

Relationship of Non-Word Reading and Reading Comprehension in Children Across Grade 3 Through Grade 8

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Abstract - The present study investigated the relationship of reading comprehension to nonword reading. Research participants consisted of 108 grade- 3 to grade 8 typical students studying in English medium schools classified as good academic performers by the class teacher and were “not at risk” for auditory processing disorder. The research instrument consisted of reading comprehension and non-word reading subtest designed for the larger study. For reading comprehension task, the participants were asked to read a small paragraph and answer the questions based on that paragraph. For nonword reading, the participants were made to read a nonword list and also give the nearest true word according to them for every nonword.

Statistical analyses revealed a significant main effect of grade for nonword reading as well as reading comprehension. Analysis for gender effect revealed that nonword scores between the grades were not significant for females but were found to be significantly different for the males. No gender effect was obtained for reading comprehension. Further there was no association between the nonword reading score and reading comprehension score across the grades for males. For females however, there was a strong positive correlation for the third graders and strong negative correlation for children in the eighth grade. On qualitative analysis, unexpected responses were more than the expected responses. Overall, we can conclude that the phonological skills contribute to reading comprehension when children just begin to learn to read. Once the children are able to read and comprehend, it in turn contributes to the way the words are decoded.

Index Terms - nonword reading, reading comprehension, true word, phonological route.

INTRODUCTION

Reading is a cognitive process that involves decoding symbols to arrive at meaning. It is a quest to understand meaning. Sookchotirat (2005)[1] suggested that reading skill is the most important skill as it is the basis of all the success in one’s life. Learning to read is a continuing process from the first to the highest educational level.

Before children can begin to read, certain cognitive prerequisites such as abilities to perceive as well as segment speech must be met. Also, ability to draw the correspondence between the string of spoken sounds and the written symbol is essential.

Many variables such as phonological, orthographical and its semantic representation influence reading comprehension. (Carmen López-Escribano et al 2013).[2] Word recognition is a critical variable contributing to the development of reading comprehension. (LaBerge & Samuels, 1974; Stanovich, 2000; Tannenbaum, Torgesen, & Wagner 2006; Perfetti, 2007). [3-6]

According to Gunning, (2002)[7] knowledge of vocabulary and of sentence structure are prerequisite skills for reading comprehension.

According to the dual-route model (Grainger & Ziegler, 2011),[8] reading can be accomplished either by a direct reading system which involves attaching meaning to the printed words, or by a phonological system incorporating grapheme-phoneme correspondences. The direct route is used for reading exception words and familiar regular words, whereas nonwords have to be read using the phonological reading system.

The use of nonwords is well-established as a research tool in dyslexia. Nonword reading could be viewed as

a process which depends on rules other than those needed for reading true words. An inability to decode nonwords highlights difficulties in making grapheme-phoneme correspondence.

Similarly, Kim and Pallante (2012) [9] demonstrated that that fluency in the phonological decoding of nonsense words or pseudo-words was significantly related to reading comprehension.

The aim of the present research, was to compare the non-word reading as well as reading comprehension in children across grade three through grade eight. Additionally, the perception of nonwords which is reflected in their responses of nearest true word was studied. Finally, the relationship of reading comprehension to nonword reading has been investigated.

METHOD

Participants

The study was conducted on 108 typical participants (54 males and 54 females), from English medium school, studying in 3rd through 8th grades. Children from three public schools of South Mumbai served as participants. Children were in the age range of 7 to 13years. All the participants were classified as good academic performers by the class teacher and were “not at risk” for auditory processing disorder based on the Screening Checklist for Auditory processing (Yathiraj & Mascarenhas).[10] There was no history

of neurological, psychological/ emotional disturbance or any sensory impairment.

PROCEDURE

The participants were shown the nonwords one at a time. The test was trialled using the following instructions as standard: ‘Here are some made-up words. They are not real words, so you cannot guess them. But you can read them. Try these.’

After all the non -words were read out, the participants were shown the same list and the task now was to give the nearest true word for each nonword. The response obtained were noted which were further analysed qualitatively.

Every non-word read was given a score of 1 and every nearest true word was also given a score of 1. Maximum obtainable score was 20.

For reading comprehension task the participants were given a passage to read and then answer five questions based on that passage. If children were unable to read any word in the passage, the investigator helped them read that word but did not give any explanation of the word. Maximum obtainable score on this task was 10. The scores obtained were statistically analysed. Appropriate statistical software, including but not restricted to MS Excel, PSpP version 1.0.1 was used for statistical analysis. Graphical representation was done in MS Excel package of Office 365.

RESULT

Variables	Grade	Mean	SD	Median	Minimum	Maximum	Shapiro-Wilk Test	p-value	Normality
Nonword score	3rd	11.10	1.91	10.00	10.00	15.00	0.647	0.0002	Not established
	4th	14.27	3.88	15.00	10.00	20.00	0.857	0.022	Not established
	5th	16.38	3.54	17.00	10.00	20.00	0.871	0.00999	Not established
	6th	14.65	5.31	17.00	5.00	20.00	0.862	0.00448	Not established
	7th	18.33	2.29	20.00	12.00	20.00	0.765	0.0002	Not established
	8th	17.22	2.37	18.00	9.00	20.00	0.717	0.00013	Not established
Reading comprehension score	3rd	4.40	1.90	4.00	2.00	8.00	0.911	0.287	Established
	4th	5.07	2.28	5.00	2.00	10.00	0.920	0.195	Established
	5th	6.86	3.55	7.00	3.00	19.00	0.798	0.0006	Not established
	6th	7.04	2.50	7.00	1.00	10.00	0.916	0.056	Established
	7th	6.86	1.56	7.00	3.00	10.00	0.947	0.296	Established
	8th	7.50	1.72	8.00	5.00	10.00	0.902	0.063	Established

Table1 gives the grade -wise mean, median, standard deviation and range of the nonword reading and reading comprehension

Table-1: Distribution of mean Nonword scores and Reading comprehension scores by Grade

Table1 gives the grade -wise mean, median, standard deviation and range of the nonword reading and reading comprehension.

The mean scores of nonword reading shows increase from third through seventh grade. Where maximum scores are reached by seventh grade. Similar findings were obtained for reading comprehension task. There was slight reduction in scores of eight graders for nonword reading.

Shapiro Wilk test showed that the data was not normally distributed. Hence non parametric tests were performed to investigate the objectives of the study Kruskal-Wallis test was carried out to study the grade effect on non-words and reading comprehension. There was a significant main effect of grade for nonword reading ($\chi^2 = 26.004$, $p = 0.00008909$) as well as reading comprehension. ($\chi^2 = 19.161$, $p = 0.0018$) Hence pair wise comparison was carried out using Dunn's test

Dunn's post-hoc test results revealed that the pairs which contributed to difference were 3rd vs 5th, 3rd vs 7th, 3rd vs 8th and 4th vs 7th grade. for nonword reading. Differences between remaining all the pairs were found to be insignificant. For reading comprehension, similar findings were obtained. Results of Dunn's post-hoc test revealed that the pairs which contributed to difference were 3rd vs 6th, 3rd vs 8th, and 4th vs 8th grade.

To see the gender effect on nonword reading ability and reading comprehension, the data was analysed separately for females and males using Kruskal-Wallis One Way Analysis of Variance on Ranks. Analysis of nonword scores between the grades were not significant for females but were found to be significantly different for the males.

Analysis of performance of boys and girls on reading comprehension revealed that reading comprehension scores between grades were significant for both girls as well as for boys. Again a post hoc analysis using Dunn's method data revealed that only one pair 4th vs 6th, grade was significantly different for girls. Whereas for boys, the pair 3rd vs 8th grade was the only pair which showed significant difference. Differences between remaining all the pairs were found to be insignificant for both the groups.

Further the relationship of nonword reading score with reading comprehension score across the grades was investigated. The obtained correlation was weak suggesting that there is no association between the nonword reading score and reading comprehension score across the grades for males. For females however, there was a strong positive correlation

(0.894) ($p < 0.04$) for the third graders and strong negative correlation (- 0.808) ($p < 0.02$) for children in the eighth grade.

Lastly, the difference in the perception of nonwords by participants across grades 3 through grade 8 which is reflected in their responses of nearest true word was investigated. Unexpected responses were more as compared to expected responses across all the nonwords except for three nonwords were first and last consonants were in same position as any true words for children in the fifth through eight grade. Children in the third and fourth grade, found reading most difficult as compared to higher grade children which is reflected in increase of number of children giving no responses to reading nonwords.

DISCUSSION

Word reading and reading comprehension skills are essential to educational success. Deficits in word reading or reading comprehension may lead to learning disability. Children with LD have been found to have problems in phonemic awareness (Thatcher 2010, Murphy & Schochat 2009),[11, 12] decoding (Muter, Hulme, Snowling, and Stevenson (2004), Mohapatra (1991) [13, 14] and spelling (Bahr, Silliman, Berninger and Dowa 2012).[15] All these issues lead to problem in comprehension and reading thereby have a serious impact on their education (Mcnamara & Kendeou 2011).[16] It has been reported that 15% of school going children have dyslexia, warranting it to be identified at an early age and providing remediation is of utmost importance.

Reading comprehension is the foundation for learning to read. 2 – 18% of primary school children in India have problems in reading (Goel 2021).[17] Non word reading is a novel task which does not depend on prior knowledge. This task can serve as one of the best options to control the effect of language knowledge on reading (Rispen and Baker 2012).[18] Hence it is important to assess non word reading.

The present study compared the grade effect on nonword reading and reading comprehension skills. Also, relationship between reading comprehension and non-word reading was investigated. Typically developing boys and girls performed in similar manner on reading comprehension task. Results suggest that there was significant effect of grade for both nonword reading as well as reading comprehension. Scores on

both these tests showed improvement with the advanced grade. These results are in accordance to the previous studies reported in the literature. (Bahr, Silliman, Berninger and Dowa 2012).[15]

Analysis of the relationship between reading comprehension and non-word reading suggest that there was a strong association between the nonword reading score and reading comprehension scores. For third graders, as the non- word reading scores increased the reading comprehension scores also increased. That is, with improvement in grapheme to phoneme correspondence, reading comprehension ability improves.

For eighth graders, strong negative association suggests, with increase in reading comprehension scores, nonword reading scores decreased. Because the eighth graders have the knowledge of true words, they probably, found it increasingly difficult to accept the nonword combination and read it as words. These findings substantiate the findings of various researchers (Tilstra, McMaster, Van den Broek, Kendeou, & Rapp, 2009; Vellutino, Tunmer, Jaccard, & Chen, 2007) [19, 20] who suggested that the relative importance of decoding and reading comprehension changes over time, with language skills becoming more predictive of reading comprehension as children gain mastery over decoding skills . In another study investigating non word reading in the Indian context Kiran, Bellur and Krishnan (2017)[21] reported that non-word reading is greatly difficult compared to word reading, indicating the weak sub-lexical processing of written symbols. Also, the level of exposure to English prior to school entry varies. Many children enter school with limited English language skills, particularly in terms of vocabulary knowledge (Mahon & Crutchley, 2006).[22] Differences in findings between girls and boys on nonword reading task points towards the fact that the two groups probably use different strategies in reading nonwords. Girls as a group, seem to rely on phonological route whereas no such association was seen in boys.

Grade effect was observed both on non-word reading and reading comprehension. However, there were certain differences in the performances on the two skills.

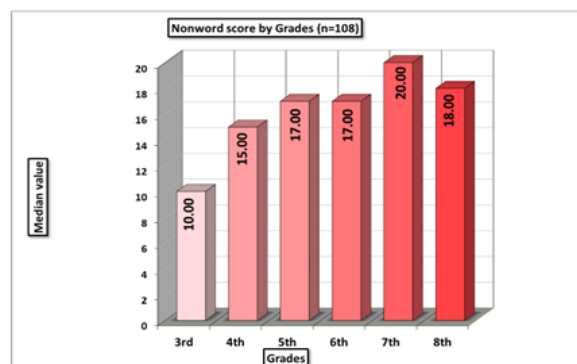


Fig1: Grade- wise scores of non-words.

As seen from Figure 1 and 2, gradual improvement was seen in nonword reading task from 3rd to seventh grade and a slight reduction in the eighth grade whereas a plateau was seen in reading comprehension between grade fifth to seventh and then a slow rise in the scores of reading comprehension in the 8th grade.

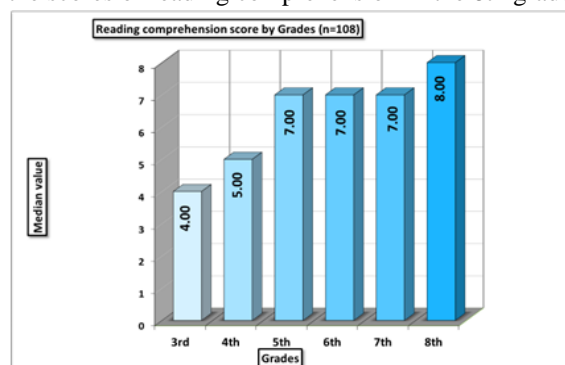


Fig 2: Grade- wise scores of reading comprehension

This indicates that the scoring method used for non-word reading subsection of giving credit to both the tasks involved that is the reading of the nonword as well as recollecting the nearest true word brings out or highlights the gradual improvement across the grades. If the second task of recollecting the nearest true word was not considered, no gradation was seen as there is no right or wrong way of reading nonword, all the children would have scored the same as any response would have gained a credit. Also, both non word reading and reading comprehension place different demands on the cognitive resources. There is dearth of studies reported on nonword reading in Indian context. According to Kiran, Bellur and Krishnan (2017)[22] non-word reading is more difficult compared to word reading, indicating the weak sub-lexical processing of written symbols.

CONCLUSION

Data obtained from typically developing children showed a significant grade effect for both reading comprehension and non-word reading in the children studying in 3rd to 8 grade. Gender effect was seen in non word reading . Reading comprehension was more difficult than nonword reading for both boys and girls. However, scoring the nearest true word, made the task of reading nonword equally difficult. Combined use of both nonword reading and reading comprehension may bring out subtle problems faced by children more efficiently. Overall, we can conclude that the phonological skills contribute to reading comprehension when children just begin to learn to read. Once the children are able to read and comprehend, it in turn contributes to the way the words are decoded. Future studies can be done comparing performance of typical and children with LD to see if children with LD perform in the same manner or is there any other trend noted in those who have learning disability.

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