

## Effect of Text-to-speech Software on Academic Achievement of Students with Dyslexia

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### ABSTRACT

Dyslexia is a neurobiological disorder that creates serious difficulties in learning process. Being a special learning disorder, it demands special learning environment with a blend of right approach, method and technology. Text to speech software comes under the head of assistive technology that helps dyslexic children understand and assimilate structure sound and meaning of the words. Present study is an experimental study in which 20 students of 6-12 years of age range were selected and randomly distributed in experimental and control group. Experimental group was taught with text to speech software for four months while control group received no treatment and was taught by conventional method of teaching. In the beginning of the study a pretest was conducted in order to know the prevalent differences among the groups. After four months of intervention post test was conducted. Results revealed that students in experimental group performed significantly better than the control group. Text to speech software contributed to remarkable gains in the achievement of students with dyslexia.

**Keywords-** Dyslexia, Text-to-speech, Academic achievement

### I. INTRODUCTION

Learning is a life-long process that determines the way a person grows and lives his life. As far as academic achievement is concerned it depends largely upon learning and retention. Sometimes child faces difficulty in comprehension, processing information and retention. These difficulties refer to learning disabilities. Learning disability is a group of disorders that affect many academic and functional skills like speaking, writing, reasoning, information processing etc. there are a number of specific learning disabilities that touch different domains of learning and achievement. ADHD, dyscalculia, dysgraphia and dyslexia are some of them. Dyslexia is one of the learning disabilities that affects approximately 10 percent of total population. It is an auditory and visual processing disorder. It creates difficulty in reading writing and speaking (Richardson, 1992). This disorder is neurobiological in origin and is characterized by poor word recognition, spelling and decoding ability (Shaywitz and Shaywitz, 2003).

American psychiatric association (2013) defines dyslexia as difficulty in acquiring and processing language that is typically manifested by the lack or proficiency in reading, spelling and writing. When a child has difficulty in decoding skill, reading comprehension gets compromised (Snowling et. al., 2020). Dyslexia is a result of various neurobiological factors. Problem in reading writing and spelling are caused due to short verbal memory, poor decoding, slow processing speed and problem in long term retrieval (Kramer, Knee and Delis, 2000). When a new word comes in the learning hemisphere of the child various cognitive processes like recognition, memory, attention, the use of new information etc. start working (Cook, 1977). The structure of the word, its sound and meaning all play important role in understanding and assimilation of the word. Some researches proved that dyslexia is caused by problem at the level of phonological representation means sound of the word (Shankweiler et. al., 1979). Problem with phonology leads to difficulty in learning mapping between orthography (writing system) and phonography (Snowling, 2019). Every new word comes with a particular structure and sound. In dyslexic

children the word sound connection is stored in deteriorated form. When, in future, child tries to recall this word, only deteriorated information is retrieved. Sometimes problem acts at the level of transferring information from long term memory to working memory. In both the situations learning and recalling becomes strenuous task for the child. Learning is also affected by attention and mind wandering to a large extent. Due to mind wandering and deficit in attention irrelevant information is stored in long term memory. It creates word recognition and retention more difficult.

Dyslexia is reflected in various activities of the child and difference in height of problem also persists. Evidences reveal that dyslexia shows heterogeneity and individual differences (Perry et. al., 2019). Each dyslexic child reflects different level of difficulty and association with other psycho-developmental disorders. Catts et. al., (2005) found in their study that it is common for dyslexic children to have language problems and some children also meet clinical criteria for Developmental Language Disorder (DLD). Dyslexia not only leads to cognitive problems like poor reading language and compromised achievement but it is also accompanied with emotional and social difficulties. Due to low achievement, peer group neglect and ignorance of teacher dyslexic children develop low self-confidence and inferiority complex that can lead to stress social isolation and depression. Dyslexia has multiple effects on personality development so its identification in early stage and timely intervention is the only key to tackle it (Snowling, 2013).

To improve information processing and for getting better output, it is necessary to provide meaningful and small inputs to dyslexic children. Teacher should create a collaborative and supportive classroom environment. Concept checking question, various forms of feedback and more opportunities for revision and reviews should be provided (Riddell, 2006). Tactics like summarizing, paragraphing and mind mapping should be a part of teaching. Teaching method like alphabetic phonic method gives better results in form of significant gains in phonological awareness, decoding and reading comprehension (Joshi et. al., 2002). In a general classroom setup teachers tend to ignore the needs of special children and focus more on general children. Actually, the educational setup is so structured that it leaves no opportunity to incorporate special methods and techniques that can cater to the needs of slow learners' backward children, dyslexics etc. a more interactive and activity-based teaching can do wonders. Use of audio-visual aids along with right amount of activities, interaction, feedback and revision can pave the way to better learning outcomes.

## II. REVIEW OF LITERATURE

Dyslexia is a specific learning disorder that badly affects reading and writing skill of the child. Dyslexic children possess normal range of I.Q. and can be

quite creative but difficulty in decoding and comprehension results in poor academic achievement. Right teaching strategy is a must for improving learning outcomes of students with dyslexia. In a study done by Omidean and Molaei (2021), it was revealed that art-based education, e-learning and participatory learning are useful for dyslexic children. All of these approaches mainly focus upon the use of sensory organs. Benefits of using audio-visual aids led to the development of multimedia approach. It has been proved that involvement of sensory organs can be quite beneficial in the teaching of normal as well as special children. Reading interventions for dyslexic children should not only be phonologically based but it should also incorporate the multisensory technique involved in children's visual auditory and kinesthetic sensory component (Thompson, 2010). Involvement of multiple sense organs at one time can be more beneficial. Cognitive theory of multimedia learning recommends incorporating multiple media in order to help students overcome limitations of cognitive system (Mayer, 2014). Multisensory approach is a good teaching tactic for dyslexics as these kids are believed to have more receptive sensors (Ohene-Djan and Begum, 2008). Read aloud technology, m-learning and text to speech technology are some approaches that come under the head of assistive technology that is primarily based on multisensory learning. The use of assistive technology can attribute to strengthening students' skills in decoding, comprehension, reading with fluency (Elkind, Cohen and Murray, 1993), writing (Raskind and Higgins, 1995) and spelling (Dalton, Winbury and Morocco, 1990). Schiavo et. al. (2021) found in their study that attention driven read aloud technology increases reading comprehension in children with reading disabilities. Results show that children with dyslexia improved the comprehension score 24 percent. Text to speech is another ICT based approach that incorporates different sense organs of children at one time. There are sufficient evidences which prove that multimedia presentation of the text or text to speech software can help students with dyslexia by reducing reading speed by presenting only a limited text at a glance (Schneps et.al., 2019). Many research suggests that for dyslexic children text to speech tool might compensate to their decoding difficulties (Wood et.al., 2018) and if the child doesn't have any previous developmental disorder, is expected to have adequate listening comprehension skills (Snowling et.al., 2020).

## III. METHODOLOGY

### 3.1 Objective of the study:

Objective of the study is as follows:

To study the effect of text-to-speech software on the academic achievement of students with dyslexia

### 3.2 Hypothesis:

For the purpose of the study following testing hypothesis was formed:

There is no significant effect of text-to-speech software on the academic achievement of students with dyslexia

**3.3 Research design**

Present study is experimental in nature. A pretest-posttest design has been used for the study. The basic premise behind this design involves obtaining a pretest measure of the outcome of interest prior to administrating some treatment, followed by a posttest on the same measure after treatment occurs (Salkind, 2010).

**3.4 Sample**

The study focuses upon the dyslexic children and is limited to Pt. DDU Nagar of Chandauli. The sample size is 20. In this study students with dyslexia were identified. The age range of students was 6-12 years.

**3.5 Tools**

Investigator developed an open-ended questionnaire for the teachers for primary identification of dyslexic children. The questions were framed on the basis of primary symptoms of dyslexia. After primary identification, Dyslexia Screening Test- junior India kit (DST-j India) was administered. This kit has been developed by Dr. Angela Fawcett and Professor Rod Nicolson. This is an individual test. It consists of twelve subtests that focus to evaluate accuracy and fluency in reading, writing and spelling.

To measure the academic achievements of students and achievement test was developed by the researcher. The test consists of 50 questions from Hindi and English.

**3.6 Statistical techniques and Data collection**

The students were classified in two groups; one control group and another experimental group. A pretest was administered to both the groups. The experimental was taught with the help of text to speech application for the next four months while students in control group were taught with conventional mode of teaching. After four months posttest was administered and data was collected. Mean standard deviation and t-test were calculated for the data.

**IV. RESULTS**

The scores obtained by experimental and control group were analyzed statistically. Mean standard deviation and obtained t value on pretest for both the groups have been shown in table 4.1.

**Table 4.1**

S.N.	Group	Test	N	Mean	S.D.	t value
1	Exp. Group	Pretest	10	23	3.52	0.64**
2	Con. Group		10	22	3.48	

\*\*not significant

The obtained mean values were 23 and 22 and the SD values were 3.52 and 3.48 respectively. The obtained t value was 0.64 which is not significant at 0.05

level of significance. It means both the groups did not differ significantly before the intervention was made.

**Table 4.2**

S.N.	Group	Test	N	Mean	S.D.	t value
1	Exp. Group	Pretest	10	23	3.52	3.14*
2		Posttest	10	28	3.61	

\*significant at 0.05 level

Table 4.2 shows pre test post test values for experimental group. The mean and SD values were found to be 23, 28 and 3.52, 3.61 respectively. The obtained t value is 3.14 which is significant at 0.05 level. Experimental group showed significant gains in terms of academic achievement. The performance of dyslexic students improved after using text-to speech software.

**Table 4.3**

S.N.	Group	Test	N	Mean	S.D.	t value
1	Exp. Group	Posttest	10	28	3.61	2.186*
2	Con. Group		10	24	4.52	

\*significant at 0.05 level

To support the results the comparison of experimental group with control group had been done. The posttest scores have been shown in table 4.3. The mean scores for both the groups were 28 and 24 while the SD values were 3.61 and 4.52. The calculated t value is 2.186 that is significant at 0.05 level. The results reveal that the group that got intervention performed better than the other group. So, the null hypothesis that ‘there is no significant effect of text to speech software on the academic achievement of students with dyslexia’ is rejected.

**V. DISCUSSION**

Present study primarily focused upon the effect of text to speech software on the academic achievement of students with dyslexia. Pretest-posttest design was used for the purpose. Students were randomly assigned to experimental and control group. Experimental group was taught with text to speech software while control group received conventional mode of teaching. After four months a posttest was conducted. Results clearly show that experimental group performed better in terms of scores on posttest. Experimental group received significantly higher scores on posttest in comparison to their pretest scores as well as the posttest scores of the control group. The result of the present study goes in line with previous studies on the effectiveness of text to speech software (Schneps et.al.,2019, schiavo et.al.,2021).

## VI. CONCLUSION

Learning disabilities work as a major hindrance in the developmental path of a child. They do not only seriously affect learning outcomes but also break self-confidence of the child. Dyslexia is one of the learning disabilities that is basically related to difficulty in reading writing and spelling. The structure sound and meaning of the words are not stored and retrieved properly that creates problem in recognition and comprehension. Text to speech software is an assistive technology in which presentation of the text can be controlled. In text to speech software the content can be presented in a reduced speed, words can highlight and limited text can be produced at a time. All these things help students in establishing word-sound relation which results in better phonological understanding. Present study proves the effectiveness of text to speech software in the teaching of dyslexic students. Identification of dyslexia at an early stage along with training of teachers in assistive technology can remove many obstacles from the learning path of students with dyslexia.

## REFERENCES

[1] American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. <https://psychiatry.org/patients-families/specific-learning-disorder/what-is-specific-learning-disorder>

[2] Catts, H. W., Adolf, S. M., Hogan, T. P. & Ellis Welsmer, S. 2005. Are specific language impairment and dyslexia distinct disorders? *Journal of Speech, Hearing and Language Research*. 48(6), 1378-1396. [https://doi.org/10.1044/1092-4388\(2005/096\)](https://doi.org/10.1044/1092-4388(2005/096))

[3] Cook, V. J. 1977. Cognitive processes in second language learning. *International Review of Applied Linguistics*. 15(1), 1-20

[4] Dalton, B., Winbury, N. E. & Morocco, C. C. (1990). If you could just push a button: Two fourth grade boys with learning disabilities learn to use computer spelling checkers. *Journal of Special Educational Technology*. 19(4), 57-80

[5] Elkind, J., Cohen, C. & Murrey, C. (1993). Using computer based readers to improve reading comprehension of students with dyslexia. *Annals of Dyslexia*. 43, 238-259

[6] Joshi, R.M., Dahlgren, M. & Boulware-Gooden, R. (2002). Teaching reading in an inner city school through a multisensory teaching approach. *Annals of Dyslexia*. 52(1), 229-242

[7] Kramer, J. H., Knee, K. & Delis, D. C. (2000). Verbal memory impairments in dyslexia. *Archives of Clinical Neuropsychology*, 15(1), 83-93. [https://doi.org/10.1016/S0887-6177\(99\)00022-0](https://doi.org/10.1016/S0887-6177(99)00022-0)

[8] Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning*, 43-71.

Cambridge University Press.  
<https://doi.org/10.1017/CBO9781139547369.005>

[9] McGrath, L. M., Peterson, R. L., & Pennington, B. F. (2020). The multiple deficit model: Progress, problems, and prospects. *Scientific Studies of Reading*, 24(1), 7-13. <https://doi.org/10.1080/10888438.2019.1706180>

[10] Omidian, F. and Nolaie, F. (2021). Investigating the dyslexia of pre school students and presenting educational strategies by combined method. *Journal of Educational Studies*. 18, 59-68.

[11] Perry, C., Zorzi, M. & Ziegler, J. C. (2019). Understanding the dyslexia through personalized large-scale computational models. *Psychological Science*. 30(3), 386-395

[12] Rasking, M. H. & Higgins, E. (1995). Effects of speech synthesis on the proofreading efficiency of postsecondary students with learning disabilities. *Learning Disability Quarterly*, 18, 141-158

[13] Richardson, S.O. (1992). Historical perspectives on dyslexia. *Journal of learning disabilities*. 25(1), 40-47. <https://doi.org/10.1177/002221949202500107>

[14] Riddell, S. and Weedon, E. (2006). What counts as a reasonable adjustment? Dyslexic students and the concept of fair assessment. *International Studies in Sociology of Education*. 16, 57-73. <https://doi.org/10.1080/19620210600804301>

[15] Schiavo, G., Mana, N., Mich, O., Zan Canaro, M., & Job, R. (2021). Attention driven read aloud technology increases reading comprehension in children with reading disabilities. 37(3), 875-886. <https://doi.org/10.1111/jcal.12530>

[16] Schneps, M. H., Chen, C., Pomplun, M., Wang, J., Crosby, A. D., & Kent, K. (2019). Pushing the speed of assistive technologies for reading. *Mind, Brain, and Education*, 13(1), 14- 29. <https://doi.org/10.1111/mbe.12180>

[17] Shankweiler, D., Liberman, I. Y., Mark, L. S., Fowler, C. A. and Fisher, F. W. (1979). The speech code and learning to read. *Journal of Experimental Psychology: Human Learning and Memory*. 5(6), 531-545. <https://doi.org/10.1037/0278.5.6531>

[18] Shaywitz, S. E., Shaywitz, B. A., Fulbright, R. K., Skudlarski, P., Menci, W. E., Constable, R. T. et al. (2003). Neural systems for compensation and persistence: young adult outcome of childhood reading disability. *Biological Psychiatry*. 54 (1), 25-33

[19] Snowling, M. J. (2013). Early identification and interventions for dyslexia; a contemporary view. *Journal of Research in Special Educational needs*, 13(1), 7-14

[20] Snowling, M. J. (2019). *Dyslexia: A very short introduction*. Oxford university press. 20-33. <https://doi.org/10.1093/actrade/9780198818304>

[21] Snowling, M. J., Hayiou-Thomas, M. E., Nash, H. M., & Hulme, C. (2020). Dyslexia and developmental language disorder: Comorbid disorders with distinct effects on reading comprehension. *Journal of Child Psychology and*

*Psychiatry*, 61(6), 672– 680. <https://doi.org/10.1111/jcpp.13140>

[22] Thompson, J. (2010). *Good practice in interventions for teaching dyslexic learners and in teacher training in English speaking countries*. Harvard Graduate School of Education.

[23] Wood, S. G., Moxley, J. H., Tighe, E. L., & Wagner, R. K. (2018). Does use of text-to-speech and related read-aloud tools improve reading comprehension for students with reading disabilities? A meta-analysis. *Journal of Learning Disabilities*, 51(1), 73– 84. <https://doi.org/10.1177/002221941668817>