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EFFECTIVENESS OF SUB-LEXICAL INSTRUCTION ON ENHANCING READING ABILITY AMONG LEARNERS WITH DYSLEXIA IN PRIMARY SCHOOLS

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Abstract

This study examined the effectiveness of the sub-lexical reinforcement technique in enhancing reading abilities among grade three learners with dyslexia in two public primary schools in Mpumalanga, South Africa. The Skinner's reinforcement theory was employed. A quasi-experimental design with one control group and one experimental group was used. A sample size of 43 learners was obtained in two selected schools using purposive sampling technique. 23 parents participated in the questionnaires while only 6 parents were interviewed in the qualitative survey. The tools used were the Bangor Dyslexia Test, pre- and post- tests, and a reading comprehension test. The results revealed that there is a statically significant difference between pre-test and post-test scores for experimental group, t (22) = -10.753; p <.001, suggesting that sub-lexical instruction is effective in enhancing reading abilities among the primary school learners with dyslexia. The study recommends that foundation phase teachers should begin teaching reading using grapheme-phoneme correspondence.

Keywords
Sub-Lexical Instruction, Reading Ability, Learners, Dyslexia, Primary Schools

1. Introduction

Dyslexia is defined as a specific learning disability that impact on reading and writing abilities (Shaw, *et al*., 2022). Comparatively, Elliot (2020) asserts that most researchers operating across all relevant disciplines have treated dyslexia as synonymous with the concept of reading disability, a term generally used to describe difficulty in word-level reading (decoding) difficulties. Similarly, Wu, *et al*., (2022) point out that dyslexia is a disorder characterized by an impaired ability to understand

written and printed words. People with dyslexia have trouble reading at a pace and without mistakes and may also have a hard time with reading comprehension, spelling and writing (Favaretto, *et al*., 2020). These challenges are, however, not a problem with intelligence. This means that a person might have dyslexia but still be intelligent in other subject areas and be successful in life. Dyslexia is a specific learning disability that is neurological in its origin, characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities, (International Dyslexia Association (I.D.A.) 2021). I.D.A (2017) further contends that dyslexia is a language-based learning disability. Snowling *et al.,* (2020) and I.D.A (2021) both agree that dyslexia is a difficulty in learning to decode (read aloud) and to spell. Dyslexia is a member of the family of learning disabilities; in fact, reading disability is by far the most common learning disability, affecting over 80% of those identified as learning disabled (Ooko & Aloka 2021). The primary symptoms of dyslexia are inaccurate or slow printed word recognition and poor spelling problems that, in turn, affect reading fluency, comprehension and written expression (Ooko & Aloka 2021). Moreover, Roitsch and Watson (2019) point out that dyslexia in grade three learners may be noted when a child has difficulty associating sounds with letters, reading difficulties, spelling difficulties, challenges with written expression and poor handwriting. On the contrary, Ooko and Aloka (2021) defined dyslexia as a complex neurological condition which is constitutional in origin and may affect oral language skills, motor function, organizational skills and numeracy. According to Ooko & Aloka (2021), dyslexia is an impairment that interferes with fluency and accuracy when a person is reading and spelling words. International Dyslexia Association (I.D.A. 2017) contends that dyslexia refers to a cluster of symptoms, which result in people having difficulties with specific language skills, particularly reading. British Dyslexia Association (2013) defines dyslexia as a specific learning difficulty that interferes with the development of the ability to read and (write). From the above definitions, the current study adopted the I.D.A. (2017) definition which states that dyslexia is neurological in its origin and that it is characterized by difficulties with accurate and/ or fluent word recognition and by poor spelling and decoding abilities. From existing literature in the South African context, very little attention has been given to the efficacy of the sub-lexical reinforcement interventions on learners with dyslexia. Only a few authors have touched on sub-lexic technique to help learners improve their reading ability. Dunlosky *et al*., (2013) have researched on lexical and sub-lexical effects on accuracy, reaction time and response duration and their results show that children are capable of reading aloud using lexical and sub-lexical coding processes in a transparent orthography. Burt & Hefferman (2018) researched on lexical and sub-lexical subtypes of individuals in terms of reading and spelling in adults. Moreover, Geertsema, *et al*., (2022) study in South Africa reported that most parents of children with dyslexia had good knowledge regarding dyslexia. Most parents with children with dyslexia had difficulty with the social

stigma surrounding the disorder. Furthermore, parents were aware of their role in their children with dyslexia education; however, a lack of resources was evident in South Africa leading to poor parental experiences. In another research in South Africa, Makgato, *et al*., (2022) indicated that the primary school teachers had a basic awareness and knowledge of dyslexia. Many of them were found to be using limited strategies in order to teach learners with dyslexia in their classrooms. Most recently, Altin *et al*., (2023) study in South Africa highlighted the uncertainties about the importance of addressing phonological awareness skills in treatment. Sub-lexic technique may be equated to synthetic phonics, a most widely used approach associated with teaching of reading in which phonemes (sounds) associated with particular graphemes (letters) are pronounced in isolation and blended together. Reading a word requires processing of visual, orthographic, phonological, and semantic information (Hasenacker & Schroeder 2022). Learners need to be taught how to read as young and as early as possible and not to wait until they have reading difficulties. Eslick, *et al*., 2020) stress that phonemic awareness skills should develop during grade R (age 6 years) and grade 1 (age 7 years). Therefore, sub-lexical technique may be referred to as phonological technique, or synthetic/ blended / inductive phonics, which is a method of teaching English reading which teaches letter sounds then builds up to blending these sounds together to achieve full pronunciation of whole words. An example would be to take a single syllable word like cat apart into three letters, pronounce a phoneme for each letter in turn: k/a/t and blend the phoneme together to form a word. The present study employed the sublexic reinforcement technique as an intervention to enhance reading abilities among grade three learners with dyslexia in the experimental school.

1.1 Theoretical Framework

This study was guided by the Skinner's Operant Conditioning Theory. The Operant conditioning theory was advanced by BF Skinner and the key element in it is reinforcement (Rafi, *et al*., 2020). Overskeid (2018) reiterates that reinforcer, then, is at the same time a behavior, and again something that cannot be said to exist outside of behavior. In the present study, grade three learners with dyslexia who were able to read a stipulated number of words, were allowed to choose any short- story books of their choice from the library and take them home to read for a week. Gentilin & Greer (2021) assert that children who read in their leisure time perform better on measures of reading achievement when controlling for cognitive abilities. When Skinner applied operant conditioning to school learning and discipline (Schunk 2012), the learners were required to make a response for every frame and receive immediate feedback. In this case, positive behaviour would reoccur since intermittent reinforcement is particularly effective. Reinforcement is responsible for response strengthening- increasing the rate of responding or making responses more likely to occur (Schunk 2012). Skinner believed that a desirable learning outcome is possible if we can change the learner's behaviour. On the bases of this argument, reinforcement can be positive or negative, but both types aim to strengthen behaviour. According to

Schunk (2012), positive reinforcement refers to the process of adding a pleasant stimulus to strengthen behaviour and increase the likelihood of it occurring again. Reinforcers are situationally specific because they apply to individuals at given times under given conditions (Skinner, 1957; Critchfield & Miller, 2017). Skinner (1953) further highlighted that stimuli or events that reinforce behaviour can, to some extent, be predicted. Positive reinforcement involves presenting a stimulus, or adding something to a situation, following a response, which increases the future likelihood of that response occurring in that situation. In order to apply Skinner's reinforcement theory in the classroom, the researcher created a system of positive incentives for individual, group and class behaviour as well as ensure that positive reinforcement is immediate so that it can be associated with positive behaviour.

2. Literature Review

Previous research exists on effectiveness of Sub-lexic Reinforcement Technique in varied contexts. In Australia, Wright, *et al*., (2011) concluded that the sub-lexical reinforcement technique can yield good results and substantial improvements in the teaching of reading among grade three learners with dyslexia. In Canada, Metsala and David (2017) found that a measure of learning for sub lexical automaticity predicted fluency outcome for each phase of the intervention, beyond that predicted by the first-time trial with sub lexical patterns and this suggests that learning through the intervention, rather than already established, pre-intervention individual differences in identifying sub lexical patterns, was important for gaining sub lexical automaticity. However, the reviewed studies above focused on learners with Asperger or Attention-Deficit Hyperactivity Disorder (ADHD), unlike the present study which focused on learners with dyslexia. In the United Kingdom, Bowers (2020) found out that there is widespread consensus in the research community that reading instruction in English should first focus on teaching letter to sound correspondence rather than adopt meaning-based reading approaches such as whole language instruction. In the Netherlands, Borleffs, *et al*., (2019) reported that assuming lexical and sub lexical processing routes for reading acquisition have been developed, describing types of reading difficulties depending on the component of the skill being most affected. Moreover, Borghesani, *et al*., (2020) study in USA reported that support a dual-route model for reading aloud mediated by the interplay between lexico semantic and sub-lexical/phonological neuro-cognitive systems. In another study by Odo (2021), in the Republic of Korea, reported a moderate and statistically significant mean effect size was identified for the effect of phonics instruction on word reading skills. In Africa, very few studies exist on the effectiveness of sub-lexical intervention among learners with disabilities. A quasi-experimental study by Amadi and Offorma (2019), in Nigeria concluded that synthetic phonics is a more effective mode of teaching beginning reading than analytic phonics. The above reviewed study used the quasi-experimental design and adopted the non-equivalent, non-randomized control group design while the present study used experimental and control group as well as use of the sub-lexical

instructional reinforcement technique. In Kenya, Ooko and Aloka (2021) reported a statistically significant difference between pre-test and post-test scores of experiment group implying that a significant effect was found in the use of behaviour modification strategies in improving learner English reading skills. While the reviewed study above used selected modification practices, the present study used sublexic reinforcement techniques, to enhance reading abilities among learners with dyslexia. In Zimbabwe, Gumede (2020) showed that the reading comprehension level of the cohort of grade 9 learners in government schools was below that expected for grade 4. In South Africa, National Reading Panel (NRP) (2000) report indicated that facts and findings provide converging evidence that explicit, systematic phonics instruction is a valuable and essential part of a successful reading program. On the bases of reviewed literature above, some reviewed studies have focused on learners with other disabilities and some from mainstream schools, but very scanty literature was obtained on learners with dyslexia. Thus, the present research filled in this research gap by focusing on learners with dyslexia.

2.1 The Present Study

This study examined the effectiveness of sub-lexical instruction on enhancing reading ability among learners with dyslexia in primary schools.

2.2 Research Hypothesis

The following null hypothesis was tested:

There is no significant effectiveness of sub-lexical instruction on enhancing reading ability among learners with dyslexia in primary schools.

3. Methods

3.1 Research Design

The study adopted the Quasi-experimental research design which include a wide range of nonrandomized or partially randomized pre-post intervention studies (Handley, *et al*., 2018). Iwahori, *et al*., (2022) suggests that quasi-experimental methods that involve the creation of a comparison group are most often used when it is not possible to randomise individuals or groups to intervention and control groups. De Vocht, *et al*., (2021) concurs that quasi-experimental research designs are less susceptible to bias than other observational study designs. In the current research, a quasi- experimental design with one control group and one experimental group was used. The quasi-experimental research design was chosen because it was difficult to conduct a randomised controlled trial (RCT) due to lack of consent from principals, both from the control and from the experimental school.

3.2 Research participants

In this study, the quantitative sample was 43 grade one learners from the two primary schools (23 learners with dyslexia in the intervention and 20 learners with dyslexia in the control group), one from Ximhungwe and another from Mkhuhlu Circuits. The learners were obtained using purposive sampling method. Purposive sampling is 'used to select respondents that are most likely to yield appropriate and useful information' and is a way of identifying and selecting cases that use limited research resources effectively (Campbell, *et al*., 2020). The sampling technique (purposive sampling) selected and employed by the researcher

in the present study was relevant for the study because it clearly situated both the quantitative and qualitative results in terms of trustworthiness for data collection and analysis.

3.3 Research Instruments

In the present study, pre-testing was administered using the Bangor Dyslexia Test (BDT) and a short reading comprehension test. First, internal validity was ascertained by presenting the research proposal and tools to academic staff and fellow students at the Wits School of Education. The feedback that was obtained during these presentation sessions was incorporated into the research tools, and this ensured that they were valid. On the other hand, Tabachnick & Fidell (2001) hold that Bartlett's Sphericity test statistic should be less than 0.05 for an adequate internal validity. From the table, Bartlett's test for Sphericity are all significant ($p<0.001$, $p=0.000$) and Kaiser-Meyer-Olkin indexes are all > 0.6 for all the subscales of the questionnaire. The Cronbach's alpha value of 0.833 was reported. The Cronbach's alpha for all the subscales reveal that the instruments had adequate reliability for the study. This is in line with the recommendation by Oso and Onen (2009) that a coefficient of at least 0.60 is of adequate reliability, implying that the instrument has acceptable inter-item consistency reliability standard.

3.4 Procedure

Ethical clearance was first obtained from University of the Witwatersrand Human Research Ethics Committee. Thereafter, permission to carry out the research was obtained from Mpumalanga Department of Education and the school principals. The BDT was administered to all grade three learners (275 learners) from both the control and the experimental schools. In addition, a total of 43 learners (23 learners for the intervention school and 20 learners for the control school) were randomly selected but taking into consideration how many wrong answers one got. In the end, the 43 learners were selected. The BDT had 19 items, and the rule was that a grade three learner who attained seven or more wrong answers was considered to be dyslexic, while a grade seven learner would be expected to attain not more than three wrong answers. After the pre-test, learners with dyslexia from the intervention school received intervention lessons on sub-lexic reinforcement techniques for one hour per day, five times a week for 6 months while those from the control school continued receiving their usual reading lessons without any intervention. Post-tests were administered to the learners with dyslexia both at the control and at the intervention school after 6 months.

3.5 Data Analysis

Quantitative data was analyzed using both descriptive and inferential statistics. Descriptive statistics was used to describe the views of the respondents on each sub-scale, while the inferential statistics aided to make inferences. Statistical tests, t-test analysis were used to investigate the differences between the variables, given gender and age. All tests of significance were computed at $\alpha = 0.05$. The Statistical Package for Social Sciences (SPSS) version 26.0 was used to analyze the data.

4. Results

The study sought to investigate the demographic characteristics of the learners and parents who took part in the study. The background information was considered necessary in determination of whether they were adequately representative in terms of their demographic characteristics to allow generalization of the results of the study. The demographic information of the considered included respondents' gender and age.

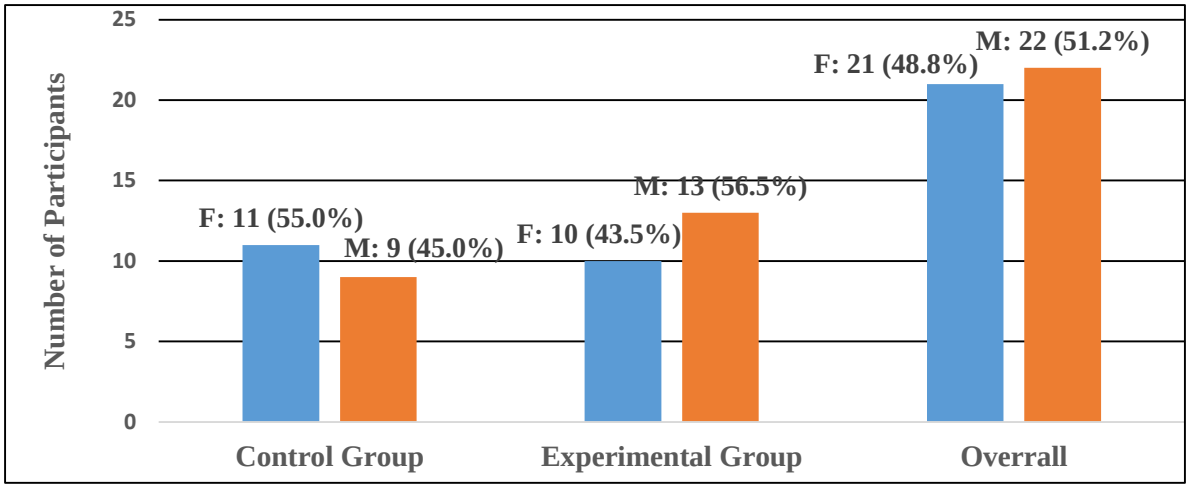

Figure 1: Gender distribution of the learner study participants (Source: Primary data (2022)

4.1 Gender of the Learners

The study sought to explore the gender of the learners, which was considered as the basic genetic differences among the learners. Information on gender was considered important to this research because it is anticipated that performances of the learners may vary given their gender. Figure 1 shows the summary of the gender distribution among the learners who took part in the research study because it is anticipated that performances of the learners may vary given their gender.The exploratory analysis of the background information of the learners who took part in the study indicates that in overall slightly a large number (51.2%) of the participants were males compared to females (48.8%), reflecting a slight disparity in gender among the learners who have dyslexia. Given that the sampling procedures employed (census) in this study gave equal opportunities for participation to both genders, it can be inferred that the dominant gender among grade three learners with dyslexia from the two primary schools is generally male. However, studies show that males are diagnosed with dyslexia more frequently than females, so the number of boys with dyslexia among primary school learners is higher than the number of girls. All the same, both genders were represented in the study implying that the results of this study could be generalized to a wider population because it captured both genders. This is because each gender can have a unique contribution to research that cannot be filled by the other sex in its entirety.

4.2 Effect of Sub-Lexical Instruction on Enhancing Reading Ability

$H_0$2: *Sub-Lexical instruction has no statistically significant effect on enhancing of reading ability among grade three learners.*

This study investigated the effectiveness of sub-lexical reinforcement techniques on reading abilities among grade three dyslexic learners. The null hypothesis being tested was *"Sub-lexical instruction has no significant effect on enhancing of reading ability among grade three learners".* The hypothesis was tested using experimental data, where two groups of dyslexic learners were considered, intervention and control group. Group-1, the intervention group, were given treatment by training them on reading skills using sub-lexical reinforcement technique. Contrariwise, Group-2, the control group were only taught reading through the normal traditional technique. A pre-test reading assessment test was administered to both the intervention and control groups. After the pre-test, learners from the experimental group were given sub-lexical reinforcement, while those from the control group continued receiving their usual reading lessons without any intervention. Once the intervention period expired, a post-test was administered to both the groups of learners. Independent and paired sample t-tests were used to establish the difference in reading ability between the two groups of the learners with dyslexia. The learners' reading skills were measured using two sub-scales: reading test and comprehension test. Table 1 shows the groups and descriptive statistics of their performance in reading and comprehension tests.

Table 1: Descriptive statistics of the scores of the two groups –sub-lexical techniques

Type of Test	**Group**		**N**	**Mean**	**Std. Deviation**	**Std. Error**
Reading Test	Pretest scores	Group 1	23	0.82	1.46	0.305
		Group 2	20	2.05	2.72	0.609
		Total	43	1.44	2.21	0.336
	Post-test scores	Group 1	23	19.78	10.38	2.164
		Group 2	20	3.15	3.95	0.883
		Total	43	12.05	11.57	1.764
Comprehension Test	Pretest scores	Group 1	23	0.96	0.29	0.060
		Group 2	20	0.50	1.12	0.250
		Total	43	0.88	1.16	0.177
	Post-test scores	Group 1	23	3.52	1.75	0.366
		Group 2	20	0.90	1.00	0.224
		Total	43	2.11	2.09	0.319

Source: English Language Reading Test Scores (2022)

Table 1 displays the descriptive statistics of pre-test and post-test scores in reading and comprehension tests which were obtained before and after sub-lexical techniques. It is evident that post-test scores from group 1 in both reading and comprehension tests were higher. For instance, the average score recorded for the post-test reading by Group-1 learners was 19.78 (*SD*=10.38) and post-test mean score of Group-1 learners in comprehension test was 3.52 (*SD*=1.75). Conversely, the least score recorded were from pretest reading (Mean=0.82; SD=1.46) for Group-1 learners and comprehension (Mean=0.50; SD=1.12) test results for Group-2 learners. Also notable, all the learners generally performed poorly in comprehension than in reading, while pre-test scores were all lower than post-test scores in all the two aspects of reading skills. The learners with dyslexia who were given sub-lexical treatment exhibited comparatively higher abilities in all aspects of reading skills than their counterparts who did not receive the same treatment. However, to investigate whether there is any statistically significant difference in reading abilities between those were given sub-lexical training and those who only received the traditional teaching, four different pairs were compared using t-tests and findings were shown in Table 2:

Table 2: Pairwise comparison of pre-test and post-test scores for control and intervention (sub-lexical treatment) groups in reading test

Pair	Groups	Mean	Mean Difference	Std. Error Difference	T	df	Sig.
Pair 1	Group-1 pretest - Group-2 pretest	1.04 2.30	-1.256	.844	-1.487	41	.145
Pair 2	Group-1 pretest - Group-1 post-test	1.69 23.30	-21.610	2.009	-10.753	22	.000**
Pair 3	Group-2 pretest - Group-2 post-test	2.95 3.65	-.700	.696	-1.005	19	.327
Pair 4	Group-1 post-test – Group -2 post-test	38.47 3.40	35.08	5.00	7.011	41	0.000**

*significant @ 5% level ** significant @ 1% level

From Table 2, the results of an independent t-test analysis reveal that there was no statistically significant difference in pretests scores between the control and experimental group reading skills [t (41) = -1.487; p =.145] as indicated in Pair 1 results. This finding suggests that the two groups did not have remarkable differences in scores before the intervention hence signifying that the randomization process was effective. This ratifies that the experimental noise and confounding variables were excluded, suggestive of adequate internal validity of the data. To investigate whether there was statistical difference between pretest scores and posttest scores for the learners who were treated on sub-lexical technique, a paired sample t-test was used as shown in pair 2.

The results revealed that there is a statically significant difference between pre-test and post-test scores for experimental group, t (22) = -10.753; p <.001, suggesting that sub-lexical instruction is effective in enhancing reading abilities among the primary school learners with dyslexia. Further, an investigation was done to find out whether the existing difference in reading abilities was exclusively due to use of sub-lexical instruction technique or effect of any other intervening variable which was not included in the study. A paired sample t-test on pair 3 (Control Group Pretest - Group-2 and Control Group Post-test -Group 2) indicate that there was no statistically significant difference, t (19) = -1.005, p =.327 (ns). This shows that there is no difference between pre-test scores and post-test scores in reading skills among the learners who did not receive any treatment. Additionally, investigation to establish whether the significant difference found between the pretest and posttest scores for the experimental group was solely attributed to the treatment factor or other factors was conducted. This was done by conducting a test on pair 4 that checked whether there was any significant difference between posttest scores of the experimental and control group learners. The result shows that there was a statically significant difference between experimental group post-test (Group-1) and control group post-test (Group-2), t (*41*) = 7.011, p <.001. The mean scores in posttest exams for the intervention group (n=23; *Mean*=38.47; *SD*=21.18) was significantly higher than the mean score in posttest for the control group (n=20, *Mean*=3.40; *SD*=7.65). This rise in mean score omits the influence of pre-test procedure on the score, therefore it was concluded that the statistical significant difference in reading skills between the learners with dyslexia who were taken through sub-lexic training technique and those who received the traditional training was largely attributed to treatment effect, which means that sub-lexical teaching strategy has a significant effect on enhancement of primary school grade three learners with dyslexia reading ability.

4.2 Hypothesis Testing- Effect of Sub-lexic Instruction on Enhancing Reading Ability

The null hypothesis of the study was, *"Sub-lexic instruction has no significant effect on enhancing of reading ability among grade three learners*". The results of the paired sample t-test established that there was a statically significant difference [t (22) = -10.753; p <.001] in learners reading ability before intervention and after intervention. On the other hand, the study established that there was no statistically significant difference in leaners reading ability scores between pretest scores and post score for the control group, t (19) = -1.005; p =.327. In addition, since the study had shown that randomization process was effective during sampling of the experiment and control groups, it was evident that reading ability among the dyslexic learners was enhanced by sub-lexical intervention. Hence, the null hypothesis was rejected, and it was concluded that sub-lexical instruction is effective in enhancing reading abilities among the primary school learners with dyslexia.

5. Discussion

The study findings revealed that many learners with dyslexia who had been put on sub-lexical intervention for two terms generally had strong idea of sound-spelling relationships and that they developed a strong awareness of the differences between graphemes and phonemes. This finding is consistent with previous studies of Wright, *et al*., (2011); Metsala and David, (2017); Smith, (2016); which all reported that learners with either Aspergers, Attention Deficit Hyper Disorder (ADHD) or dyslexia can be taught using phonological skills including phoneme segmentation fluency, letter-naming fluency and letter-sound fluency and improve. The finding also agrees with more recent literature by Canizo, *et al*., (2018); Paris, (2019); Bowers, (2020); Odo, (2021); Larsen, *et al*., (2020) which all reported that reading instruction in English should first focus on teaching letter (grapheme) to sound (phoneme) correspondence instead of meaning-based reading approaches like whole language instruction. The implication of this finding is that teachers should begin teaching reading using phonemic awareness skills. The results revealed that most of the Grade three learners with dyslexia developed word recognition as a result of exposure to the sub-lexic technique intervention in the experimental school. This finding agrees with prior research by Borleffs (2019) which reported that assuming lexical and sub-lexical processing routes for reading acquisition have been developed, describing types of reading difficulties depending on the component of the skill being most affected. Moreover, Skubic, *et al*., (2021) reported that there was a statistically significant difference in phonological awareness between the experimental and control groups in favour of the experimental group. This finding is also consistent with Wahyuni, *et al*., (2016); Izadpanah & Rezaei (2022); Niolaki, *et al*., (2022) who reported that students showed much eagerness in following the programme, that they were keen to participate more in classroom activities and that academic enthusiasm depends on the effort put by both the teachers and learners under investigation. These findings support the Information Processing Theory's (Howard 2015) claim that visual imagery is easier to recall than abstractions. These findings are in line with Boyes, *et al*., (2017) which revealed that almost all parents indicated that the program helped with learning how to assist their child 's reading and spelling, that they would use the resources provided, and would likely attend a future workshop. The findings are also consistent with Gumede (2020) which showed that the reading comprehension level of private school learners was better than that of the government learners. The results also revealed that repeated reading as a form of sub-lexical reinforcement techniques is effective in enhancing reading abilities among learners with dyslexia. These findings are consistent with old and current research that discuss the effectiveness of phonological decoding skills and increased competence to read complex sentences on enhancing reading abilities (National Reading Panel (NRP), (2000); Wright *et al*, (2011); Amadi & Offoma, (2019); Smith, (2016); Metsala & David, (2017), Gellert & Elbro (2017); Baron, *et al*., (2018); Canizo, *et al*., (2018); Borleffs, *et al*.,

(2019); Paris, (2019); Bowers, (2020); Borghesani, *et al*., (2020); Glazzard & Stones, (2020); Larsen, *et al*, (2020); Sun & Xie, (2021); Pallathadka, (2022); Monster, *et al*., (2022); Niolaki, *et al*., (2022); Viersen, *et al*., (2022). The research findings support Skinner's (1953) reinforcement theory, which argues that repeated learning of phonological skills and the subsequent motivation and reinforcement go a long way in enhancing reading abilities among learners with dyslexia. This implies that teachers should take phonological awareness seriously since it is critical for learning to read any alphabetic writing system.

6. Conclusion & Recommendations

The study concludes that many learners with dyslexia who had been put on sub-lexical intervention for 2 school terms generally had strong idea of sound-spelling relationships and that they developed a strong awareness of the differences between graphemes and phonemes. The study also concludes that after the intervention, the learners improved in reading and developed interest with schoolwork. The study concludes that the learners with dyslexia were able to make meaning from text and to map sound onto spellings after intervention and that most of the Grade three learners with dyslexia who participated in the intervention developed increased enthusiasm in their work at school. The study concludes that learners who participated in the intervention had increased development of their attentive skills. The study concludes that learners in the intervention school benefitted from the picture-sound and the picture-word method, and this made them to improve in spelling and dictation. The study also concludes that several learners who participated in the intervention programme improved, not only in English, but also in other subjects like XiTsonga and Mathematics. The study also concludes that learners' reading improved due to the knowledge of phonemes they acquired during intervention because they could now read three-letter words and that their competence increased to read complex sentences. The findings of this study are significant to foundation phase teachers, learners with dyslexia and Department of Education. The study recommends that foundation phase teachers should begin teaching reading using grapheme-phoneme correspondence. Furthermore, learners must, from an early age, acquire reading proficiency, be taught phonemic awareness, understand the alphabetic principle, possess strong vocabulary, syntax, and grammatical skills, and relate reading to their own experiences in order to ensure sufficient levels of fluency, automaticity and understanding. Further still, phonological skills have been found to be strongly related to early reading and writing development.

7. Limitations of the study

In any study of this nature, it is inevitable to encounter limitations. Below, follows a discussion of the limitation experienced during the data collection of this study. One of the limitations was language barrier since effective communication was limited. The parent participants who took part in interviews as well as those who responded to questionnaires, could not also communicate using English used by the researcher. To curb this

limitation, the researcher resorted to using the local language, XiTsonga since she at least was able to use it for communication purposes.

References

Altin, A., Geertsema, S., Mia le R., & Graham, M. (2023). South African professionals, and developmental dyslexia: Knowledge, needs and perspectives. *South African Journal of Childhood Education, 13*(1), 1-10.

Alvarez-Canizo, M., Suarez-Coalla, P., & Fernando, C. (2018). The role of sub-lexical variables in reading fluency development among Spanish children. *Journal of Child Language, 45*(4), 858-877. https://doi.org/10.1017/S03050000917000514

Amadi, E.A., & Offorma, G. (2019). Effects of two phonics instructional modes on English as second language learners' achievement in reading. *ResearchGate.* https://doi.org/10.22158/selt. v7n2p236

Borghesani, V., Hinkley, L.B.N., Ranasinghe, K.G., Thompson, M.M.C., Shwe, W., Miziuri, D., Lauricella, M., Europa, E., Honma, S., Miller, Z., Miller, B., Vossel, K., Henry, M., Houde, J.F., Gorno-Tempini, M.L., & Nagarajan, S. S. (2020). Taking the sub-lexical route: Brain dynamics of reading in the semantic variant of primary progressive Aphasia. *Brain, 143* (8), 2545-2560. https://doi.org/10.1093/ brain/awaa212.

Borleffs, E., Maassen, B.A.M., Lyytinen, H., & Zwarts, F. (2019). Cracking the code. The impact of orthographic transparency and morphological-syllabic complexity on reading and developmental dyslexia. *Frontiers in Psychology*, *9* Article 2534. https://doi.org/10.3389/fpsyg.2018.02534

Bowers, J.S. (2020). Reconsidering the evidence that systematic phonics is more effective than alternative methods of reading instruction. *Educational Psychology Review, 32,* 681-705.

Boyes, M.E., Leitao, S., Claessen, M., Dzidic, P., Boyle, G., Perry, A., & Nayton, M. (2017). Improving phonological awareness in parents of children at risk of literacy difficulties: A preliminary evaluation of the boost program. *Educational Psychology 2,* 1-10. https:// doi.org/10.3389/feduc.2017.00047

British Dyslexia Association (BDA) (2013). *About Dyslexia.* https://www.bdadyslexia.org.uk/dyslexia/about-dyslexia/what-is-dyslexia

Burt, J.S., & Heffernan, M.E. (2018). Reading and spelling in adults: Are there lexical and sub-lexical sub-types? May 2012. *Journal of Research in Reading*, *35*(2), 183-203. https://doi.org/10.1111/j.1467-9817.2010.01455.x

Campbell, S., Greenwood, M., Prior, S. Shearer, T., Walker, K., Young, S., Bywaters, D. & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*,

25(*8*), 652-661. https://doi.org/10.1177/1744987120927206.

Critchfield, T. S., & Miller, J. R. (2017). Are theories of reinforcement necessary? [Editorial]. *The Behavior Analyst*, *40*, 11–16. https://doi.org/10.1007/s40614-017-0113-x

De Vocht, F. Katikireddi, S.V., McQuire, C., Tilling, K., Hickman, M. & Craig, P. (2021). Conceptualizing natural and quasi-experiments in public health. *Bristol Medical Centre Medical Research Methodology, 21* (1), 32-40. https://doi.org/10.1186/s12874-021-01224-x

Dunlosky, J., Rawson, K.A., Marsh, E.J., Nathan, M., & Willingham, D.T. (2013). Improving students' learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4-58. https://doi.org/10.1177/152900612453266

Eslick, C.J., le Roux, M., Geertsema, S., & Pottas, L. (2020). Phonological awareness and speech perception: Skills of Grade 1 English second language learners. *Reading and Writing, 11*(1), 1-10. http://dx.doi.org/10.4102/ rw.v.11i1.263

Elliot, J.G. (2020). It's time to be scientific about dyslexia. *Reading Research Quarterly, 55*, (S1), S61-S75. https://doi.org/10.1002/rrq.333

Favaretto, M., De Clercq, E., Scneble, C.O., & Elger, B.S. (2020). What is the definition of Big Data? Researchers' understanding of the phenomenon of the decade. *PLoS ONE, 15* (2), e0228987. *https://doi.org/10.1371/journal.pone.0228987*

Geertsema, S., le Roux, M., van Niekerk, C., Dyer, L., Booyse, M., Bothma, M., & Nel, T. (2022). Developmental dyslexia in selected South African schools: Parent perspectives on management. *South African Journal of Childhood Education, 12*(1), 1-11. http://dx.dox.doi.org/10.4102/sajce.v12i1.1136

Gellert, A.S., & Elbro, C. (2017). Try a little bit of teaching: A dynamic assessment of word decoding as a kindergarten predictor of word reading difficulties at the end of grade 1. *Scientific Studies of Reading. 21*(4), 277-299,https://doi.org/10.1080/10888438.2017.1287187

Gentilin, L.M., & Greer, R.D. (2021). The effect of the establishment of conditioned reinforcement for reading content on second graders' reading achievement. *Behavior Analysis in Practice, 14*(1), 141-160. https://doi.org/10.1007/s40617-020-00511-1

Glazzard, J., & Stones, S. (2020). A rigorous approach to the teaching of reading? Systematic synthetic phonics in initial teacher education. *Frontiers in Education, 5*.https://doi.org/10.3389/feduc.2020.587155 ISSN2504-284X

Gumede, T., & Boakye, N., A., Y. (2020). Investigating the reading comprehension of Grade 9 (Form 2) learners at Bulawayo Central District high schools in Zimbabwe. *Per Linguam: A Journal of Language Learning, 36* (1), 71-89. DOI: https://doi.org/10.5785/36-1-938

Handley, M.A., Lyles, C.R., McCulloch, C., & Cattamanchi, A. (2018). Selecting and Improving Quasi-Experimental Designs in Effectiveness and Implementation Research. *Annual Review of Public Health 39* (1), 5-25. https://doi.org/101146/annurev-publhealth-040617-014128

Hasenacker, J., & Schroeder, S. (2022). Specific predictors of length and frequency effects in German beginning readers: testing component processes of sub-lexical and lexical reading in the Dual -Route C (DRC). *Read and Writing, 35*(2), 1627-1650. https://doi.org/10.1007/s11145-021-1025/-5

International Dyslexia Association (IDA 2017). Dyslexia in the classroom: What every teacher needs to know. *DITC Handbook*. Pdf https://dyslexia.org> DIT.

International Dyslexia Association (IDA) (2021). *Dyslexia Basics 6-6-17*. https://dyslexiaida.org>dyslexia-basics

Iwahori, M., Oshiyama, C., & Matsuzaki, H. (2022). A quasi-experimental controlled study of a school-based mental health programme to improve the self- esteem of primary school children. *Humanities and Social Sciences Communications, 9,* 148-157. https://doi.org/10.1057/s41599-022-01156-x

Izadpanah, S., & Rezaei, Y.M. (2022). Causal explanation of academic enthusiasm based on the interaction of teachers and English Language Learners: Self-regulation, academic hope, and academic engagement among English language learners. *Frontier Psychology, 12.* https: //doi.org/10.3389/fpsyg.2022.

Larsen, L., Schauber, S.K., Kohnen, S. Nickels, L., & McAuthur, G. (2020). Children's knowledge of single- and multi-letter grapheme -phoneme correspondences: an exploratory study. *Early Childhood Research Quarterly, 51,* 379-391.https://doi.org/10.1016/j.ecresq.2019.12.001

Makgato, M.M, Leseyane-Kgari, M., Cekiso, M., Mandende, I.P., & Masha, R. (2022). "Evaluating the awareness and knowledge of dyslexia among primary school teachers in Tshwane District, South Africa." *African Journal of Disability, 11,* 807-814. https://doi.org/10.4102/ajod.v11i0.807

Metsala, J.L., David, M.D., & Brown, S. (2017). An examination of reading skills and reading outcomes for youth involved in a crime prevention program. *Reading and Writing Quarterly, Overcoming Learning Difficulties, 33*(1), 1-14. https://doi.org/10.1080/10573569.2016.1268081

Monster, I., Tellings, A., Burk, W.J., Keuning, J. Segers, E., & Verhoeven, L. (2022). Word properties predicting children's word recognition. *Scientific Studies of Reading, 26*(5), 373-389. https://doi.org/10.10888438.2021.2020795

National Reading Panel (2000). Report of the National Reading Panel-Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. *Eunice Kennedy Shriver National Institute of Child Health and Human Development*. https://www.nichd.nih.gov/publications/pubs/nrp/smallbook

Niolaki, G.Z., Vousden, J., Terzopoulos, A.R., Taylor, L.M. Sephton, S. & Masterson, J. (2020). Predictors of single word spelling in English speaking children: a cross sectional study. *Journal of Research in Reading, 43* (4), 577-596. https://doi.org/10.1111/1467-9817,12330

Odo, D.M. (2021). A meta-analysis of the effect of phonological awareness and / or phonics instruction on word and pseudo word reading of English as an L2. *Sage Open, 11* (4), 1-10. https://doi.org/10.1177/215824402110591 68

Ooko, P.A., & Aloka, P. J.O. (2021). Using selected behaviour modification practices to enhance reinforcement of reading abilities among dyslexic learners in Kenya. *African Journal of Disability* (Online), *10, 1*-10. https://dx.doi.org/10.4102/ajod.v10i0.707

Oso, W. Y., & Onen, D. (2009). A general guide to writing research proposal and report: A Handbook for beginning researchers. Jomo Kenyatta Foundation.

Overskeid, G. (2018). *Do we need the environment to explain operant behavior? Frontiers in Psychology*, 20 March 2018. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2018.00373/full

Pallathadka, H., Xie, S., Alikulov, S., Al-Gubhanchi, H.S., Alshahrani, S., Yunting, Z., & Behbahani, H.K. (2022). Word recognition and fluency activities' effects on reading comprehension: An Iranian EFL learners' experience. *Hindawi Education Research International 2022* (2), 1-10. https://doi.org/10.1155/2022/4870251

Rafi, A., Ansar, A., & Sami, M.A. (2020). The implication of positive reinforcement strategy in dealing with disruptive behavior in the classroom: A scoping review. *Journal of Rawalpindi Medical College 24* (2), 173-179. https://doi.org/10.37939/jrmc. v24i2.1190

Roitsch, J., & Watson, S. (2019). An overview of dyslexia: Definition, characteristics, assessment, identification, and intervention. *Science Journal of Education, 7*(4), 81-86 https://doi.org/10.11648/j.sjedu.20190704. 11

Schunk, D. (2012). *Learning Theories: An Educational Perspective (6th Ed.).* Boston,MA: Pearson Education, Inc/Allyn & Bacon.

Shaw, S.C.K., Hennessy, L.R. & Anderson, J.L. (2022). The learning experiences of dyslexic medical students during the COVID-19 pandemic: A phenomenological study. *Advances in Health Sciences Education, Theory Practice, 27*(1), 107-124. https://doi.org/10.1007/s10459-021-10074-7

Skinner, B.F. (1953). *Science and human behavior*. Macmillan.

Skinner, B.F. (1957). *Verbal behavior.* Appleton-Century-Crofts. https://doi.org/10.10.37/11256-000

Snowling, M. J., Hulme, C., & Nation, K. (2020). Defining and understanding dyslexia: past, present and future. *Oxford Review of Education, 46*(4), 501–513. https://doi.org/10.1080/03054985.2020.1765756

Sun, G., & Xie, W. (2021). Phonics approach in english teaching in China from 2011 to 2020 *Atlantis Press SARL*. Conference: 1st International Conference on Education: Current Issues and Digital Technologies (ICECIDT 2021). DOI:10.2991/asserhr.k.210527.082

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* 4th edition, Allyn and Bacon, Boston.

Van Viersen, S., Protopapas, A., & de Jong, P.F. (2022). Word and text-level processes contributing to fluent reading of word lists and sentences. *Frontiers in Psychology, 2022.* https://doi.org10.3389/fpsyg 2021 789313

Wahyuni, N.T., Fauziati, E., & Hikmah, M. (2016). The effectiveness of using phonics instruction and storybooks in English reading classes to improve student participation. *Jurnal Penelitian Humaniora, 17* (*1*), 1-10. https://doi.org/10.23917/humaniora.v17i1.2351

Wright, C., Colon, E., Wright, M., & Dyck, M. (2011). Sub-lexical reading intervention in a student with dyslexia and Asperger's disorder. *Australian Journal of Educational and Developmental Psychology, 11*, 11-26.

Wu, Y., Cheng, Y., Yang, X., Yu, W., & Wan, Y. (2022). Dyslexia: A bibliometric and visualization analysis. *Frontiers in Public Health, 23.* https://doi.org/10.3389/fpubh.2022.915053