

Effect of A Reading Intervention on Reading Ability Among Children with Specific Reading Disorder

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Abstract

The present study examined the effect of a reading intervention on the reading ability of children with specific reading disorders. Ten participants between 7 to 10 years of age who met ICD-10 criteria for specific reading disorder were randomly assigned to an experimental group, or a control group. Intelligence screening was done using the Colored Progressive Matrices. Pre-test and post-test assessment was conducted using the NIMHANS Index for SLD. The intervention group received an 8–9-week reading intervention, 30 minutes per day, on every alternative day of the week. The control group received no intervention. Participants who had received the intervention showed more improvement in reading than controls, and these gains were maintained in a follow up assessment. The majority of the participants in the experimental group performed at their expected grade level on the reading test of NIMHANS SLD post-intervention.

Keywords: reading intervention, specific reading disorder, reading ability, individualized intervention

1. Introduction

Reading is a set of cognitive processes that includes the association of discrete and reticulated skills (Curtis, 1980). Several studies have linked phonological processing with reading development (Hakvoort et al., 2016) as a predictor of dyslexia (Peters et al., 2020), reading awareness (Melby-Lervåg et al., 2012), and its effect on untimed word reading (Wise et al., 2000). Therefore, the present study involves a reading intervention that is based on a phonological processing model.

Various cognitive processes are involved in reading and phonological processing, like decoding (Shaywitz & Shaywitz, 2005; Ramus, 2003; Dodd & Gillon, 2001), auditory processing (Snowling et al., 2018), central auditory and visual processing (Lipowska et al., 2019), working memory and processing speed (Darcy et al., 2015), inhibition control (Darcy et al., 2016), segmental and suprasegmental phoneme processing (Männel et al., 2016), and retention and reading fluency (Mukerjee, 2020). Evidence from neuroimaging studies has highlighted differential processing of the cerebellum during phonological tasks (Feng et al., 2016), a functional network linked to phonological skills (Yu et al., 2018), and poor connection of the left putamen to the rest of the brain during phonological processing tasks (Wang et al., 2018).

Early intervention is important because individuals with childhood reading disorders continue to exhibit reading difficulties into adulthood without intervention. Early phonological skills predict conventional literacy skills (Lonigan et. al., 2008), like early reading and arithmetic (Amland et. al., 2021), and play a role in predicting dyslexia (Lohvansuu et. al., 2021). Many studies have emphasized the importance of early phonological intervention, especially for children who are at risk. (Drigas et. al., 2017; Lovett et. al., 2017; Dorofeeva et. al., 2020).

Researchers have proposed several kinds of phonological processing-based reading interventions for dyslexia and other learning disabilities (Shahzadi Malhotra et al., 2010; Tilanus et. al., 2016; Layes et. al., 2019). Baker and colleagues (2018) identified 72 components of phonological interventions, and identified strategies that integrate audiovisual elements in the intervention, e.g., video game training (Sandro & Sara, 2019) and computer-assisted cognitive re-training (Bansal & Singh, 2021). Training in a native language can improve English reading outcomes and mitigate the negative effects of inadequate English proficiency (Gonzales & Hughes, 2018).

Phonological training benefits typically developing children as well as those who are at risk, from a low SES background, or already having learning disability, and various age groups (Ehri et al., 2001). Sadasivan (2009) found that phonological awareness training improved reading accuracy but not comprehension. Pape-Neumann and colleagues (2015) found that phonology-based reading influences decoding but not reading comprehension. Silva & Capellini (2015) found that phonological intervention improved phonological awareness and reading and writing skills among children at risk of developmental dyslexia.

Effective implementation of interventions depends not only on the content but also on the administrator. Researchers identified several studies in this area, including those involving teaching assistants (Ryder et al., 2007), paraeducators (Vadasy & Sanders, 2010), specially trained interveners (Centre et al., 1995), regular classroom teachers (Elbaum et al., 2000), student peers (Fuchs & Fuchs, 2005), or computers (Cheung & Slavin, 2012). Researcher-administered interventions tend to result in larger effect sizes, while computer-led interventions lead to smaller effects, as well established in earlier reviews (Cheung & Slavin, 2012; Dignath et al., 2001; Ehri et al., 2001).

In light of the widely researched links between phonological processing and reading and the efficacy of phonological processing interventions for children with reading disorders, the present study demonstrates the effects of an individualized reading intervention on reading ability among children with specific reading disorders (SRD).

Method

Sample

Ten participants between 7 and 10 years of age with average intelligence, meeting the criteria for Specific Reading Disorder as per ICD 10, and studying in an English medium school for at least the past 2–3 years were selected from clinical and school settings. Children with comorbid psychiatric and neurological conditions, and children with prior remedial training were excluded. We administered a sociodemographic

and clinical datasheet and CPM for background information and intelligence screening. Consent from parents and assent from children were obtained.

Instruments

1. CPM for intelligence screening:

CPM is a culture fair test developed by Court and Raven (1983). The test measures intelligence and general cognitive ability, encompassing analysis-synthesis, visual reasoning, visuo-spatial judgement, and problem solving. The child version of the test, known as coloured progressive matrices (CPM), has three sets of 12 items of progressively increasing order of difficulty in each set. This test will be used to screen participant's intelligence.

2. NIMHANS Index for Learning Disability:

NIMHANS SLD, developed by Kapur, John, Rozario, and Oommen (1991), consists of tasks related to reading, writing, spelling, and arithmetic. It consists of two levels: Level I (5–7 years) and Level II (8–10 years). Considering the participants' age, Level II was administered. It includes domains like attention, language (reading, writing, and comprehension), spelling, perceptual motor abilities, memory, and arithmetic. If the child's performance on any domain is two grades (or more) below the expected grade level, a learning disability is diagnosed. The test has adequate reliability ($r = 0.53$) and criterion validity of 0.75 for teachers' assessments and 0.61 for clinicians' assessments.

Procedure

Five participants were assigned to the experimental and control groups, respectively. The experimental group had 4 boys and 1 girl, and the control group had 3 boys and 2 girls. The experimental group received a reading intervention for 8–9 weeks, with a 30-minute session per day on alternate days of the week. The intervention was individualized as per the pace of development of each participant. We did not provide any intervention to the control group. Pre-test and post-test assessments were conducted using the NIMHANS SLD Index. The experimental group was also assessed in a 4-week follow-up. The setting was a hospital or clinic. The session was done on a one-on-one basis.

The reading intervention was based on a phonological processing model. The intervention activities were selected and modified from the manual 'The Gillon Phonological Awareness Training Programme for Children at Risk for Reading Disorder' (2008) and tasks developed by Dr. Akila Sadasivan in 2009 for her doctoral thesis, which were based on Professor Gail Gillon's model. The intervention consisted of activities in domains like phoneme identification, isolation, rhyming, segmentation, substitution, deletion, blending, phoneme manipulation, and tracking sound changes in words. The intervention activities were designed to help the children identify the link between speech and print and the decoding and encoding of non-words.

Results

Figure 1: Pre-test, post-test, and follow-up scores of the experimental groups and pre-test and post-test scores of the control group on the reading domain of the NIMHANS Index for SLD

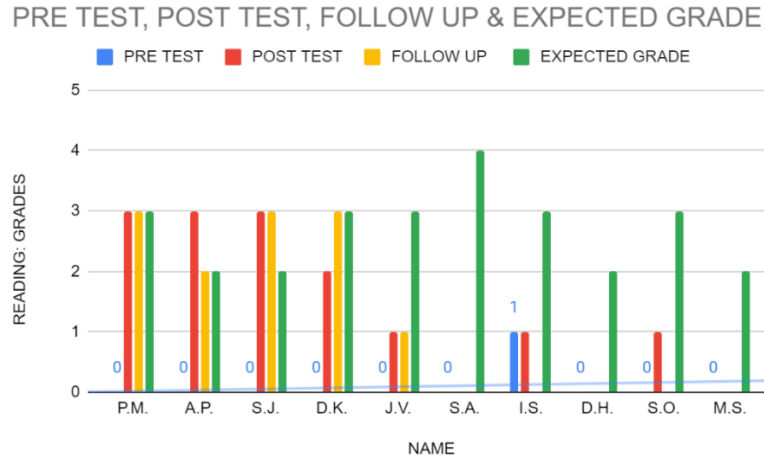


Figure 1 shows that all participants in the experimental group were performing below the expected grade level before the intervention; their performance was below the grade I level. Post-intervention, all of them showed improvement in their performance. 3 out of 5 students started performing at the expected grade level, and out of them, two students, SJ and AP, even performed above the expected grade level. These gains were maintained in the four-week follow-up by all participants. In the control group, all participants were performing below the expected grade level in the pre-test assessment. In the post-test, 4 out of 5 participants showed no change in their score. In the post-test assessment, the participants in the control group were performing at the expected grade level.

Table No. 1: Pre-test and post-test scores of the experimental group on the Reading and Spelling domains of the NIMHANS Index for SLD.

Participant name	PM	AP	SJ	DK	JV
Domain	Reading				
Expected grade level	Grade 3	Grade 2	Grade 2	Grade 3	Grade 3
Pre-test	Below Grade 1	Below Grade 1	Below Grade 1	Below Grade 1	Below Grade 1
Post-test	Grade 3	Grade 3	Grade 3	Grade 2	Grade 1
Follow up	Grade 3	Grade 2	Grade 3	Grade 3	Grade 1
Domain	Spelling				
Expected grade level	Grade 3	Grade 2	Grade 2	Grade 3	Grade 3
Pre-test	Below Grade 1	Below Grade 1	Below Grade 1	Below Grade 1	Below Grade 1
Post-test	Grade 2	Grade 1	Grade 2	Grade 1	Grade 1

Table 1 shows that apart from showing improvement on the reading domain, participants also showed improvement on the spelling domain. All five of them had better performance on the post-test compared to the pre-test.

Table. No. 2: Pre-test and post-test scores of the control group on the Reading and Spelling domains of the NIMHANS Index for SLD

Participant name	SA	IS	DH	SO	SM
Domain	Reading				
Expected grade level	Grade 4	Grade 3	Grade 2	Grade 3	Grade 2
Pre-test	Below Grade 1	Grade 1	Below Grade 1	Grade 2	Below Grade 1
Post-test	Below Grade 1	Grade 1	Grade 1	Grade 2	Below Grade 1
Domain	Spelling				
Expected grade level	Grade 4	Grade 3	Grade 2	Grade 3	Grade 2
Pre-test	Below Grade 1	Grade 1	Grade 1	Below Grade 1	Below Grade 1
Post-test	Grade 1	Grade 2	Grade 1	Below Grade 1	Below Grade 1

Table 2 shows that 3 out of 5 participants in the control group didn't show any changes in the spelling domain in the post-test compared to the pre-test.

Discussion

The main goal of the present study was to assess the effectiveness of a reading intervention on the reading ability of children with specific reading disorders. It was found that a majority of children who received the intervention showed improvement in their reading skills. Moreover, these gains were maintained over a period of 4 weeks, as observed in the follow-up assessment.

These results confirm the already established links between phonology-based reading interventions and reading skills, according to a large body of previous literature. Sadasivan (2009), however, found that such an intervention led to gains in reading accuracy and phonological processing, but not reading comprehension, among children in the age group of 7 to 15 years.

Past literature has shown that early phonological skills have an impact on conventional literacy skills as children grow up (Amland et. al., 2021), which is why phonological processing is considered a predictor of dyslexia (Lohvansu et. al., 2021). Several interventions in the past (Shahzadi Malhotra et al., 2010; Tilanus et. al., 2016; Layes et. al., 2019) have demonstrated the effects of a phonology-based intervention on the reading skills of children with dyslexia. Research has also shown that phonological processing differs in children with dyslexia compared to typically developing peers (Feng et. al., 2016; Yu et. al., 2018; Wang et. al., 2018). The present study used an intervention based on phonological skills, which confirms the impact of phonological skills on reading among children with specific reading disorder.

The intervention presented in this study can help schools and clinics introduce training programs for children who struggle with reading. Psychologists, teachers, and special educators can facilitate these training programs. Many available interventions are designed in Western countries or the USA, and their application in the Indian context is not always appropriate. This intervention is an effective indigenous alternative since its effects are demonstrated on an Indian sample.

Future research can address certain limitations of this study by recruiting more participants with diverse socio-economic backgrounds, languages of instruction in school, and quality of educational experiences.

Secondly, since it is an investigator-mediated intervention program, the researcher has to be careful of self-serving bias and experimenter expectancy error. Moreover, further exploration can be done by adding homework activities as a part of the intervention and assessing whether it affects the outcome.

Appendix

Conflict of interest

The authors declared no conflict of interest

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