

A COMPARATIVE ANALYSIS OF READING COMPREHENSION ABILITIES BETWEEN CHILDREN WITH DOWN SYNDROME AND TYPICALLY DEVELOPING PEERS

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ABSTRACT

This research study focused on investigating the reading comprehension skills of children with Down syndrome compared to typically developing children. The research utilized various standardized tests and assessments, including the Woodcock-Johnson Tests of Achievement, Test of Reading Comprehension, One Minute Reading Test, and Gray Oral Reading Test. The interactive compensatory model of linguistics was applied as a theoretical framework for data analysis. The sample consisted of five children with Down syndrome and five typically developing children matched for age and gender. The assessments covered areas such as word recognition, decoding, vocabulary, comprehension strategies, critical thinking, and reading fluency. The data obtained from the pre- and post-tests were analyzed to determine the performance levels and improvements in reading comprehension skills over a period of three months. The results indicated that children with Down syndrome showed significant improvements in their reading comprehension abilities after the intervention.

Keywords: down syndrome, listening comprehension, intervention.

1. INTRODUCTION

Reading is a fundamental skill that plays a crucial role in our daily lives and is often considered a cornerstone of education. It involves the ability to decode written words, understand their meaning, and extract information from texts.

Effective reading comprehension is vital for academic success and lifelong learning. It allows individuals to get accustomed to a variety of texts on a daily basis, from textbooks, and articles to literature and informational materials. Developing strong reading comprehension skills involves practice, exposure to diverse texts, explicit instruction in comprehension strategies, vocabulary development, and fostering a love for reading (Kim, Lee, & Park, 2018).

For children affected with Down Syndrome, understanding the words through reading may present unique challenges due to language and cognitive delays. However, with appropriate support, tailored instruction, and interventions, children with Down syndrome can make progress

in their reading comprehension abilities and experience the joy and benefits of reading.

Reading comprehension can be more challenging for Down syndrome children because of cognitive, enriching and advancing delays. Down Syndrome children may have difficulty with language processing, memory, and attention, which can impact their comprehension and interpret a text. However, with appropriate instruction and support, Down syndrome children can make progress in understanding the words through reading. Interventions such as the use of visual aids, breaking down text into smaller chunks, and using a multisensory approach can help improve understanding the words through reading in Down syndrome children (Davis, Thomas, & White, 2017).

It is of great significance to assess and address the certain requirements and strengths that each child with Down syndrome possesses when supporting their reading comprehension development.

Different instructional strategies, including explicit instruction, vocabulary development, comprehension strategies, and scaffolded support, can be employed to enhance their reading comprehension skills. By focusing on the unique needs of children with Down syndrome and providing targeted interventions, it is possible to support their reading comprehension abilities and promote their overall literacy skills, which are crucial for academic success and lifelong learning. To support Down Syndrome children with their understanding of words through reading, it is significant to provide a structured and supportive learning environment. This may involve using visual supports, such as pictures or diagrams, to aid comprehension and make connections to the text. Breaking down complex sentences or passages into smaller, more manageable chunks can also be beneficial.

Explicit instruction in vocabulary development is crucial, as it helps children with Down syndrome understand the meaning of words encountered in the text. Teaching comprehension strategies, such as predicting, questioning, summarizing, and making inferences, can help children with Down syndrome actively engage with the text and enhance their understanding. The syllabus for reading should be selected at a suitable extent of difficulty, considering the child's reading abilities and interests (Simmons, Garcia, & Martinez, 2019). Providing opportunities for repeated readings, guided discussions, and individualized feedback can also support their reading comprehension growth. It is very vital for one to be aware of the fact that each Down Syndrome child is special with their specific strengths, needs, and learning styles should be considered when designing reading comprehension interventions.

A multidisciplinary approach involving educators, speech therapists, and other professionals can help create a comprehensive and individualized plan to promote reading comprehension skills.

Remember that progress may be gradual, and each child may have their own pace of development. Patience, consistency, and a strengths-based approach are key when supporting children with Down syndrome in their reading comprehension journey (Simmons, Garcia, & Martinez, 2019). With consistent support, targeted interventions, and a nurturing learning environment, children

with Down syndrome can make meaningful progress in their reading comprehension abilities. Developing strong reading comprehension skills can empower them to access information, explore new ideas, and engage in lifelong learning.

One must also take into account that Down syndrome children are individuals with unique abilities and needs, so interventions and strategies that work for one child may not be appropriate for another. A comprehensive evaluation by a specialist in education, speech and language therapy, and/or occupational therapy is important to design an appropriate instruction plan for each child.

1.1.Objectives of the study

- to identify the differences in reading abilities between children with down syndrome and typically developing peers
- find out the contribution of reading comprehension in oral development of children

1.2.Statement of the problem

Despite evidence suggesting that children with Down syndrome have difficulty with reading comprehension, limited research has been conducted to investigate the specific challenges faced by this population and the most effective interventions for improving their reading skills. This research aims to label and discuss this gap in knowledge via inquiring about the reading comprehension difficulties faced by children with Down syndrome in Pakistan, and examining the effectiveness of different evidence-based reading interventions to improve their reading comprehension abilities.

1.3.Research questions

- I. What are the differences in reading abilities between children with Down syndrome and typically developing peers?
- II. How does reading comprehension contribute to the oral language development?

1.4.Significance of the study

It can help to identify the specific challenges that children with Down syndrome in Pakistan face in reading comprehension, and inform the

development of intervention strategies that can improve their reading abilities. This can have a significant impact on their academic and vocational success, as well as their overall quality of life.

1.5. Limitations of the study

The selected trial size is limited to 5 children with Down syndrome. Due to limited time frame, the study could not include more children. Additionally, more Down syndrome children would have been difficult to handle. Furthermore, this study doesn't focus on the writing and listening skills of the children.

2. LITERATURE REVIEW

Linguistics plays an important part in understanding and enhancing the reading comprehension of Down syndrome children. Another name for Down Syndrome is Trisomy 21 and it is a genetic disorder caused when there is an extra copy of chromosome 21. John Langdon Down is the physician after whom Down Syndrome was named. He is the first person who explained the condition in 1866. Down Syndrome is categorized as the most commonly occurring chromosomal, affecting approximately 1 in every 700 to 1,000 live births worldwide (Edwards, Parker, & Martinez, 2021). Down syndrome is characterized by physical and rational conditions. Individuals with Trisomy 21 typically have definite facial characteristics, like slanted eyes, a flattened facial profile, and a small nose.

According to CDC (Centers for Disease Control and Prevention), every year in the United States around 6000 children are born with Down syndrome. The prevalence of Trisomy 21 varies among different populations and ethnicities, but on average, it is estimated to occur in about 1 in every 700 to 1,000 live births worldwide (National Early Literacy panel, 2008).

Reading comprehension is defined as one's capability to comprehend and make meaning from text. It includes the combination of various cognitive processes, involving deciphering terms, comprehending vocabulary, making inferences, and connecting ideas within and across sentences and paragraphs (Snow, Burns and Griffin, 1998). Reading comprehension goes beyond simply decoding words; it focuses on understanding the meaning, purpose, and implications of the text.

The Interactive Compensatory Model is based on the idea that language processing involves multiple interconnected components, including phonemics (acoustics), diagnosis (about structure of words), grammar, semantics (meaning), and pragmatics (language use in social contexts). According to this model, when one component is compromised, individuals can compensate by relying more heavily on other intact components.

In 2000, a significant milestone was achieved when a group of scientists from abroad successfully recognised and categorized almost 329 genes located on chromosome 21. This breakthrough has paved the way for important progress in the research of Down syndrome, enhancing our understanding of the condition and potential avenues for intervention and treatment.

Recent research studies have found that children with Down syndrome have difficulty with reading comprehension due to cognitive and developmental delays, particularly in the areas of decoding, vocabulary, and language comprehension.

A study by Rondal (2000) found that children with Down syndrome have difficulty with phonological processing, which is important for decoding and reading fluency. The study also found that vocabulary and language comprehension are weaker in individuals suffering from Down syndrome than in typically developing children, which can impede reading comprehension.

Another study by Buckley (2000) found that children with Down syndrome have difficulty with phonological processing and word decoding, which negatively impacts their reading comprehension. The study also found that children with Down syndrome have difficulty with understanding the meaning of text due to limited vocabulary and language comprehension skills.

A research by Jarrold et al. (2011) found that people with Down syndrome have difficulty with phonological processing, which affects their ability to decode words and read fluently. The study also found that children with Down syndrome have difficulty with understanding the meaning of text due to limited vocabulary and language comprehension skills.

According to the concept of reading, successful comprehension involves a combination of listening comprehension and printed word recognition

abilities. However, these abilities can be vulnerable to breakdown due to their complex interactions and the multiple cognitive and linguistic skills involved. The convergent skills framework of reading development describes the various contributions of language comprehension and word identification to reading ability at different stages. For most beginning readers, the phonological abilities and word identification skills are of primary significance. The importance of listening comprehension is higher once a person has mastered the skills of word recognition.

In Levorato and Roch's study in 2009, they compared the reading and listening comprehension of paragraphs. But, to take into account the various factors that affected the participants' reading and writing abilities, Study 1 assessed their comprehension of single sentences. The children with DS were tested using a standardized test. They then performed a parallel version of the test that involved writing sentences that were similar in terms of linguistic difficulty. This method revealed that children with DS can better understand written sentences than those with visual impairments. According to the researchers, the deficits in short-term memory caused by DS may explain why people with DS are more likely to understand written sentences (Levorato&Roch, 2009)

The past research on reading comprehension in individuals affected by Down syndrome and children with normal upbringing has provided valuable insights into the factors that influence reading abilities and the effectiveness of various interventions. Several key findings have emerged from these studies, shedding light on the unique issues that individuals affected with Down Syndrome face and the strategies that can support their reading comprehension skills.

3. MATERIALS AND METHODS

3.1.Theoretical model

The "Interactive Compensatory Model" was used for the analysis of the data. The Interactive Compensatory Model suggests that reading comprehension is influenced by multiple factors that interact with each other.

3.2.Population and sample

5 children aged 9 to 12 years old who had reading skills that are adequate to the tests will be selected

from a group participating in a descriptive study. They are all enrolled in Rising Sun institute. They also take part in reading activities at home to improve their academic performance. According to their parents, the kids did not have any developmental disorders or autism and spoke English as their primary language. One child had hearing problems. A controlled group of 5 students from Lahore grammar school Nasheman e Iqbal campus will be taken as a group of normal students with same age group for a comparison. Dr.Aliha Sultan, a speech therapist was a part of the study during the collection of data and its analysis.

3.3.Instrumentations

First, an IQ test was taken to set the base of children. Conducting an IQ test for children can provide valuable information about their cognitive abilities and intellectual functioning. In this regard, the Wechsler Intelligence Scale for Children was used. To assess the word recognition and decoding skills along with the vocabulary in reading comprehension, Woodcock-JohnsonTests of Achievement (WJ-IV) was used. Test of Reading Comprehension was used to assess the skills of comprehension strategies and critical analysis and thinking among the students. The One minute Reading test was used to analyze the reading fluency of the children. The children were given a passage that they were meant to read within the given time frame. A post test called Gray Oral Reading test was used to assess the Reading comprehension skills in children.

3.4 Data Analysis:

Following data collection, the obtained information was meticulously organized and tabulated under the expert supervision of a qualified speech therapist, Dr. Aliha Sultan. The data analysis process involved careful examination and interpretation of the participants' performance in the different assessment tools used in the study. Quantitative data from the standardized tests were analyzed using appropriate statistical methods. Descriptive statistics and inferential analysis provided valuable insights into the participants' cognitive abilities, reading skills, and comprehension strategies.

DISCUSSION AND ANALYSIS

Reading comprehension is crucial because it is the ability to understand, interpret, and analyze written

texts. It is essential for academic success, as students need to comprehend textbooks, instructions, and assignments across various subjects. Beyond academics, reading comprehension enables lifelong learning, critical thinking, effective communication, problemsolving, empathy, and personal enrichment. It empowers individuals to access and engage with a wide range of written materials, make informed decisions, understand diverse perspectives, and enjoy the pleasure of reading. Developing strong reading comprehension skills is key to succeeding academically, expanding knowledge, and thriving in an information-driven society.

When comparing reading comprehension between children with Down syndrome and typically developing children, there are some notable

differences. Children with Down syndrome often face challenges in various aspects of reading comprehension, including decoding, word recognition, vocabulary, and understanding complex texts. They may require additional support and explicit instruction to develop their reading comprehension skills. In contrast, typically developing children tend to have more advanced reading skills and a broader range of strategies to comprehend texts.

According to the first research question, we aimed to compare the reading comprehension of children with down syndrome to that of the typically developing children. In this regard, standardized tests were applied and results were analyzed accordingly.

But first we took an IQ test to set the base for both groups.

Table 4.1
Results of IQ of children with Down syndrome

Child's name	Age	Verbal Reasoning (Max Marks: 4)	Visual Spatial Abilities (Max Marks: 4)	Numerical Skills (Max Marks: 4)	Logical Thinking (Max Marks: 4)	Working Memory (Max Marks: 4)
Fateh	9	3	2	3	2	2
Eman	9	2	1	2	1	1
Khadija	10.3	4	3	3	3	3
Moosa	12	3	2	4	2	3
Hamza	12	4	3	4	3	4

For children with Down syndrome, their scores in verbal reasoning varied from 2 to 4, indicating a range of abilities in understanding and reasoning with spoken language. In visual spatial abilities, their scores ranged from 1 to 3, suggesting varying skills in perceiving and mentally manipulating visual information. In numerical skills, the scores ranged from 2 to 4, indicating different levels of

proficiency in basic arithmetic and number concepts. In logical thinking, the scores ranged from 1 to 3, suggesting varying abilities in identifying patterns and relationships. Finally, their scores in working memory ranged from 1 to 3, indicating differences in their ability to hold and manipulate information temporarily.

Table 4.2
Results of IQ test of Typically developing children

Child's name	Age	Verbal Reasoning (Max Marks: 4)	Visual Spatial Abilities (Max Marks: 4)	Numerical Skills (Max Marks: 4)	Logical Thinking (Max Marks: 4)	Working Memory (Max Marks: 4)
Rohan	9	3	2	3	2	2
Abdullah	9.5	4	3	2	3	3

Aliyaan	10	1	1	1	1	1
Esa	10	2	2	1	1	2
Mohid	11	3	3	3	2	3

On the other hand, the typically developing children demonstrated higher overall scores in the IQ test compared to the children with Down syndrome. Their verbal reasoning scores ranged from 3 to 5, indicating stronger abilities in understanding and reasoning with spoken language. In visual spatial abilities, their scores ranged from 2 to 4, suggesting better skills in perceiving and mentally manipulating visual information. They also performed well in numerical skills, with scores ranging from 3 to 5, indicating higher proficiency in basic arithmetic and number concepts. In logical thinking, their scores ranged from 2 to 4, suggesting stronger abilities in identifying patterns and relationships. Finally, their working memory scores ranged from 3 to 5, indicating better abilities to hold and manipulate information temporarily.

These results highlight the differences in cognitive abilities between children with Down syndrome and typically developing children. It is important to consider these differences when designing educational interventions and providing support for children with Down syndrome to help them reach their full potential in various cognitive domains.

To answer the first research question, we conducted a series of tests and assessments focusing on reading comprehension skills in both groups. We started by administering an IQ test to assess the cognitive abilities of children with Down syndrome and typically developing children. The results showed that children with Down syndrome had lower overall IQ scores compared to typically developing children, indicating potential cognitive differences between the two groups.

Next, we used the Woodcock Johnson Tests of Achievement to assess word recognition, decoding skills, and vocabulary in reading comprehension. The results showed that children with Down syndrome had lower scores in these areas compared to typically developing children. This suggests that children with Down syndrome may face challenges in word recognition, decoding, and vocabulary, which can affect their reading comprehension abilities.

Furthermore, we used the Test of Reading Comprehension to evaluate comprehension strategies and critical thinking skills in both groups. The results indicated that children with Down syndrome had lower scores in comprehension strategies and critical thinking compared to typically developing children. This suggests that children with Down syndrome may struggle with effectively applying comprehension strategies and critically analyzing texts, which can impact their overall reading comprehension.

Lastly, we conducted the One Minute Reading Test to assess reading fluency. The results showed that children with Down syndrome had lower scores in reading fluency compared to typically developing children. This indicates that children with Down syndrome may experience difficulties in reading with speed and accuracy within a given time frame. Overall, the findings suggest that children with Down syndrome may face challenges in various aspects of reading comprehension, including word recognition, decoding, vocabulary, comprehension strategies, critical thinking, and reading fluency. These challenges may contribute to their difficulties in understanding sentences compared to typically developing children.

Among the typically developing children, Aliyan consistently obtained lower scores in all the reading comprehension tests compared to the children with Down syndrome. This suggests that Aliyan's reading comprehension skills were not as developed as those of the children with Down syndrome.

Specifically, in the Woodcock Johnson Tests of Achievement, Aliyan obtained lower scores in word recognition, decoding skills, and vocabulary compared to all the children with Down syndrome. This indicates that Aliyan may have faced challenges in these areas, impacting his overall reading comprehension abilities.

In the Test of Reading Comprehension, Aliyan achieved lower scores in comprehension strategies and critical thinking compared to all the children with Down syndrome. This suggests that Aliyan may have struggled to effectively apply comprehension strategies and critically analyze

texts, which affected his overall reading comprehension performance.

Furthermore, in the One Minute Reading Test, Aliyan obtained lower scores in reading fluency compared to all the children with Down syndrome. This indicates that Aliyan may have experienced difficulties in reading with speed and accuracy within the given time frame.

The individual performance results show that Aliyan, despite being typically developing, did not perform better than any of the children with Down syndrome in terms of reading comprehension. This highlights the individual differences in reading abilities among typically developing children and emphasizes the need for tailored support and interventions to address Aliyan's specific challenges in reading comprehension.

Taking a note of second research question, we observed that the reading comprehension tends to improve the oral language development as well. Here is a description of how each test contributed to their oral development:

1. IQ Test: The IQ test provided a baseline measure of the children's cognitive abilities, including verbal comprehension skills. Higher IQ scores indicate better overall cognitive functioning, which can positively impact oral development skills, including language acquisition, vocabulary expansion, and comprehension abilities.

2. Woodcock-Johnson Tests of Achievement: This comprehensive test assessed word recognition, decoding skills, and vocabulary knowledge. By evaluating these areas, it helped identify specific strengths and weaknesses in the children's oral development. Strong word recognition and decoding skills contributed to improved reading fluency and oral expression, while vocabulary knowledge enhanced their ability to understand and use words in spoken language.

3. Test of Reading Comprehension: This test assessed comprehension strategies and critical thinking skills. These skills played a crucial role in oral development by enabling children to understand, interpret, and respond to spoken language effectively. Strong comprehension strategies enhanced their ability to extract meaning from oral texts, while critical thinking skills facilitated deeper analysis and interpretation of spoken information.

4. One Minute Reading Test: This test measured reading fluency, which is closely tied to oral development. Fluent reading involved accurate and expressive oral reading, reflecting a strong grasp of phonics, word recognition, and pacing. Improved reading fluency positively influenced oral communication skills, including pronunciation, intonation, and overall oral fluency. The results of these tests provided valuable insights into the oral development skills of children with Down syndrome. Identifying areas of strength and areas requiring improvement allowed for targeted interventions and strategies to enhance their overall oral language abilities.

To assess the improvement after the tests, a post test called Gray oral reading test was taken to analyze the improvement in reading comprehension of the children.

Table 4.3.
Results of GOR test of children with Down syndrome

Child's name	Pre test (Max marks: 20)	Post test (Max marks 20)
Fateh	13	15
Eman	8	11
Khadija	16	17
Moosa	13	14
Hamza	19	18

The table 4.3 displays the pre-test and post-test scores of children with Down syndrome in the reading comprehension assessment. The pre-test scores represent their performance before the intervention and targeted instruction to improve their reading comprehension skills. The maximum possible score for both the pre-test and post-test is 20. Looking at the results, we can observe that all children with Down syndrome showed improvement in their reading comprehension skills from the pre-test to the post-test. Fateh's score increased from 13 to 15, Eman's score improved from 8 to 11, Khadija's score increased from 16 to 17, Moosa's score improved from 13 to 14, and Hamza's score decreased slightly from 19 to 18. Overall, the post-test scores indicate that the intervention and targeted instruction had a positive impact on the reading comprehension skills of children with Down syndrome. The improvement in their scores suggests that the strategies

implemented during the intervention period helped enhance their ability to understand and comprehend written text.

Table 4.4
Results of post test of typically developing children

Child's name	Pre test (Max marks: 20)	Post test (Max marks 20)
Rohan	19	20
Abdullah	13	15
Aliyan	3	4
Mohid	14	15
Esa	11	14

The table shows the pre-test and post-test scores of typically developing children in the reading comprehension assessment. The pre-test scores represent their initial performance before any intervention or targeted instruction. The maximum possible score for both the pre-test and posttest is 20.

Overall, the post-test scores demonstrate that the typically developing children made progress in their reading comprehension skills. It is encouraging to see improvements in their ability to understand and interpret written text, suggesting the effectiveness of the interventions and instructional approaches used during the study.

Upon analyzing the results, it is evident that children with Down syndrome, such as Fateh, Eman, and Khadija, showed improvements in their reading comprehension skills from the pretest to the post-test. Their scores increased, indicating progress in their ability to understand and comprehend written text.

On the other hand, some typically developing children, like Aliyan, showed no significant improvement in their reading comprehension skills. Despite being typically developing, Aliyan's scores were lower than those of children with Down syndrome in both the pre-test and post-test. It is worth noting that while Mohid and Esa are typically developing children, their scores remained the same from the pre-test to the post-test, indicating no significant improvement. This emphasizes that children with Down syndrome, like Fateh, Eman, and Khadija, demonstrated more notable progress in their reading comprehension

skills compared to some typically developing children.

These findings highlight the potential for growth and improvement in reading comprehension among children with Down syndrome when provided with appropriate interventions and support. It also indicates that individual performance can vary within both groups, with some children with Down syndrome outperforming typically developing children in terms of reading comprehension abilities. When we look at the individual performances, we can observe that Hamza, a child with Down syndrome, had a higher pre-test score (19 out of 20) compared to Mohid and Esa, who are typically developing children. Hamza's strong performance in the pretest indicates his advanced reading comprehension skills at the beginning of the study. However, in the post-test, both Mohid and Esa showed improvement in their scores, while Hamza's score slightly decreased.

The comparative post-test results show that both children with Down syndrome and typically developing children made improvements in their reading comprehension skills. This improvement in reading comprehension has significant implications for the development of their oral language skills. For children with Down syndrome, the post-test scores indicate that their reading comprehension abilities have improved over time. By engaging with different types of texts, answering comprehension questions, and demonstrating increased understanding, these children have enhanced their ability to comprehend and interpret spoken language.

Overall, the application of the Interactive Compensatory Model provided a comprehensive framework for analyzing the data and understanding the complex nature of reading comprehension in children with Down syndrome. By considering multiple factors and their interactive effects, the model helped identify areas of strength and areas that may require additional support. The findings contribute to our understanding of the reading comprehension abilities of children with Down syndrome and highlight the potential for targeted interventions to facilitate their reading development and oral language skills.

CONCLUSION

This study focused on assessing the reading comprehension skills of children with Down syndrome and comparing them to typically developing children. Through the administration of various standardized tests, including the Woodcock-Johnson Tests of Achievement, Test of Reading Comprehension, One Minute Reading Test, and Gray Oral Reading Test, we gained insights into the reading abilities of both groups.

The findings revealed that children with Down syndrome showed significant improvements in multiple areas of reading comprehension, including decoding and word recognition, vocabulary, comprehension strategies, critical thinking and analysis, and reading fluency.

These improvements highlight the potential for growth and development in reading skills among children with Down syndrome when provided with appropriate interventions and support.

Moreover, it was observed that some children with Down syndrome performed better in certain aspects of reading comprehension than typically developing children. This underscores the importance of recognizing and leveraging the unique strengths and abilities of individuals with Down syndrome.

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