

Individualized Educational Therapy for Child with Dyslexia at Tsehay Chora Primary School, Addis Ababa, Ethiopia

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Abstract

Dyslexia is one of the most common manifestations of specific learning disorders. Early diagnosis, appropriate educational therapy, and support can mitigate dyslexia before it advances to severe level. The maxim “catch the child before he/she fails” is an inspiring and sensible axiology. The purpose of this study was to investigate the effectiveness of individualized educational therapy for students with dyslexia. Wakuma (pseudonym) was identified as a student with dyslexia based on diagnostic baseline assessment tests. A-B single-subject experimental research design with repeated measures and visual inspection techniques were used to investigate effectiveness of individualized educational therapy for student with dyslexia. Three different alphabet tests were used to collect data. Educational therapy package that has four individualized educational therapies and positive reinforcement was manipulated through alphabet song, alphabet naming, matching alphabet, and wooden letters arranging game. Diagnostic baseline assessments result showed that Wakuma’s level of alphabet recognition was 39.6%. Mean stable alphabet recognition of pretest was 10.3. Post-therapy results showed that the change in level between pretest and post-test was 14.2 and the immediacy of educational therapy effect was 15.3. Literacy scores at post-test were significantly higher than pre-test scores. The study has implication that intervention through individualized educational therapy was effective in bringing change in alphabets recognition of student with dyslexia.

Keywords: Alphabet recognition, Dyslexia, Intervention, Reinforcement, Therapy

Introduction

Dyslexia is a hidden specific learning disability. According to the American Psychiatric Association Diagnostic Statistical Manual-Five (2013), dyslexia is a specific learning disability diagnosed when there are specific deficits in an individual’s ability to perceive or process information efficiently and accurately. Dyslexia is a developmental disorder that mainly affects brain activity that associated with learning and memory system (Démonet et al., 2004), a language-based disorder characterized by difficulties in single-word decoding (Ward et al., 2019; Wajuihian and Naidoo, 2011), phonological processing (Tijms, 2004), that prevent learning of alphabet and phoneme associations (Castles and Coltheart, 2004). Dyslexia is characterized by

difficulties in alphabet sensing (Butler, 2022), mental confusion in letter identification, and struggle to recognize written words (American Psychiatric Association, 2013), poor spelling, encoding, and decoding disabilities (Vellutino et al., 2004).

In the early stage when children are at the level of catching the alphabet, some of the children could be identified with reading difficulty, commonly known as foundation-level dyslexia (Seymour and Evans, 1999). Specific learning disability, typically dyslexia is caused by a deficit in the way in which a child was taught to read (Butler, 2022) and the phonological component of language (Hurford et al., 2016) that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction (Lyon et al., 2003). The

evidence suggests that inadequate facility in word identification due to basic deficits in alphabetic coding is the basic cause of difficulties in learning to read (Vellutino et al., 2004). The common symptoms of dyslexia are difficulties with reading and writing (Rose, 2009; Snowling and Hulme, 2012). Literal dyslexia is a condition in which a child has difficulty identifying letters, matching letters, name letters, or letter-sounds matching (Vellutino et al., 2004).

According to Elliott and Grigorenko (2014), the estimation of dyslexia for any population often ranges from 5%-20%. Statistical survey in America showed that approximately 20% of children in America have dyslexia (Butler, 2022). Similarly, International Dyslexia Association (2016) stated that the global prevalence rate of dyslexia is approximately 15%-20%. Findings are not consistent regarding the gender prevalence of dyslexia. According to Hall (2008), males are 3-4 times more likely to be affected by dyslexia than females. Some argue that it affects both boys and girls nearly at about the same rates (Zauderer, 2023). However, boys are more often sent for diagnosis of dyslexia than girls in which 60% for males and 40% for females (Jiménez et al., 2011; Zauderer, 2023), and about 85% of students with an individualized education program have a dyslexion (Zauderer, 2023). It occurs in at least 1 among 10 people and putting more than 700 million children and adults worldwide at risk of life-long illiteracy and social exclusion (International Dyslexia Association, 2016).

Enhanced teaching method through individualized educational therapy (IET) is an effective instructional intervention to teach alphabets recognition for child with dyslexia (Rose, 2009). Children who have literal dyslexia also have difficulty recognizing characters, learning the sounds of letters, and even identifying words that rhyme. Alphabet recognition is the ability to name letters, identify characteristics specific to said letter, and letter formation of all 26 uppercase and lowercase letter symbols used in the English language. According to Share (2004), children need to know letter names as well as letter-

sounds to experience ease in learning how to read.

Children who do not successfully recognize the alphabet at an early age have a heightened chance of struggling with general reading skills throughout their lives. Hence, effective teaching methods through individualized educational therapy (IET) in their early educational paths are critical (Hurry and Sylva, 2007). According to Fawcett et al. (2014), early intervention through individualized education has lasting benefits for young children. The theories of Orton (Miles and Miles, 1999) investigated dyslexia alongside learning style proponents. The importance of reinforcement in education of students with dyslexia has theoretical background.

A student with dyslexia has difficulty reading (Doyle, 2002). A student with dyslexia needs his/her own way of learning. Teaching methods for children with dyslexia are independent of conventional teaching (Blockside and Dudley, 2003). Early diagnosis, appropriate educational therapy, and support can mitigate dyslexia before it advances to severe or profound levels that are difficult to remedy.

The reason for conducting this study was that an eight-year-old boy, Wakuma (pseudonym) has recognized few uppercase English alphabets despite his three years of schooling experience. He was born being fraternity twin. He born with birth underweight and stayed in incubation for three weeks at Menelik Hospital. There is no family history of reading difficulties (dyslexia). Wakuma was placed in three different schools due to his difficulty of alphabet recognition. After two schools refused him to attend his education, he placed to Tsehay Chora Primary School at special class for children with different disabilities including autism spectrum disorder. He has no other impairments except struggling with alphabet recognition. In addition to this background information gathered from child's mother and coordinator of special needs education teachers of the school, Wakuma was screened as a child with dyslexia on the basis of baseline diagnostic assessment. This diagnostic baseline assessment was based on Diagnostic and

Statistical Manual of Mental Disorders (DSM-5) that reveals symptoms of children with dyslexia as listed in diagnostic criteria A3, B, C, and D.

The maxim in early intervention “catch the child before he/she fails” is a sensible and inspiring axiology in inclusive education system. Providing proper early instructional support through individualized education therapy that is designed to teach students with dyslexia on alphabet recognition is an essential strategy. Regarding this, British Dyslexia Association (2007) noted that the impact of dyslexia can be mitigated by proper teaching, strategy development, and the use of information technology in education. Similarly, most children and adults with dyslexia can learn to read and can be successful in college and careers (The Dyslexia Guide, 2019).

This study was intended to improve a student’s specific learning disability in alphabet recognition by targeting uppercase letter recognition at early grade one. The measurable learning target in this therapy was the level of alphabet recognition. The main objective of the current study was to investigate effective individualized educational therapy that would enhance the learning of alphabet for a student with dyslexia at an early grade. To deal with this study, the following research questions were addressed. These were:

1. What is the effect of individualized educational therapy on uppercase alphabet recognition of a student with dyslexia?
2. What is the functionality level of the designed individualized educational therapy package of alphabet recognition?
3. How positive reinforcement is important in individualized educational therapy for students with dyslexia?

Methods and Materials

Research Design

This study was conducted in A-B single-subject experimental research design with repeated measures. According to Mills and Gay (2019), single-subject experimental research design is

design that can be applied when the sample size is one or when a number of individuals are considered as one group. A-B single-subject experimental research design in this study was used to investigate the effectiveness of individualized educational therapy on letter recognition of a student with dyslexia. Accordingly, the student’s performance on the dependent variable (letter recognition) was recorded in the baseline phase (phase A) until his performance level became stable. Following the establishment of a baseline, the proposed individualized educational therapy was provided. In the therapy phase (phase B) student’s performance on letter recognition was repeatedly measured. At the end of IET, student’s performance on letter recognition at baseline phase and therapy phase (pre-tests and post-tests) were compared. Results were presented by computing means and percentages and displayed by visual inspection in tables and figures.

Instruments

In this study, three types of alphabet tests that have different letter arrangements were used. The first test was an alphabet test in which letters were arranged in alphabetical order i.e., A B C D E F G H I J K L M N O P Q R S T U V W X Y Z. The second alphabet test was adapted from the work of Clay (2016) titled as Observation Survey of Early Literacy Achievement. The Observation Survey of Early Literacy Achievement is an assessment tool used to gather information about children’s alphabet recognition skill and development. This tool is designed to be administered individually to children aged 3-8 years old. This alphabet test consists of essential information about how to assess young children’s progress in alphabet learning such as letter identification. The arrangement of this alphabet test was A F K P W Z B H O J U C Y L Q M D N X S I E G R V T. The third alphabet test was adapted from a reliable alpha assessment website by Lakeshore (n.d). The arrangement of this alphabet test was A C D G F H L R P O Q E W J N V K U S T Z Y X B M I.

Procedures

To accomplish this individualized educational therapy, 31 sessions were used on a daily basis. Letter song practice by means of simple melody local tune was the first educational activity in this therapy. This activity was used as eye-breaking and motivating the child to learn the alphabet. Letter song activity was provided for three (3) sessions in the whole alphabets learning approach and formative assessment was made on the whole uppercase alphabets learning activity. The data recording format was prepared in tabular form for formative assessments. Following the letter song activity, letter naming rehearsal was provided by chunking alphabets into a part learning approach. This learning activity was used for more than half sessions of the total sessions of the intervention phase. Chunking, rehearsing, and using a learning computer for a multi-sensory learning approach to the teach alphabet were used in letter-naming rehearsal instructional sessions which took fifteen (15) sessions. Formative assessments were made on chunked part learning activities.

Matching letters' shape-symbols instructional activity was the third activity used in this therapy. This activity took five (5) sessions. Wooden letters arranging game was the fourth instructional activity used in this educational therapy. This activity also took five (5) sessions. Formative assessments were conducted at the end of every session for letter-matching and letter-arranging game learning activities.

The effectiveness of this therapy was evaluated by means of visual inspection, tabular and

graphic presentation of results. Baseline assessments were conducted and mean scores were calculated. Formative assessments were conducted and results were organized in tables. Summative assessments were conducted and the mean scores were calculated. The mean scores at the baseline condition and at therapy conditions were compared to determine the effectiveness of the educational therapy. The mean difference, range, and percentage change were computed to determine the consistency of scores and immediacy effect of educational therapy. The trend of student's progress in alphabet recognition was detected by means of the slope on a line graph of formative assessments.

Variables of the Study

The dependent variable in this therapy was the student's alphabet recognition of uppercase letters. This variable was measured three times at the baseline conditions (Phase A) and nine times at the therapy conditions (Phase B). The alphabet knowledge assessment results were recorded without manipulation of independent variables at the baseline phase. The independent variable (treatment variable) in this therapy was individualized educational therapy (IET) package. This package consists of letter learning activities that consisted of letter song, letter naming rehearsal, letters' shape matching, and wooden letters arranging game. These instructional activities were used as a single independent variable to measure their effect on a student's alphabet recognition ability. Student's alphabet recognition was measured by means of summative assessments to determine whether the therapy has an effect on the dependent variable.

Table1. Proposed individualized educational therapy package

Intervention package	Providers
Alphabet song	Investigator and special education teachers
Alphabet naming rehearsal	Investigator and special education teachers
Matching alphabet shapes to its bolded graphemes	Investigator and special education teachers
Wooden letters arranging game	Investigator and special education teachers

Reinforcement Strategies

Reinforcing students in general and students with disabilities in particular in educational settings by means of variable ratio schedule has very high response rate and very steady as well as the most resistant of all schedules to extinction. Hence, this reinforcement schedule was selected and used during the provision of IET. Accordingly, the investigator used substance-positive reinforcements, chocolate and candy as well as positive social reinforcements. The investigator provided the mentioned substance-positive reinforcements for Wakuma initially on a continuous reinforcement basis (for every correct response of letter name, he received one chocolate/candy) and gradually the provision of reinforcements was shifted from continuous to variable ration reinforcement and the number of correct responses in a ratio was elapsed. The elapsing number of correct responses in a ratio was followed by smooth shifting in such a way that 1: 2, 1: 3, 1: 4, and 1:5. In addition to the substance-positive reinforcements, social-positive reinforcements were also used in this therapy. Social positive reinforcements included verbal reinforcements (your work is great! viva! keeping it up! and you did it correctly!) and nonverbal reinforcements (shack hand and clap hand) for correct responses to alphabet recognition activities.

Data Analysis

The effectiveness of the individualized educational therapy package in alphabet recognition was examined by computing mean differences between phases, immediacy, and percentage of change in alphabet recognition. Based on A-B single-subject experimental research design, visual inspection (level, trend, variability, immediacy of effect, and consistency of data) were analyzed. Table and figure presentations were used to determine functionality level of the proposed educational therapy package and how much student's alphabet recognition was improved in post-

therapy tests. In order to measure the effectiveness of this educational therapy, the current investigator opted to analyze the data using mean scores (levels), range, and percentage change (variability) in dependent variable (alphabet recognition).

Ethical Statement

The researcher received permission from the director of the school and from the parent of the child to conduct this study. After the purpose of the study was disclosed, informed consent was obtained. Discussion made with the school's individualized education program teams including the parent of the child. The investigator gave informed consent to respect personal rights of the child which require protection of autonomy (privacy, confidentiality, and anonymity) and the right to know the purposes of the study. The investigator was ethically obliged not to commit any harmful deed in this study and any condition that could have a harmful effect on the child was not attempted.

Results

Comparison of Pre- and Post-therapy

Alphabet Recognition

Baseline data were collected in three steps for 26 uppercase English letters. The scores for baseline assessments were 10, 11, and 10 respectively for first round, second round, and third round on alphabetical order letter recognition test. A stable baseline with a mean of 10.3 and a range of 1 was observed by test-retest reliability. The results of formative assessments are indicated in the following figure.

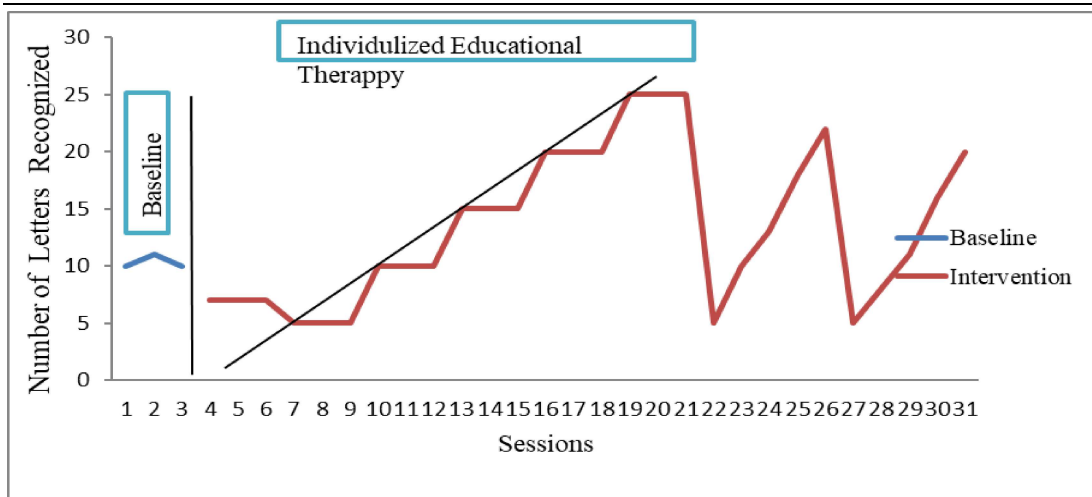


Figure.1. Formative assessment results for alphabet recognition progress during IET sessions.

As indicated in Figure1, the slope (trend) of alphabet recognition increased as IET continued. Sessions were divided based on different therapy activities to teach the student with literal dyslexia. Accordingly, sessions 1-3 were baseline, sessions 4-6 were letters teaching by letter song activity, sessions 7-21 were letter naming rehearsal on the basis of read it again (RIA) strategy, sessions 22-26 were letter matching activities, and sessions 27-31 were wooden letter arranging game. The mean score for therapy phase (phase B) was 24.5 with a range of 4 at nine steps (repeated measures). This mean score was calculated from Wakuma’s alphabet attainment in three tests of alphabet recognition which each of the tests administered three times. Wakuma had

achieved 25, 26, and 26 on the first test (sequenced alphabet test). He had achieved 23, 25, and 25 on the second test (non-sequenced type 1 alphabet test). He had achieved 22, 24, and 25 on the third test (non-sequenced type 2 alphabet test). The sum of correctly recognized letters from repeated measures was 221. The mean score of these tests was $221 \div 9 = 24.5$. The mean scores for each test respectively were 25.6, 24.3, and 23.6. With a range of 2, these mean scores have consistency. The comparison of alphabet recognition at the baseline phase and therapy phase is indicated in the following tables.

Table 2. Pre-therapy alphabet recognition test result at the first round

Correctly named alphabets		Incorrectly named alphabets		
B	S	A	M	W
C	X	E	P	Y
D	Z	F	Q	
G		H	R	
K		I	T	
N		J	U	
O		L	V	

Table 2 shows that a child with dyslexia recognized 10 alphabets before receiving educational therapy. This was a very low

achievement when compared with three years of schooling experience for a child.

Table 3. Post-therapy alphabet recognition

Correctly named alphabets				Incorrectly named alphabets	
A	H	O	V	W	
B	I	P	X	Y	
C	J	Q	Z		
D	K	R			
E	L	S			
F	M	T			
G	N	U			

Table 3 shows that a child recognized 24 alphabets after therapy. Both substance-positive reinforcements and social reinforcements played roles in the success of this therapy. Positive substance reinforcements (candies and chocolates) were provided on a continuous reinforcement basis for the first three sessions of the letter song activity. Variable ratios in the number of responses that gradually increased were used in the rest of the sessions. Social reinforcements were provided every time the child finished the learning activity along with positive substance reinforcements.

The immediacy of effect was calculated from three data points in the baseline phase and from the first three data points in the therapy phase. The change in level between these two phases was obtained by subtracting the mean score of alphabet recognition on pre-therapy phase (pretest), i.e.10.3 from the mean score of alphabet recognition on the therapy phase of the first three data points, i.e. 25.6. Hence there was a 15.3 mean difference between these two phases which indicated that IET had a significant effect on alphabet recognition of a child. Data in the ovals of Figure 2 below illustrated the immediacy of the effect.

Immediacy of Effect

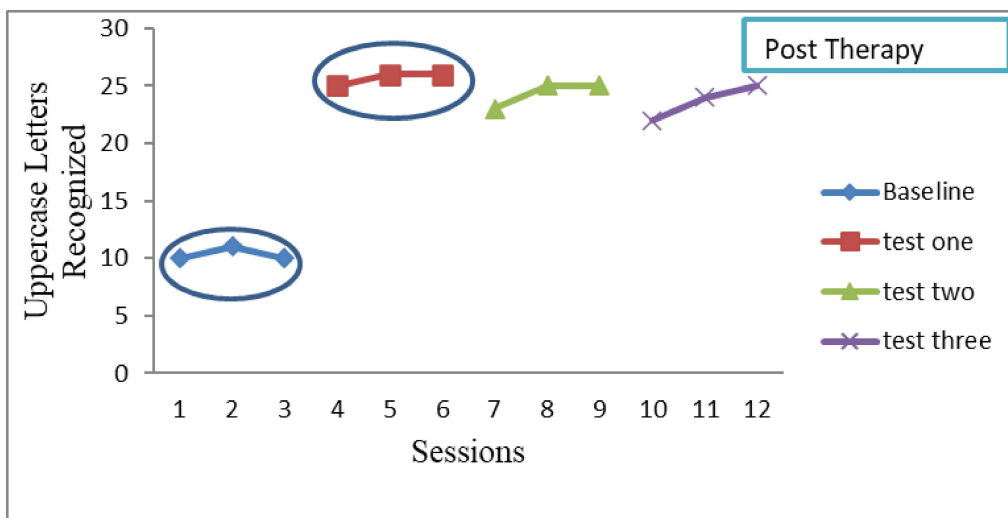


Figure.2. Immediacy effect of individualized educational therapy

As Figure 2 revealed, there was a rapid change in alphabet recognition (strong effect of therapy i.e., 15.3 mean deference). When the mean differences were calculated for the baseline phase and for the three post-therapy assessments, i.e. 24.5-10.3, there was a 14.2-

Discussion

Results are discussed in terms of the individualized educational therapy objective initially planned. The purpose of this therapy was to improve alphabet recognition of a student with dyslexia by means of IET. There are strong research findings that suggest rehearsing and chunking letters of the alphabet influence letter recognition of student with dyslexia (Annmarie and Nancy, 2013). The alphabet recognition assessment results of the current study indicated that child's alphabet recognition ability was progressively increased. This finding is in lined with previous studies that stated letters song, letters naming rehearsal, letters matching, and wooden letters arranging game learning activities were effective academic therapy package used to teach a student with dyslexia on alphabet

Figure1 depicted that assessment results of sessions 4 to 6 were approached, but lesser than the baseline data. Letter song learning activity was practiced by whole learning rather than chunked. The child simply sings a song without paying attention to grapheme of the alphabets. This made assessment results fall under the baseline data as displayed in Figure 1. Even though few letters were recognized by this learning activity, the student was motivated to learn letters after practicing letter song. Regarding this, Aguirre et al. (2016) stated that songs stimulate students to participate more actively. The graph in Figure 1 also depicted the consistent increase in letter recognition from session 7 to session 21, from session 22 to session 26, and from session 27 to session 31 due to the introduction of IET. This is in line with consistency criteria that state there should be sufficient data with sufficient consistency to demonstrate a predictable pattern of responding (Kratochwill et al., 2010).

point increase in the mean and a 54.6% increase in alphabet recognition from the baseline phase to the therapy phase. This was 94.2% (24 out of the total 26 uppercase English letters).

The reason why the graph in Figure 1 moved downward at sessions 22 and 27 and then raised up was that session 22 was where letter naming rehearsal learning activities were accomplished and letters matching activities started on chunked groups of letters and session 27 was where letters matching learning activities end and wooden letters arranging game started. Summative assessment results indicated that the letter recognition ability of the student with literal dyslexia was significantly increased due to the manipulation of IET. In congruence with the findings of an earlier study (Schultz, 2015), the findings of the current study reveal that the IET through proposed therapy package and reinforcement strategy is an effective educational therapy in learning alphabet recognition by student with dyslexia. Similarly, Berninger (2004) stated that redundancy is important to hold letters in multiple formats in memory. Repeated measures were conducted to reduce the probability of threats to internal validity that might be confounded with the effect of educational therapy. This is in line with the recommendation of Kratochwill et al. (2010) that stated statistical regression would be a major concern when only pretest and posttest scores were used to evaluate outcomes. Hence, repeated measures with alternate forms of assessment are acceptable.

With a range of 2, the mean scores of the three tests used in post-therapy assessments have consistency. These consistencies of data points show that the functionality level of the educational therapy package for dyslexia remedy to alphabet recognition is effective. Regarding this, Kratochwill et al. (2010) stated that the greater the consistency, the more likely the data represent a functional relation. The 54.6% increase in alphabet recognition indicated that there was a positive effect of IET for students with dyslexia. As a result of this

educational therapy, student recognized uppercase English alphabets more than double percent of what he had recognized at baseline. This is in line with Brooks (2013) that stated when at least a double rate of progress is achieved in intervention for a child with dyslexia, that intervention has a good impact. Within a 15.3 point increase in mean from baseline to the first three data points of the therapy phase (immediacy), there is a rapid change in alphabet recognition due to individualized educational therapy. This is evidence that this therapy has a strong effect on alphabet recognition. Regarding this, Kratochwill et al. (2010) stated that the more immediate the effect, the more convincing the inference that change in the outcome measure was due to manipulation of the independent variable.

Chunking the alphabet into smaller groups facilitated conditions for a student to learn the alphabet in small steps. It enhanced student's learning of letters name and symbol. Singleton (2009) reviewed that small step as one of the

Conclusion and recommendation

Based on the results of the current educational therapy, the following major findings were concluded. Wakuma's alphabet recognition significantly increased from 10 letters to 24. This alphabet attainment was more than double when compared with baseline alphabet recognition. Individualized educational therapy for a student with dyslexia was effective in alphabet recognition. Both substance and social reinforcements were important in educational therapy for students with dyslexia. Individualized educational therapy brought significant changes in Wakuma's uppercase English alphabet recognition. After therapy was provided, student's alphabet recognition was significantly improved and educational therapy for student with dyslexia has a 94% functionality level and has a strong effect on student's alphabet recognition.

Recommendations

This educational therapy matches the student's needs. So, teachers can take useful experience (lesson) from this educational therapy and plan

common features of teaching students with dyslexia. On the basis of this construct, uppercase letters were chunked into five small groups of letters. The chunked letters were explicitly taught by means of IET instructional activities. Educational therapy brought significant change in student's alphabet recognition and the intended objective was achieved as the student recognized 24 uppercase alphabets at the end of the therapy.

Limitation of the Study

Different educational experimentalists used different independent variables as intervention packages to improve the learning of students with dyslexia. To the extent of current investigator's knowledge, no exactly the same package and procedure used to provide individualized educational therapy. Thus, this individualized educational therapy through A-B single-subject experimental research design would have limitation in controlling extraneous factors that can affect the generalizability of results.

for high expectations to achieve rapid improvement when used it. Teachers can also find ways to embed this educational therapy into their daily lessons when teaching the alphabets to students with dyslexia at kindergartens or at early grade one or even at primary schools. Specifically, instructing alphabet recognition (letters' names and symbols) will be effective if delivered in similar way this therapy is delivered. Schools can use this therapy to teach alphabet recognition to students with dyslexia. If similar individualized educational therapy is implemented for students with dyslexia by following similar steps, students can learn lowercase English alphabets more easily because uppercase alphabets recognition can facilitate condition to learn lowercase alphabets. The concepts and practices of educational therapy should be introduced in every preprimary and primary school in Ethiopia. It is also suggestible for higher education institutions, particularly department of Special Needs and Inclusive Education to include educational therapy in their practicum course to equip undergraduate students with educational therapy/intervention skills.

Implications

A-B single-subject experimental research design with repeated measures was used to evaluate the effectiveness of individualized educational therapy. The independent variables used in this educational therapy have a positive effect on a child with dyslexia to master alphabet recognition. Individualized educational therapy is a good instructional intervention to help child with specific learning disability-dyslexia. The study reveals that student's alphabet recognition ability is increased due to educational therapy. Alphabet recognition learning activities through the mixture of different methods (letters song, letters naming rehearsal, chunking, letters matching, and wooden letters arranging game) are good compositions of educational therapy to teach student with dyslexia. Repeating learning activities such as "name it again", "match it again", and "arrange it again" are crucial therapeutic strategies to teach students with dyslexia. Manipulation of positive substance reinforcements and social reinforcements during treatment help to increase the rate of alphabet recognition for students with dyslexia.

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Data Availability: The data generated and analyzed were incorporated in this study and can be available from the corresponding author on reasonable request.

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