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Does Different Types of Music Have Any Impact on Exam Anxiety?

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Abstract. This paper presents a hypothetical experimental design intended to investigate the interactive impact of music type (calm music vs. obnoxious music) and grade consequences (grade-relevant vs. grade-irrelevant) on test anxiety and academic performance of college students. The experimental design will be 2x2 between-subjects, with the target participants being the college students. Test anxiety will be measured through a combination of physiological indicators (systolic blood pressure, diastolic blood pressure, heart rate) and self-report scales (State-Trait Anxiety Inventory, Form Y1, STAI-Y1), while academic performance will be evaluated through a standardized subject test. The research aims to confirm that calm music can help to reduce test anxiety and improve academic performance more effectively than obnoxious music, and whether this effect is more prominent under grade-relevant conditions. This hypothetical design offers a framework that can be used in future empirical studies to gain further insights into the regulatory role of music in test anxiety under different pressure scenarios, and offers potential practical strategies for students to cope with test anxiety.

Keywords: test anxiety, music type, grade consequences, experimental design, anxiety regulation

1. Introduction

Test anxiety is a common psychological phenomenon among students, particularly when it comes to higher education, where academic assessments are directly connected with significant life objectives like course credits, academic rankings, and future career development [1]. It is not a simple transient emotional experience but a very complex one with psychological and physiological responses.

Psychologically, test anxiety may lead to cognitive interference, such as difficulty concentrating, memory lapses, and negative self-evaluation; physiologically, it often manifests as increased heart rate, elevated blood pressure, and muscle tension [2]. These responses, in turn, can significantly impair students' academic performance, and this leads to a vicious cycle of anxiety - poor performance - more anxiety. So, how can we find ways to reduce test anxiety?

Anxiety has become a key issue in the fields of educational psychology and student mental health. Grade consequences, a core situational factor influencing test anxiety, have been long under the attention of researchers. In case students believe that test scores are directly connected to their academic performance, they will be motivated to study harder. Achievements (e.g., affecting course

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credits or GPA), their sense of pressure is likely to rise, and hence test anxiety [3]. The positive correlation between grade importance and test anxiety level has been confirmed by previous studies, yet the majority of them consider the independent effect of grade consequences on anxiety or performance, and rarely explore how to buffer its negative effects through external interventions.

Music, as an inexpensive and simple to apply emotional control mechanism, has demonstrated potential in reducing anxiety. A large number of studies have found that calm music (characterized by slow tempo, soft melody, and no lyrics) can reduce individuals physiological arousal level, relieve tension, and improve emotional state [4,5]. On the contrary, obnoxious music (with high tempo, harsh sound and strong rhythm) can elevate the level of arousal and even induce negative emotions. However, the existing research on music and test anxiety primarily concentrates on the general impact of music, and does not discuss in detail whether or not the regulatory effect of music depends on situational variables like grade consequences. Indicatively, when high - pressure situations are involved, with grades at risk, is it possible that calm music can still have a positive effect on anxiety? Will the negative effect of obnoxious music be more obvious? These questions remain to be answered.

From a theoretical perspective, the Yerkes - Dodson Law provides a valuable framework for understanding the relationship between arousal level, situational pressure, and performance [6]. The law holds that there is an inverted U - shaped relationship between arousal level and task performance: moderate arousal is conducive to achieving the best performance, while too high or too low arousal will lower performance. When it comes to tests, the consequences of grades can drive students to an overly high level of arousal and various types of music can change the arousal level in either direction. Calm music might bring down the very high level of arousal to a moderate one, thus enhancing performance; alternatively, obnoxious music might. Further increase the arousal level, leading to worse performance.

However, this hypothesis has not been fully verified in the specific test anxiety scenario, in particular, the inability to measure physiological and psychological signs simultaneously to assess the regulatory impact of music. Considering the research gaps mentioned above, this paper develops a hypothetical experiment to examine the interactive influence of music type and grade consequences on college students test anxiety and academic performance. By manipulating music type and grade consequences, and using multiple indicators to measure test anxiety, this study attempts to clarify the following core issues: (1) What are the separate effects of music type and grade consequences on test anxiety and academic performance? (2) Do music type and grade consequences have an interactive effect on test anxiety and academic performance? Specifically, is the anxiety -relieving and performance - improving effect of calm music more significant under grade - relevant conditions? The findings of this research are likely to add to the theoretical literature on test anxiety. regulation, and provide practical guidance for students to cope with test anxiety and improve academic performance.

2. Method

2.1. Research design

The research takes a 2 (music type: calm music vs. obnoxious music) x 2 (grade consequences: grade - relevant vs. grade - irrelevant) between-subjects experimental design. The participants will be randomly assigned to one of the four experimental conditions and the impact of various combinations of independent variables on the dependent variables (test anxiety and academic performance) will be examined.

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Academic performance: It will be measured using a standardized mathematics test. The test questions will be selected from the mathematics test bank of relevant educational institutions, including 25 multiple - choice questions covering basic mathematical knowledge and reasoning skills. The time to take the test will be 10 minutes and the index of academic performance will be based on the number of correct answers. The test will be pre - tested on a small sample of college students before the formal experiment to make sure that it is neither too hard nor too easy.

2.2. Participants

The target participants are college students from different majors in a university. The sample size will be determined based on power analysis. Referring to similar studies in the past [7], it is estimated that about 80 participants will be recruited to ensure that each experimental group has about 20 participants, which can meet the statistical power requirements for detecting medium - sized effects ($\alpha = 0.05$, power = 0.80). Participants should have no history of cardiovascular diseases (to avoid interference with physiological indicator measurement) and no professional music training experience (to reduce the impact of individual differences in music expertise on the experimental results). Before the experiment, all participants will be informed of the general process of the experiment and sign an informed consent form. They will be compensated with appropriate course credits or small gifts for their participation.

2.3. Variables

2.3.1. Independent variables

Music type: It includes two levels: calm music and obnoxious music. Calm music will be selected from instrumental music works with a slow tempo (about 60 - 80 beats per minute), soft melody, and no lyrics, such as certain pieces from the album Music for Brainwave Massage [8]. Obnoxious music will be selected from works with a fast tempo (about 120 - 160 beats per minute), sharp sound, and strong rhythm, such as certain heavy metal music tracks. Both types of music will be played at the same volume (about 60 decibels) to avoid the interference of volume differences on the experimental results.

Grade consequences: It includes two levels: grade - relevant and grade - irrelevant. For the grade - relevant group, participants will be told that their performance in the subsequent test will directly affect the extra credit of a related course (the extra credit can account for 5% - 10% of the total course score). For the grade - irrelevant group, participants will be told that the test is only a practice activity, and the results will not be linked to any course credits or academic evaluations.

2.3.2. Dependent variables

Test anxiety: It will be measured from two aspects: physiological indicators and self - report indicators. Physiological indicators include systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR), which will be measured using a professional automatic blood pressure monitor (e.g., Dinamap PRO, Model 100V2) with an accuracy of ±2 digits for blood pressure and ±3 digits for heart rate. Self - report indicators will be measured using the State - Trait Anxiety Inventory, Form Y1 (STAI - Y1) [9], which consists of 20 items. Participants will rate each item on a 4 - point scale (1 = not at all, 4 = very much), and the total score will range from 20 to 80. A higher score indicates a higher level of state anxiety. The scale has good internal consistency (Cronbach's $\alpha = 0.93$) and validity in previous studies.

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Academic performance: It will be measured using a standardized mathematics test. The test questions will be selected from the mathematics test bank of relevant educational institutions, including 25 multiple - choice questions covering basic mathematical knowledge and reasoning skills. The test time will be set to 10 minutes, and the number of correct answers will be used as the index of academic performance. Before the formal experiment, the test will be pre - tested on a small sample of college students to ensure its difficulty and discrimination are appropriate.

2.3.3. Control variables

In order to reduce the impact of irrelevant variables on the experimental results, the following variables will be controlled: (1)Participants prior mathematical ability: It will be measured using a self - report questionnaire, asking participants to report their mathematics GPA in the past year and the number of mathematics courses they have taken. These statistics will be used as the covariates in the further statistical analysis. (2) Physical condition of participants prior to the experiment: Participants will be requested not to drink coffee, tea or other caffeinated drinks 2 hours prior to the experiment and avoid. Strenuous exercise to ensure that their physiological state is relatively stable.

2.4. Experimental process

The entire experiment will be divided into three stages, with a total duration of about 30 minutes.

2.4.1. Pre-experiment stage (about 10 minutes)

Random assignment: Participants will be randomly assigned to one of the four experimental conditions using a random number table.

Baseline measurement: The experimenter will first explain the experimental process to the participant and then measure the participant's baseline physiological indicators (SBP, DBP, HR) using the automatic blood pressure monitor. The measurement will be repeated 5 times, and the average value of the last 4 times will be taken as the baseline physiological index to reduce the error caused by accidental factors.

Filling out questionnaires: Participants will fill out the demographic questionnaire (including gender, age, major, etc.), the prior mathematical ability questionnaire, and the STAI - Y1 (first measurement, used to assess the baseline anxiety level).

2.4.2. Experimental manipulation stage (about 5 minutes)

Manipulation of grade consequences: According to the experimental condition assigned to the participant, the experimenter will verbally inform the participant of the relationship between the test results and the course credits. For the grade - relevant group, the experimenter will emphasize the importance of the test results for the extra credit; for the grade - irrelevant group, the experimenter will clarify that the test is only for practice.

Music intervention and learning: Participants will be given a 3 - page learning material about mathematical problem - solving strategies and will be required to study it for 5 minutes. During the study period, the corresponding type of music (calm music or obnoxious music) will be played in the laboratory. At the 1st minute and 3rd minute of the music playing, the experimenter will measure the participant's physiological indicators (SBP, DBP, HR) twice, and the average value will be taken as the physiological index during the music intervention. After the study, participants will fill out the

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STAI - Y1 again (second measurement, used to assess the anxiety level during the music intervention).

2.4.3. Post-experiment stage (about 15 minutes)

Test implementation: Participants will take the standardized mathematics test in the laboratory. The test time is 10 minutes, and the experimenter will remind the participants of the remaining time at the 2nd minute and 1st minute before the end of the test. During the test, the experimenter will measure the participant's physiological indicators (SBP, DBP, HR) at the 1st minute, 5th minute, and 8th minute, and the average value will be taken as the physiological index during the test.

Post - test measurement: After the test, participants will fill out the STAI - Y1 for the third time (used to assess the anxiety level during the test) and a manipulation check questionnaire. The manipulation check questionnaire will include two questions: (1) "To what extent do you think the test results will affect your course credits?" (rated on a 7 - point scale, 1 = not at all, 7 = very much); (2) "How would you describe the music you listened to during the study?" (rated on a 7 - point scale, 1 = very calm, 7 = very obnoxious). This is to verify whether the manipulation of grade consequences and music type is effective.

Debriefing: The experimenter will explain the true purpose and hypotheses of the experiment to the participants, answer their questions, and thank them for their participation.

2.5. Data analysis plan

The collected data will be analyzed using SPSS 26.0 statistical software. The main analysis methods are as follows:

Manipulation check: Independent samples t - test will be used to verify whether there are significant differences in the scores of the manipulation check questionnaire between the different levels of the two independent variables. For example, the score of the grade - relevant group on the "test result - course credit relationship" question should be significantly higher than that of the grade - irrelevant group; the score of the obnoxious music group on the "music description" question should be significantly higher than that of the calm music group.

Main effect and interaction effect analysis: 2×2 analysis of covariance (ANCOVA) will be used to analyze the effects of music type and grade consequences on test anxiety and academic performance. The baseline physiological indicators, baseline STAI - Y1 score, and prior mathematical ability (mathematics GPA) will be used as covariates to control their potential impact on the dependent variables. Separate ANCOVAs will be conducted for each dependent variable (including physiological indicators during music intervention, physiological indicators during the test, STAI - Y1 scores during music intervention, STAI - Y1 scores during the test, and academic performance). The significance level will be set to $\alpha = 0.05$, and Bonferroni correction will be used for multiple comparisons to avoid type I errors.

Simple effect analysis: If there is a significant interaction effect between music type and grade consequences, simple effect analysis will be conducted to further explore the effect of one independent variable at different levels of the other independent variable. For example, the effect of music type on test anxiety and academic performance will be analyzed separately under the grade - relevant and grade - irrelevant conditions.

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3. General discussion

3.1. Expected results and theoretical implications

Based on the research design and existing theoretical and empirical foundations, this study expects to obtain the following main results: First, in terms of the main effect, compared with obnoxious music, calm music will significantly reduce participants' physiological anxiety indicators (SBP, HR) and self - reported anxiety scores, and improve academic performance; grade consequences will also have a significant main effect, that is, the test anxiety level of the grade - relevant group will be significantly higher than that of the grade - irrelevant group, and the academic performance may be lower (due to excessive anxiety). Second, and more importantly, there will be a significant interactive effect between music type and grade consequences: under the grade - relevant condition, the effect of calm music on reducing test anxiety and improving academic performance will be more significant; under the grade - irrelevant condition, the difference between calm music and obnoxious music in regulating test anxiety and academic performance will be small or not significant.

These expected results will have important theoretical implications. First, they will further verify the applicability of the Yerkes - Dodson Law in the field of test anxiety regulation. The results will show that when the situational pressure (grade consequences) is high, the excessively high arousal level can be adjusted to a moderate range through external intervention (calm music), thereby improving performance. This will enrich the research on the application of the law in educational scenarios. Second, the study will expand the understanding of the regulatory effect of music on anxiety. It will confirm that the effect of music is not fixed but is affected by situational factors (grade consequences), which will help to clarify the boundary conditions of music's anxiety - relieving effect and provide a more comprehensive theoretical framework for the study of music and emotion regulation. Third, by simultaneously measuring physiological and self - reported anxiety indicators, the study will help to reveal the consistency and differences between the psychological and physiological responses of test anxiety, and provide a more in - depth understanding of the mechanism of test anxiety.

3.2. Expected practical implications

In case the anticipated findings are achieved, this research will have significant practical implications to students, teachers, and other related educational facilities. To the students it will offer an easy, low - cost and easy - to - operate strategy to cope with test anxiety. Before taking high - stakes tests (like tests concerning course credits or major certifications), students will be able to reduce anxiety and enhance performance. by listening to calm music for a short time. This will help students reduce the negative impact of test anxiety on their academic development and enhance their confidence in facing tests.

For educators, the results of the study will provide a new idea for guiding students to cope with test anxiety. Teachers can recommend calm music to students prior to major exams, and even play relaxing music in the classroom or exam waiting room to make them feel relaxed students. In addition, educators can incorporate the method of using music to regulate emotions into mental health education courses, helping students master scientific emotion regulation skills and improve their psychological resilience.

For educational institutions, the study will provide a basis for optimizing the exam environment. Educational institutions can consider installing music playing devices in examination rooms or waiting rooms, and play suitable relaxing music prior to exams to assist students to get into the

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mood. This will not only contribute to the enhancement of student performance in exams but also to the establishment of a more humanized and supportive education environment, which is of great significance for promoting students overall development.

3.3. Limitations of the study

Although this study has designed a relatively rigorous experimental plan, it still has some limitations that need to be noted. First, the sample representativeness may be limited. The target participants are college students from a single university, and there may be differences in test anxiety levels and responses to music between students of various genders, ethnicities and academic backgrounds. Thus, the findings of the study might not be extrapolated to other groups of students (middle school students, graduate students) or students in general different regions and cultural backgrounds.

Second, the manipulation of music type is relatively simple. The study compares only two types of music (calm music and obnoxious music) and does not consider other characteristics of music (such as melody, rhythm, instrument type) that can influence the anxiety - relieving effect. Besides this, the study does not consider individual differences in music preference. The so - called obnoxious music in the study may be liked by some participants and this may result in failure of the music manipulation or influence the experimental findings.

Third, the measurement of academic performance is limited to mathematics tests. Math is a rather anxiety-sensitive subject and the impact of music on test anxiety and performance can be vary in different subjects (such as language subjects, practical operation subjects). Therefore, the results of the study may only be applicable to mathematics or similar subjects, and their applicability to other subjects needs to be further verified.

Fourth, the study only focuses on the short - term effect of music intervention. The time of the music intervention in the study is just 5 minutes, and it is not specified whether long - term music intervention (such as listening to calm music for a long time before exams) will have a more profound and permanent impact in reducing test anxiety. Besides, the research does not follow the long - term effect of music intervention on the academic performance and mental health of students, which is a drawback understanding of the long - term value of music intervention.

3.4. Directions for future research

Taking the above limitations into account, many of future research can be demonstrated. The first step is to expand the range of the sample. Future research could include students from other regions and different types of schools (key universities, ordinary universities, vocational colleges) or different academic stages (middle school students, graduate students) to improve the representativeness of the sample and the generalizability of results. Moreover, cross -cultural studies can be conducted in order testing if the effect of music on test anxiety change in other cultural context.

Based on the above, the second is to enhance research on music characteristics and individual differences. In the future, studies can analyze the influence of different music features (for example: tempo; melody; mode and type of instrument) on test anxiety as well as to find out for which music parameters it helps reduce this test anxiety mostly. On the other hand, studies can take into account individual differences in music preference during the research design and test whether music preference moderates the anxiety - reducing effect of music. For instance, compare effect of preferred calm music and non - based correlated calm music on test stress.

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Third, expand the scope of academic performance measurement. Future studies are able to choose various subjects (like Chinese, English, physics, chemistry) as the subject of testing in order to investigate whether the influence of music on test anxiety and performance is the same in various subjects. Moreover, besides objective test scores that are used to determine academic performance, subjective evaluation indicators (e.g., self -evaluation of students on their performance during tests) may also be included in comprehensively evaluate the impact of music intervention.

Fourth, investigate the long - term impact of music intervention. The future research can develop a longitudinal research plan and implement it in the long run. Music treatment on the subjects (like listening to relaxing music 15 -30 minutes per day over a month prior to exams), and monitor the changes in their test anxiety level and academic performance over time. This will assist in knowing the long - term effect and mechanism of music intervention, and give a more substantial ground to the practical application of music intervention.

Fifth, use a combination of research methods. Future studies can integrate neuroscience techniques (electroencephalography, functional magnetic resonance imaging) to investigate the neural mechanism of music regulation. For example, by measuring the brain activity of participants when listening to music and taking tests, we can also learn more about the influence of music on the brain areas associated with anxiety and cognitive processing, and demonstrate the neuroanatomical foundation of the anxiety -relieving effect of music.

4. Conclusion

To sum up, this study set out to see whether music type and whether an exam counts toward a grade work together to influence college students' test anxiety and performance. Based on the experimental design, we expect a few key findings. First, calm music should help students relax—lowering both physiological measures like heart rate and blood pressure and self-reported anxiety—while obnoxious music may do the opposite. Second, the grade consequence condition clearly matters: students who believe the test affects their credits naturally feel more anxious. More importantly, we anticipate an interaction effect: the benefits of calm music—both for reducing anxiety and improving performance—should be stronger under the high-pressure, grade-relevant condition. When the test doesn't matter for their grades, the difference between the two types of music might be much smaller.

What makes this work stand out is that it goes beyond simply saying "music reduces test anxiety." It highlights that the effect depends on the situation—calm music becomes especially valuable when the stakes are high. Also, by measuring both physiological and psychological aspects of anxiety, the findings should be more solid than studies relying only on questionnaires. On a practical level, if these expected results hold, students could use a few minutes of calm music before important exams as a cheap and easy coping strategy. Teachers and schools might also consider playing relaxing background music before tests or in waiting areas to help students get into a better state of mind.

Of course, there are limitations. The sample is limited to one university, the subject is only math, and only two extreme types of music were compared. Future studies could include students from different grades and schools, try other subjects and music genres, or even use EEG to look at what is happening in the brain. Hopefully, follow-up research will fill these gaps and make music a truly practical tool for helping students deal with test anxiety.

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