

Effect of cognitive-behavioral therapy with music therapy in reducing physics test anxiety among students as measured by generalized test anxiety scale

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Abstract

Background: The study determined the effect of cognitive-behavioral therapy (CBT) with music in reducing physics test anxiety among secondary school students as measured by generalized test anxiety scale.

Methods: Pre-test post-test randomized control trial experimental design was adopted in this study. A total of 83 senior secondary students including male (n=46) and female (n=37) from sampled secondary schools in Enugu State, Nigeria, who met the inclusion criteria constituted participants for the study. A demographic questionnaire and a 48-item generalized test anxiety scale were used for data collection for the study. Subjects were randomized into treatment and control groups. The treatment group was exposed to a 12-week CBT-music program. Thereafter, the participants in the treatment group were evaluated at 3 time points. Data collected were analyzed using repeated measures analysis of variance.

Results: The participants who were exposed to CBT-music intervention program significantly had lower test anxiety scores at the post-treatment than the participants in the control group. Furthermore, the test anxiety scores of the participants in the CBT-music group were significantly lower than those in the control group at the follow-up measure. Thus, the results showed a significant effect of CBT with music in reducing physics test anxiety among secondary school students.

Conclusion: We concluded that CBT-music program has a significant benefit in improving the management of physics test anxiety among secondary school students.

Abbreviations: ΔR^2 = adjusted R^2 , CBT = cognitive-behavioral therapy, CBT-music = CBT-based music group, CI = confidence interval, GTAI = Generalized Test Anxiety Inventory.

Keywords: cognitive-behavioral therapy, music therapy, test anxiety, physics, generalized test anxiety inventory

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1. Introduction

Anxiety is a psychological construct which can cause many problems in the mental life of students or any human. Students always express inner struggles with different words, moods, feelings, emotions. According to Bayangard,^[1] students use expressions such as anxiety or worry in expressing their inner struggles. Anxiety is one of the most important factors of all mental disorders based on the theory of psychological analysis. Anxiety has a prominent role in the psychological analysis of students' activities in school, especially during test condition.^[2] Test anxiety is a global phenomenon which most students face during the examination and consequently results in low achievement in such examination. This does not indicate that the students are less intelligent but because they are tensed up at that moment. Thus, highly test anxious students are often worried due to the test situation.^[3] They are always in the situation of thinking negative thoughts and consequently their achievement becomes low. Test anxiety is a physiological condition which makes the students experience distress, before, during, or after taking a test to such an extent that causes poor performance in such test.^[4] Eifediyi, Ojugo, and Aluede^[4] further found that while many students experience some degree of anxiety before and during an examination, it can actually impair

learning and hurt test performance. According to Farooqi, Ghanl, and Spieberger,^[5] test anxiety is an overwhelming feeling of disturbance and distress among students globally which can be a devastating problem for them because it may impair their performance, their wellbeing, and other adversities later in life in the long run. The number of adversities or negative life events experienced seem to have a positive dose-response relationship with youth suicidal behavior.^[6] The type of event experienced also appears to matter: one of the most consistent findings was the association between suicidal behavior and experience of sexual abuse.^[6]

According to Clark and Beck^[7] test anxiety has three components, which are cognitive, affective, and behavioral. The cognitive component consists of worry or negative thoughts, depreciating self-statements which occur during test condition leading to a problem in recalling facts in reading and understanding questions. The affective component is the person's appraisal of his/her physiological state such as tension, tight muscles, and trembling during testing. The behavioral component consists of poor study skills, avoidance, and procrastination. The high level of test anxiety among test anxious students activates worry conditions which will be stored up in the memory and these conditions interfere with test performance.^[8] There are

numerous prevailing conditions that have severally induced test anxiety among students in Nigeria.^[9] According to Eifediyi, Ojugo, and Aluede,^[4] mental and chronological ages are determining factors of students' manifestation of test anxiety which can cause hindrances in the learning process. Test anxiety among students of adolescent's stage is very common and natural (Fig. 1).

In the Nigeria context, over 50% of the students are faced with anxiety before and during test conditions which usually affect their achievement in such test. Early research showed that test anxiety rates were found to be much higher than 33% among the school children and adolescents affected.^[10] After that further research showed that approximately 40% of students have been affected.^[11-13] Test anxiety in adolescents is common and disruptive, pointing to a need for an effective treatment for this age group. Studies in Nigeria^[13-15] have revealed a high rate of poor academic achievement of students in public examinations. Students' poor academic achievement has become the concerns of parents, teachers, school administrators, and government.^[14-16] Their worries are becoming more intense as they realize that students' performance in school may connect with their performance in real life.^[15] Earlier research in Nigeria traced students' poor academic achievement to teachers' specific factors,

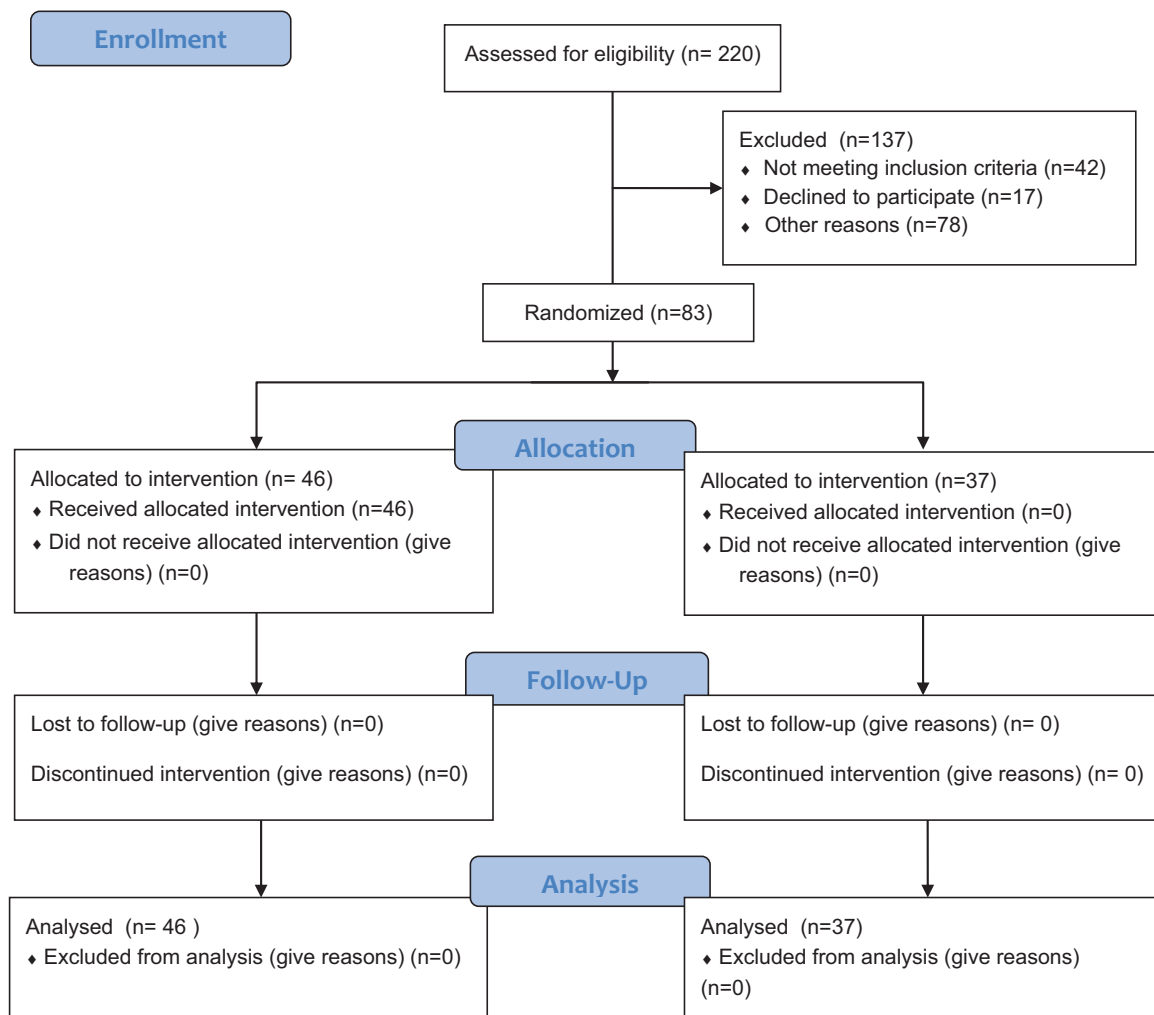


Figure 1. Consort flow diagram for participants allocation.

school-related problems,^[17,18] and the home.^[14] Despite such efforts by the researchers, students' academic achievement in Nigeria has not improved to expectations.^[16] This calls for a study of this nature to explore effective therapy such as cognitive-behavioral therapy (CBT) with music therapy for the reduction of test anxiety among physics students in southeast Nigeria.

According to Butler et al,^[19] CBT is an effective treatment of depression and anxiety. CBT can be in the form of individual, group, brief, guided self-help, and online. Among these forms, delivery of CBT in a group format is common in North America as it has been established to be more effective than the others. CBT group therapy has the advantages of connecting group members to facilitate symptom reduction and insight, and also increase the efficiency of service delivery.^[20] However, music, as a collective activity, can introduce clients to CBT therapy concepts by adding non-verbal facilitation, and as such, it may be able to sustain therapeutic engagement beyond the talking form of CBT. According to Trimmer, Tyo, and Naeem,^[20] music is a universal activity which enriches every culture. They^[20] found that it is the rare person who does not possess a connection to music, or a fundamental music-making ability. For the present therapeutic intervention, music was used as a delivery medium rather than a therapy itself. According to Trimmer, Tyo, and Naeem,^[20] music as a therapeutic metaphor facilitates the understanding of psycho-therapeutic materials, promote discussion of difficult topics, and be harnessed to promote a connection between facilitators and group members, thus placing a positive light on therapy for the client.

A lot of researchers have proved the efficacy of combining CBT and music therapy in helping individuals with clinical and non-clinical problems.^[20,21] Hakvoort et al^[22] found that the use of music with CBT "could become a motivator, inspirer, reinforcement, or even 'seducer' to psychotherapy." Dingle et al^[23] used music therapy as an addition to group CBT and found increased attendance and engagement for CBT. Such clinical problems include depression, anxiety disorders, phobias, post-traumatic stress disorder, sleep disorders, and eating disorders.^[24] The non-clinical problems include social isolation^[25] and emotional distress.^[21]

The researchers in the present study sought to build upon these findings by using a CBT-based music group (CBT-music) to reduce physics test anxiety among Nigerian students. The CBT was supplemented with musical activity. This is a novel treatment strategy in the Nigerian context in the sense that no such intervention has been done. CBT-music therapy brings test anxiety students together in a therapy group that musicalizes traditional aspects of CBT. Statistics show that over 10 million students perform poorly in school examinations due to anxiety. In line with this, Fiore^[26] found that approximately 20% of school children and 25% of college students have a debilitating performance on a test. Majority of the students in secondary schools in southeast Nigeria are daily confronted with challenges of coping with their academic activities under serious emotional stress as a result of test anxiety. Thus, test anxiety if not reduced through intervention as proposed by the researchers can hinder students' educational development. The researchers, therefore, tested the hypothesis that there is a significant effect of CBT with music therapy in reducing physics test anxiety among secondary school students as measured by generalized test anxiety scale. This paper has several contributions as documented by previous researchers. CBT-music therapy increased engagement, adhered to low cost and efficient models of delivery while also meeting

clients at their cognitive and emotional level.^[20] CBT with music method was found to be significant in improving depression, aggression, and anxiety among students.^[21] The following factors motivated the researchers to undertake the study: negative emotion has a wide range of pernicious impacts on people, ranging from the failure in real-time task performance to the development of chronic health conditions.^[27] Due to the variation in factors surrounding humans, the physiological impact of stress is reported to be different for each individual.^[28] Besides, studies indicated that innovative approaches can outperform traditional methods.^[29-34]

2. Methods and materials

2.1. Ethical considerations

Faculty of Education, University of Nigeria, approved this study through their institutional review board with ID No: REC/FE/19/00067. The researcher strictly followed the ethical standard specifications of the American Psychological Association (APA, 2017) and the World Medical Association (2013).

2.2. Design of the study

Pre-test post-test randomized control trial experimental design was adopted by the researchers for the study. Subjects were randomized into experimental and control groups.

2.3. Participants

A total of 83 secondary school students in Enugu State, Nigeria, were used as participants. Furthermore, the accuracy of the sample size was determined using *G-Power*, version 3.1 which gave 0.93. The demographic statistics of the participants are presented in Table 1.

2.4. Measure

2.4.1. Generalized test anxiety inventory. The generalized test anxiety inventory (GTAI) developed by Suinn^[35] was used as a measure of the test anxiety levels of students. GTAI is a 48-item inventory on a 5-point scale with response options of Not at All (1), Very Little (2), A Fair Amount (3), Much (4), and Very Much (5). A score of 48 is the lowest score for GTAI and a score of 240 is the highest score. A low score (48-59) indicates that the individual does not suffer from test anxiety. Scores between 60 and 95 indicate that, although a participant exhibits some of the characteristics of test anxiety, the level of stress and tension is probably healthy. Scores between 96 and 159 indicate moderate test anxiety. Scores of 160 and above suggest an unhealthy level of anxiety. The instrument was construct-validated using the rotated component matrix. The analysis showed that the Kaiser-Meyer-Olkin measure is 0.82 which shows that the sample for the factor analysis was very adequate. Also, Bartlett test of sphericity is significant, $P = .001$, meaning that correlation matrix for the instruments is not an identity matrix. The benchmark for the selection of the items based on their factor loading was 0.5. Thus, only items that loaded up to 0.5 on only 1 factor were selected for the study. The factor loadings of the 48-item instrument indicated that 3 items were factorially impure and thus were excluded from the instrument. Summarily, the 48-item instrument was reduced to 45-item. For this study, the internal consistency reliability of the instrument was 0.83 using Cronbach alpha reliability method.

Table 1
Demographic information of the participants.

Variables	Categories	Treatment group	Control group	Total
Gender	Male	28 (60.87%)	18 (48.65%)	46 (55.42)
	Female	18 (39.13%)	19 (51.35%)	37 (44.58)
	Total	46 (100%)	37 (100%)	83 (100%)
Mean age	M ± SD	18.98 ± 5.45		18.23 ± 4.67
Location	Urban	20 (43.49%)	21 (56.76%)	41 (49.40%)
	Rural	26 (56.52%)	16 (43.24%)	42 (50.60%)
	Total	46 (100%)	37 (100%)	83 (100%)

It is worthy to note that these symptoms of anxiety in testing situations are not abnormal or strange. They are the types of things people normally experience when they are under stress that is difficult to handle, or when they are very anxious. The feelings usually pass away quickly, including the irrational thoughts, when the test is over and the situation changes.

2.5. Procedure

The researchers visited the principals of each of the schools in Enugu State, Nigeria, to notify and obtain permission from them. At the course of the visits, the researchers explained to the school authorities what CBT with music therapy is all about and how the intervention can be beneficial to them by reducing test anxiety among students. The researchers did the initial selection by word of mouth during the morning assembly. The initial screening lasted from May to June 2018 in Enugu State, Nigeria. A total of 220 students showed interest and volunteered to participate in the intervention program via Inform Consent Form distributed to them. Prior to that, the Researchers wrote the parents informing them about the intervention which they certified. All the 220 students who volunteered to participate in the study were screened for eligibility based on the classification conditions by the *Diagnostic Scientific Manual for Mental Disorders volume 5*. The researchers also considered the following:

- (i) must be physics students;
- (ii) students must have low academic achievement records;
- (iii) demonstrate mild-to-moderate symptoms of anxiety using the GATI.

Volunteers who did not meet all the inclusion criteria were excluded. After that, the 83 students who met all the inclusion criteria were randomly assigned to experimental (43 participants) and control (40 participants) group conditions using a simple randomization procedure (participants were asked to pick 1 envelope containing pressure-sensitive paper labeled with either E, experimental group, or C, control group) from a container by the researchers.

A demographic questionnaire was administered to the eligible participants to access their age, gender, and location as students. In order to remove randomization bias, information from the demographic questionnaire was concealed from the person who randomized the participants to experimental and control conditions. Before the commencement of the testing and treatment package, the researchers assured the participants of confidentiality of interactions and personal information as they work together in self-disclosure. The researchers were pleasantly surprised when participants used music as a metaphor to add additional aspects to the group therapy experience. For example, participants developed music-based group guidelines (e.g., “Only

one solo at a time” to address speaking in turn, and “everyone shows up on time for band practice” to address punctual attendance).

Thereafter, the pre-treatment assessment (pre-test) was conducted using the generalized text anxiety scale in order to collect baseline data (Time 1). Thereafter, the experimental group was exposed to 90 minutes of CBT-based music program. The program lasted once a week for a period of 12 weeks. The treatment took place between September and November 2018. Post-test (Time 2) assessment was conducted 1 week after the last treatment session. Two months after the intervention program, regular follow-up assessment measure (Time 3) was conducted by the researchers. The participants, research assistants, and the data analysts were blinded during the recruitment process, treatment, and data analyses. Data collected from the experimental group at each evaluation were compared to that from the no-intervention control group.

2.6. CBT-music intervention program

CBT-music program is a 12-week guided self-help group derived from a guided self-help approach which is an established protocol.^[36] Each session was held once a week and lasted for 90 minutes. The sessions were group-oriented. The program was implemented by 4 facilitators with basic training in CBT and supervised by 2 experienced CBT therapists and music therapists. The aim of the program was to reduce the level of physics test anxiety among students using CBT group therapy with music infusing music into nearly every aspect of CBT group therapy as a means for further comprehension and engagement with the material by participants. Such infusion involved the use of critical listening to the musical material, songwriting, playing various musical instruments, and using music as a point of reference in group discussion and homework assignments. All music playing was geared toward the non-musician through the use of easily playable instruments (e.g., shakers and bells) that integrate well together (i.e., all pitched instruments are played in the key of C). The group adhered to a traditional CBT group structure, including theme weeks (e.g., thinking, behavior, and emotions), and the use of CBT tools such as behavioral experiments, thought records, and homework at the conclusion of each session. A secondary goal of the facilitators was to promote a feeling of coherence similar to attending “band practice.”

During sessions 1 to 3, the facilitators familiarized the participants with the objective of the intervention, built rapport, established rules and regulations, and discussed about anxiety, symptoms, and causes of physics phobia. After the sessions, an assignment was given based on physics workbook. During the fourth to seventh sessions, activation of event, consequences, how to change automatic thoughts about a task in physics to rational

thoughts were discussed and followed by a review of previous exercise and homework.

Sessions 8 and 11 involved critically listening to the musical material, songwriting, playing various musical instruments, and using music as a point of reference in group discussion and homework assignments. Every week was devoted to the performance and discussion of a CBT-related distinct song. Songs chosen for each week were pre-written and adapted from recognizable classic rock songs with the original lyrics replaced with lyrics pertaining to CBT.

The students/participants in the intervention group were made to adhere to a traditional CBT group structure, and the use of CBT tools such as behavioral experiments, thought records, and homework at the conclusion of each session. Music techniques were adopted namely opera, rock, pop, classical relaxation, song, and breath control. CBT techniques such as cognitive restructuring, cognitive disputation, reframing, rhythmic-based skills, attention training, and mood monitoring skills were used.^[21,37]

2.7. Data analysis

The SPSS software version 13 was used to conduct the statistical analyse for the effect of CBT with music in reducing physics test anxiety among secondary school students in southeast Nigeria. Statistically, repeated measures 2-way analysis of variance (ANOVA) was used to analyze the data collected. The effect size of the intervention on physics test anxiety among secondary school students was reported using partial eta squared (η_p^2) and adjusted R^2 values. The assumption of the sphericity of the test statistic was tested using the Mauchly test of sphericity which was not significant (Mauchly $W=0.926$, $P=.867$), implying that the assumption was not violated. Thus, the variances of the differences between all combinations of the related measures are equal.

3. Results

Table 2 reveals that there was no significant difference between the treatment and control groups in initial physics test anxiety among secondary school students as measured by GTAI, $F(1,80)=0.753$, $P=.513$, $\eta_p^2=.003$, $\Delta R^2=.009$. At the post-treatment and follow-up measures, the effect of CBT with music in reducing physics test anxiety among secondary school students was significant, $F(1,80)=256.876$, $P=.000$, $\eta_p^2=.904$, $\Delta R^2=.956$, and $F(1,80)=243.873$, $P=.000$, $\eta_p^2=.823$, $\Delta R^2=.887$. The results also showed that there was a significant interaction effect of time and group on the reduction of physics test anxiety among secondary school students, $F(2,76)=25.196$, $P=.000$, $\eta_p^2=.543$, $\Delta R^2=.604$. Figure 2 shows the graph of the interaction effect of time and group.

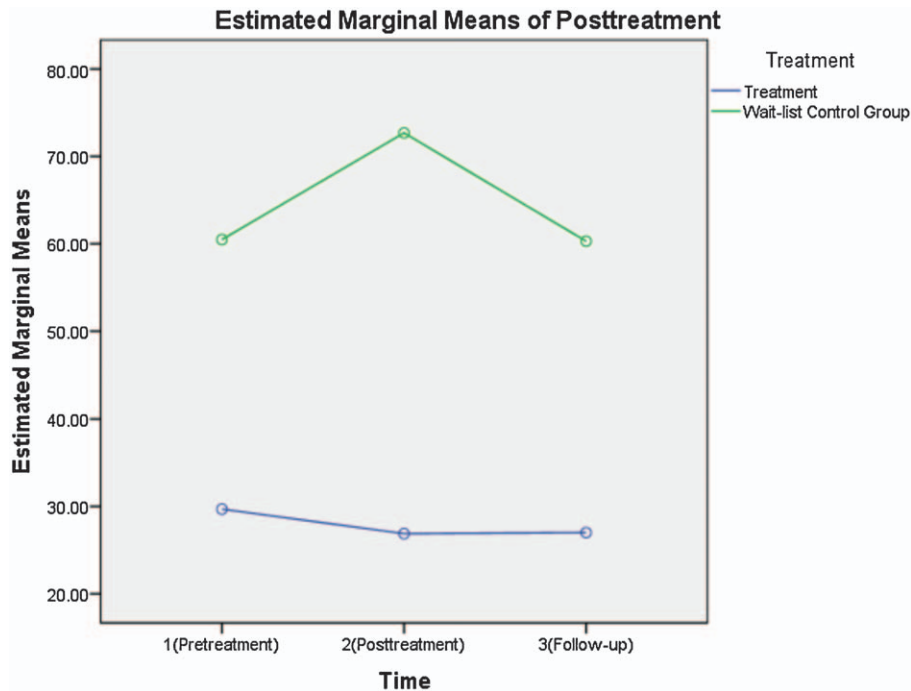
4. Discussion

The results of the study showed that CBT-music was very significant in the reduction of physics test anxiety among secondary school students in southeast Nigeria over the non-intervention group. Besides, the efficacy of the CBT-music in the reduction of physics test anxiety among secondary school students in southeast Nigeria was significantly retained after some months of the intervention at the follow-up assessment. As expected, there was a significant difference between treatment versus no treatment control on the post-test as well as the follow-up measures. According to Per, Jakob, Henrik, and Lars,^[38] the combination of natural recovery and the possibility that once a person has decided that he or she has a problem so severe that it requires professional treatment, he or she is more or less determined to stop and can sometimes do so by him- or herself^[39] may have explained the results. Besides, these results corroborated the students-centered nature of CBT-music. The results are in agreement with the findings of Yoosefi, Fatehzade, Etmadi, Ahmadi, and Isanazhad^[22] who found that cognitive therapy method is significant in improving depression, aggression, and anxiety among students. The findings are in line with other studies about the effectiveness of the cognitive therapy method on the reduction of test anxiety.^[40-43] The current study is in conformity with other studies such as Bott et al^[44] and Yoosefi and Hosseiny.^[45] Although the results show that both Ellis’s cognitive therapy method and client-centered therapy method have been effective in reducing anxiety, it can be assumed that anxious individuals suffer from cognitive problems such as irrational thinking or that they have a biological tendency of self-destruction.^[40] These individuals deal with some sorts of obligations subconsciously during the course of self-destruction and these factors bring about anxiety in them. Based on the client-centered view, anxious people suffer from a lack of conformity between “self” and their “experiences.” This means that a part of their personality which has been detached as “self” does not have conformity with the individual’s experiences and this causes a sort of anxiety. Buttressing the results of the present study are the findings of the studies conducted by Akagy,^[44] Bradshaw and Slade,^[46] Saunders,^[47] and Shni.^[48] Thus, the present study’s hypotheses were confirmed. The current study was a valuable study of its kind in the examination of the effect of CBT-music therapy on the reduction of anxiety among physic students in southeast Nigeria. Therefore, it is hoped that the findings of the current study be noted in Nigeria and other parts of the world; it is expected that mental health counselors, psychotherapists, and music therapists could choose of CBT-music therapy in mitigating psychological symptoms affecting physics students. The roles of mental health counselors in carrying out CBT-music

Table 2
Repeated measures analysis of variance showing the effect of cognitive-behavioral therapy with music in reducing physics test anxiety among secondary school students in southeast Nigeria.

Time	Measures	Group	Mean(SD)	F	P	η^2	ΔR^2	95%CI
1 Pretreatment	GTAI	Treatment	167.43 (19.43)	0.753	.513	.003	.009	0.13,.156
		Control	166.87 (18.25)					
2 Post-treatment	GTAI	Treatment	45.06 (17.90)	256.876	.000	.904	.956	154.24,287.06
		Control	156.13 (20.78)					
3 Follow-up	GTAI	Treatment	43.65 (6.56)	243.873	.000	.823	.887	150.15,270.01
		Control	156.45 (18.98)					

CI: confidence interval, GTAI=Generalized Test Anxiety Inventory, SD)=standard deviation, η^2 : effect size, ΔR^2 =adjusted R^2 .



Covariates appearing in the model are evaluated at the following values: Pretreatment = 73.8916

Figure 2. Graph of time \times group interaction effect using Generalized Test Anxiety Inventory.

therapy include working with students and groups to improve mental health, encouraging clients to discuss emotions and experiences, helping clients define goals, plan action and gain insight, developing therapeutic processes, referring clients to psychologists and other services, and taking a holistic (mind and body) approach to mental health care. The roles of psychotherapists in carrying out CBT-music therapy include performing therapy sessions in a controlled environment using verbal interaction to explore behavior, attitudes, and emotions, and helping clients to understand and address their inner conflicts. The roles of music therapist in carrying out CBT-music therapy include helping their clients achieve therapeutic goals through the development of the musical and therapeutic relationship but not to teach clients how to play an instrument.

The results of the study point to several issues related to the prevention and intervention of psychological disorders for Nigerian students. There was valid evidence that adjustment difficulties or psychological distress may be a sign of underlying differentiation in students' performance in their educational endeavours. Furthermore, therapists should not take a position in terms of relations of individual's value orientation and differentiation with the psychological adjustment but rather take a more balanced position, especially when working with clients in order to increase therapeutic effects of the clients and adolescents who experience.

4.1. Strength of the study

This study empirically established the efficacy of CBT-music program on the reduction of text anxiety using a sample of Nigerian secondary school students. This is the first study of its kind in southeast Nigeria which will go a long way in ameliorating the poor performance of students in physics.

4.2. Limitations

Like other empirical-based studies, this present study has some methodological weaknesses. First, there is a possibility of inappropriate control for the effect of music and inability to query previous exposure to CBT at baseline. Secondly, the songwriters encountered difficulties in writing lyrics that convey the basic concepts of self-help material in structured sessions. With these limitations, the generalizability of the findings should be done with care.

5. Conclusion

The study established the efficacy of CBT-music on the reduction of physics test anxiety among senior secondary school students in southeast Nigeria. The intervention program which lasted for 12 weeks produced a significant effect on the management of test anxiety among the participants. The researchers, therefore, arrived at a conclusion that CBT-music efficacy has been only demonstrated within the present study; thus, further additional studies are needed in the near future in order to replicate the present findings. Thus, future researchers may also investigate the efficacy of CBT-music in the management of test anxiety in other subject areas by a different population of students.

5.1. Recommendations

The researchers made the following recommendations based on the findings of the study:

1. CBT-music should be applied in the management of test anxiety among secondary school students.
2. CBT-music should also be adopted by guidance counselors in the treatment of other irrational fears responsible for

examination of malpractice and problem behaviors among students

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