

EFFECTS OF COGNITIVE BEHAVIOURAL THERAPY ON INTEREST OF IN-SCHOOL ADOLESCENTS IN MATHEMATICS IN NSUKKA EDUCATION ZONE

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Abstract

The study investigated effect of Cognitive Behavioural Therapy on interest of in-school Adolescents in Mathematics in Nsukka Education Zone. two research questions and two null hypotheses guided the study. The research design used in this study was quasi-experimental, pre-test, post-test control group design. The study was carried out in Nsukka Education Zone of Enugu State. The sample of the study was 94 in-school adolescents, 39 males and 55 female students. The instruments used for the study were adapted, Mathematics Interest Scales (MIS). Cronbach Alpha which yielded 0.88 and 0.81 reliability co-efficient was used to determine the internal consistency of the instruments. Cohen D was used to determine the effect size of CBT. Mathematics Interest Scales was administered before the treatment began. The treatment lasted for four weeks, after which the re-shuffled MIS was re-administered. The data collected were analysed using mean and standard deviation. Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. The result of the study showed that in-school adolescents' Mathematics interest was improved more for those exposed to CBT than those not exposed. The hypothesis showed a significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. Similarly, shows that in-school adolescents' mathematics interest was improved more for female in-school adolescents more than their male counterparts. The hypothesis shows that there is no significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. Based on the findings of the study, the researcher, among others, recommended that Mathematics teachers should endeavor to adopt the use of CBT as it would enhance in-school adolescents' interest and achievement in Mathematics. Educational implications, recommendations and suggestions for further studies were made.

Keywords: Cognitive behavioural therapy, interest, in-school Adolescents, Mathematics

Introduction

The decline level of interest of in-school adolescents towards Mathematics is becoming a source of worry to the mathematics teachers and the stakeholders in education. This is irrespective of the importance of Mathematics as one of the core subjects studied at the secondary education level. Mathematics is a way of describing relationship between numbers and other measurable quantities. Jayanthi (2019) explained that mathematics is a field of knowledge used in training the intellect to think logically and systematically as regards problem-solving and decision-making. The author further declared that mathematics is the foundation of scientific and technological knowledge, which is central to the socio-economic development of any nation. In every field of study, such as Finance, Natural Sciences, Economics, Medicine, and Engineering among others, Mathematics seems to be at the center. To

this effect, Mazana, Montero and Casmir (2019) stated that the knowledge of Mathematics is an essential tool in our society and in understanding every other science subject. This indicates that Mathematical theories and concepts are very important in understanding and solving various types of problems in academics as well as in real-life situations. In the context of this study, Mathematics is therefore, a core school subject that sharpens the learner's intellect and aids in the understanding of other school subjects.

Notwithstanding the vital and central position Mathematics occupies, most in-school adolescents' achievements in the subject are still low. In-school adolescents' academic achievement in Mathematics at this educational level have become a source of worry and embarrassment to educators and stakeholders (Mji&Makgato,2020). The in-school adolescents' achievement in National Examination Council (NECO) in General Mathematics in Nsukka Education Zone of Enugu State for 2018/2019: 28.3% pass and 71.7% failure, 2019/2020: 46.5% pass and 53.5% failure, 2020/2021: 55.5% pass and 44.5% failure, 2021/2022: 52.3% pass and 47.4% failure. In recent years, there have been recurring miserable and unacceptable achievements of in-school adolescents in Mathematics. Adekunle and Oyediran (2020) found that between 2001 and 2009 (except in 2005), less than 50% of the candidates who took the mathematics examinations obtained credit-level passes or higher. Specifically, the authors stated that the credit level passes between 2007 to 2009 were 44.9%, 46.1% and 45.9% respectively. Similarly, Eze and Ojo (2021) highlighted the ongoing failure trends in 2015, 2017, and 2020, with credit pass rates of 46.83%, 43.6%, and 39.8%, respectively. To this effect, Ibe and Adigun (2022), argue that the overall achievement levels in Mathematics at the Senior School Certificate Examination (SSCE) remain unsatisfactory and call for further measures to enhance students' Mathematical proficiency. The WAEC chief examiner's reports of 2020/2021, and 2021/ 2022 respectively stated that students' poor results in Mathematics and Sciences could be linked to a lack of interest in the subject, suggesting that Mathematics teachers should develop means of arousing learners' interest in the subject (Chief examiner's reports, 2020; 2021; 2022).

Interest helps us to undergo and carry out various exploits in life, without interest, one cannot achieve anything good. Interest is a powerful motivational process that energizes learning, guides academics and accompanies individuals on their career path (Harackiewicz, Smith, & Priniski, 2016). Similarly, Onah and Anamezie (2022) conceptualized Interest as a kind of responsive inclination that drives an individual to pursue specific goals in acquiring cultural and scientific knowledge. Ezeudu, Ezeudu, and Sampson (2016) viewed interest as a strong desire or persistent willingness to observe, listen or be attentive to a particular activity, person or content. Interest is categorized into two; low and high level of interest. Low level of interest entails operating below average while high level of interest means operating above average (Krapp, 2002). Students with a high level of interest in a subject tend to behave positively, listening and paying attention when the teacher is teaching (Filgona, Sakiyo, Gwany & Okoronka, 2020). Such students are more likely to participate actively both in class work and projects. On the other hand, students with low or lack of interest in a particular school subjects are most likely to exhibit odd behaviours such as absenteeism, noise-making, truancy, and hard-headedness among others (Blotnicky, Franz-Odendaal, French, & Joy, 2018). In the context of this study, interest is pictured as an internal drive that motivates a student to develop an unquenchable desire to work hard and acquire Mathematics knowledge. However, gender was also considered as a joint factor to the students interest in this study.

Gender is the classification of individuals as men or women, girls or boys following their roles and physical characteristics. According to (Histrich, 2018) gender is a significant factor to be considered while studying the in-school-adolescent's achievement in school subjects. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2024), gender refers to the societal and culturally constructed roles and responsibilities assigned to individuals based on their physical appearances. The Canadian Institute of Health (2023) conceptualized gender as a conventionally defined set of economic, social, and political roles, responsibilities, rights, and privileges accompanying the state of being a female or a male, as well as the power, and relationships among women and men, boys and girls. Here, gender is, therefore, the term used to distinguish between male and female sexes. According to Blotnicky et al. (2018), there is no agreement among scholars as regards the significance of gender in school subjects, especially as it concerns Mathematics. Ezeudu, et al. (2016) stipulated that males achieve significantly better than their female counterparts in Mathematics. On the contrary, Umeh (2011) found out that female students perform better than their male counterparts in Mathematics. Nzewi (2010) opined that there is difference in achievement and interest among males and females in Mathematics. These evidence points out that gender has influence as regards adolescents' achievement in Mathematics. Scholars such as Yu and Zhou (2024) have advocated for the use of therapeutic interventions to enhance students' interest in Mathematics. Based on this, the researcher found it irresistible to investigate effects of Cognitive Behavioural Therapy (CBT), on interest of In-School-Adolescents in Mathematics in Nsukka Education Zone, Enugu State.

Cognitive Behavioral Therapy (CBT) was developed in the 1960s by Aaron T. Beck and Albert Ellis. CBT is basically a form of psycho analytic therapy or counselling principle utilized to create positive and adaptive coping strategies for individuals (Hollin, 2019). The author described two main approaches of CBT, Cognitive and Behavioural. Cognitive approach focuses on identifying and challenging negative thought patterns, known as cognitive distortions while Behavioural approach focuses on identifying and challenging maladaptive behaviours. Fenn and Byrne (2016) conceptualized CBT as a temporary treatment that teaches clients some definite skills to deal with trauma or other emotional issues. The author further explained that because the thoughts, emotions and behaviours are linked, CBT allows the counsellor to intervene at different points in the cycle. Oud et al. (2019) suggested that CBT is an innovative therapy for enhancing positive behaviours. According to Hofmann, Asnaani, Vonk, Sawyer, and Fand (2012), ABCD model is a framework used to understand and change the way we think and feel about situations. Where A is the activating event or situation that triggers a reaction which could be external event, an inside thought or a situation that provokes feelings. B is the believe or thoughts that come to mind in response to the activated event. C is the emotional and behavioural consequences as regards the believe about the activating event. D is the disputation; it is the process of challenging and disputing the irrational beliefs. E is effect, the new effects that arise from disputing the irrational beliefs leading to healthier emotional responses and behaviours. CBT is, therefore, a psychotherapeutic approach that aims at helping individuals identify and modify negative thought patterns and behaviours to improve emotional well-being and manage psychological challenges.

This implies that with CBT, dysfunctional thoughts, beliefs, negative and unrealistic dispositions of an individual or a group of people can be managed or replaced with positive, appropriate, and realistic ones. Some of the irrational and

dysfunctional thoughts of adolescents towards Mathematics include;” I must not pass Mathematics to be somebody in life, Mathematics is meant for only the science inclined persons, I dislike that Mathematics teacher and as such have no time to listen to his/her teachings.”

Purpose of the Study

The general purpose of this study was to find out the effects of Cognitive Behavioural Therapy on interest of in-school Adolescents in Mathematics in Nsukka Education Zone. The specific purposes are;

1. find out the effect of Cognitive Behavioural Therapy on interest of in-school Adolescents in Mathematics.
2. find out the influence of gender on interest of in-school Adolescents in Mathematics.

Research Questions

The following research questions were answered in this study.

1. What are the mean interest scores in Mathematics of in-school adolescents exposed to CBT and those in the control group?
2. What are the mean interest scores in Mathematics of male and female in-school adolescents?

Hypotheses

H₀₁: There is no significant difference in the mean interest scores in Mathematics of in-school adolescents exposed to CBT and to those in the control group.

H₀₂: There is no significant difference in the mean interest scores in Mathematics of male and female in-school adolescent.

Methods

The study adopted a quasi-experimental design involving intact classes rather than randomly assigned groups, as recommended by Nworgu (2015). This design was appropriate because the experimental and control groups were naturally assembled within existing school classes. The research was conducted in the Nsukka Education Zone of Enugu State, one of six education zones in the state. Nsukka Zone was selected due to its large number of public secondary schools, 61 in total and the persistent evidence of poor student performance in Mathematics. The population comprised 3,357 Senior Secondary Two (SS2) students enrolled in public secondary schools within the zone, consisting of 1,496 males and 1,861 females. The sample size was 94 students drawn using intact classes from selected schools under the Post Primary School Management Board (PPSMB, 2021). Distribute thus, 39 males and 55 females. The experimental group received treatment through the implementation of the designated instructional strategy, while the control group was taught using conventional methods. Both groups were exposed to the same curriculum content and evaluated using identical instruments. Data collection involved pre-test and post-test measures to determine the effect of the intervention on students' achievement and interest in Mathematics. The instruments were validated by experts in measurement and evaluation, and reliability was established through pilot testing. Data obtained were analyzed using appropriate statistical techniques to compare mean scores and determine the significance of observed differences between the groups.

Results

Table 1: mean and standard deviation interest scores in Mathematics of in-school adolescents exposed to CBT and those in the control group

Groups	N	Pretest	Posttest	Mean $\bar{x}$	Mean $\bar{x}$ gain
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		$\bar{x}$	SD	$\bar{x}$	SD	gain	difference
Experimental (CBT)	63	46.89	8.27	85.90	9.27	39.01	32.95
Control	31	31.81	7.90	37.87	9.27	6.06	

Table 1 shows the pre-test mean and standard deviation scores ($\bar{x}$ =46.89; SD=8.27) of the experiment group and post-test mean and standard deviation scores ($\bar{x}$ = 85.90; SD= 9.27) of the same group with mean gain of 32.95. Also, the pre-test mean and standard deviation scores ($\bar{x}$ =31.81; SD=7.90) of the control group and post-test mean and standard deviation scores ($\bar{x}$ =37.87; SD=9.27) of the same group with mean gain of 6.06. The standard deviation scores which ranged from 8.27 to 9.27 for the experimental and 7.91 to 9.27 for the control groups show that their responses did not vary widely. Also, the mean $\bar{x}$ gain difference of the two groups of 32.95 shows that in-school adolescents' mathematics interest was improved more for those exposed to CBT than those not exposed.

Table 2: ANCOVA of the Mathematics interest scores of in-school adolescents exposed to CBT and those in the control group

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	47680.476 ^a	2	23840.238	274.290	.000	.859
Intercept	14447.336	1	14447.336	166.222	.000	.649
Pretest	.455	1	.455	.005	.942	.000
Methods	26977.986	1	26977.986	310.391	.000	.775
Error	7822.448	90	86.916			
Total	509804.000	94				
Corrected Total	55502.925	93				

a. R Squared = .859 (Adjusted R Squared = .856)

0.2 (small effect), 0.5 (moderate effect) and 0.8 (large effect) (Cohen 1998)

Table 2 shows $F(2, 90) = 310.391$, $p = .00 < 0.05$ level of significance. This shows that the hypothesis was significant. Therefore, there is a significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. The effect size of CBT on the Mathematics interest scores of in-school adolescents is large with Eta value of 0.78 based on Cohen's D categorization.

Table 3: mean and standard deviation interest scores in Mathematics of in-school adolescents exposed to CBT and those in the control group

Groups	n	Pretest $\bar{x}$	SD	Posttest $\bar{x}$	SD	Mean $\bar{x}$ gain	Mean $\bar{x}$ gain difference
Males	40	40.12	1.69	65.93	3.95	25.81	4.35
Females	54	43.19	1.45	73.35	3.28	30.16	

Data in table 5 show the pre-test mean and standard deviation scores ($\bar{x}$ =40.12; SD=1.69) of the male in-school adolescents and post-test mean and standard deviation scores ($\bar{x}$ = 65.93; SD= 3.95) of the same group with mean gain of 25.81. Also, the pre-test mean and standard deviation scores ($\bar{x}$ =43.19; SD=1.45) of the female in-school adolescents and post-test mean and standard deviation scores ($\bar{x}$ =73.35; SD=3.16) of the same group with mean gain of 30.16. The standard deviation scores which ranged from 1.69 to 3.95 for the males and 1.45 to 3.28 for the females show that their responses did not vary widely. Also, the mean $\bar{x}$ gain difference of the two groups of

4.35 shows that in-school adolescents' mathematics interest was improved more for female in-school adolescents more than their male counterparts.

Table 4: ANCOVA on interest scores in Mathematics of in-school adolescents exposed to CBT and those in the control group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	21094.044 ^a	2	10547.022	27.274	.000	.375
Intercept	890.663	1	890.663	2.303	.133	.025
Pretest	19826.580	1	19826.580	51.270	.000	.360
Gender	234.856	1	234.856	.607	.438	.007
Error	35190.509	91	386.709			
Total	519408.000	94				
Corrected Total	56284.553	93				

a. R Squared = .375 (Adjusted R Squared = .361)

0.2 (small effect), 0.5 (moderate effect) and 0.8 (large effect) (Cohen 1998)

Data in table 6 show $F(2, 90) = 0.61$, $p = .44 > 0.05$ level of significance. This shows that the hypothesis was not significant. Therefore, there is no significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. The effect size of CBT on the Mathematics attitude scores of in-school adolescents is small with Eta value of 0.01 based on Cohen's D categorization.

Discussion of Findings

The findings show that in-school adolescents' mathematics interest was improved more for those exposed to CBT than those not exposed. The hypothesis shows that there is a significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. The in-school adolescents' mathematics interest was improved more for female in-school adolescents more than their male counterparts. The hypothesis shows that there is no significant difference in the mean Mathematics interest scores of in-school adolescents exposed to CBT and those exposed to the conventional method. The findings of this study showed that the in-school adolescents taught Mathematics using Cognitive Behavioural Therapy performed better in Mathematics than those taught Mathematics using conventional methods. Further analysis showed there is a significant difference between the mean interest ratings of in-school adolescents taught Mathematics using CBT and those taught Mathematics using conventional method. The reason for enhancement of in-school adolescents' interest was as a result of the use of innovative teaching therapy such as Cognitive Behavioural Therapy. CBT identifies and challenges negative thought patterns and behaviours such that the in-school adolescents refute their irrational beliefs and picked up interest. This finding agrees with the earlier findings of Moskalenko, Hadjisvropoulos and Katapally (2020) and Aghamohammadian et.al (2015) who in their separate studies found out that Cognitive Behavioural therapy helps to sustain in-school adolescents' academic interest. Furthermore, Okigbo and Okeke (2011), and Obiweluzo (2014) also found out in their respective studies that the use of therapy in teaching such as CBT enhances in-school adolescents' academic interest.

The findings also show that the mean Mathematics interest of in-school adolescents' score shows that in-school adolescents' Mathematics interest was improved more for female in-school adolescents more than their male counterparts. However, the corresponding null hypothesis shows that there is no significant difference between male and female mean interest scores of in-school adolescents taught Mathematics using Cognitive Behavioural Therapy and those not taught with it. This finding is in line with

some earlier findings of kanchan (2023), Amadi (2019) and Ifeakor (2008) that found that gender has no significant influence on students' academic interest and achievement when taught using Cognitive Behavioural Therapy. However, this finding contradicts the earlier findings of Godpower-Echie and Ihenko (2017) who found out that gender has significant influence on in-school adolescents' interest when taught using the same innovative teaching therapy.

Conclusions

On the bases of the results, it could be noted that Cognitive Behavioural Therapy generally has positive and statistically significant effect on interest of in-school adolescents in Mathematics. Male and female taught Mathematics using Cognitive Behavioural Therapy had higher interest, more maximally than their counterparts taught Mathematics using conventional method. This implies that CBT has significant interactive effect on in-school adolescents' interest. The study has empirically proven that CBT is an effective intervention therapy that can improve students' interest toward the achievement in Mathematics.

Recommendations:

Based on the findings of this study the following recommendations were made;

1. In order to enhance in-school adolescents' interest towards Mathematics, teachers should adopt Cognitive Behavioural Therapy in teaching Mathematics since it is effective in improving their interest and achievement more than the conventional methods. This will enable the in-school adolescents develop cooperative ability and overcome their learning difficulties and achieve better in Mathematics.
2. The curriculum planners should ensure that they incorporate Cognitive Behavioural Therapy in Mathematics curriculum as it will help to promote in-school adolescents' interest towards the subject.
3. The Federal Ministry of Education and other relevant education bodies should popularize therapy through seminars, workshops, conferences and publications.
4. The Government should organize workshops for serving Mathematics teachers to enable them to learn how to display and use Cognitive Behavioural Therapy in teaching Mathematics.

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