



# Efficacy of Rational Emotive Behavior Therapy on Depression Among Children with Learning Disabilities: Implications for Evaluation in Science Teaching

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## Abstract

Owing to the prevalence of mental health issues among Nigerian in-school children, the effect of Rational Emotive Behavior Therapy's (REBT) efficacy on depression management among children with learning disabilities (LD) in inclusive classrooms in Nigeria was explored. Using a sample of 48 children with LD, the researchers conducted true experimental research. The participants were randomised into experimental (n=24) and control (n=24) groups. The Wide Range Achievement Test and Children's Depression Inventory were used as instruments for the study. The intervention program lasted for approximately 3 months. Data were quantitatively analyzed using analysis of variance of a special case. Hypotheses were tested at a 0.05 level of significance. It was therefore revealed that the level of depression of the participants who were exposed to CBT decreased significantly at posttest and follow-up measures than those who were not so exposed. Thus, REBT is very effective in reducing the level of depression among children with learning disabilities.

**Keywords** Rational emotive behavior therapy · Depression · Learning disabilities · Science education

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## Introduction

### Conceptual Clarifications

Learning disabilities occur when there is a manifestation of reduced ability to comprehend new information or information that seem to be complex (Department of Health, 2001). For the Learning Disabilities Association of Canada (2012), disorders that affect the possession, organization, retention, as well as understanding of information, are termed learning disabilities. Orim and Uko (2017) defined learning disabilities as disorders that impede learning in individuals who have low abilities that are needed for human reasoning. According to American Psychiatric Association (APA, 2013), a specific learning disability (SLD) is a type of Neurodevelopmental Disorder 3 that affects the learners' ability to learn. Those specific academic skills are pivot or the foundation for other academic learning. Learning difficulties manifest in form of difficulties in the identification of letters or counting of objects may appear in the preschool years but manifest better after starting formal education (APA, 2013). SLD just like learning difficulties is caused by a cross-cultural and chronic condition that typically persists into adulthood as well as developmental changes (APA, 2013).

National Institute for Health and Care Excellence (NIHCE, 2016) opined that learner with Down's Syndrome which is a clear genetic cause is unique from all other children with LD. Moreover, some children need more support at school to ensure their proper adaptation or adjustment among people with LD (NIHCE, 2016). Research showed that there exist more children with LD than adults as the former need more supports than the latter (NIHCE, 2016; Hatton et al., 2016). Moreover, Zablotsky et al. (2019) found that there was a significant increase in the prevalence of learning disability among US children aged 3 to 17 years between 2009 and 2017. According to the U.S. Department of Education (2020), children and adolescents within the ages of 3–21 years who received special service under the Education Disabilities Act were approximately 7 million, representing 14% of all children and adolescents in schools. Besides, specific learning disabilities accounted for 33% of this population of children and adolescents. There is a high prevalence of learning disabilities among children in Nigeria (Obani, 2006; Okoye, 2014). According to USA Centre for Learning Disability (2014), 2% of males had LD while 1.3% of females had the same problem showing that male males had LD than females. Besides, learning disabilities are more in a population of poor children (2.6%) than the rich children (1.5%). Thus, mental problems are prevalent in a population of children with learning disabilities.

In the Nigerian context, most children are vulnerable to mental health problems as a result of a lack of proper medical care and adequate provision of nutrition. Belle et al. (2012) found that Nigerian adolescents perceived mental health issues as a disorder of the brain. This perception of the adolescents was influenced by a lack of mental health knowledge, cultural and superstitious beliefs (Belle et al., 2012). The Nigerians perceived mental health issues to be caused by sorcery, evil spirits possession, divine punishment, and witchcraft (Labinjo

et al., 2020). According to the WHO (2006), in Nigeria, issues of mental health are neglected. This can be attributed to the fact that the existing formulated Mental Health Policy document in 1991 as the first mental health policy has not been reformed to date. WHO noted that there is non-availability of essential medicines and desk officers for mental health issues at the Nigerian health centers with the worst situation being that only four percent (4%) of government health expenditures are allocated for mental health issues.

According to Cooper et al. (2007a), Emerson and Hatton (2007), McManus et al. (2009), about 30% of mental health problems are associated with people having a problem of learning disabilities than with the rest of the population. Collins et al. (2011), and WHO (2008) found that there is a higher percentage (13%) of mental health problems compared to cancer and cardiovascular disease. Cooper et al. (2007b) found that depression is the most common type of mental health problem among children with LD.

Donald and Jing (2007) defined depression as a state of emotional isolation that one feels at interval. Low mood, negative self-perceptions, irritability, cognitive problems among others are the major characteristic symptoms of depression (Nardi et al., 2013; Orchard et al., 2017). According to Donald and Jing (2007), depression in young people has a serious adverse effect on their cognitive development. Abedini et al. (2007), Eller et al. (2006), Lei et al. (2016), Ovuga et al. (2006) found that one of the serious public health challenges among students is depression. Studies show that there is widespread depression among students in Nigeria (Adewuya et al., 2006; Aniebue & Onyema, 2008; Ibrahim et al., 2013; Peltzer et al., 2013). Despite the high prevalence of mental health issues, they are often unnoticed among children with learning disabilities and this leads to prolonged distress for such class of children (NIHCE, 2016). De Ruiter et al. (2007), Wallander et al. (2006) found that children with learning disabilities in the Netherlands manifest depression symptoms with hyperactivity at younger ages. Studies have revealed that in different populations of subjects, there is a link between irrational beliefs and depression (Bridges & Harnish, 2010; David, 2015; David et al., 2009). Despite that, empirical evidence showed that irrational beliefs are significantly associated with symptoms of depression (Sarracino et al., 2017). There are only a few studies that have investigated the efficacy of CBT on the reduction of depression among children with learning disabilities. Among the few studies carried out in Nigeria, none investigated the efficacy of CBT in reducing depression among children with LD.

### **Impact of Depression on Children with LD's Science Achievement**

According to NIHCE (2016), depression predicts a variety of negative psychosocial outcomes, including low educational attainment. Riglin et al. (2014) found that depression is associated with children's low school grades. Similarly, difficulties in concentration, self-reliant school performance among others are as a result of depression (Frojd et al., 2008). Thus, depression is highly related to poor school performance (Almquist, 2013; Sznajder-Murray et al., 2015; Caspi et al., 1998; Sorberg et al., 2018).

Due to the presence of depression in children with LD, they manifest low self-esteem than their counterparts (Gardner, 1971). Furthermore, there were observed lower scores on academic achievement tests among depressive children than their counterparts (Colbert et al., 1982). According to Brumback and Stanton (1983), children who had LD, as well as depression, were hypothesized to have an overlap in cerebral dysfunction. It was also revealed that there were significantly higher depression scores among children with LD than their counterparts without LD (Maag & Reid, 2006). Students with LD often struggle with academic challenges in their science classes (Grumbine & Alden, 2006). Such students scored one standard deviation lower in achievement tests in science than their counterparts who do not have LD (Anderman, 1998 as cited in Grumbine & Alden, 2006). Chow et al. (2015) found that there was reported lower academic performance among adolescents who had more depressive symptoms. As a result of those, it was opined that one of the major public health concerns for children is depression (Wickersham et al., 2019). Cases of repeating a grade or class and dropping out of school can be attributed to mental health issues (Schulte-Körne, 2016). This situation calls for school-based therapies that will help reduce the feeling of depression among children with LD. Among such therapies is cognitive behavioral therapy.

## Cognitive Behaviour Therapy and Theoretical Background

Cognitive behavioral therapy (CBT) is fundamentally an intervention that is psychologically rooted in cognition, emotions, and scientific approaches to human behavior (Willner, 2007). Choo (2014) defined CBT as a group of psychotherapeutic techniques whose objective is to deemphasize irrational beliefs through changing of cognition and behavior. CBT as a psychotherapeutic intervention is based on cognitive and behavioral principles (David et al., 2018). Besides, CBT is an umbrella term that describes a variety of evidence-based psychological interventions and treatments derived from such principles (David et al., 2018). Under the umbrella term of CBT are many interventions such as CT, REBT, Problem-solving therapy, and Others (DiGiuseppe et al., 2019). According to various international clinical guidelines, CBT is largely the gold standard in the field of psychotherapy for a large variety of clinical and non-clinical conditions (David et al., 2018). CBT includes two major schools of thought REBT first and then Cognitive Therapy but the treatment in the context of this study utilized REBT. According to Ellis (1994), REBT is a type of therapeutic approach that helps a client to identify irrational beliefs (overwhelming feelings of anger, depression, addictive behavior, anxiety, phobias, procrastination, etc.) and negative thought patterns that may result in behavioral or emotional issues.

Cognitive behavior theories explain how cognitive and affective aspects of human functioning interact (Beck, 1976; Ellis, 1994). CBT theories explain how our emotions, behavior, and physiological responses are determined by cognitions (Oltean et al., 2017). CBT uses the ABC Model (DiGiuseppe et al., 2014; Ellis, 1994). In the ABC Model; A stands for activating events, B stands for beliefs while C stands for consequences. According to the ABC Model; life events (A: activating events) are not directly determined by our emotions and behavior (C: consequences) but

rather the way events are cognitively processed and evaluated (B: beliefs) (David et al., 2009). REBT states that our beliefs regarding a life event can be rational or irrational (Ellis, 1994). Irrational beliefs, according to David and Cramer (2009), are evaluative cognitions without logical or empirical support. David et al. (2009) classified irrational beliefs into four categories: low frustration tolerance, demandingness, catastrophizing, and self-downing. According to Ellis (1994), dysfunctional feelings and maladaptive behavior are caused by irrational beliefs, while functional emotions and adaptive behavior as a result of rational beliefs.

## Review of Related Empirical Studies

Karen and Jeffrey (2007) revealed that CBT had a significant impact on anxiety reduction in a sample of children with autism. Susan et al. (2009) found that CBT reduced anxiety significantly among the participants. Siebke et al. (2011) proved the efficacy of cognitive behavioral therapy in a sample of socially phobic children. Sasha et al. (2016) found that CBT in a modified version had a significant decrease in depression as well as anxiety. Eseadi et al. (2017) found that there was a significant effect of rational emotive cognitive behavioral coaching on depression among the participants.

Lauren and Kate (2018) found that exposure to the CBT program resulted in a significant decrease in the client's feelings of anger and an increase in their self-esteem. Zafer (2018) found that the cognitive behavioral therapy (CBT) intervention was effective in managing persons with learning disability illnesses. Onuigbo et al. (2019) found that rational emotive behavior therapy led to a significant decrease in the depression scores of students. However, Zafer (2018) noted that there are few case studies on the use of CBT in treating patients with anxiety and depression.

## Gaps in Literature

The current study was necessary because of the lack of literature on the effect of CBT on depression among children with LD in Nigeria. Thus, the study determined the effect of REBT on the reduction of depression among children with LD. The researchers hypothesized that REBT would significantly reduce symptoms of depression in a sample of children with LD.

## Method

### Ethical Approval Statements

The University of Nigeria Research Ethics Committee approved the conduct of this research. Moreover, informed consent forms were served to the children and their parents as well as their teachers before the recruitment process. The forms were properly filled and signed by them. Prior to the signing of consent forms by the different parties, the risks and benefits of the intervention were properly explained to

them and room for questions was provided. Further, teachers had to fill the consent forms because the children were under their care.

## Research Design

The researchers adopted a randomized controlled trial (RCT) experimental research design. A randomized controlled trial is a study that involves the allocation of people at random to receive one of several clinical interventions (William, 2018). One of these interventions is the standard of comparison or control. In similar studies, Ogbuanya et al., (2017a, b), Nwokeoma et al. (2019), Onyishi et al. (2020), Ugwuanyi et al. (2020a) Ugwuanyi et al. (2020b), Ugwuanyi et al. (2020c), Ugwuanyi et al. (2020d), Ede et al. (2020), Ogba et al. (2020), Okide et al. (2020), Umoke et al. (2020), Agboeze et al. (2020), Omeje et al (2021), Abiogu et al. (2020), Ugwuanyi et al. (2021) have adopted this design.

## Participants

The participants for the study were 48 primary three pupils in inclusive classrooms in the South-East States schools in Nigeria. Those pupils are only the ones who met the set criteria for inclusion in the study. In the Nigerian context, an inclusive classroom is a classroom setting in which pupils with diverse and different learning and physical abilities are taught in the same classroom conditions. The following eligibility following criteria were used to screen the participants: (1) must attend school regularly; (2) must show a low score on the Wide Range Achievement Test (WRAT) indicating that he/she has a learning disability; and (3) a high score on the children depression inventory (CDI). Thus, exclusion criteria are (1) not being regular in school, (2) a high score on WRAT, and (3) a low score on CDI. G-Power, Version 3.1 software was used in arriving at an adequate sample size of 48 which gave a power of .91 at an effect size ( $f^2$ ) of .15 which was considered medium, and 5% probability level. Out of 193 pupils who accepted to take part in the study, 48 pupils were arrived at after screening for inclusion criteria for eligibility. Thereafter, the 48 pupils were assigned to the experimental group and control group randomly using a simple randomization procedure. This procedure involved asking participants to pick one envelope from a container containing papers labeled either E or C. Figure 1 shows the flow diagram for the sampled participants for the study.

## Measures

### Demographic Questionnaire

A demographic questionnaire was administered to get the demographic information of the children concerning gender, age, and location as shown in Table 1.

Table 1 shows that there are significant gender, age and tribe differences in the number of children used for the conduct of the research,  $\chi^2(1) = 10.65$ ,  $p < 0.05$ ;

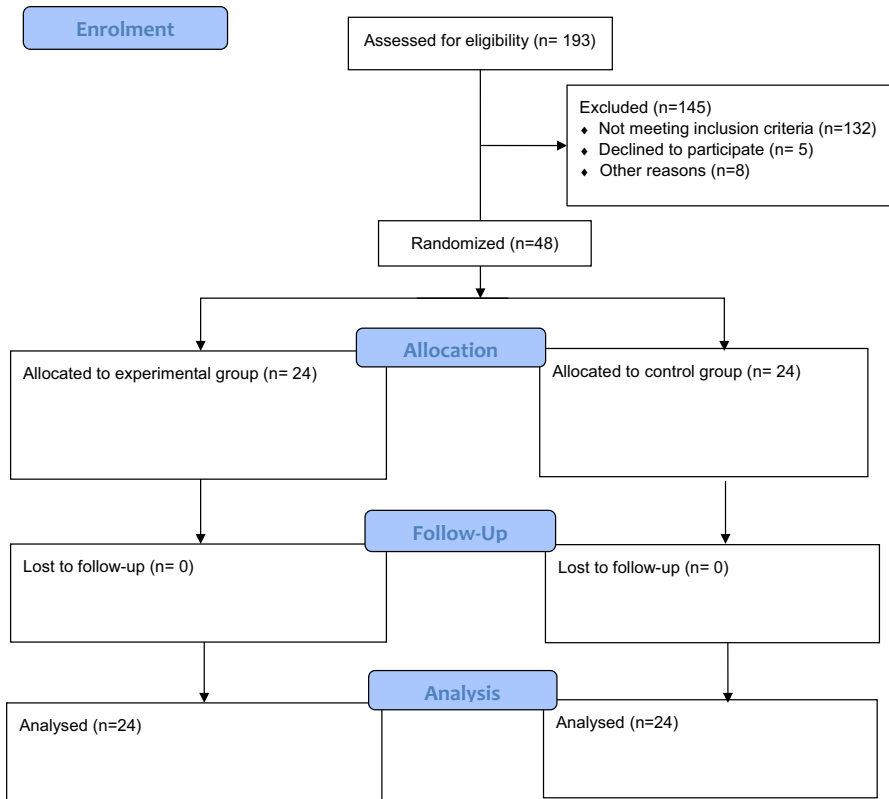


Fig. 1 Flow diagram of the sampled participants

Table 1 Demographics of the Participants

Demographic characteristics	Experimental	Control	n (%)	$\chi^2$	<i>p</i>
<i>Gender</i>					
Male	9	10	19(39.58)		
Female	15	14	29(60.42)	10.65	.005
<i>Age</i>					
5–7	4	3	7(14.58)	8.59	.020
8–9	11	13	24(50.00)		
>9	9	8	17(35.42)		
<i>Tribe</i>					
Igbo	18	17	35(72.92)	25.83	.000
Hausa	2	4	6(12.50)		
Yoruba	4	3	7(14.58)		

$\chi^2$  = Chi-square statistic, *p* = probability value

$\chi^2(2) = 8.59, p < 0.05$  and  $\chi^2(2) = 250.83, p < 0.05$ . The significant gender difference may be as a result of the fact that the schools used were mainly female-dominated. Similarly, the significant age difference could be because, in Nigeria's primary education system, children within 8–9 years are mostly found in primary three. Finally, due to the fact that the South East region of Nigeria, which was used as the study site, is an Igbo-dominated region, a significant tribal difference was found.

### **Wide Range Achievement Test (WRAT)**

The Wide Range Achievement Test (WRAT) developed by Wilkinson and Robertson (2006) was adopted as an identification instrument for children with learning disabilities. This edition (4th edition) has word reading, spelling, math computation, sentence comprehension, and a reading composition subtest. The word reading subtest help to provide data for decoding and printed word recognition. The math computation subtest allows the researchers to identify errors of inattention to detail. The sentence comprehension subtest requires individuals to supply a keyword using a cloze procedure. A low score on WRAT indicates a learning disability. In this study, the children identified using WRAT were not regarded as underachievers but those who had specific learning disabilities (SLD).

For the psychometric properties of the WRAT, the items demonstrated good construct validity with factor loadings ranging from 0.5 to 0.8. WRAT is very similar to Peabody Individual Achievement Test (PIAT). Thus, WRAT correlated with the PIAT very highly. Further, WRAT correlated with various intelligent quotient (IQ) tests moderately within the range of 0.40 to 0.70 in a population of children. Also, the split-half reliabilities for reading and spelling subtests ranged from 0.88 to 0.94 while that of the arithmetic subscale ranged from 0.79 to 0.89 indicating that WRAT demonstrated good reliability. WRAT was normed on a sample of 50 Class 3 participants in the three states of South East Nigeria. The sample was stratified by age, sex, location, and tribe. It was found that WRAT was not influenced by any of the norms.

### **Children's Depression Inventory (CDI)**

The Children's Depression Inventory (CDI) developed by Kovacs (1992) was adopted for the study. Among the frequently used measures of depression in children, CDI is mostly used. CDI is 27-item modeled on a 3-point Likert Scale of 0–2, each evaluating depressive symptoms. Items of CDI are presented on three different statements indicating varying symptom severity (e.g., I do not do what I am told most of the time). The internal consistency reliability coefficient of CDI is 0.80, while the test–retest reliability coefficient is 0.87. The minimum and maximum scores obtainable using the CDI are 0 and 54 respectively. A cut-off score of 39 appears to be appropriate for detecting depressive symptoms in samples of children. Thus, any child who had a CDI score of above 39 is regarded as being depressive while a score below 39 shows no symptom of depression.



## Procedure

The researchers conducted a preliminary survey of primary schools in the South-East states of Nigeria by paying weekly visitations to the schools. That enabled the researchers to create a rapport with the various headteachers of the primary schools used for the study. The researchers on the visitation to the schools explained to the authorities what REBT intervention program is and the benefit of such intervention among children with learning disabilities. On approval for the conduct of the study in some of the schools visited, primary three pupils were screened for participants' eligibility criteria.

The WRAT and CDI were used for the identification of pupils who had learning disabilities and showed signs of depression. Further, the main instruments (WRAT and CDI), as well as a demographic questionnaire, were administered to the pupils as paper and pencil-based tests in a space of 40 min for the pupils to respond accordingly. Thereafter, completed copies of the WRAT and CDI were retrieved from the pupils and packaged accordingly for analysis. The analysis was done within two weeks to enable the researchers to select pupils who had learning disabilities and showed signs of depression.

At this stage, the intervention program started for the experimental group. The duration of the intervention was two times in one week. The researchers ensured that the location of the intervention site was central for easy accessibility by the pupils from schools located at different places. Friday at 15:00–15:40 h and Saturday at 9:00–9:40 h for the 12 weeks on weekly basis were the schedules for the CBT program. That was done to ensure that there was no clash of the program with the normal school program. The experimental group participants were exposed to 40 min of the REBT program twice a week. It is worthy to note that the control group pupils were not exposed to any form of counseling. Two specialists in REBT carried out the intervention program. The researchers had vast experience and expertise in REBT and Randomized Controlled Trial (RCT) experiments. To achieve the demands of the RCT, the research team is composed of experts in counseling psychology, measurement and evaluation, childhood care, and education. The participants were assured of the confidentiality of interactions and personal information as they worked together in self-disclosure before the commencement of the pretesting vis-à-vis the intervention program.

Posttest assessment was conducted using only CDI at the expiration of the intervention program while the follow-up assessment was done at an interval of 3 months after the CBT program had stopped.

## REBT Intervention Program

The researchers adapted the REBT intervention manual for pupils with depression from Muñoz et al. (2007) in conjunction with the ABC Model of CBT developed by Ellis (1994). In this manual, therapy sessions were divided into three modules that consist of four sessions each.

### **Module I: Influence of Participants' Thoughts on their Mood (Sessions 1–4)**

Module I explained the influence of participants' thoughts on their moods. The following were established at the initial session of the module: structure module, the target of the other sessions, including the sessions' day, therapy rules, and confidentiality limits. In this module which had four sessions, for the fact that level of confidentiality could have an effect on the type as well as the quality of the therapeutic relationship, participants were made aware of its limits and scope. Some exercises in between the sessions were targeted at identifying thinking errors. Participants in these sessions were also taught how to enhance their thoughts positively to decrease dysfunctional negative thoughts (depression).

### **Module II: Influence of Participants' Activities on their Mood (Sessions 5–8)**

Participants in this module II (sessions 5–8), enjoyed a lot of pleasant activities with depressive symptoms. In the process, the therapist explained to the participants how the depressive symptom can limit their participation in activities that may be pleasant. Situations that would enable the participants to establish clear goals in order to decrease depression were made available for them. Coaching sessions pertaining to the steps in getting reachable goals were set aside for the participants. Those steps were properly practiced and rehearsed in sessions.

### **Module III: Influence of Participants' Relationships on their Mood (Sessions 9–12)**

The participants were introduced to how their relationships influence their moods. This was done by discussing social supports that are needed and how they help in ameliorating difficult situations. Participants through sessions 9–12, learned how to strengthen their social support networks by identifying them first. A summary of the previous themes was done. Further, both the therapist and the participants examined how thoughts affect participants' engagement in activities. Through exercise, the pupils were taught assertive communication skills that aid them in establishing healthy satisfying relationships. The strengths and successes of the intervention were explored through the evaluation of the therapy experience with the pupils.

In each of the sessions, the ABC Model of REBT was used to facilitate the intervention program where; A stands for Adversity or activating event, B stands for Clients' beliefs about the event, and C stands for Consequences, which includes the behavioral or emotional response of the clients (participants). In this model, B is the most relevant component among others, and it is assumed that B links A and C because CBT focuses on changing beliefs (B) in order to create more positive consequences (C). In using the ABC Model, the therapist helped the participants to explore the connection between B and C by causing the participants to focus on their behavioral or emotional responses and the automatic beliefs that might be behind them. Furthermore, the therapist helped the participants to re-evaluate their beliefs and learn how to recognize other potential beliefs (B) about adverse events (A). Through that, the participants had the opportunity for healthier consequences (C) which helped them move forward.

## Data Analytic Procedure

To ensure data quality, the raw data were screened and cleaned by monitoring errors, standardizing the processes, validating the accuracy, and scrubbing for a duplicate before the analysis of the data. Statistically, repeated measures analysis of variance (ANOVA) of mixed design was used to determine the within-groups and between-groups effects. An important assumption of repeated-measures ANOVA is sphericity, which is the condition where the variances of the differences between all possible pairs of within-subjects conditions are equal. The assumption of the sphericity was not violated, Mauchly  $W = .853$ ,  $p = .418$ . Also, Chi-Square statistic was used to analyze the demographic characteristics of the participants ( $\chi^2(2) = 8.59$ ,  $p < .05$ ).

## Results

Table 2 shows that the mean depression rating of the experimental group ( $M = 51.63$ ,  $SD = 9.74$ ) was almost the same as that of the control group ( $M = 52.37$ ,  $SD = 5.03$ ) at the pretest. However, at the posttest, the mean depression rating of the participants of the experimental group was ( $M = 23.25$ ,  $SD = 4.39$ ) while that of the control group participants was ( $M = 51.96$ ,  $SD = 5.12$ ). The mean depression rating of the experimental group at the follow-up was ( $M = 21.33$ ,  $SD = 3.93$ ) while that of the control group participants was ( $M = 52.04$ ,  $SD = 4.83$ ).

Table 3 revealed that across the three-time measures, there were significant differences,  $F(2, 92) = 131.211$ ,  $p < .05$ ,  $\eta^2 = .740$ , and between groups, there was significant difference in depression scores of children with learning disabilities,  $F(1, 46) = 264.915$ ,  $p < .05$ ,  $\eta^2 = .988$ . Interaction effect of time and treatment was significant,  $F(2, 92) = 123.708$ ,  $p < .05$ ,  $\eta^2 = .729$ .

Following up the result of the interaction, it was found that the participants did not differ at the baseline,  $F(2, 92) = 131.211$ ,  $p < .05$ ,  $\eta^2 = .740$  and the depression scores of the participants of the control group did not change over time while those of the intervention group decreased over time. This showed that REBT had a significant effect on the reduction of depression among children with learning disabilities with an effect size of 0.988. This implies that a 98.8 percent reduction in the depression scores of children with learning disabilities was as a result of their exposure to

**Table 2** Mean analysis of the depression scores of the participants at pretest, posttest and follow up measures

Treatment	n	Pretest (1)		Posttest (2)		Follow-up (3)	
		Mean	SD	Mean	SD	Mean	SD
Experimental	80	51.63	9.74	23.25	4.39	21.33	3.93
Control	29	52.37	5.03	51.96	5.12	52.04	4.83

SD = Standard Deviation

**Table 3** Repeated analysis of variance for the effect of the intervention on participants' depression levels

Measure	Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
CDI	Measure						
	Measure * Treatment						
	Error(Measure)						
CDI	Intercept						
	Treatment						
	Error						
		Within-subjects effect					
		Between-subjects effect					

CDI = Children Depression Inventory,  $\eta^2$  = Effect size

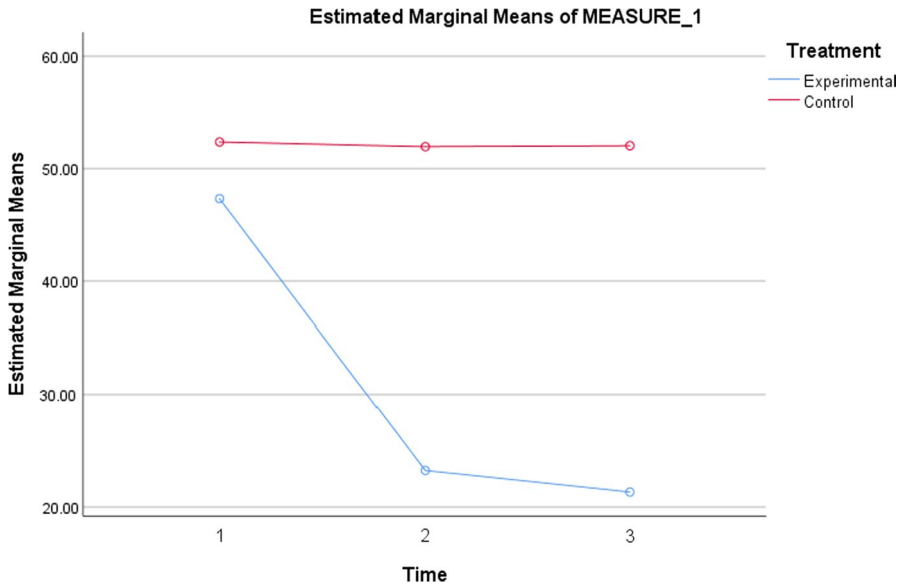


Fig. 2 Interaction plot of time and treatment

Table 4 Post-hoc pairwise comparisons test for the significant effect of time of measures

Measure	(I) Time	(J) Time	Mean difference (I-J)	SE	Sig
CDI	1	2	12.250	1.062	.000
		3	13.167	1.071	.000
	2	1	-12.250	1.062	.000
		3	.917	.442	.131
	3	1	-13.167	1.071	.000
		2	-.917	.442	.131

REBT intervention. Figure 2 shows the interaction plot of time and treatment on the depression scores of children with learning disabilities.

Table 4 shows that the mean difference for times 1 and 3, contributed most to the significant effect of time followed by the mean differences for times 1 and 2.

## Discussion

This study showed that children with learning disabilities (LD), irrespective of the treatment condition, showed a high level of depression at the baseline. On the other hand, the mean depression scores of the intervention group significantly decreased over time after the intervention period, implying that REBT had a significant effect on the reduction of depression among children with LD. Furthermore, it was found that a greater percentage reduction in the depression symptoms among children with LD was attributed to the effect of the REBT intervention program. These findings

supported the researcher's hypothesis for the study that REBT will significantly reduce signs of depression in a population of children with LD. The children with LD who were exposed to the REBT intervention program were found to be less prone to depression after a 12 weeks intervention program while those who were not so exposed did not change in their high depressive symptoms after the same period of exposure. These findings must have been this way because of the nature of the REBT intervention program.

Buttressing these findings, Sasha et al. (2016) found that CBT had a significant decrease in depression levels among the subjects. Eseadi et al. (2017) and Onuigbo et al. (2019) found that the rational emotive cognitive behavioral intervention had a significant effect on the reduction of depression among the participants. Zafer (2018) found that the cognitive behavioral therapy (CBT) intervention was effective in reducing the number of persons suffering from learning disability illnesses. Unwin et al., (2016) indicated that CBT led significantly to reducing symptoms of depression among adults with mild intellectual disabilities. Sizoo and Kuiper (2017) found that the CBT intervention program is associated with a reduction in anxiety and depressive symptoms among adults with disabilities. For Cole et al. (2021), CBT had a significant decrease in depression levels and functional impairment among the staff of an Ebola Treatment Center. Schienle and Jurinec (2021) indicated that completion of the CBT therapy led to significantly reduced depression symptoms of the participants. Lawton and Spencer (2021) found that mental health symptom scores post-intervention had significantly reduced due to exposure to CBT intervention.

### Implications for Evaluation in Science Teaching

These findings have educational implications for evaluation in science teaching in order to enhance the academic activities of children with LD. Maag and Reid (2006) opined that increased risk for students with LD to experience depression has direct implications for teachers of science education. Such implications include identifying students who may be depressed by the school personnel. Secondly, carrying out ongoing scrutiny of students' behavior as well as academic performance, which is an important indicator of mood and coping ability in the school environment (Maag & Reid, 2006). Accordingly, since children spend more time in school than at home, school personnel should play major role in identifying children with depressive symptoms (Powers, 1979 as cited in Maag & Reid, 2006). Changes in the school environment, as well as the implementation of evidence-based school programs, can help reduce the risk of developing mental health issues (Schulte-Körne, 2016). This situation calls for school-based therapies that will help reduce the feeling of depression among children with LD.

Based on these findings, teachers of science education need to collaborate with counseling psychologists to work out a better counseling approach to reducing depression among children with learning disabilities. This finding implies that when the depression among children with LD is significantly reduced, the children will be better positioned to achieve in their academic pursuits. In other words, when the level of depression among children with LD is not managed, there is bound to be

decreased performance of the children in their academic pursuit. This will hamper the realization of the enhanced academic achievement of children with LD.

This study has empirically established the effectiveness of the REBT intervention program on the reduction of depression among children with learning disabilities in primary schools in South-East Nigeria. This is a novel study/research in South-East Nigeria in the sense that no such study has been conducted before it. Thus, science teachers and counselors in primary schools, as well as educational evaluation experts in South-East Nigeria and beyond, can leverage the outcomes of this study in the reduction of depression among children with learning disabilities to enhance their science learning.

### **Limitations of the Study**

The aim is to infuse music into nearly every aspect of CBT group therapy as a means for further comprehension and engagement with the material by participants. This includes 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 is geared towards 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 adheres 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.

This present study as an experimental study has some methodological weaknesses. Specifically, this study could not analyze the possible moderating effects of participants' demographics such as location, age, and gender, which may cause difficulty in generalizing the study's findings. Moreover, the findings of this study may be limited by the fact that the participants were not subjected to diagnoses of LD but instead were identified as having LD by scores on the WRAT. Moreover, conducting this study on a South-East Nigeria population, and not involving parents and teachers in the study, are limitations to the findings. Thus, it was suggested that future researchers can explore the moderating effect of any of the moderators on the effectiveness of the REBT intervention program on the reduction of depression among children with LD. Further, subjecting participants of future research to diagnoses of LD in addition to using WRAT score for identification of participants with LD is recommended.

### **Strengths of the Study**

This study is the first of its kind to establish empirically the efficacy of REBT intervention program on the reduction of depression in a population of pupils with LD in South East Nigeria. The strengths of this study lie in the fact that the curriculum of science education needs to be reviewed in order to infuse the use of the REBT intervention program in the management of depression among pupils with LD. Also, the 100% participants' retention rate is another strength of the study.

## Conclusion

The researchers concluded that the REBT intervention program had a significant effect on the reduction of depression among children with learning disabilities (LD). This implies that the feeling of depression among children with LD can be reduced using the REBT intervention program. Based on this, therefore, the researchers recommended that the use of REBT intervention program in the reduction of depression among children with LD to maximize their academic outcomes. Also, for proper teaching and learning of science, teachers of science education should use REBT as a school-based therapy in managing depression among children with LD.

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## Declarations

**Conflict of interest** The authors declared no form of conflict of interest.

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