



Efficacy of music-based cognitive behavior therapy on the management of test-taking behavior of children in basic science using a randomized trial group: Implication for community development

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Abstract

Background: This study sought the efficacy of cognitive-behavioral therapy-based music group (CBT-Music) intervention program on primary school children's test-taking behavior in Southeast Nigeria.

Methods: A pretest, posttest randomized controlled trial experimental design was adopted for the study using a sample of 53 primary three (3) children. A test-taking behavior questionnaire was used for data collection. The instrument was face validated by test development experts. Construct validation of the instrument was done by subjecting the instrument to factor analysis after trial testing. Data were analyzed using independent samples *t*-test and paired samples *t*-test.

Results: The findings of the study revealed that CBT-Music had a significant effect on the management of test-taking behavior of among children. Furthermore, the test-taking scores of children in the music-based CBT group were significantly lower than those in the control group at the follow-up measure. This implies that the test-taking behavior of the children can be better managed using the CBT-music intervention program to enable the children to grow better academically and contribute to the community they belong to.

Conclusion: Music-based CBT demonstrated significant efficacy in the management of children's test-taking behavior. Thus, primary school teachers should be enlightened on how to make use of CBT-Music in the management of test-taking behavior among children.

Abbreviations: CBT = cognitive-behavioral therapy, CBT-music = CBT-based music group, TAQ = test anxiety questionnaire.

Keywords: Children, cognitive behavior therapy, music therapy, test-taking behavior

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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1. Introduction

The performance of children in basic science has not been encouraging and this constitutes worries to the basic education stakeholders and parents. In Nigeria, most children go in for their examinations or tests with a high level of tension which results in the exhibition of different kinds of test-taking behavior like text anxiety. Test anxiety, according to Segool, Carlson, Goforth, Von der Embse, and Barterian as cited in Nwokolo et al,^[1] is the emotional and behavioral reactions to an upcoming test or examination. There is prevalence of Test anxiety among school children and most of the cases are not recognized early in schools.^[1] Test anxiety influences negatively the academic attainment of most children in school.^[1] Researchers' experiences as teachers show that most children in Nigerian schools experience test anxiety before, during and after test conditions. Early research showed that among the school children, test anxiety rate was more than 33%.^[2] Most children with one form of anxiety disorder of the other hardly get treated not minding the high rate of anxiety disorder in Nigeria.^[3,4] According to Asghari et al,^[5] Herbert et al,^[6] Khalid-Khan et al,^[7] treatment of anxiety disorder among the children receives little interventions.

Music based cognitive behavioral therapy (CBT) intervention reduces anxiety disorder among school aged children.^[8] According to Trimmer et al,^[9] music is a global event that helps in the restoration of every culture. Music allows children to

explore avenues of self-expression at an individual basis.^[10] According to Egenti et al,^[8] music is utilized as a device promoting interactions among humans. Leubner and Hinterberger^[11] noted that potential alternatives for depression therapy are music interventions but there is dearth of current literature on them. According to Trimmer, Tyo and Naeem,^[9] music therapy helps in understanding of psycho-therapeutic materials and promotion of explanation of difficult topics by creating connection between facilitators and group members. Moreover, through music activities, clients can be introduced to CBT therapy concepts by adding nonverbal facilitation.^[8]

CBT is an effective treatment of depression and anxiety.^[12] CBT is an approach that links cognitions to feelings and behaviors.^[13] According to Garry and Katie,^[13] CBT operates on the assumption that faulty thinking can lead to strong inappropriate feelings and behaviors to a particular situation. CBT allows a client to look back on the way they think to consider the evidence for their feelings and behaviors. Individual, group, brief, guided self-help, and online are different types of CBT. Among these forms, group format of CBT is more effective than the others.^[9] According to Trimmer, Tyo and Naeem,^[9] CBT group therapy connects group members to enhance reduction of irrational beliefs and increase the efficiency of service delivery which is its advantage over the other forms.

Several studies have proved the efficacy of music-based CBT interventions. Dingle et al^[14] found that music-based CBT increased attendance and engagement for CBT among clients. Trimmer et al^[9] found that CBT-based music group (CBT-Music) therapy led to a significant reduction of anxiety and depression symptoms among participants. Egenti et al^[8] found that music-based cognitive-behavioral therapy had significant effect on the reduction of social anxiety symptoms among participants. However,^[15] found that music-based CBT had a significant effect on reduction of symptoms of anxiety among participants. However, some studies found that music therapy does not decrease social anxiety disorder.^[16–18]

The foregoing has shown that there are inconsistencies in the findings of previous works on the effectiveness of CBT-Music in the reduction of psychological disorders like test anxiety, depression, etc. Moreover, the participants used for the studies are mainly secondary school students or in-school adolescents and university undergraduates. It has been recommended that teachers' use of cognitive-behavioral strategies in their classrooms will have an effective and positive effect on managing students' psychological behaviors.^[19] Cognitive-behavioral therapeutic interventions are increasingly recognized as a viable, research-based approach appropriate for use in school settings. Based on these premises, the researchers sought to determine the effectiveness of music-based CBT on the management of test-taking behavior among children in Basic Science in Southeast Nigeria. Thus, the researchers hypothesized that music-based CBT would have a significant effect on the management of children's test-taking behavior in Basic Science.

2. Methods

2.1. Ethical considerations

Ethical clearance letter was obtained for the conduct of the study through the University of Nigeria Committee on research ethics with REC/FE/2019/000046. The children and their teachers were

served with informed consent forms to fill and sign before the commencement of the intervention.

2.2. Design of the study

The pretest, posttest randomized controlled trial experimental design was adopted for the study. Subjects were randomized into experimental and control groups through simple random sampling technique. This study design has been used by^[20–23] to carry out similar studies.

2.3. Participants

A total of 53 primary three (3), male (n=22), and female (n=31) children in Southeast schools in Nigeria. A total of 125 children who showed interest in participating in the intervention program were screened for eligibility. The criteria for eligibility were:

1. the pupil must be regular in school attendance register;
2. pupil must have a high score on test anxiety scale which was used for the identification of the children who showed signs of test anxiety.

Considering the above criteria, 53 children were randomly assigned to experimental and control groups conditions using a simple randomization procedure. The children were randomly assigned to experimental (27) and control (26) groups as shown in the Figure 1 below. The demographic characteristics of the children are shown in Table 1.

Table 1 shows that there is a significant difference in the number of male and female participants, $\chi^2(1)=5.98, P<.050$. There were also variations in age and tribe of the children, $\chi^2(1)=24.52, P<.050$ and $\chi^2(2)=17.78, P<.050$.

2.4. Measure

2.4.1. Test anxiety questionnaire. Test anxiety questionnaire (TAQ) developed by Nist and Diehl (1990) was adopted for the study. TAQ was a 10-item instrument structured on a 5-point scale of Never=1, Rarely=2, Sometimes=3, Often=4, and Always=5. The scores ranged from 10 to 50. A cut off score of 35 was used for determining children who showed signs of anxiety. Children with scores above 35 were considered as experiencing an unhealthy level of anxiety. The internal consistency reliability of the items of the instrument was established to be 0.86 using Cronbach alpha method.

2.5. Procedure

The researchers visited the headmasters of each of the schools in Southeast Nigeria to notify and obtain permission to carry out the study from them. With the permission of the headmasters, the researchers went to the schools the next day to conduct the selection process based on the inclusion criteria. That was done by first identifying each child with a number and thereafter administered the TAQ to the children. A period of 30 minutes was allowed for the children to respond to the items of the TAQ. In the end, the copies of the questionnaire were collected and analysis done by the analyst for 5 days after the administration of TAQ. The results of the analysis enabled the researchers to select 53 children who showed signs of test anxiety by their scores.

Randomization bias during the assignment of the participants to the experimental and control groups was removed by concealing the information from the demographic questionnaire

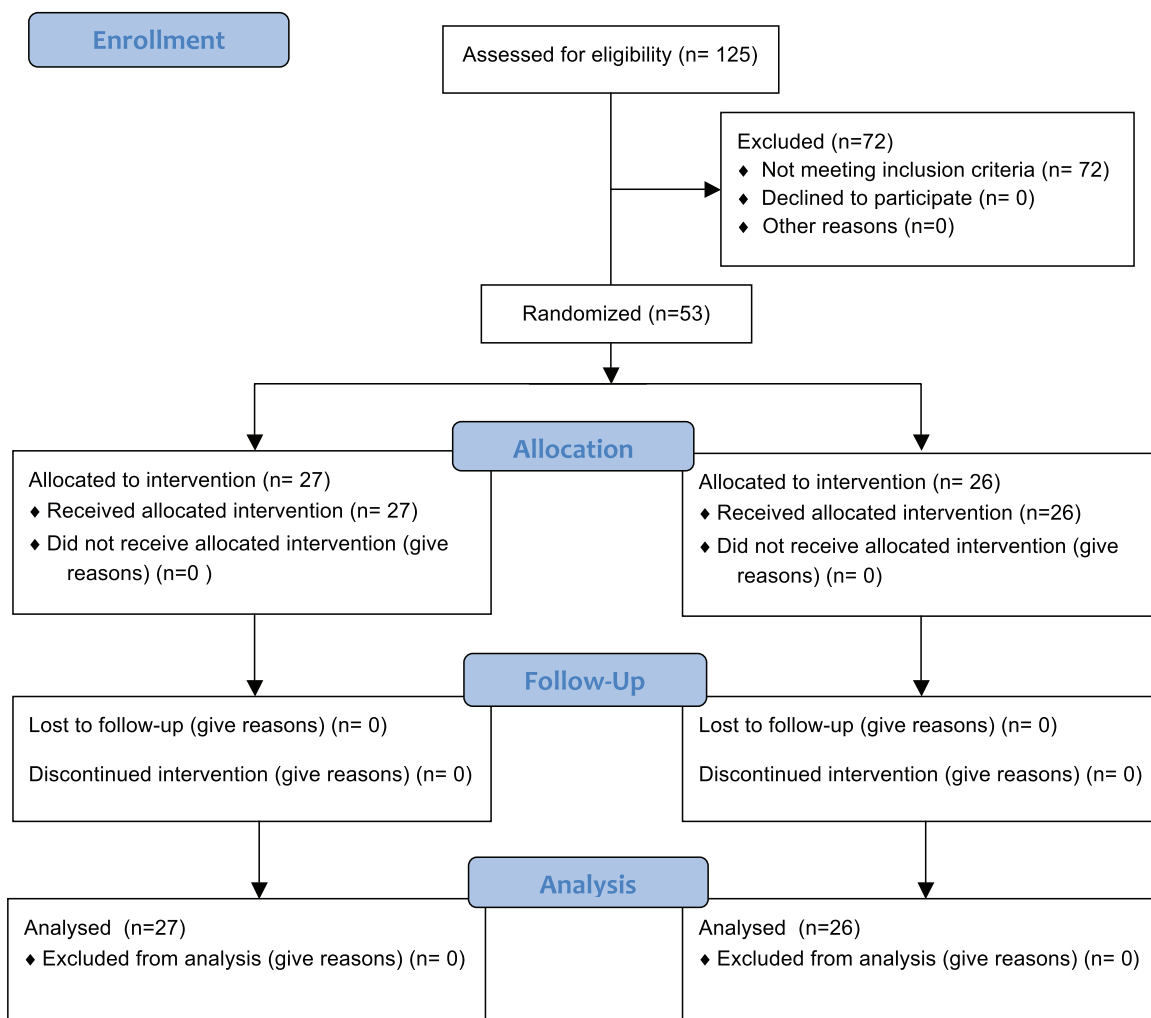


Figure 1. Consort flow diagram for participants' allocation.

from the person who conducted the randomization. During the recruitment process, the participants, research assistants, and the data analysts were blinded. After that the baseline data (pretest) were collected using the text anxiety questionnaire. Thereafter, the experimental group was exposed to 90 minutes of music-based CBT program. The program lasted once a week for 12 weeks from 10/08/2019 to 10/11/2019. At the end of the

treatment, a posttest assessment was conducted while a 2-month follow-up measure was conducted on 10/01/2020.

2.6. Music-based CBT program

Music-based CBT program by^[24] which is a 12-week guided self-help group was adopted for this study. The program was

Table 1

Demographic characteristics of the participants.

Demographics Characteristics	Experimental	Control	n (%)	χ^2	P
Gender					
Male	12	10	22 (41.51)	5.98	<.050
Female	15	16	31 (58.49)		
Age					
7-8	25	24	49 (92.45)	24.52	<.050
≥9	2	2	4 (7.55)		
Tribe					
Igbo	14	19	33 (62.26)	17.78	<.050
Hausa	4	3	7 (13.21)		
Yoruba	9	4	13 (24.53)		

implemented by 2 experienced CBT therapists and music therapists. The program aimed to reduce the level of test-taking behaviors among children by infusing music into nearly every aspect of CBT group therapy. Such infusion involved the use of critical listening to the musical material, playing various musical instruments, and using music as a point of reference in group discussion and homework assignments.^[8] The group adhered to a traditional CBT group structure such as team work, and the use of CBT tools such as behavioral experiments, thought records, and homework after each session.^[8]

During sessions 1 to 3, the facilitators familiarized the participants with the objective of the intervention, built rapport, established rules and regulations, discussed anxiety, symptoms, and causes of physics phobia. An assignment was given after each session.

Sessions 4 to 7 involved the activation of events and teaching the participants how to change automatic thoughts to rational thoughts. Before the beginning of sessions 4 to 7, a review of previous exercise and homework was done.

In sessions 8 and 11, the participants were taught how to listen critically to the musical material, write song, play different types of musical instruments. As usual group discussion and homework were discussed before the commencement of the sessions. Songs chosen for each week were prewritten and adapted from recognizable classic rock songs with the original lyrics replaced with lyrics about CBT.^[8] Different techniques of CBT such as cognitive restructuring reframing, rhythmic-based skills, attention training were adopted (Fig. 2).^[25]

2.7. Data analysis

The SPSS software version 22 was used to conduct the statistical analysis. Statistically, the *t*-test of independent samples and paired samples *t*-test were used to analyze the data collected. The effect size of the intervention on basic science test anxiety among children was reported using Partial Eta squared (η_p^2) value. Figure 3 shows the summary of the methods and materials.

3. Results

Table 2 shows that the mean test anxiety rating of the participants of the experimental group ($M=38.00$, $SD=4.50$) did not differ significantly from that of the participants of the control group at



Figure 2. CBT-Music session adopted from Smith and Daunic (2006).

the pretest stage ($M=37.84$, $SD=4.62$), $t(51)=.123$, $P=.903$, $\eta^2=0.025$. At the posttest, the mean test anxiety rating of the participants of the experimental group ($M=12.18$, $SD=1.58$) differed significantly from that of the control group participants ($M=31.96$, $SD=11.98$), $t(51)=-8.502$, $P<.050$, $\eta^2=0.728$. Similarly, at the follow-up measure, the mean test anxiety rating of the participants of the experimental group ($M=12.44$, $SD=2.30$) differed significantly from that of the control group participants ($M=32.00$, $SD=11.91$), $t(51)=-8.369$, $P<.050$, $\eta^2=0.721$. This implies that music-based CBT intervention program had a significant effect on the management of children's test-taking behavior in basic science with effect sizes of 72.8% and 72.1% at the posttest and follow-up measures. The bar chart presentation of the pretest, posttest and follow-up mean test anxiety scores of the participants in experimental and control groups is shown in Figure 4.

Table 3 reveals that the mean test anxiety rating difference of the experimental group participants at the pretest and posttest ($M=16.03$, $SD=13.19$) is significant, $t(26)=8.849$, $P<.050$. Similarly, mean test anxiety rating difference of the experimental group participants at the pretest and follow-up measure ($M=15.88$, $SD=13.09$) is significant, $t(26)=8.834$, $P<.050$. However, the mean test anxiety rating difference of the experimental group participants at the posttest and follow-up measure ($M=-0.15$, $SD=1.29$) is not significant, $t(26)=-0.851$, $P=.399$. This revealed that a music-based CBT intervention program had a significant effect on the management of children's test-taking behavior in basic science.

4. Discussion

The findings of the study showed that a music-based CBT intervention program was significantly effective in the management of test-taking behavior of children in basic science. It was found that the children in the intervention group had a significant reduction in their test anxiety rating at both posttest and follow-up measures as a result of their exposure to 12 weeks intervention program with music-based CBT. This result goes to validate the efficacy of the CBT-music program which has in the past proved effective when used on secondary school and university students. Perhaps, the music component of the program stimulated the attention of the children due to the attachment children to music. Buttressing this finding are the findings of Yoosefi et al,^[26] Trimmer et al,^[9] Trimmer et al,^[15] and Egenti et al.^[8]

Yoosefi et al^[26] found that the cognitive therapy had significant effect on reduction of anxiety among students. Trimmer et al^[9] found that CBT-Music therapy had a significant effect on reduction of symptoms of anxiety among participants. Egenti et al^[8] found that music-based cognitive-behavioral therapy had significant effect on the reduction of social anxiety among the treatment group. However, Trimmer et al^[15] found that music-based CBT significantly reduced symptoms of anxiety among the participants. Buttressing the results of the present study are the findings of the studies conducted by Ugwuanyi et al,^[21] Akagy,^[27] Bradshaw and Slade,^[28] Saunders,^[29] Shni,^[30] Britton and Moore,^[31] Britton,^[32] Goldin et al,^[33] Guetin et al,^[34] Hakvoort and Bogaerts,^[35] Klein et al^[36] and Melfsen et al.^[37]

The current study is a valuable study of its kind in the examination of the effectiveness of music-based CBT on the management of children's test-taking behavior in basic science. This present study has a serious contribution to knowledge in that no such study has been carried out in Nigeria especially in the

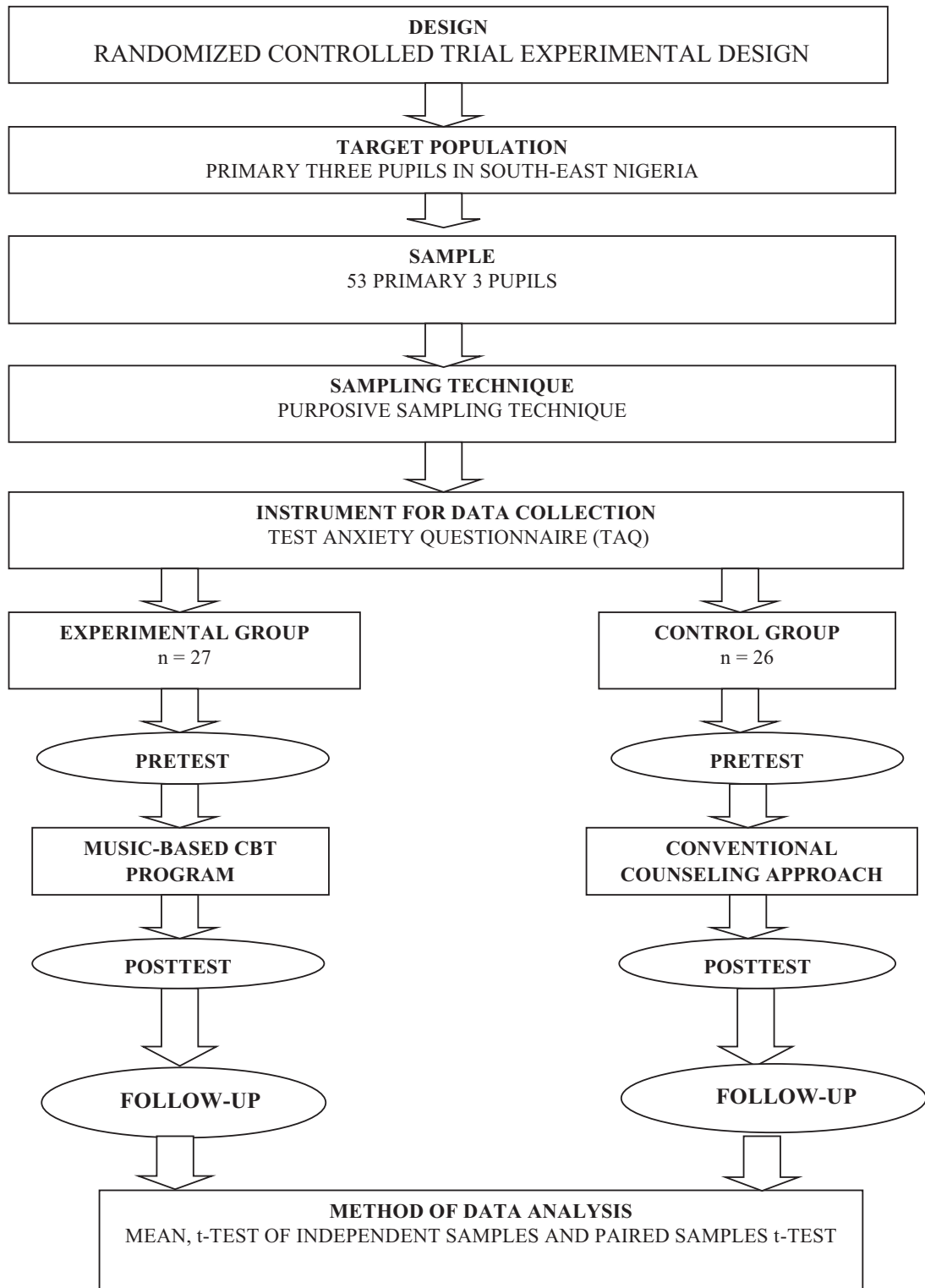


Figure 3. Schematic representation of the research method.

south-eastern part. To effectively use this therapy on children, the teachers should note the following roles: always work with children and groups to improve mental health, encourage children to discuss emotions and experiences, help children define goals, plan action and gain insight, develop therapeutic

processes, refer children to psychologists and other services, and take a holistic (mind and body) approach to mental health care. This has implications for community development. The community has a role to play in this regard for the proper development of the pupils in the community they belong to. In this case, the

Table 2
t-test of independent samples for the difference in the mean test anxiety ratings of the experimental and control groups participants at pretest, posttest, and follow-up measures.

Treatment	Time	n	Mean	SD	df	t	P	η^2
Experimental	Pretest	27	38.00	4.50	51	0.123	.903	0.025
Control		26	37.84	4.62				
Experimental	Posttest	27	12.18	1.56	51	-8.502	.000	0.728
Control		26	31.96	11.98				
Experimental	Follow-up	27	12.44	2.30	51	-8.369	.000	0.721
Control		26	32.00	11.91				

η^2 = Effect size, P = associated probability, SD = standard deviation, t = independent samples t-test.

community leaders should assist the teachers in carrying out their roles of exposing the pupils to the music-based CBT intervention program by making available the resources needed for its effective implementation.

4.1. Strength of the study

This study empirically established the efficacy of a music-based CBT intervention program on the management of children’s test-taking behavior in basic science using a sample of south-eastern Nigerian children. This is the first research of its kind in South-East Nigeria which will go a long way in ameliorating the poor performance of children in basic science. Thus, teachers and counselors in primary schools have a program they can leverage on in managing psychological problems among the children to enhance their academic performance.

4.2. Limitations

As an experimental study, this present study has some methodological weaknesses. This study was not able to factor in the possible moderating effect of any of the moderators

(gender, age, and location), which may affect the generalizability of the findings. Thus, it was suggested that future researchers can explore the moderating effect of any of the moderators on the effectiveness of a music-based CBT program on the management of children’s test-taking behavior. With these limitations, the generalizability of the findings of the study should be done with caution.

5. Conclusion

The effectiveness of music-based CBT on the management of children’s test-taking behavior has been proven to be significant. The intervention program which lasted for 12 weeks produced a significant effect on the management of test-taking behavior among the participants. Thus, test-taking behavior among children can be better managed using the CBT-music intervention program to enable the children to grow better academically and contribute to the community they belong to. The researchers, therefore, concluded that music-based CBT has demonstrated significant efficacy in the management of children’s test-taking behavior.

5.1. Recommendations

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

1. Music-based CBT should be applied in the management of test-taking behavior among children to enable them to grow better academically and contribute to the community they belong to.
2. Music-based CBT should also be adopted by guidance counselors in the treatment of other irrational fears responsible for examination malpractice and problem behaviors among children.

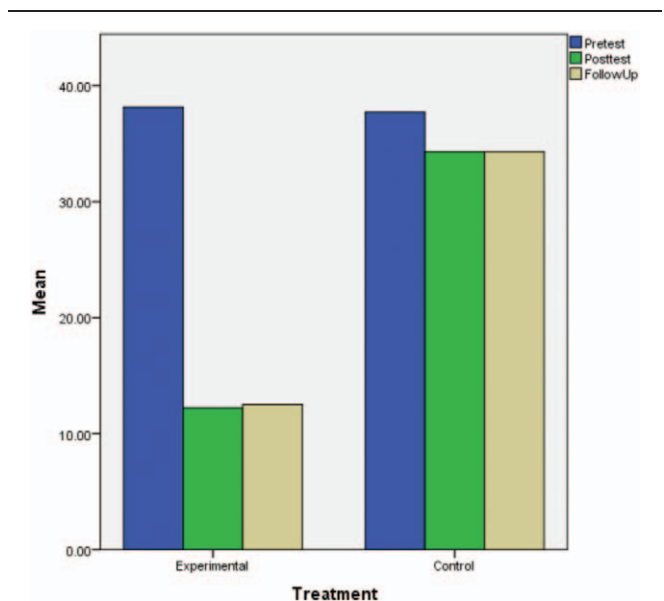


Figure 4. Graph of the pretest, posttest, and follow-up mean test anxiety scores of the participants in experimental and control groups.

Table 3
Paired samples t-test for the difference in the mean test anxiety ratings of the experimental group participants at pretest, posttest, and follow-up measures n=27.

Pair		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation			
Pair 1	Pretest – Posttest	16.03	13.19	8.849	26	0.000
Pair 2	Pretest – Follow Up	15.88	13.09	8.834	26	0.000
Pair 3	Posttest – Follow Up	-0.15	1.29	-0.851	26	0.399

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