxiety Inventory-German (TAI-G; Hodapp, 1997) were used to collect data from a population sample of 218 American and 218 German university students. The RTA is an 18-item inventory that assesses the areas of worry, tension, test-irrelevant thinking, and bodily symptoms. Test-irrelevant thinking refers to the content of cognitions, and bodily symptoms are the autonomic changes in the body felt by an individual.

The TAI-G is a revised version of Spielberger's TAI that it is translated into German. The most important revision is the addition of a separate measure for lack of confidence (Sarason, 1984), which previously was coded under the Worry component of the TAI. In all, the TAI-G measured: Worry, Emotionality, Interference, and Lack of Confidence (Hodapp & Benson, 1997). Interference refers to blocking cognitions and cognitive activities that disrupt task performance (Sarason, 1984). Lack of confidence is a measure of personal feelings of incompetence (Carver & Scheier, 1984). In the evaluation of the different scales as models of dimensional measurement of test anxiety, worry, emotionality, interference, and lack of confidence were best explained by the data collected in Hodapp and Benson's study.

Hodapp and Benson's study confirmed findings from research by L. Morris, D. Davis, D. and C. Hutchings (1981) that found a lack of scientific support for the existence of tension and bodily symptoms as separate dimensions. These dimensions became subcomponents of the emotionality dimension. Also, Hodapp and Benson were able to validate the existence of I.G. Sarason and R. Stroops's interference component as a separate dimension (Hodapp & Benson, 1997). Overall, Hodapp and Benson were able

to demonstrate evidence-based support for a four dimensional model. Therefore, test anxiety is best described by the four dimensions of Worry, Emotionality, Interference, and Lack of Confidence. An understanding of the multi-dimensionality of test anxiety allows for research to be conducted on how interactions with specific dimensions of test anxiety affect the level of test anxiety as a whole.

#### Early Research on the Effects of Test Anxiety

It is necessary to understand how test anxiety effects test performance before interventions to address test anxiety are considered. Countless studies have supported theories that prove that test anxiety has detrimental effects on test performance (Mandler & Sarason, 1952; Hunsley, 1985; Hunsley, 1987; Hembree, 1988; Seipp, 1991; Kivimaki, 1995; Hughes, 2005; Chapell, 2005). Stress contributes to anxiety, which can, in turn, interfere with students' academic performance (Hughes, 2005).

As early as 1952, G. Mandler and S. Sarason examined the effects that anxiety had on intelligence test performance. Mandler and Sarason hypothesized that the anxiety specific to testing situations was detrimental to test performance. Mandler and Sarason (1952) developed the Test Anxiety Questionnaire (TAQ) to gather information on anxiety specific to examination situations. The TAQ is a standardized questionnaire and tool for measuring anxiety levels in response to test conditions. The study population was split into two test samples: High Anxiety (HA) group and Low Anxiety (LA) group, based upon their scores on the TAQ. The LA group performed better on the IQ test, evidenced by higher IQ scores. Results show that there is an inverse relationship between test anxiety level and test performance.

In a study with 96 undergraduate psychology students, John Hunsley, from the Department of Psychology at the University of Calgary, sought to identify the relationship between cognitive processes in math anxiety and test anxiety. Subjects were given questionnaires before and after of their five academic midterms. The questionnaires assessed their anxiety, appraisals, internal dialogue, and performance attributions. Tabulated responses to the questionnaire demonstrated a valid inverse relationship between test anxiety and actual performance, with higher levels of anxiety being correlated with lower performance (Hunsley, 1987). These findings are concordant with results of Hunsley's earlier study on test anxiety and performance (Hunsley, 1985).

Modern Research on the Effects of Test Anxiety

A more recent study by J. Cassady and R. Johnson (2002) examined test anxiety in respect to student performance on the Scholastic Aptitude Test (SAT) as well as on three academic examinations. An anxiety assessment was conducted to determine the general levels of anxiety for 168 undergraduate students. The students self-reported performance on the SAT and on three of their academic examinations. Results indicate that students who generally displayed high levels of test anxiety were more likely to have scored significantly lower on the SAT and each of the three examinations. These results confirm beliefs that "test anxiety exerts a significant stable and negative impact on academic performance" (Cassady & Johnson, 2002). Such findings substantiate the need for research on interventions to lower test anxiety in testing settings.

Mark Chapell, Benjamin Blanding, Michael Silverstein, and others (2005) continued research on the relationship between anxiety levels and academic performance. The sample population of 5,414 students contained 4,000 undergraduate students and

1,414 graduate students. Subjects were gathered from colleges and universities from New Jersey, Illinois, and Pennsylvania. Of this population, females represented 63.6 percent of the undergraduate sample and 74.7 percent of the graduate sample, with males representing the remainder of the samples. The participants were administered a questionnaire about their age, sex, and grade point average (GPA). Next, participants completed Spielberger's (1980) Test Anxiety Inventory (TAI). Based on their individual standardized scores on the TAI, the undergraduate (mean age = 21.98) and graduate (mean age = 33.2) groups were split into three additional groups: low anxiety, moderate anxiety, and high anxiety. Undergraduate females in the low anxiety group had a mean GPA of 3.35; males had a mean GPA of 3.22. Undergraduate female students in the high anxiety group had a mean GPA of 3.12; males had a mean GPA of 2.97.

Evidently, undergraduate participants in the low anxiety group had higher overall GPAs than those of the high anxiety group, whereas participants in the high anxiety group achieved lower GPAs. The difference in GPA between high and low anxiety groups for females and male undergraduate students was about 0.13 and 0.25 accordingly. Despite the gap in mean age between the undergraduate and graduate students, the results were consistent for graduate students as well, with there being an inverse relationship between test anxiety and achievement. This study is yet another evidenced based study that confirms the notion that test anxiety is detrimental to academic performance.

#### Need for an Intervention

Statistically evidenced research accentuates the clear need for interventions that reduce anxiety in test related situations. Anxiety reduction interventions may allow

students to function with cognitive clarity and thus, promote maximal academic success.

The following research evaluates the effectiveness of music as an intervention.

#### General Research on Music Therapy

Over the past few decades increased attention has been given to music as a therapy for stress and anxiety reduction. Properly selected music can elicit relaxation a variety of ways. Music may operate as a distraction and divert attention from the stressful stimuli, or it may act directly on the autonomic nervous system (Davis, Gfeller & Thaut, 1992). Clinical nurse Gwendolyn Watkins (1997) argues that music has therapeutic properties and can be used in a therapeutic relationship to induce psychological, cognitive, physical, emotional, and physiological state changes. In agreement, Edward Bernard and Larry C. Krupat (1994) claimed that music is an external stimuli that be used to affect an internal response, and promote relaxation in stressful situations. Classical music by artists like Mozart is believed to promote mental clarity (Rauscher, Shaw & Ky, 1993). New Age music was developed specifically to promote healing, alter mood, and create peace within the body by stress reduction (Harvey, 1989). These styles of music can be applied to an almost endless array of settings to manipulate mood, emotion, or physiological state (Ambroziak, 2003). For these reasons, therapists have utilized music to promote healthy cognitive and autonomic functioning.

The American Music Therapy Association claims that music is therapeutic when used in healthcare and educational organizations. Extensive research has been coordinated on the use of music within hospital settings, work environments, and educational settings to identify its effects on stress and performance (Kemper, 2005).

The following studies validate claims to the therapeutic value of music.

## Music Intensity and Physiological Response

Dr. Nikki Rickard (2004) evaluated physiological responses to various auditory stimulatory conditions. Data was collected from 21 undergraduate students (9 females, 12 males). The participants were exposed to relaxing classical music, arousing, but less emotionally powerful classical music, an emotionally powerful film scene, and an emotionally powerful music piece personally selected by study participants. Subjective measures of arousal indicated by physiological changes in skin conductance (SC), heart rate (HR), temperature, and muscle tension (EMG) were recorded before and during the various musical treatment conditions. The emotionally powerful music condition produced the greatest increases in SC, while the relaxing music condition produced greatest decreases in SC. SC is understood as a particularly sensitive measure of strong emotions (Andreassi, 2000). In other words, drastic increases in SC generally signify an intense emotional response to a stimulus. Findings from Rickard's study indicate that emotionally intense music exposure is associated with higher levels of physiological arousal.

In 1992, Gail Mornhimweg of the University of Louisville, studied the effects of different styles of music to determine which styles aided most in stress reduction. Mornhimweg collected a sample of 58 undergraduate students and surveyed their preference for various music styles. Participants rated the following music styles: Easy Listening, Popular, Country/Western, Hard Rock, Classical, and New Age. 45% of subjects preferred Popular music, 21% preferred Easy Listening, 12% preferred Country/Western, 5% preferred Classical, 3% preferred Hard Rock, and 0% preferred New Age. The subjects were subjected to 20 minute sessions of each of the

aforementioned music styles. Heart rate (HR) was measured before and after each of the music conditions. Despite subjective preference, Popular music actually increased HR, and amplified stress and physiological arousal levels. The New Age music condition yielded greatest decreases in HR, and Classical yielded second greatest decreases in HR. These decreases in HR indicate that New Age and Classical music greatly reduced stress levels in research participants. Mornhimweg's study validates claims to the therapeutic value of the New Age and Classical music styles.

#### Music and Hospital Patients

In research that examined the effects of music on surgical anxiety, M. Brunges and G. Avigne (2003) evaluated the value of relaxing music. Subjects consisted of 23 male and 21 female pre-operative patients that awaited total joint replacement surgery. The subjects were assigned to either the 30-minute music condition or the 30-minute non-music condition. In the music condition study, participants were given headphones that played nature sounds, such as sea, thunder, rainstorms, wind, and waterfall sounds. Epinephrine, a hormone related to stress reaction, levels were compared prior to and following the experiment. A post condition comparison of epinephrine levels indicates that patients exposed to the relaxing music condition were generally less anxious upon entering surgery than those exposed to non-music condition.

More recent research by O. Lee (2005) evaluated the effect of music on anxiety levels of patients receiving mechanical ventilation. Lee et al. gathered 64 subjects and assigned them to either of two conditions. The experimental condition underwent a 30-minute session with which subjects had a choice of listening to the following music styles: Chinese classical, western classical, religious, or sounds of nature. The control

condition underwent a 30-minute silence session. Both groups were told to relax and close their eyes for the entire length of the session. Respiratory rate (RR), Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the subjects were compared pre and post session. Subjects from the experimental music condition experienced the most significant decreases in RR, HR, SBP, and DBP, and thus, reported highest levels of comfort and lowest levels of anxiety. Regardless of specific relaxation music style, the experimental music condition displayed an anxiety reducing effect. Evidently, relaxation promoting music is high in therapeutic value.

#### Music and Perceived Relaxation

Burns, Labbe, Arke, Capeless, Cooksey, Steadman, and Gonzales (2002) conducted slightly different research on anxiety and music. This study evaluated the effects that different types of music had on perceived stress in 60 undergraduate psychology students. Although all participants were told to bring a preferred compact disc to the research setting, students were randomly assigned to different music conditions. Experimental groups were exposed to the following music styles: Classical (Mozart), Hard Rock (Alice in Chains), or a self-selected personal compact disc. Control groups experienced a silence condition where no music was played. Throughout all conditions, participants' muscle activity, skin temperature, and heart rate were monitored by various biofeedback instruments. Following music or silence conditions, participants rated their perceived relaxation, then completed the State-Anxiety Scale, and finally participated in Crawford and Christensen's (1995) Mental Rotation Task Test (MRT). The MRT was an activity conducted to invoke stress or arousal. Individuals who listened to Classical music reported highest levels of perceived cognitive relaxation (Burns et al.,



2002). Perceived cognitive relaxation was validated statistically by results from the State Anxiety Scale and by biofeedback records as well. Inter-group comparison shows lower levels of anxiety and physiological arousal being associated with Classical music listening.

#### Music and Academic Performance

Research by D. Kiger (1989) was able to verify positive gains in academic performance due to music exposure. Kiger investigated reading comprehension in 54 high-school students that were separated into three auditory conditions: no sound, low information-load music, and high information-load music. Kiger differentiated information-load by its volume, variety, complexity, and tonal range of the music. Therefore, high information-load music was louder and more complex as indicated by an exceptionally diverse tonal range. Subjects read a passage and answered a 20-question reading comprehension test while in the three auditory conditions. Results showed better test scores for participants who read passages in the presence of low information-load music than both those that read in silence or with high information-load background music.

A more current study by S. E. Haynes (2003) sought to identify what effect background music had on 160 college algebra students. Haynes split the subjects into either the experimental group that contained music or the control group with no music. Subjects in the music condition (experimental condition) were allowed to study for 10 minutes prior to an exam while Classical music was played at a low volume in the background. The subjects in the non-music condition (control condition) studied in silence for the same amount of time. Subsequent to the study period, subjects completed

their algebra exam. Comparison of pre and post-exam scores on the 25-item Mathematics Anxiety Rating Scale (MARS) (Alexander & Martray, 1989) demonstrated that subjects in the music condition experienced decreases in anxiety. Although Haynes' research was able to verify anxiety reduction due to music exposure, gain in academic performance due to music exposure were not confirmed.

### Summary

In summary, current research indicates that exposure to Classical or New Age music aids in reducing anxiety and physiological arousal levels. The therapeutic properties of these two styles of music facilitate emotional and physiological changes that promote mental clarity, focus, and performance. These findings are evident, not only in hospital settings, but academic environments as well. For students, pre-exam exposure to these styles of music should successfully produce lower physiological arousal and anxiety levels.

## Chapter III: DESIGN

### Participants

The participants in this study consisted of 39 undergraduate students enrolled in various introductory psychology courses at Rowan University in New Jersey during the Spring semester of 2007. Participants signed-up for the current study to meet research credit requirements set by their undergraduate psychology classes. These prospective subjects had the choice to sign-up for one of three different sign up blocks for the study. There were three conditions: silence condition (control), Classical condition (experimental # 1), and New Age condition (experimental # 2). Each of the three blocks of subjects was randomly assigned to a condition following the sign- up period. The Silence condition was comprised of 15 participants, with nine males, and six females. The Classical condition was comprised of 11 participants, with six males, and five females. The New Age condition was comprised of 13 participants, with eight males, and five females. Participants were at least 18 years old and were predominately of the Caucasian race.

### Materials

In the current study, the experimenter selected relaxing music to be played for both of the experimental conditions. For the Classical condition, the experimenter chose piano sonatas of the Andante speed of tempo (76 - 108 beats per minute) composed by Mozart. Native American meditation music from Anima's (2000) album

titled, “Spirit of the Canyon,” was selected for the New Age condition. A portable stereo system was used to play background music for the two experimental conditions.

The experimenter distributed the six question BrainBashers™ Logic Test to the participants (see appendix b). This logic test contains questions that were individually selected from the BrainBashers™ online website which contains a collection of logic puzzles, games, and optical illusions. BrainBashers™ online website was created and copyrighted by Kevin Stone, a mathematician with an Honors Degree in Mathematics from a leading United Kingdom university. Permission for the use of this copyrighted material was granted directly from Kevin Stone. All logic questions were open-ended and students were allowed to write their responses directly on the test packet. Additional paper was provided for subjects to work through the problems.

The Individual Test Anxiety Assessment was developed by the experimenter and employed a Likert-type scale to gauge participants’ reactions to questions on the questionnaire (see appendix c). The questionnaire contained 23 short statements that were phrased in the first person. The statements randomly pertained to individual feelings before, during, and after the logic test. The Individual Test Anxiety Assessment requires responses to statements using a never to always scale of 0 to 4 (0-never, 4-always). Instructions for completing the test anxiety questionnaire were included at the top of the questionnaire.

#### Reliability/Validity of Scales

The BrainBashers™ logic test was compiled of various logic questions and puzzles from the BrainBashers™ online website. The validity and reliability for this

logic test is unavailable. There is no statistical evidence for the reliability or validity of the Individual Test Anxiety Assessment because it was developed by the experimenter.

## Method

Participants entered the experimental setting and were given a copy of the informed consent form (see appendix a). Subjects read and completed the informed consent forms. Next, the experimenter began a relaxation session of seven minutes and asked subjects to relax in the three conditions. Subjects of all three conditions were allowed to draw on paper or rest for the duration of the timed relaxation session. The experimenter played Classical music for subjects in the Classical condition and New Age music for subjects in the New Age condition at a volume just loud enough to allow participants to hear the experimenter speak at a normal volume. Subjects of the Silence condition sat for seven minutes, without music.

Following the relaxation session, the experimenter distributed the BrainBashers™ logic test packet (see appendix b) and subjects were informed that they would have a 10-minute test period to complete as many logic test questions as possible. The experimenter started the timer and all subjects worked on their logic tests in silence, without music. Participants were asked to submit their BrainBashers™ logic tests, with answers, when the test period ended.

The experimenter distributed the Individual Test Anxiety Assessment (see appendix c) to the participants to evaluate overall anxiety levels of subjects in response to the BrainBashers™ logic test. After subjects completed the Individual Test Anxiety Assessment, the experimenter circulated a debriefing statement that explained the rationale of the experiment. The debriefing statement also thanked subjects for their

participation and informed them that the BrainBashers™ logic test was solely used to increase their individual anxiety levels.

#### Independent and Dependent Variables

The independent variable in this study was condition. The dependent variable was the Individual Anxiety Assessment score. It was expected that test anxiety scores would be significantly lower for subjects of the Classical and New Age conditions than subjects of the Silence condition.

#### Analysis of Data

Subjects' data from the Individual Anxiety Assessment was compared between conditions. A two-way analysis of variance of data at the .05 level was performed to indicate statistical significance between conditions.

#### Summary

In the current study, 39 undergraduate general psychology class students individually chose to sign up for one of three time blocks. Subjects were grouped by time block. Each time block was randomly assigned to a different condition. One time block became the Silence condition, another became the Classical condition, and the last became the New Age condition. The two experimental conditions, Classical and New Age, experienced music by either Mozart or Anima, respectively. The control group sat in silence for the same amount of time. In all three conditions, subjects were required to relax for a period of seven minutes. Next, subjects attempted questions on the BrainBashers™ logic test for 10 minutes. Then, subjects responded to the Individual Test Anxiety Assessment. Scores were analyzed and compared between groups to determine which condition yielded lowest amounts of test anxiety. It was expected that

the participants from Classical and New Age conditions would report less test anxiety than those in the Silence condition.

## CHAPTER IV: RESULTS

### Introduction

The purpose of this study was to evaluate the effects that music has on test anxiety when played before a logic test. Three groups of Rowan University undergraduate student each experienced a different condition. It was hypothesized that the subjects that experienced music in the two experimental conditions would report lower anxiety levels than subjects of the non-music Silence condition. Although there was an apparent difference between mean anxiety scores between groups, these results lack statistical significance to validate this hypothesis.

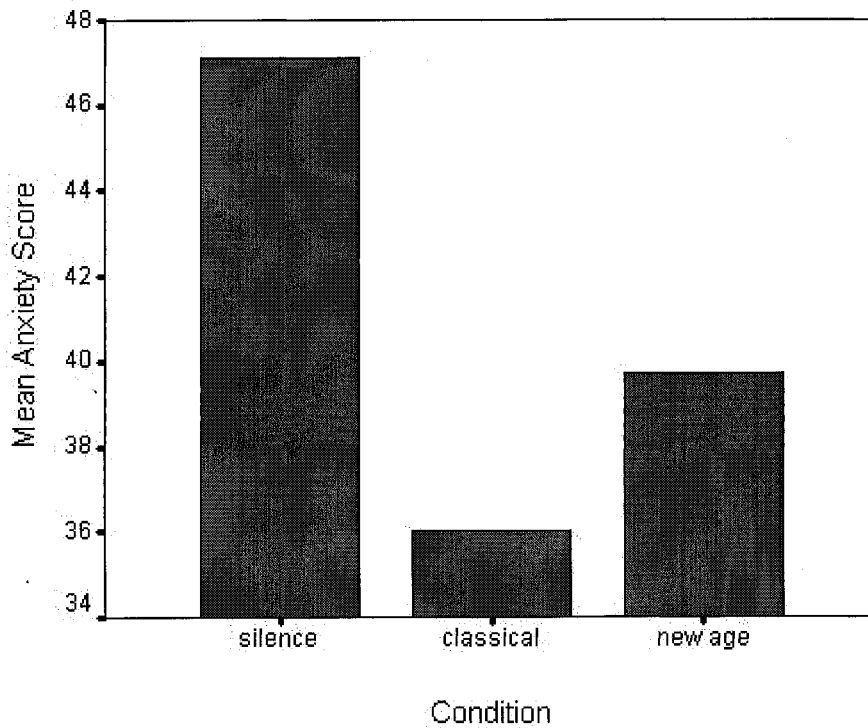
### Results

During the course of the study, all subjects were administered the logic test and the Individual Test Anxiety Assessment to gather information on their anxiety levels immediately following the logic test. The anxiety scores from the three separate conditions were collected and compared. There were 15 subjects in the Silence (control) condition, 11 in the Classical condition and 13 in the New Age condition. Also, anxiety scores from both experimental (music) conditions were combined and compared against data from the control condition. There were 24 total subjects in the combined experimental New Age and Classical group and 15 subjects in the Silence control group. Last, mean anxiety scores were compared between genders. Data from 23 male and 16 female subjects was tabulated and analyzed.



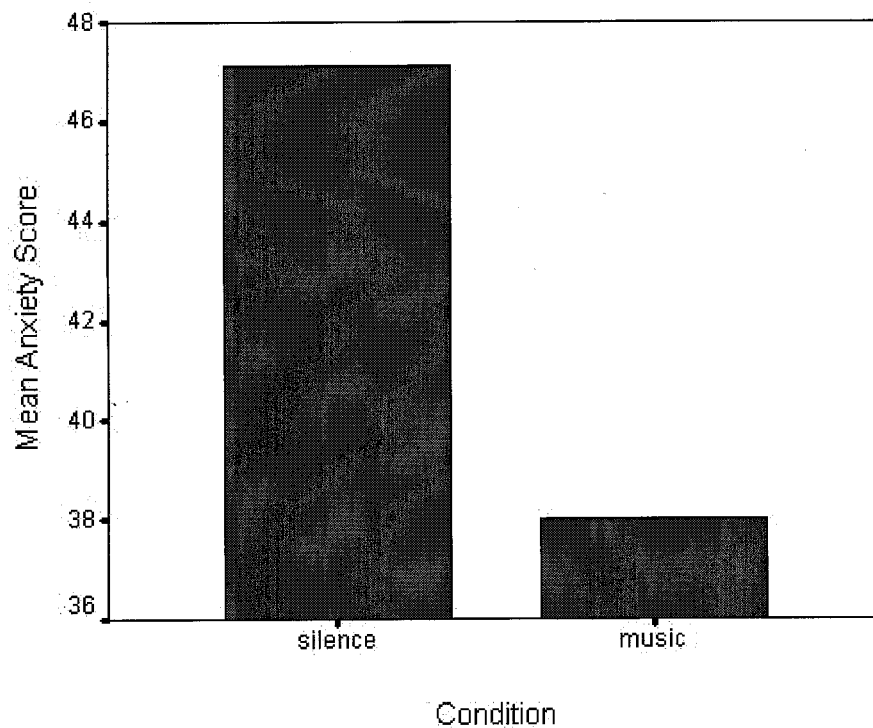
A two-way analysis of variance (ANOVA) was conducted to analyze data between condition and anxiety. Analysis showed no statistical significance between anxiety scores and condition variables. The mean anxiety score for the New Age condition was lower than the mean score for the Silence condition, but was higher than the mean score for the Classical condition (see figure 4.1). More specifically, the mean anxiety score for the Silence condition was 47.13 with a standard deviation of 19.160, the mean anxiety score for the Classical condition was 36.00 with a standard deviation of 23.858, and the mean anxiety score for the New Age condition was 39.69 with a standard deviation of 13.913.

*Figure 4.1* Mean anxiety scores for the silence, classical, and new age conditions.



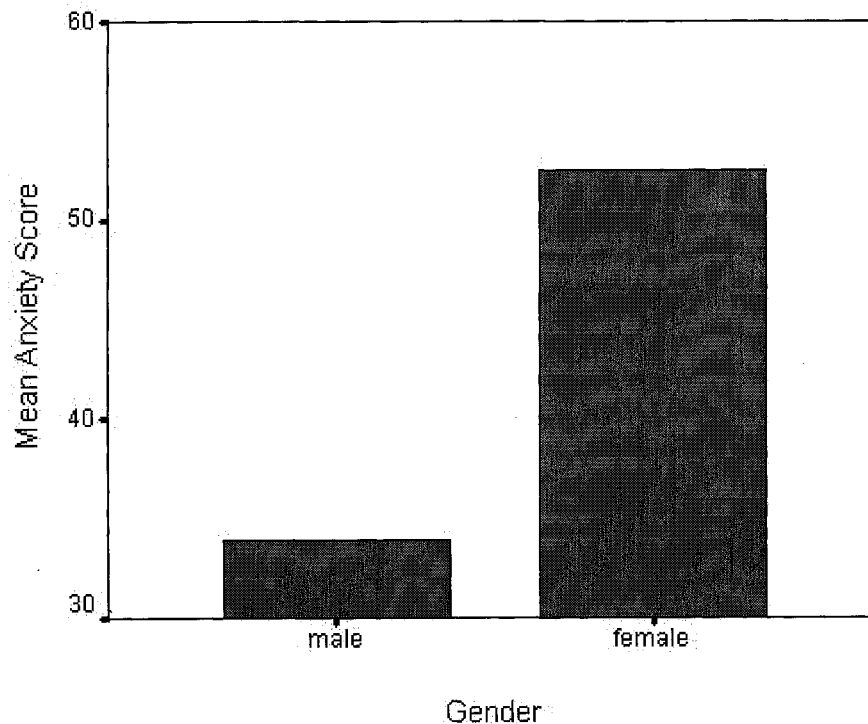
A two-way ANOVA of data for the combined experimental group and anxiety scores also showed no statistical significance, although there appeared to be some small difference between means of the control condition and the combined experimental condition. The mean anxiety score of the control condition was 47.13 with a standard deviation of 19.160 and the mean anxiety score of the experimental condition was 38.00 with a standard deviation of 18.762. This indicates that the subjects from the control group may have experienced more anxiety than subjects from the combined experimental group, although the differences are not drastic enough to be considered statistically significant (see figure 4.2).

*Figure 4.2 Mean anxiety scores for the control and experimental conditions.*



A separate two-way ANOVA was also conducted for mean anxiety scores attained by each gender. Of the total 39 participants, the 16 females, or 41% of the total participant pool, seemed to have had higher anxiety scores than the 23 males that represented 59% of the total participant pool (see figure 4.3). The mean anxiety score for the females was 52.44 and the standard deviation was 19.058, while the mean anxiety score for the males was 33.91 and the standard deviation was 15.550.

*Figure 4.3 Mean anxiety scores for females and males.*



### Summary

In summary, there were three two-way ANOVAs conducted in this study. No statistical significance was found in any of the three analyses. Although no statistical significance was found, it is important to note that there seemed to be some trends. Generally, the Classical and New Age experimental conditions reported lower anxiety

scores on the Individual Test Anxiety Assessment than the Silence control condition that experienced no music. Therefore, the mean of the Silence control condition was slightly higher than both the New Age and Classical experimental conditions. The mean anxiety score of subjects in the Classical condition was lowest of the three conditions. It is also important to note that the mean anxiety score on the Individual Test Anxiety Assessment was higher in females than in males.

## CHAPTER V: DISCUSSION

### Review of Results

After reviewing the data, it was found that there are some differences in anxiety levels between the control group and the experimental groups. Similar to the findings from Mornhimweg's 1992 study, Classical and New Age music listening was shown to be associated with lower levels of anxiety. Despite the disparity between mean anxiety scores of the control condition and the experimental conditions, the differences were not drastic enough to be statistically significant. While this finding fails to support the hypothesis of this study, this finding could be the result of less than ideal sample sizes. Given the less than ideal method of gathering participants, the sample sizes were uneven and smaller than expected. The samples were also unequal in their representation of gender as indicated by a male dominated participant pool. A sample size of 20 randomly selected participants for each of the three groups, with an even representation of gender, may have helped produce statistically significant results. Despite the lack of statistical significance, there seemed to be a trend as indicated in Figure 4.1, where the control group showed higher mean anxiety scores than the experimental groups.

Analysis of the combined experimental group which consisted of anxiety scores from the Classical and New Age conditions also produced statistically insignificant results. Although the combined data from the experimental groups indicated a difference in means, as indicated by Figure 4.2, the sample size may have been too small for the findings to be considered statistically significant. Therefore, the findings fail to support

the hypothesis of this study. Again, a larger sample size may have produced statistically significant findings.

### Limitations

One limitation of the study involves the characteristics and size of the samples. Although the sign up sheet allowed for a maximum of 60 participants, only 39 subjects signed up for the current study. Small sample size can be attributed to the method with which the primary investigator gathered participants. The primary investigator posted a sign-up sheet in a building on campus. The sign-up sheet was only made available to undergraduate students in an introductory psychology course which, in turn, led to a small subject pool.

Another limitation of the study can be attributed to the unrealistic testing environment. An ideal environment would have been a traditional classroom with desks or even a small lecture hall. Instead, the participants of this study were tested at a large table in a conference room that was not representative of a traditional academic test setting. A more realistic setting may have produced different results.

Another limitation of the study involved the lack of baseline data. An anxiety assessment conducted before the relaxation period would have produced baseline data on anxiety levels of participants. Baseline data could have been compared to existing data to indicate individual changes in anxiety of participants. Since anxiety was only assessed after relaxation period, actual relaxing effects of music exposure are not known.

## Conclusion

In conclusion, the results of this study showed no significant differences in anxiety levels between those that listened to music and those that did not. Limitations to the study include small and uneven sample size, and the lack of baseline data. These limitations may be accountable for findings that do not support the hypothesis. Despite lack of statistical significance, trends in the data indicate differences in mean anxiety scores between the control and experimental groups. The greatest difference existed between data from the control condition and the experimental conditions. Mean anxiety scores from the Classical and New Age conditions were much lower than the mean anxiety score from the Silence control condition. Smaller disparity existed between the two experimental conditions where the mean anxiety score of the Classical condition was slightly lower than that of the New Age condition.

## Implications for Future Research

There is a need for more research on the effects of music on test anxiety. It would be interesting to examine the effects of music and relaxation techniques, when presented together, on test anxiety. It would also be interesting to study test anxiety in students from elementary, middle, and high schools across cultures. Such a study may lead to early predictors of test anxiety and methods of intervention.

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APPENDIX A  
Informed Consent Form

## Informed Consent Form

I agree to participate in a study entitled "The Effects of Pre-Exam Exposure to Music on Test Anxiety," which is being conducted by Samuel Parashis of the Psychology Department, Rowan University.

The purpose of this study is to evaluate the effects that music, when played immediately before a test, has on test anxiety levels and test performance. The experiment will begin with a transition period of seven minutes where I will either listen to music or sit in silence depending on my predetermined assignment to a music condition or silence condition. Immediately following the transition period of seven minutes, I will be given ten minutes to answer questions on the BrainBashers™ logic test. Following the test, I understand that I will need to complete a survey that assesses my anxiety level after the test. The data collected in this study will be analyzed and submitted in a graduate level dissertation.

I understand that I will be individually required to attempt a challenging logic test and the Individual Test Anxiety Assessment immediately thereafter. My participation in the study should not exceed thirty minutes.

I understand that my responses will be anonymous and that all the data gathered will be confidential. I agree that any information obtained from this study may be used in any way thought best for publication or education provided that I am in no way identified and my name is not used.

I understand that there are no physical or psychological risks involved in this study, and that I am free to withdraw my participation at any time without penalty.

I understand that my participation does not imply employment with the state of New Jersey, Rowan University, the principal investigator, or any other project facilitator.

If I have any questions or problems concerning my participation in this study I may contact Samuel Parashis at (609) 731-7514 or [parash28@students.rowan.edu](mailto:parash28@students.rowan.edu).

## APPENDIX B

### Brainbashers Logic Test



## Brainbashers Logic Test

BrainBashers™ Logic Test: The following logic puzzles were compiled from the Brainbashers™ collection created by Kevin Stone. Please feel free to visit <http://www.brainbashers.com> for more puzzles.

Directions: You have 15 minutes to answer as many of the following questions as possible. Please feel free to use the provided scrap paper to work the problems out. Write your answers in the space provided below each problem.

**#1** A fire engine was rushing to a small fire, 15 miles away. The fire engine set out with 120 gallons of water, however, the water tank had a leak and the fire engine was losing water at the rate of 2 gallons per minute. The fire engine traveled at a constant 30 miles per hour. The fire required 50 gallons of water - did the fire engine have enough water when it arrived?

**#2** During a crazy weekend of paintball, four friends were having great fun. The paint came in blue, green, yellow and red. Coincidentally, the four friends had T-shirts in those same colors. Brenda used blue paint balls. The person in the green T-shirt used yellow paint balls. James was not wearing a red T-shirt. Diane used green paint balls and wore a blue T-shirt. Simon was the only person who used paint which was the same color as his T-shirt. Can you tell which color paint they each used and the color of their respective T-shirts?

**#3** The local river Trent is 4100 inches wide, which happens to be a fantastic number. There is a magnificent, perfectly straight, bridge which spans the river. During a recent survey of the area it was found that one seventh of the overall length of the bridge was on one side of the river and one eighth of the bridge was on the other side of the river. How long is the bridge which spans the river Trent?

**#4** Albert is a keen dog admirer and over the years has had a number of dogs. He has had an Alsatian, a Dalmatian, a Poodle and a Great Dane, but not necessarily in that order. Albert had Jamie first. The Dalmatian was an adored pet before the Great Dane. Sammy, the Alsatian, was the second dog Albert loved. Whitney was housed before the Poodle and Jimmy was not a Great Dane. Can you tell each of the dogs' name and the order in which Albert had them?

**#5** Unluckily, last week I lost my measuring tape. It was unlucky as I had to measure Daniel's toy box. Luckily though I could remember that the top had an area of 720 square inches, the side was 800 square inches and the end was 360 square inches. What were the true dimensions of the toy box?

#6 By changing the second letter of each word below, you can make another valid word. Can you change each word such that the second letters will reveal an eleven letter word when read downwards. Therefore, what now reads VOKAHLIUPPW will be a real word.

OVAL  
POST  
SKIN  
MAL  
WHEN  
SLAB  
MISS  
FUND  
APED  
SPED  
SWAY

APPENDIX C

Individual Test Anxiety Assessment

**Individual Test Anxiety Assessment**  
Samuel Parashis

**Directions:** Read each of the items below. Indicate how often you experience each situation by circling the response that most accurately describes your experience with tests or exams. Please be honest.

ITEM		RESPONSE				
1.	I become frightened while thinking about an exam 1 week before the exam	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
2.	My mouth becomes dry while taking tests or exams	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
3.	I feel that others are performing better than me while I take tests	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
4.	I wish there were some way to succeed without taking exams	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
5.	Noises in the testing environment bother me while I take tests	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
6.	I feel unprepared before taking tests	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
7.	I feel that the pressure of a time constraint interferes with my test performance	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
8.	My body tenses during exams and tests	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
9.	I think less of myself if I have done poorly on a test	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4

10.	I get nervous immediately before receiving test results	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
11.	I wish that I could write a paper instead of taking exams for a grade	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4
12.	I get frustrated when people make noise around me while I take tests	Never 0	Almost Never 1	Half the Time 2	Almost Always 3	Always 4