Early Identification and Intervention and the Reading Ability of Children with Dyslexia in Some Primary Schools in Buea, Cameroon

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ABSTRACT

This study investigated the effect of a systematic reading programme with the use of multi-sensory teaching, repeated reading, structuring information and reinforcement on the reading ability of learners with dyslexia. It employed a modified version of the four step instructions programme, using a reading readiness master plan of activities. The study's design was quasi-experimental with 14 pupils with dyslexia identified with a flash card. A pre-test-intervention-post-test design was further used to compare the effect of intervention. The Kolmogorov-Smirnov-Z test was used to compare between and within groups, the effect of intervention on reading ability. Meanwhile Cramer's V test and sets of pre-test and post-test difference percentage scores were used to report statistical progressions made by the experimental group. Results showed that the experimental group significantly gained better results in reading. Repeated reading (100%) and reinforcement (100%) were most effective intervention strategies followed by multi-sensory teaching (78.6%) and structuring information (64.3%). Meanwhile children in the control group lagged behind at 42.9% for reinforcement and 35.7% each for repeated reading, multisensory strategy and structured information. On the whole, progression rates showed that early identification and intervention significantly improved on the reading ability of learners with dyslexia. It was concluded that early identification is very important and necessary for early intervention; and that for effective intervention, effective strategies could be adopted in shaping and improving on the reading ability of learners with dyslexia.

Keywords: *Early identification, Early intervention, Multi-sensory teaching, Repeated reading, Structuring information, Reinforcement, Reading ability, Dyslexia.*
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Highlights of this paper

- This study investigated the effect of a systematic reading programme with the use of multi-sensory teaching, repeated reading, structuring information and reinforcement on the reading ability of learners with dyslexia.
- This study was concluded that early identification is very important and necessary for early intervention; and that for effective intervention, effective strategies could be adopted in shaping and improving on the reading ability of learners with dyslexia.

1. INTRODUCTION

Dyslexia, constituting reading, writing and spelling difficulties is a common issue in educational science and is becoming more prevalent in the classroom today than ever. Teachers must be able to adapt and become more aware of these reading problems in order to promote students' ability to do certain reading assignments. According Nicolson *et al.* (2001) this learning problem causes learners to drop from school as they get frustrated and reluctant to attend classes. Reading plays a vital role in the education of learners. According to Lyons (2003) learning how to read is critical to students' academic success and has tremendous effects on their emotional, social and academic progress throughout life. The acquisition of appropriate reading skills therefore is very important to every learner's academic success and even more important to learners with dyslexia or reading difficulties. Such reading skills are taught early in life during the first years of elementary school. But not all learners demonstrate these skills early even after receiving lessons on them resulting in reading difficulties. Failure of early identification and intervention for learners with reading difficulties suggests trouble in coping with studies in later years. According to Lyon and Weiser (2009) dyslexia renders affected learners with the inability to decode, comprehend and retain written words. In more precise terms, they have difficulty in reading, writing and spelling throughout elementary primary and secondary school. Early identification and intervention is therefore a key issue in the education of children with reading difficulties, especially when there is need to improve on their reading ability. It is on the strength of this that this study investigated the effect of early identification and intervention on the reading ability of children with dyslexia in some primary schools in Buea, Cameroon.

2. BACKGROUND TO STUDY

The word "dyslexia" is derived from Greek roots "dys" which means "not" and "lexia" which means "read". Thus, dyslexia simply means the inability to read. In the medical field, when an adult patient loses the ability to read because of brain damage caused by a stroke, an accident, or organic brain disease, neurologists refer to the condition as "acquired alexia". When a child is unable to learn the skill of reading because of brain pathology, the condition is sometimes called "developmental dyslexia" or "dyslexia" (Morgan, 1896). Reading is one of the principal tools for understanding humanity, for making sense of the world, for advancing the democratic ideal and for generating personal and national prosperity. According to Duane (1983) the ability to read allows humans to achieve three important goals: building knowledge, acquiring information for accomplishing task, and deriving pleasure and feeding individual interest. Without a reading ability humans would be very different. This is because those with reading difficulties face enormous challenges learning to read, like the inability to build knowledge and acquire information to feed their interest or enrich their lives. They face persistent and on-going difficulty which results in discouragement and frustration and hinders their chances to succeed academically if they are not handled properly.

Chapman and Tunmer (2003) have reported that if learners are still struggling in third grade then they are likely to have continuous reading difficulties. Such learners leave elementary school with severely deficient reading and writing skills, with little or no improvement and with many dropping out of school without graduating. In line

with this argument, Kopp-Duller (1995) argued that a person with dyslexia and who is of average intelligence perceives his or her environment in different ways. This person's attention diminishes when confronted by letters and numbers and their ability to perceive them differs compared to those without dyslexia leading to difficulties in learning to read. They are unable to break up words into their component sounds, that is the ability to master the sound system and matching it to produce a meaningful word.

Many individuals never reach a level of reading proficiency that allows them to build knowledge, acquire information, feel their interest or enrich their lives. That is why in order to overcome these barriers, early identification and intervention becomes imperative for children with such reading difficulties. In some cases, their attempt to read results in a degree of discouragement and frustration that subtracts reading rather than adds to their lives (DeBettencourt *et al*., 1989). Several decades of research have shown that children with dyslexia often have phonemic awareness deficits which can also impede the development of early reading skills. The earlier these learners receive early identification and intervention, then the higher chances they have of meeting acceptable reading standards. According to Hiebert and Taylor (2000) reading in school is crucial and constitutes the foundation for learning. But then, there is evidence that learners with dyslexia struggle to develop adequate word recognition and decoding skills; they remain poor readers in later years and the more frustration they experience, the more disinterested they become in reading and may eventually dropout of school (Nicolson *et al*., 2001).

In line with this, Lyon (1995) and the National Reading Panel (2000) found that deficits in phonological processing can be a major impediment in learning to read. The research cites oral language, phonological sensitivity, concepts about print, alphabetic knowledge, invented spelling, rapid naming and ability to write one's own name as early indicators of literacy success; and if this is not the case, there can be suspected dyslexia. In this connection, the level or extent of dyslexia becomes very strong in the absence of early identification and intervention. According to Gest *et al*. (2004) a child of average intelligence, whose academic performance is impaired by a developmental lag in the ability to sustain selective attention, requires specialized instruction in order to permit the use of his or her full intellectual potentials.

Early identification and intervention studies have shown that learners with dyslexia tend to be of above average intelligence compared to learners without the disability. They can therefore also succeed academically if identified early and proper early intervention is done. That is why Marope (2005) maintained that a child with a reading difficulty is neither damaged nor permanently impaired as he or she may just have difficulty in reading but very good at solving mathematical problems and other kinds of tasks. According McCormick (1999) the best way to manage the problems with these learners would be to first identify affected children and connect them with necessary resources and interventions that will create a positive classroom environment not only for them with the disability but also for their teachers as well. Identifying learners most likely to encounter reading problems early may constitute the first step in reducing the incidence or severity of reading disability. Because most schools tend to identify these learners until middle elementary grade, their reading difficulties grow stronger roots, and possibly become more profound (Stanovic, 1986). For the most effective intervention, schools must find ways to identify these learners much earlier than just waiting until their situation becomes worst.

Abundant evidence links early identification of reading problems with constructive intervention that improves learner's achievement. Studies like Goldstein (2011) have helped many researchers analyze intervention programs and the frameworks of their lessons. Researchers continue to study the effect of early intervention and report that progress continues to be made steadily in the area of preventing reading disabilities in early childhood. This brand of research has helped educators to understand and identify learners who struggle with reading and how with the help of appropriate intervention, they have made strides towards reading efficiency. A reading intervention

program is an avenue within the school to assist learners who need extra help with reading. Small group intervention and instruction allows learners with dyslexia to receive more individualized reading instruction. In line with this, Sideridis *et al.* (2006) recommended that the intervention operate in a small group or one-on-one session that offers support along with demonstration, consultation and mentoring. Intervention programs should allow learners to receive additional instruction in a small environment that promotes needed individualized attention. Pikulski (1997) stated that such interventions provide valuable instruction, remediation, and prevention.

3. STATEMENT OF PROBLEM

Learners with dyslexia face enormous challenges learning how to read; with many never reaching a level of reading proficiency that allows them to build knowledge, acquire information, feed their interest or enrich their lives in some ways. In some cases, their attempt to read results in such a degree of discouragement and frustration that reading subtracts rather than adds to their lives. For learners with dyslexia, their early struggle in learning to read is extended to their life style and the inability to read and process documents in later years. This is because they leave elementary school with severely deficient reading and writing skills. This is sometimes exacerbated by the failure of teachers to be able to identify the learners with such unique needs. Also, failure to put in place tools, strategies for identification and intervention has caused many to drop out before graduation or graduate without ever receiving required assistance. In Cameroon schools, children run away from the frustration they get in school because of persistent and on-going difficulty in reading. The shortage of good practicing teachers, weak elicitation techniques as well as limited facilities put in place to adequately teach reading is common. Also, many parents run into the state of denial, flight and frustration when they learn their child has a reading disability, forgetting they can be an advocate for their child to help him/her receive remediation so as to improve on their reading skills. Without the ability to read well, opportunities for personal fulfillment and job success is inevitably lost. Learners must become effective readers to meet the demands of literacy and learning in the 21st century. Bearing this in mind, this research investigated the effect of early identification and intervention on the reading ability of learners with dyslexia.

4. LITERATURE REVIEW

According to Morgan (1896) the word "dyslexia" is derived from the Greek word "dys" which means "not" and "lexia" which means "read". Thus, dyslexia simply means the inability to read. The condition may be referred to variously in different circumstances and contexts. For example, in the medical field, when an adult loses the ability to read because of brain damage, an accident, or organic brain disease, neurologists refer to it as "acquired alexia"; and when a child is unable to learn the skill of reading and the cause is ascribed to brain pathology, the condition is sometimes referred to as "developmental dyslexia" or "dyslexia" (Duane, 1983). According to the American Psychiatric Association (2000) things can be wrong with the brain in a variety of ways. Part of the brain may fail to develop, part may have been damaged before, during or shortly after the child's birth; which is known as the pre-natal, peri-natal and post-natal stages. But according to Chapman and Tunmer (2003) a reading disability is a condition whereby a person displays difficulty in reading resulting primarily from neurological factors such as dysfunctions of the central nervous system. This varies across individuals but with common characteristics including difficulties in spelling, phonological processing, manipulation of sounds and rapid visual verbal responding. These individuals typically read at a level significantly lower than expected despite having normal intelligence (Schunk, 2004). In older populations, it may also be caused by dementia, and in some individuals, brain

injury as a result of a serious accident is also cited as a cause; meanwhile, some research has also linked it to hereditary and genetic inheritance (Lieberman, 1989).

Early research in the 20th century focused on the belief that dyslexia was a visual defect that involved seeing letters backward or upside down. Later, it was thought to be related to the way people heard and processed the sounds of speech and related the sounds to written words (Duane, 1983). Accoding to the Canadian Ministry of Education (2003) while phonological processing is still considered to be the central feature of the difficulties that learners experience, recent brain research has shown that learners with persistent literacy learning problems are using their brains in ways that are not effective for reading. These ways of operating can however be changed with the use of appropriate evidence-based intervention strategies that focus on improving phonological processing and word recognition (Gayán and Olson, 2001). The origin of dyslexia in scientific literature is due to acquired aphasia which summarizes the acquisition and storage of visual memory of sounds, letters and words.

Dyslexia occurs everywhere in the world; in all environments and does not respect class boundaries. Estimates show that 4% of children are dyslexic and out of this, the majority is boys in the ratio of 4:1 to girls. But generally, the overall literacy problem today is serious. For example, according to a national survey in the U.S, 10% of the country's 17years old learners are unable to read even simple materials (National Assessment of Educational Progress, 1982). Reading is a meaning-making process in an interaction between the reader and the text. Rose (2009) supported the fact that readers use mental activities to construct meaning from text. In this light, effective readers do not only read words, but rather use their background knowledge and various strategies to make meaning out of a text. But learners with reading disability need support through appropriate intervention programs to assist them improve on their reading skills. According to Rose (2009) intervention is an area of practice where improvements are badly needed. Practitioners need more skills so they could become more confident about making appropriate observations of children who may be having difficulties, assessing the nature of those difficulties and making appropriate interventions.

Early identification of literacy difficulty is critical since literacy is the foundation for human learning. Young learners can be supported through intervention to participate fully at school. According to Lo-oh (2014) all school-going children whether with disability or not, minorities or whatever label, have the right to decent education where they can acquire up-to-date reading skills in the language of instruction. Therefore learners with reading difficulties need to be given all the assistance they need in other to help them manage the situation. This is to enable them comfortably study in an inclusive classroom with their peers and to reduce the stigma of not being able to perform normally as their peers. Similar to this is the United Nations (1948) which state that all children have the right to education, of course including those with dyslexia. In addition, the 1994 Salamanca Declaration supports inclusion and the enrolment of all learners in regular schools, irrespective of their condition.

Early intervention on its part is a way to provide struggling readers with early effective instruction as well as valid means of assessing learners' needs (Fuchs and Fuchs, 2005). In this regard individualized education plans become very important and can contribute to raising learners' achievement and preventing further reading problems. Taub and Szente (2012) explain that without early intervention, all learners experiencing difficulty acquiring reading skills in the early grade may never read adequately. Early intervention targets specific skills that learners lack in the areas of word recognition, vocabulary, fluency, comprehension, and writing (Morgan *et al.*, 2008). There are a multiplicity of methods and intervention strategies that may be useful in school. These intervention strategies may require one-on-one relationships with a teacher-learner relationship or small group settings in addition to classroom instruction. In this process, a number of strategies maybe adopted and in this

study we considered structuring information, multi-sensory teaching, repeated reading and reinforcement as intervention strategies.

Instruction that is supported by research is explicit, systematic and cumulative. In other words, there is a plan and the instruction is structured in some meaningful way. This evidence- based approach integrates listening, speaking, reading, and writing thereby simultaneously integrating all aspects of literacy or language learning (Vickery *et al.*, 1987). Structuring information requires a structural and meaningful break down of information from simple to complex so that affected learners gradually learn and grasp those skills needed to attain reading efficiency. Fountas and Pinnell (1996) recommended that for this to occur, teachers should improve their efficiency using at least two types of lesson structures: guided reading and skills-focused lessons. According to them, although other lesson structures may be created by blending aspects of these two types, all teachers should be able to create small group lessons using at least these two main types of lesson structures. The structure of a typical teaching lesson roughly follows the following pattern: selecting the text, introducing the text, reading the text and discussing the text, in that order. According to Meyer and Ray (2014) structuring information in this manner facilitates comprehension as it helps readers organize concepts based on the explicit or implicit relationships that are communicated in the text.

On its own, multi-sensory teaching is used to refer to any learning activity that combines two/more sensory strategies to create or express information. It has been particularly valuable in literacy and language teaching with examples such as sounds and symbols, word recognition and the use of tactile methods in combination to elicit reading efficiency. That is why Stoffers (2011) views multisensory teaching as using visual, auditory and kinaesthetic modalities simultaneously. Teachers working with learners with dyslexia have found multi-sensory approaches particularly valuable as they help learners to make sense of information in a range of ways (Jasmine and Connolly, 2015). In line with this, Coffield *et al.* (2004) found that it is less beneficial to classify learners into fixed stereotype learning styles and teach them accordingly. He insisted that work with learners with dyslexia should focus on activating and developing all the senses as fully as possible, using multi-sensory techniques and environments; and then selecting and using the most appropriate style for learning that works best for an individual. In particular, multimedia resources can promote inclusive learning if accessibility features are built in. This can go a long way to enable even learners who are having difficulty in reading and are being affected by hearing or visual impairment to use the same resources as others (Sweller, 1999; Mayer, 2001).

Falzon and Calleja (2011) present growing evidence that well designed multimedia resources lead to deeper learning than just traditional verbal learning. Teachers must understand that learners learn in different ways and in order for instruction to reach all learners, teaching methods must relate to each child's own learning preference and style. Also, using a variety of materials allows learners to gain experience for understanding and using reading materials smartly. They become active participants in their own learning and in the formation of new ideas and concepts under the guidance of the teacher. That is why Galt-Johnson and Price (2000) believe that teachers should include in each teaching presentation, at least three basic learning modalities; and to Jones *et al.* (2000) thought and preparation are required for a well advanced adapted multi-sensory lesson facilitated by appropriate resources. The visual modality seems capable of producing immediate comprehension almost effortlessly. Hence, the sighting of pictures for beginning readers is worth a thousand words (Jones *et al.*, 2000). Constructivist teachers believe there are practical alternatives to drill and practice that combine teaching with meaningful mental engagements (Wakefield, 2001) producing advances in reading efficiency.

Meanwhile repeated reading as an intervention strategy initially known as multiple oral reading involves multiple successive encounters with the same visual material, the key being repetition of the same word, sentence,

or connected discourse to advance reading fluency. According to Samuels (1979) repeated reading is an instructional technique designed originally for improving reading fluency in learners with reading disabilities. It has been practiced with disabled and non-disabled learners in a variety of ways, ranging from having the learner read aloud to listening and to simultaneously or subsequently reading aloud (Samuels, 1979). Chomsky (1978) added that silently reading the same material multiple times enables the learner to become used to the material and the likelihood of following the same trend in other situations. Chomsky reported that this procedure increased the fluency of slow and halting readers and instilled in them a heightened sense of confidence, motivation and willingness to undertake the reading of new material independently.

At the heart of repeated reading is repetition and Perfetti (1985) affirms that such repetition or redundancy may lead to an increase in familiarity and corresponding decrease in the amount of information to be processed while reading. Essentially, educators can demonstrate reading by simultaneously explaining and showing an individual how to read. Perfetti (1985) argues that when this is done repeatedly, it helps the learners to gradually follow and practice for further understanding. More so, having learners engage in repeated reading helps them to improve on their skills in reading across grades, levels and ages. Freeland *et al.* (2000) and Kuhn and Stahl (2003) also added that repeated reading has consistently been found to improve fluency. Educators are advised to have learners read orally during repeated reading lessons so that errors are recorded and corrected. It is also recommended that reading be timed so that words correct per minute can be determined.

Finally, Reinforcing appropriate reading and language behaviour strengthens that behaviour (Skinner *et al.*, 1997). When children are beginning to learn to read and apply strategies to read words accurately and comprehend text, they may need to be provided with reinforcers in successive approximations to emitting correct responses. According to Carnine *et al.* (2004) providing reinforcement in successive approximations shapes learners reading behaviours towards making accurate responses. It helps learners know the aspects of the task they are completing correctly. Skinner believed that behaviour is a function of its consequences. The learner will repeat the desired behaviour with positive reinforcement and a pleasant consequence follows the behaviour. According to Burns and Hood (1995) positive reinforcement or reward can include tangible or verbal reinforcers. Also, negative reinforcement strengthens behaviour and refers to a situation when a negative condition is stopped or avoided as a consequence of behaviour (Burns and Hood, 1995). Punishment on the other hand weakens behaviour because a negative condition is introduced or experienced as a consequence of that behaviour and teaches the individual not to repeat the behaviour that is punished.

According to Snider and Battalio (2011) behavioural models of learning focus on observable outcomes of learning as predominantly evidenced by the key principles of reinforcement theory in different learning contexts. And the advantages lie primarily in the positive practical outlook, the clear signs of success, and the ways in which the setting of specific targets allows all those involved in teaching and learning to understand the goals and expectations of individuals and groups of pupils making advances in reading as a consequence of reinforcement. In addition, Reid and Green (2007) feel that individuals with dyslexia often cannot make the connection between old and new knowledge. To assist these learners, they have to be reinforced or motivated to reflect on what they still need to know and to be able to store known information in the long-term memory. The learner's interest should be provoked and linked with previous knowledge. Boosting learners' self-effort and confidence is a significant factor in determining their engagement with the learning process and with learning outcomes.

5. METHODS

The quasi-experimental design, including a pre-test/post-test design with randomised experimental and control groups was adopted for the study. The design permitted the identification of 28 primary five children with dyslexia using a number of informal and formal steps. Firstly, nominations by class teachers and children's reading records with low performance in reading in English were used to primarily identify children with dyslexia for formal diagnosis. The flash card design was further used to administer the reading readiness diagnostic test (Ihenacho, 1998) accompanied by the 100 high frequency words test to determine the degree and severity of dyslexia. Upon identification, the 28 learners were randomly assigned to the experimental and control groups, 14 each, including 9 males and 5 females in each group. A pre-test-intervention-post-test design was further used to test, intervene and then determine through post-testing the effect of intervention on the reading ability of learners. For intervention, a reading readiness master plan of activities (Ihenacho, 1998) was adapted and used during a 4-week intervention with multi-sensory teaching, repeated reading, structured information and reinforcement tested as strategies for teaching learners with dyslexia. A post-test was further conducted to determine the effect of intervention and results were compared between the experimental and control groups.

During intervention with multisensory teaching, children were engaged in a series of four learning activities. Firstly, we used a combination of visual aids, charts, flash cards and illustrations to have children break words into smaller syllabi, identify words that sounded alike e.g.; "teeth", "beat", "feet", and "bit". Secondly, we used a combination of flash cards, gestures, role play, and some writing tasks to have children identify or express their most preferred learning style: auditory, visual and kinaesthetic styles. Thirdly, we presented the children with new material on phonemic awareness using auditory and visual forms so that the children were able to distinguish between some letters of the alphabet and their corresponding sounds e.g. /bd/, /pq/, /ft/, /mw/, /un/; and also distinguish figures according to their shape e.g. 69, 96, 17, 71. Finally, we presented some figures according to their shapes requiring the children to classify them in multiple ways so that they were able to acquire skills in drawing, copying or writing, geometric forms, objects, letters and numbers.

The Kolmogorov-Smirnov-Z test was used to compare between and within groups, the effect of early intervention on the reading ability of learners with dyslexia. Meanwhile the Cramer's V test and sets of pre-test and post-test difference percentage scores were used to report statistical significant gains or progressions made by the experimental group. Results were presented in tables and charts and were further discussed to show how they were similar or different to or from those in the existing literature.

Table 1 presents reliability analysis and from pre-test to post-test, between experimental and control groups, reliability was satisfactory for all strategies in the experimental group at post-test with Chronbach alpha coefficient ranging from 0.500-0.675. this was however, not the same in the control group that saw alpha coefficient as low as 0.003and 0.006 against repeated reading at pre-test and post-test respectively.

Table-1. Reliability analysis.

Intervention type	Group	Reliability		N_{cases}	N_{item}
		Pre-test	Post-test		
Multi-sensory strategy	Experimental	0.695	0.622	14	17
	Control	0.639	0.675	14	17
Repeated reading strategies	Experimental	0.482	0.642	14	58
	Control	0.003	0.006	14	58
Structured information	Experimental	0.407	0.500	14	16
	Control	0.685	0.646	14	16
Re-inforcement	Experimental	0.577	0.502	14	91
	Control	0.518	0.339	14	91

Table 2 shows the test of normality to determine the tests for analyses. Given that data were generally not normally distributed, non-parametric tests were used to compare scores between the experimental and control groups. From the table, only structured information had an approximately normal distribution between the control and experimental groups.

Table-2. Test of normality.

Intervention strategies	Group	Shapiro-Wilk		
		Statistic	Df	Sig.
Multi-sensory strategy	Experimental	.900	28	.012
	Control	.931	27	.073
Repeated reading strategies	Experimental	.878	28	.004
	Control	.697	27	.000
Structured information	Experimental	.960	28	.357
	Control	.948	27	.189
Re-inforcement	Experimental	.868	28	.002
	Control	.753	27	.000

6. RESULTS

Table 3 shows comparisons between and within groups, the effect of multi-sensory teaching on the reading ability of learners with dyslexia. It shows that in the experimental group, at pre-test, the average score was 20.2 ± 2.0 and rose to 57.9 ± 2.5 at post-test making a significant increase of 37.7 point score. This improvement was significant at ($P<0.05$). In the control group, at pre-test, the average score was 17.0 ± 1.8 and stagnated at 17.7 ± 0.7 at post-test ($P>0.05$).

Table-3. Comparing between and within groups, the effect of multi-sensory teaching on the reading ability of learners with dyslexia.

Group	Stats	Pre-test	Post-test	Mean-difference	Wilcoxon Signed Ranks test
Experimental group	Mean	20.2	57.9	37.7	Z= -2.722 P=0.006
	Median	17.4	58.2		
	SEM	2.0	2.5		
	Minimum	9.9	43.5		
	Maximum	31.8	69.8		
	SD	7.5	9.2		
Control group	Mean	17.0	17.7	0.7	Z= -0.060 P=0.953
	Median	17.2	17.8		
	SEM	1.8	2.0		
	Minimum	7.6	8.8		
	Maximum	34.8	34.8		
	SD	6.6	7.4		
Kolmogorov-Smirnov-Z test		Z=0.334 P=0.027	Z=0.000 P=0.000		

Table 4 shows the effect of multi-sensory strategy on the reading ability of learners with dyslexia in terms of progression from pre-test to post-test and between the control and experimental groups. As seen on the table, progression in the experimental group was 78.6% which was significantly ($P<0.05$) higher than the 35.7% progression obtained in the control group. The effect of multisensory teaching was therefore perceptible in the experimental group.

Table-4. The effect of multi-sensory teaching on the reading ability of learners with dyslexia in terms of progression.

Group	Stats	Progression		Total
		Progress	No progress	
Experimental group	N	11	3	14
	%	78.6%	21.4%	100.0%
Control group	N	5	9	14
	%	35.7%	64.3%	100.0%

Cramer's V:V=0.433; P=0.022.

Table 5 shows comparisons between and within groups, the effect of repeated reading on the reading ability of learners with dyslexia. It shows that in the experimental group, at pre-test, the score was 4.1 ± 1.2 and rose to 18.5 ± 1.0 at post-test making a significant increase of 14.4 point score at ($p<0.05$). Whereas in the control group, at pre-test, the average score was 3.2 ± 1.3 and stagnated to 2.8 ±1.2 at post-test ($P>0.05$).

Table-5. Comparing between and within groups, the effect of repeated reading on the reading ability of learners with dyslexia.

Group	Stats	Pre-test	Post-test	Mean-difference	Wilcoxon Signed Ranks test
Experimental group	Mean	4.1	18.5	14.4	Z= -3.302 P= 0.001
	Median	2.5	18.5		
	SEM	1.2	1.0		
	Minimum	0.0	9.0		
	Maximum	13.0	22.0		
	SD	4.4	3.7		
Control group	Mean	3.2	2.8	-0.4	Z= - 0.153 P= 0.878
	Median	0.0	0.0		
	SEM	1.3	1.2		
	Minimum	0.0	0.0		
	Maximum	11.0	14.0		
	SD	4.6	4.6		
Kolmogorov-Smirnov-Z test		Z=0.670 P=0.760	Z=2.457 P=0.000		

Table 6 shows the effect of repeated reading on the reading ability of learners with dyslexia in terms of progression from pre-test to post-test and between the control and experimental groups. There was a 100% progression in the experimental group as against 35.7% in the control group ($p<0.05$), thus indicating the predictability of repeated reading on the reading ability of children.

Table-6. The effect of repeated reading on the reading ability of learners with dyslexia in terms of progression.

Group	Stats	Progression		Total
		Progress	No progress	
Experimental group	N	14	0	14
	%	100%	00%	100.0%
Control group	N	5	9	14
	%	35.7%	64.3%	100.0%

Cramer's V: V=0.688; P=0.000.

Table 7 presents comparisons between and within groups, the effect of structuring information on the reading ability of learners with dyslexia. The table shows that in the experimental group, at pre-test, the score was 8.5 ± 1.9 and rose to 11.6 ± 1.1 at post-test making a significant increase of 3.1 point score at $p>0.05$. Meanwhile in the control group, at pre-test the average score was 6.1 ± 1.5 and stagnated to 5.8 ± 1.4 at post-test ($p>0.05$).

Table-7. Comparing between and within groups, the effect of structuring information on the reading ability of learners with dyslexia.

Group	Stats	Pre-test	Post-test	Mean-difference	Wilcoxon Signed Ranks Test
Experimental group	Mean	8.5	11.6	3.1	Z= -1.099 P= 0.0.272
	Median	8.4	10.6		
	SEM	1.9	1.1		
	Minimum	-4.0	6.5		
	Maximum	18.5	18.6		
	SD	7.0	4.0		
Control group	Mean	6.1	5.8	0.3	Z= -0.245 P= 0.807
	Median	6.4	6.6		
	SEM	1.5	1.4		
	Minimum	-1.3	-1.3		
	Maximum	18.4	15.0		
	SD	5.5	5.1		
Mean-difference		1.5	0.6		
Kolmogorov-Smirnov-Z test		Z= 0.945 P= 0.334	Z= 1.512 P= 0.021		

Table 8 shows the effect of structuring information on the reading ability of learners with dyslexia in terms of progression from pre-test to post-test and between the control and experimental groups. In the experimental group, there was 60.3% progression, significantly ($p< 0.05$) higher than the 35.7% obtained in the control group, suggesting that structuring information was an effective strategy in teaching children with reading problems.

Table-8. The effect of structuring information on the reading ability of learners with dyslexia in terms of progression.

Group	Stats	Progression		Total
		Progress	No progress	
Experimental group	N	9	0	14
	%	64.3%	35.7%	100.0%
Control group	N	5	9	14
	%	35.7%	64.3%	100.0%

Cramer's V: V=0.286; P=0.031.

Table-9. Comparing between and within groups, the effect of reinforcement on the reading ability of learners with dyslexia.

Group	Stats	Pre-test	Post-test	Mean-difference	Wilcoxon Signed Ranks Test
Experimental group	Mean	3.0	16.9	13.9	Z= -3.296 P= 0.001
	Median	1.1	17.2		
	SEM	1.0	1.2		
	Minimum	0.0	5.3		
	Maximum	12.4	21.3		
	SD	3.8	4.6		
Control group	Mean	2.5	2.0	-0.5	Z= -0.079 P= 0.937
	Median	0.0	0.0		
	SEM	1.1	1.1		
	Minimum	-1.0	-1.0		
	Maximum	9.0	12.1		
	SD	3.9	4.2		
Kolmogorov-Smirnov-Z test		Z= 0.670 P= 0.760	Z= 2.457 P= 0.000		

Table 9 shows comparisons between and within groups, the effect of reinforcement on the reading ability of learners with dyslexia. Results on the table show that in the experimental group, at pre-test, the score was 3.0 ± 1.0 and rose to 16.9 ± 1.2 at post-test making a significant increase of 13.9 point score ($p<0.05$). In the control group, at pre-test, the average score was 2.5 ± 1.1 and stagnated to 2.0 ± 1.1 at post-test ($p> 0.05$).

Table 10 shows the effect of reinforcement on the reading ability of learners with dyslexia in terms of progression from pre-test to post-test and between the control and experimental groups. There was a 100% progression in the experimental group as against 42.9% in the control group ($p<0.05$), thus indicating the predictability of reinforcement on the reading ability of children.

Table-10. The effect of reinforcement on the reading ability of learners with dyslexia in terms of progression.

Group	Stats	Progression		Total
		Progress	No progress	
Experimental group	N	14	0	14
	%	100%	0.0%	100.0%
Control group	N	6	8	14
	%	42.9%	57.1%	100.0%

Cramer's V: V=0.632; P=0.001.

6.1. Summary of Results

Figure 1 summarizes the results by comparing the efficiency and significance of the intervention strategies tested. Results showed that repeated reading and reinforcement strategies topped in terms of progression rate with a score of 100%, followed by multi-sensory teaching (78.6%), and then, though not to low, structuring information (64.3%). This implied that repeated reading (100%), reinforcement (100%), multi-sensory teaching (78.6%) and structuring information (64.3%) when used as intervention strategies in that order, could lead to improvements in the reading ability of learners with dyslexia.

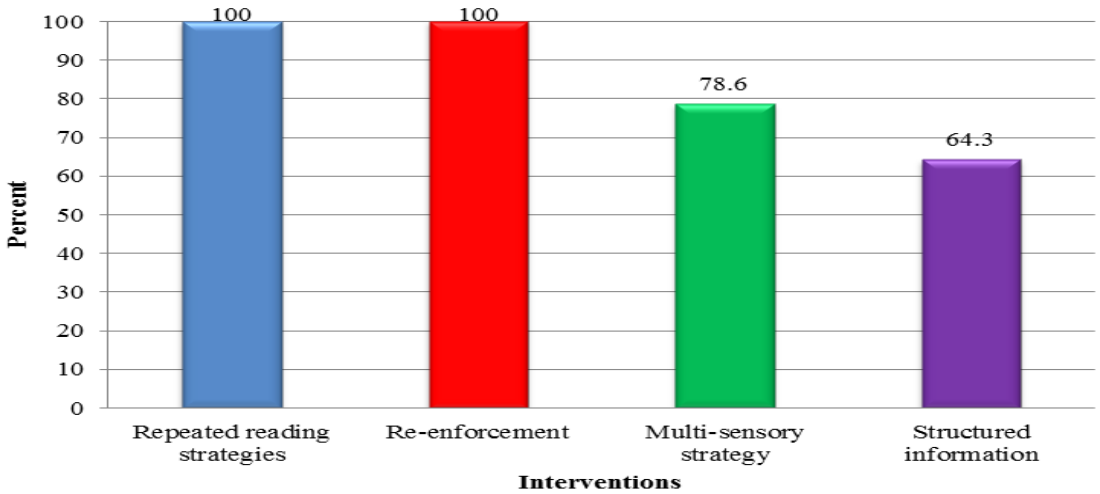

Figure-1. Comparing the efficiency and significance of intervention strategies on the reading ability of learners with dyslexia.

7. DISCUSSIONS

7.1. Multi-Sensory Teaching and the Reading Ability of Learners with Dyslexia

At the end of the intervention with multi-sensory teaching, we observed that descriptively, children could identify words that sounded alike in a passage and also tried to break down words into smaller syllabi; they could identify and use their preferred learning style; they could identify the letters of the alphabet, the sound system and

also distinguish between letters of the alphabet and between numbers; and they could classify figures and objects according to their shape while also demonstrating some skills in drawing. Statistically, findings showed that the use of multi-sensory teaching had significant effects on the development of reading skills for learners with dyslexia. From pre-test (20.2%) to post-test (57.9%), there was significant progression in reading fluency with an overall progression rate of 78.6% for the experimental group against 35.7% in the control group. In other words, learners who received intervention through multi-sensory teaching benefited greatly. Also, it revealed that this strategy could be used to improve on learners' reading ability. This is in line with Galt-Johnson and Price (2000) who argued that teachers need to include in each teaching presentation at least three basic learning modalities in other to facilitate learning for learners with reading difficulties. This is a means of slowly and thoroughly teaching with basic elements of sounds and letters and how to put these letters of the alphabet together. In relation to this, Birsh (2005) supported the fact that learners with dyslexia need to have lots of practice such as having their hands, eyes, ears, and voices working together for conscious organization and retention of the material learned. And Laird (1985) sensory stimulation theory opined that effective learning occurs when the senses are most stimulated.

On his part, Goldstein (2011) emphasises the benefits of multi- sensory n teaching in teaching and learning how to read and maintain that to aid memorization, the visual, auditory and motor skills of symbol blocks must be used simultaneously. Thus, when teachers use strategies that are inclusive of all learning styles, individual learners are able to learn through their strongest and most preferred modality. This is also supported by Joshi *et al.* (2002) who examined the effect of using multi-sensory teaching in teaching reading skills and found that using this approach was effective in improving the reading ability of learners with dyslexia. Like in the present study, Joshi *et al.* (2002) found that when multiple senses are engaged, more connections are made in the brain and learning has greater chances of "sticking".

7.2. Repeated Reading and the Reading Ability of Learners With Dyslexia

At the end of intervention with repeated reading, we observed that children could read printed words, read and turn pages and read again and again, demonstrated good mastery of information and read through presented text now with little or no error. Statistically, findings further showed that repeated reading improved upon the reading ability of learners with dyslexia. This implies that the improvement of the reading skills of learners with dyslexia could be linked to repeated reading. Between pre-test (4.1%) and post-test (18.5%), there was significant progression at the rate of 100% for experimental group and 35.7% for control group. Therefore, when using repeated reading as an intervention strategy, the learners in the experimental group developed skills which later improved on their reading efficiency. Repeatedly as the learners tried to read, they became used to the sounds and words; and improved in later reading experiences. Chomsky (1978) earlier maintained that the procedure of repeated reading increased the fluency of slow readers and instilled in them a heightened sense of confidence, motivation, and willingness to undertake reading exercises and attempt new materials independently. And Holmes *et al.* (2019) maintained that when learners correct their errors and engaged in repeated practices, they correctly read words that were once erred to strengthen their reading ability. Meanwhile Perfetti and Roth (1981) found that repetition or redundancy may lead to an increase in familiarity and corresponding decrease in the amount of information to be processed while reading.

The findings additionally revealed that in addition to repeated reading, verbal prompting is important to use with learners having reading problems. This is in conformity with Carnine *et al.* (2004) who maintained that verbal prompts can be used as a way of scaffolding. According to him, it provides assistance as skills are independently executed through repeated reading. Correspondingly, Vygotsky's social constructivist theory (Vygotsky, 1978)

maintained that when a learner encounters a word he or she does not know how to read, the teacher may verbally prompt the learner repeatedly to attempt reading the word again and again which helps them read correctly in later attempts. Finally, Skinner (1957) believed that verbal prompting does not only help learners attempt content that is unknown to them but also helps correct their mistakes.

7.3. Structuring Information and the Reading Ability of Learners with Dyslexia

After intervention with structuring information as a strategy, we observed that children could recognize, identify, sort, match, and pronounce sounds correctly, identify the letters of alphabet, sort them out, and read them correctly, pronounce sounds and make wordsout of them, blend phonemes and put them in order to enable them read written words and hence gain proper reading in reading comprehension, segment words into their phonemes, for example; gen/tle/man as in "gentleman", and marked improvement with respect to understanding suffixes and prefixes. Statistically therefore, findings showed that structuring information as a teaching strategy improved upon the reading ability of learners with dyslexia. This implies that the improvement of the reading skills of learners with dyslexia could be linked to the teacher's ability to structure and present information in some logical and meaningful way. Between pre-test (8.5%) and post-test (11.1%), there was significant progression at the rate of 64.3% for experimental group and 35.7% for control group. Therefore, when structuring information as a teaching strategy, the learners in the experimental group developed skills which later improved on their reading efficiency. The effect of structuring information as a strategy was therefore significantly perceptible in the study as it significantly improved upon the reading ability of learners with dyslexia.

This finding was related to Mayer (2001) who found that instruction that is supported by structuring of information is explicit, systematic and cumulative; and plays an important role in assisting learners who face difficulties in reading to succeed in order to acquire the skills for reading efficiency. In other words, in structuring information, there is a plan in which instructions are structured by breaking down the information from simple to complex for the gradual understanding of learners with reading difficulties. Such structuring also assists learners on the aspect of phones and phonemes necessary for gradual decoding of written material and hence the ability to learn and grasp those skills needed for reading efficiency. With the structured information approach, teachers may teach the spelling of "key" words, give grammatical tips and guidelines about sentence construction, further develop listening and remembering as well as models for all the things to look for when proof reading (Deno *et al.*, 1982).

7.4. Reinforcement and the Reading Ability of Learners with Dyslexia

On whether reinforcement practices could improve on the reading ability of learners with dyslexia, findings revealed significant increments from pre-test to post-test. At pre-test a score of 3.0% was recorded; and at post-test a score of 13.9% was achieved at a progression rate of 64.3% for experimental group. This showed that learners with reading difficulties need to be provided reinforcers in successive approximations to emitting correct responses. Doing so significantly improves on their reading abilities, improving the reading efficiency. This finding is supported by Carnine *et al.* (2004) who earlier agreed that providing reinforcers in successive approximations shape learners' reading behaviour towards making accurate responses. Reinforcement enables learners know the aspects of the task they are completing correctly. When they are motivated, they tend to work very hard in other to repeat the same behaviour.

In line with this argument, Reid and Green (2007) argued that learners' interest should be provoked for them to be able to remember and link their thoughts with previous knowledge. The findings are also similar to those of Sugai and Horner (2001) which also agreed with the fact that when learners with dyslexia develop a so-called

"learned helplessness," it becomes important to motivate them with reinforcers to make sure they experience achievement and success. This matches with Farrell (2006) who maintained that boosting learner's self-effort and confidence is a significant factor in determining their engagement with the teaching-learning process and its outcome. Massey (2008) also stressed the importance of learners' strengths to be recognized and employed in order to successfully facilitate the learning process to make knowledge known and more accessible to them. More so, it also builds up their self-esteem and nourishes their interest with motivation. In addition, the learner repeats the desired behaviour with positive reinforcement.

8. CONCLUSIONS

This study has found that early identification and intervention, through multi-sensory teaching, repeated reading, structuring information and reinforcement correspondingly lead to early development and improvement of reading skills among learners with reading difficulties. We also observed and concluded that early identification and intervention helped many children get back on track towards reading proficiency and eventually improved on their reading ability. According to Fuchs (2004) identifying reading problems at the early elementary primary school level allows for early detection and proper intervention. Meanwhile early intervention contributes in raising learner achievement and taking care of later reading and communication problems. Griffiths and Stuart (2013) found that early intervention and remediation can reduce the incidence of reading failure. Hence, intervention narrows the gap between the lowest achieving learners and their peers who score high in reading. With regards to intervention, findings in this study showed that repeated reading and reinforcement strategies topped in terms of progression rates with a score of 100%, followed by multi-sensory teaching (78.6%), then, though not really poor, the structured information strategy (64.3%). This implied that repeated reading, reinforcement, multi-sensory teaching and structured information, in that order, when used as intervention strategies, they could lead to improvements in the reading ability of learners with dyslexia.

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