

The effect of cartoon-adapted reading texts on the reading fluency of a student with autism spectrum disorder and learning disability¹

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Received: 01 July 2025 | **Revised:** 06 September 2026 | **Accepted:** 06 September 2026

ABSTRACT

Students with co-occurring autism spectrum disorder and dyslexia may experience reading-fluency difficulties associated with their individual diagnostic and reading profiles. Although interest-based materials may support students' attention and engagement in the reading process, their potential contribution should be evaluated in combination with structured reading instruction. This study examined changes in the reading accuracy, reading errors, and oral reading time of a 12-year-old sixth-grade student with co-occurring diagnoses of autism spectrum disorder and dyslexia. The study was conducted using an ABAB model, one of the single-subject experimental designs. Non-adapted reading texts were used during the A1 and A2 phases, whereas texts adapted using the student's preferred cartoon characters were implemented during the B1 and B2 phases. Guided and repeated reading were used throughout all phases. Data were collected during each session by recording the student's reading time and reading errors using Akyol's (2010) Error Analysis Inventory and were evaluated through graphical analysis. Across the ABAB process, the number of words read correctly increased, while reading errors and oral reading time decreased. The student's reading performance progressed from the frustration level at baseline to the independent reading level by the end of the study. However, the gains were maintained during the A2 phase, when the adapted texts were withdrawn, and the student's performance did not return toward baseline. Therefore, the observed improvements cannot be attributed exclusively to the cartoon-adapted texts. The findings provide preliminary, participant-specific evidence that interest-based text adaptation, when combined with guided and repeated reading, may support the reading development of a student with co-occurring autism spectrum disorder and dyslexia. Future research should employ designs that demonstrate stronger experimental control, include participants with diverse profiles, and incorporate follow-up assessments.

KEYWORDS: Autism spectrum disorder; Dyslexia; Reading fluency; Interest-based texts; Single-subject research

DOI: <https://doi.org/10.29329/pedper.2026.127> | Vol. 5, No. 2 (2026) | pp. 352-366

¹ A preliminary version of this study was presented as an oral presentation at the International Symposium on Research in Inclusive Education (ISRIS) held online on May 30–31, 2025.

1. Introduction

Reading is a complex meaning-making process that requires the combined use of visual perception, cognitive processing, comprehension, establishing connections, critical evaluation, and mental construction of meaning (Güneş, 2007). As one of the primary means of accessing information, generating new knowledge, and applying acquired knowledge across different fields, reading plays a central role in the learning process (Kardaş & Tunagür, 2020). Reading skills acquired during the early years of schooling can influence an individual's academic, social, and personal development throughout different stages of life. Individuals with well-developed reading skills are better positioned to benefit from educational experiences and participate actively in social life. In this respect, acquiring effective reading skills is considered one of the fundamental steps toward achieving academic, social, and personal success (Yıldız, 2013).

In today's rapidly developing and constantly changing world shaped by the information age, reading is one of the primary means through which individuals access new knowledge and follow current developments. Reading is a meaning-making process conducted with a specific purpose and method that involves the use of prior knowledge and interaction between the author and the reader (Akyol, 2011). However, sustained engagement in reading depends not only on reading ability but also on the individual's experience of and enjoyment derived from the reading process. The development of a reading habit is closely associated with the pleasure derived from the texts being read (Aytan, 2015). Individuals who enjoy reading are more likely to sustain their engagement in reading, establish stronger connections with texts, and use what they read to make sense of their life experiences (Sirem, 2020).

For reading to be effective and reach the desired level, there must be coherence between the message the writer intends to convey and the meaning constructed by the reader. Misreading or incomplete reading can disrupt this coherence and lead to a loss of the intended meaning. Persistent difficulties in accurate or fluent word recognition, decoding, and spelling are characteristic of dyslexia, which is classified as a specific learning disorder with impairment in reading (American Psychiatric Association, 2022). These difficulties may be reflected in letter, syllable, or word omissions; substitutions; reversals; repetitions; and slow or effortful reading, all of which can adversely affect reading fluency (Altun et al., 2011).

Autism spectrum disorder and dyslexia are distinct neurodevelopmental conditions that may co-occur. Reading performance among students with ASD is heterogeneous: some students demonstrate age-appropriate or advanced word-reading skills, whereas others experience difficulties in word recognition, phonological decoding, fluency, and/or comprehension (Brimo et al., 2021; Vale et al., 2022). Therefore, reading difficulties in a student with ASD should not automatically be attributed to autism; instead, both the student's diagnosed condition and observed reading profile should guide interpretation. Recent evidence further indicates that decoding and fluency make distinct contributions to reading performance in children with ASD, underscoring the importance of clearly identifying the specific reading component targeted by an intervention (Peristeri et al., 2024).

The participant in the present study had co-occurring diagnoses of ASD and dyslexia. ASD constituted the primary context of his educational placement because he attended a special education classroom for students with mild autism, whereas the slow oral reading, word-level inaccuracies, and decoding errors targeted by the intervention were interpreted primarily in relation to his diagnosed dyslexia. ASD was relevant to the design of the intervention because the student's individual interests and motivation informed the use of familiar cartoon characters in the reading texts. Accordingly, the

study does not characterize either diagnosis as globally dominant; rather, it differentiates their functional relevance to the outcomes measured in the study. Because written expression was not assessed, no conclusion was drawn regarding the source or nature of any writing difficulties.

The inability to read fluently slows down reading speed and can adversely affect reading comprehension. According to Aşıkcan (2019), fluent reading of a text contributes to making reading an automatic process; once this automatization is achieved, the individual can devote less time to decoding words and focus more on understanding the text. In this context, reading fluency is understood to be directly related to reading comprehension. Fluent reading enables the reader to comprehend the text as a whole, rather than in fragmented parts, by ensuring a certain reading speed (Ülper, 2010). A study conducted by Powell (2008) involving 2,437 third-grade primary school students found that students with high reading fluency also demonstrated strong comprehension skills.

There are many techniques in literature aimed at improving reading fluency. The most commonly used techniques include repeated reading, guided reading, echo reading, readers' theater, choral reading, word repetition, immediate feedback, interest-based reading, and using poetry. In this study, repeated reading technique will be used.

According to Yılmaz (2006), repeated reading is "the practice of reading texts several times until they are read fluently." In this technique, students with reading difficulties work under the guidance of an adult by reading texts repeatedly, arranged according to difficulty level. Frey and Fisher (2018) emphasize that during repeated reading, short texts of 50 to 200 words should be read silently or aloud multiple times until the student reaches a sufficient level of speed and accuracy. Johnson (2017) notes that the main focus of the repeated reading method is on correctly reading as many words as possible rather than on comprehension. He also recommends timing the readings and recording the number of correctly read words during each session.

The effects of repeated reading on reading accuracy, reading rate, and fluency have been examined in various studies involving students with and without reading difficulties. Bryant et al. (2000) conducted a four-month study with 60 middle school students, including 14 students with reading difficulties, 17 students with strong reading performance, and 29 students with moderate reading performance. At the end of a combined instructional program incorporating repeated reading, collaborative strategic reading, and word-recognition techniques, most students demonstrated improvements in oral reading fluency and reading accuracy. However, some students with particularly low initial reading levels showed limited progress, indicating that students may respond differently to the same intervention.

Studies conducted in Türkiye have also examined the effects of repeated reading on students experiencing reading difficulties. Yılmaz (2006) implemented a total of 48 hours of repeated reading instruction, delivered for four hours per week, with four third-grade students experiencing reading difficulties and found that their reading levels progressed from the second-grade frustration level to the third-grade instructional level. Kaman (2012) assigned students from two socioeconomically comparable third-grade classrooms to an experimental group and a control group and implemented repeated reading with the experimental group using 10 texts over a 10-week period. At the end of the intervention, students in the experimental group demonstrated significant improvements in reading level and reading comprehension compared with the control group. Similarly, Erbasan and Erbasan (2022) implemented 20 hours of repeated reading and word-repetition instruction with a second-grade student experiencing reading difficulties and reported that the student's reading level improved from the frustration level to the instructional level.

Research focusing on reading instruction for students with ASD and co-occurring learning or other neurodevelopmental difficulties remains more limited. Coulter and Sasnett (2016) conducted a case study with a child who had ASD and co-occurring neurodevelopmental characteristics, including attention-deficit/hyperactivity disorder and a specific learning disability, and reported that a comprehensive, multicomponent intervention tailored to the student's individual learning profile produced marked improvements in reading achievement. In their systematic review of 19 reading-instruction studies involving children with ASD, Bailey and Arciuli (2020) identified reported gains in phonics, reading accuracy, reading fluency, and reading comprehension; however, only a small proportion of the reviewed studies were judged to have adequate or strong methodological quality. Focusing specifically on repeated reading, Simons et al. (2022) combined repeated reading with performance-contingent rewards and error correction in an intervention involving three young children with ASD and found that this intervention package could support the development of reading fluency. Collectively, these studies highlight the importance of tailoring reading interventions to the individual learning profiles of students with ASD and co-occurring learning difficulties.

Taken together, these studies suggest that repeated reading may support reading accuracy and fluency among students with reading difficulties and students with ASD, although responsiveness to the intervention may vary according to individual characteristics. In the present study, repeated reading was combined with texts adapted using the participant's preferred cartoon characters. Thus, the fluency component of the intervention targeted the word-level reading inaccuracies and slow oral reading associated with dyslexia, whereas the inclusion of cartoon characters was treated as an individualized adaptation intended to support the student's attention, motivation, and engagement in the reading process. Given that the development of reading habits is associated with enjoyment and positive experiences during reading, adapting texts to students' interests may support their participation in reading activities (Aytan, 2015; Sirem, 2020).

Recent research has increasingly focused on the use of technology-supported and interest-based reading materials to address the individualized literacy needs of students with ASD. Incorporating familiar characters, narratives, and personally meaningful interests into instructional materials may increase students' attention, motivation, and engagement during reading activities (Aspiranti et al., 2020; Mandak et al., 2019; Reutebuch et al., 2015; Valencia et al., 2019). However, recent single-case studies have shown that the effects of embedding the restricted or preferred interests of students with ASD in reading texts on reading comprehension and vocabulary outcomes may vary according to student characteristics and the instructional context (Marshall & Myers, 2021; Solis et al., 2022). These findings suggest that interest-based adaptations may support engagement and learning for some students but may not produce the same level of benefit for every learner. Accordingly, the inclusion of the participant's preferred cartoon characters in the reading texts used in the present study was considered an individualized adaptation intended to support his attention and engagement in the reading process rather than a stand-alone method replacing evidence-based reading instruction.

The aim of this study is to examine the effect of reading texts created with cartoon characters on reading fluency. In this regard, the main research question is: How do reading texts created with cartoon characters affect a student's reading fluency?

Sub-questions include:

1. What is the effect of reading texts created with cartoon characters on the student's reading time?

2. What is the effect of reading texts created with cartoon characters on the student's reading errors?

This study is expected to contribute to supporting the reading fluency of students experiencing reading difficulties and to offer an applicable perspective for teachers and families working with these students. For teachers, the study provides a concrete example of identifying a student's interests, adapting reading texts according to those interests, using the adapted texts in combination with guided and repeated reading, and monitoring the student's progress through reading time and reading errors. This approach may help teachers differentiate reading instruction according to students' diagnostic characteristics, individual needs, and sources of motivation rather than using the same materials for all learners. For families, the approach may provide guidance for preparing short, structured, and supportive home-reading activities based on the child's preferred cartoon characters, stories, or other interests. In this way, reading instruction provided at school may be supported consistently at home, while the child may experience reading as a positive and engaging activity rather than as a task that creates pressure. Nevertheless, because the study was conducted with a single participant, this practice should be regarded as an individualized instructional example that needs to be adapted to each student's characteristics rather than as a standardized method suitable for all learners.

2. Method

This study used a single-subject experimental research approach to examine changes in the reading fluency of a student with co-occurring diagnoses of autism spectrum disorder and dyslexia. The student's reading performance was monitored across four experimental phases based on the number of words read correctly, oral reading time, and reading errors. Non-adapted texts and texts adapted using the student's preferred cartoon characters were implemented alternately, while guided and repeated reading procedures were applied consistently throughout all phases. This approach enabled the student's performance under different text conditions to be compared through repeated measurements.

2.1. Design

The study was conducted using an ABAB reversal design, one of the single-subject experimental designs. The dependent variables were the number of words read correctly, oral reading time, and reading errors, whereas the independent variable was the type of reading text used. Non-adapted texts were used during the A phases, while texts adapted using characters and dialogues from "Rafadan Tayfa," a cartoon that the student frequently watched and enjoyed, were used during the B phases. Single-subject research designs are frequently preferred in special education research, particularly when it is difficult to form a sample group or when individual differences make it challenging to measure the effect of an intervention consistently across multiple students (Büyükoztürk et al., 2013; Johnson & Christensen, 2014). The ABAB design enabled the student's reading performance to be monitored repeatedly across phases involving non-adapted and adapted texts.

To determine the topics of the texts, the participant was informed that reading materials would be prepared specifically for him. Questions such as "Hayri will be in the text. What should Hayri do today?" (Hayri: The main character) were asked, and texts were created based on the participant's responses. In order to create the texts efficiently, the researchers prepared a prompt and submitted it to ChatGPT. The AI-generated texts, produced according to the specified word count, topic, and content, were reviewed by the researchers and pedagogically edited where necessary. Additionally,

an image of a scene from the cartoon was added at the beginning of each text. The implementation phase of the study was planned to last for two hours per week over a total of ten weeks.

Figure 1 Sample reading texts



A1: The baseline phase in which data were collected using non-adapted texts.

B1: The intervention phase in which texts featuring cartoon characters were used.

A2: The withdrawal phase in which non-adapted texts were reintroduced.

B2: The reintroduction phase in which texts featuring cartoon characters were used again.

The guided reading technique was used in all phases. First, the texts were read aloud to the student. Then, the practitioner and the student read the texts together. Finally, the student was instructed to read the texts independently, during which his reading time and reading errors were recorded.

2.2. Participants and procedure

The participant, Deniz (a pseudonym), was a 12-year-old sixth-grade student with co-occurring diagnoses of autism spectrum disorder and dyslexia. Deniz attended a special education classroom for students with mild autism at the same school where one of the researchers worked. Therefore, ASD constituted the primary context of his educational placement, whereas the word-level reading inaccuracies, decoding errors, and slow oral reading performance targeted in this study were interpreted in relation to his diagnosed dyslexia. Because written expression was not assessed within the scope of the study, no conclusion was drawn regarding the source or nature of any possible writing difficulties. Deniz enjoyed watching cartoons and frequently imitated the gestures, facial expressions, and dialogues of the cartoon characters he watched. Among the two teachers in his classroom, he referred to the teacher whom he considered a friend as "my friend," while addressing the other teacher by name. His strong interest in cartoon characters was considered when individualizing the intervention materials, and reading texts were prepared using characters and dialogues from his preferred cartoons to support his attention and engagement in the reading process.

2.3. Measures

Due to his diagnosis of dyslexia, Deniz frequently makes reading errors. In order to determine Deniz's level of word comprehension in reading texts and his performance related to word errors, the "Error

Analysis Inventory,” adapted into Turkish by Akyol (2010), was used. The inventory includes various types of errors such as omissions, additions, words provided by the teacher, repetitions, misreadings, and reversals—all classified as error types. These errors were recorded on a chart prepared by the researchers while Deniz was reading independently.

2.4. Data analysis

For each text that Deniz read independently, the Error Analysis Inventory was used to record his reading time, word errors, and types of errors. The percentage and level corresponding to the number of errors were calculated according to the guideline for determining word comprehension levels and percentages, adapted by Akyol (2010) from Ekwall and Shanker, and the results were presented under the findings section.

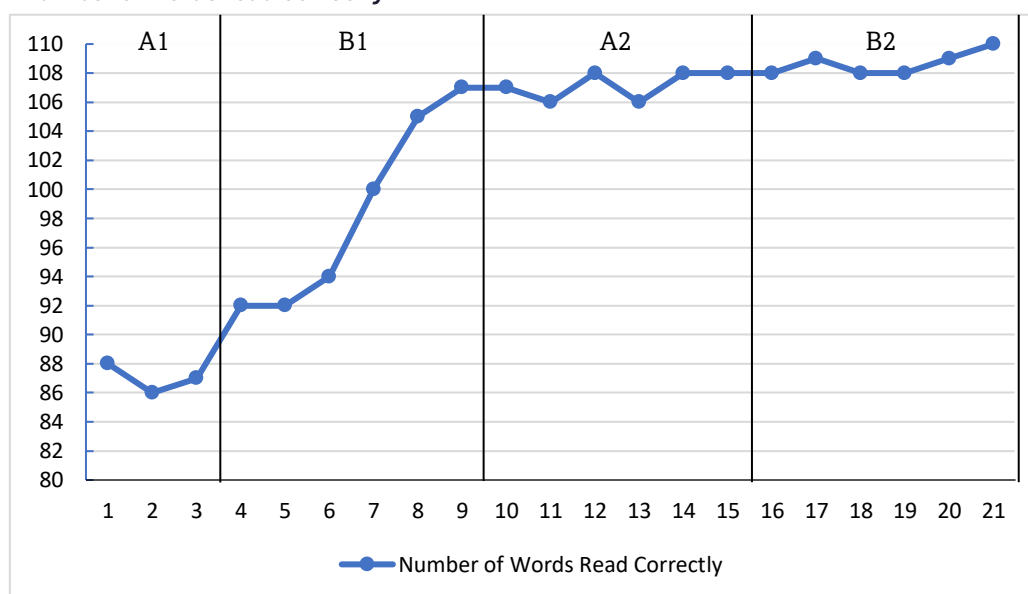
2.5. Validity, reliability, and ethical considerations

To ensure the internal validity of the study, the ABAB model—one of the single-subject experimental designs—was preferred. The A2 and B2 phases were implemented to determine whether the texts featuring cartoon characters were effective during the instructional process. Since the study was conducted at the school where one of the researchers works and allowed for direct interaction with the student, ethical committee approval was not deemed necessary for this study.

3. Findings

In this study, changes in the number of words the student read correctly in 110-word texts and in his oral reading time were monitored across four phases using an ABAB design. The A1 phase represented the baseline, the B1 and B2 phases represented the intervention phases in which adapted texts featuring cartoon characters were used, and the A2 phase represented the withdrawal phase in which non-adapted texts were reintroduced. The number of words the student read correctly in each phase is presented in Figure 2.

Figure 2 Number of words read correctly

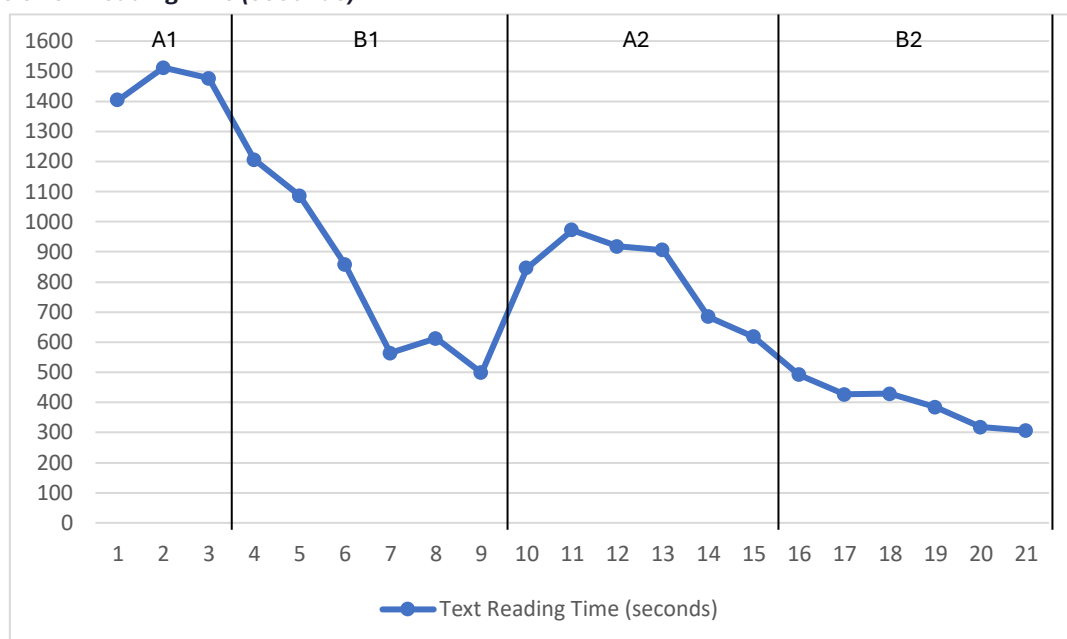


As shown in Figure 2, the number of words read correctly during the A1 phase was measured as 88, 86, and 87, respectively. Upon transitioning to the B1 phase, an increase in the number of correctly read words was observed, with values ranging from 92 to 107. This higher level of performance continued during the A2 phase, with values ranging from 106 to 108. Finally, during the B2 phase, the

student correctly read between 108 and 110 words. This pattern shows that the student's accurate reading performance increased after the transition to B1 and remained high during the A2 and B2 phases. However, because the improvement was maintained during A2, when the adapted texts were withdrawn, this pattern does not demonstrate that the observed change resulted exclusively from the adapted texts.

The student's reading time (in seconds) for the texts during all phases of the study is presented in Figure 3.

Figure 3 Text reading time (seconds)



As shown in Figure 3, considerably longer reading times were recorded during the A1 phase, ranging from 1404 to 1512 seconds. During the B1 phase, reading time decreased markedly, with values ranging from 564 to 1206 seconds. Although some fluctuations occurred across the subsequent phases, reading time generally continued to decrease over time. During the B2 phase, the student completed the texts in as little as 306 seconds. This pattern indicates an overall reduction in the student's reading time across the study process. The reading errors made by the student in the texts throughout all phases of the study are presented in Table 1.

Table 1 *Reading errors by phase*

Phases	Number of Sessions	Error Types					<i>f</i>
		Omissions	Skipped Words	Repetitions	Misreadings	Reversals	
A1	1	2	1	4	3	12	22
	2	3	2	6	3	10	24
	3	1	1	5	4	12	23
B1	1	2	1	4	2	9	18
	2	2	2	3	3	8	18
	3	1	2	2	3	8	16
	4	1	1	1	1	6	10
	5	–	–	1	1	3	5
	6	–	–	–	1	2	3
A2	1	–	–	–	1	2	3
	2	–	–	–	2	2	4
	3	–	–	–	1	1	2
	4	–	–	–	3	1	4
	5	–	–	–	1	1	2
	6	–	–	1	1	–	2
B2	1	–	–	–	2	–	2
	2	–	–	–	1	–	1
	3	–	–	–	1	1	2
	4	–	–	–	1	1	2
	5	–	–	–	1	–	1
	6	–	–	–	–	–	0

In the study, both the types and frequency of reading errors showed a marked improvement from phase A1 to B2. According to the Error Analysis Inventory adapted into Turkish by Akyol (2010), the high number of errors and the anxiety-level performance observed in the A1 phase gave way to a decrease in errors and an increase in reading accuracy beginning with the B1 phase. Notably, by the end of the B1 phase—where adapted texts were used for the first time—the student reached the instructional and independent reading levels.

These gains were maintained even during the A2 phase, where non-adapted texts were reintroduced; the number of errors further decreased compared to B1, and the accuracy rate remained high. Finally, in the B2 phase (with cartoon-character adapted texts reintroduced), the student's reading became almost error-free. The 98–100% accuracy rate reached in this phase indicates that the student achieved a fully independent reading level.

Overall, the findings show that the student's reading accuracy increased and reading errors across all categories decreased over the course of the study. According to the criteria of the Error Analysis Inventory, the student's reading performance progressed from the frustration level at baseline to the independent reading level by the end of the study. However, because the gains were maintained during the A2 phase, when the adapted texts were withdrawn, the observed improvements cannot be attributed exclusively to the cartoon-adapted texts. These results reflect changes in the student's performance across the overall instructional process and should not be interpreted as conclusive evidence of the isolated effect of the adapted texts.

4. Discussion

In this study, the relationship between reading texts adapted with cartoon characters and the reading performance of a student with co-occurring diagnoses of ASD and dyslexia was examined. The findings showed that the number of words read correctly increased, reading errors decreased, and the time required to complete the texts became shorter across the intervention process. According to the Error Analysis Inventory adapted into Turkish by Akyol (2010), the student's reading performance progressed from the frustration level at baseline to the independent reading level by the end of the study. In particular, the student was observed to complete the texts in less time and with fewer errors during the phases in which texts featuring cartoon characters were used. This pattern suggests that interest-based adapted texts used in conjunction with guided and repeated reading may have supported the development of the student's reading fluency.

The findings are generally consistent with those of previous repeated-reading studies involving students with reading difficulties. Yılmaz (2006) found that repeated reading reduced reading errors and improved the reading levels of four third-grade students experiencing reading difficulties. Kaman (2012), in a study conducted with students from two socioeconomically comparable third-grade classrooms, reported that students in the experimental group who participated in a 10-week repeated-reading intervention demonstrated significant improvements in their reading levels and reading comprehension compared with the control group. Erbasan and Erbasan (2022) similarly found that a repeated-reading and word-repetition intervention implemented with a second-grade student experiencing reading difficulties improved the student's reading level from the frustration level to the instructional level. In the present study, the reduction in reading errors and reading time alongside repeated-reading practice is consistent with these findings regarding the potential contribution of regular and structured reading practice to fluency development.

Studies in the international literature also indicate that structured and individualized reading interventions may support the reading skills of students with ASD and students experiencing reading difficulties. Bryant et al. (2000) reported improvements in oral reading fluency and accuracy for most students following a four-month program that combined repeated reading, collaborative strategic reading, and word-recognition techniques; however, some students with particularly low initial reading levels demonstrated more limited progress. In a study involving three young children with ASD, Simons et al. (2022) found that an intervention combining repeated reading with performance-contingent rewards and error correction could support reading fluency. A systematic review conducted by Bailey and Arciuli (2020) also found that reading interventions for children with ASD could produce gains in phonics, reading accuracy, fluency, and reading comprehension; however, the authors emphasized that the methodological quality of the existing studies varied and that the findings should be interpreted cautiously. These findings indicate that the improvements observed in the present study are consistent with structured reading interventions involving repeated practice, while also demonstrating that students may differ in their responsiveness to such interventions.

An important characteristic distinguishing the present study from much of the previous research is that the participant had co-occurring diagnoses of ASD and dyslexia. Coulter and Sasnett (2016), in a case study involving a child with ASD and co-occurring neurodevelopmental characteristics, including attention-deficit/hyperactivity disorder and a specific learning disability, reported that a multicomponent intervention tailored to the student's individual learning profile produced marked gains in reading achievement. Similarly, recent literature indicates that the co-occurrence of dyslexia and other neurodevelopmental conditions is not exceptional and that interventions should be planned according to the learner's behavioral, cognitive, and academic profile rather than a single diagnostic label (Brimo et al., 2021; Vale et al., 2022). Accordingly, the slow oral reading, word-level inaccuracies, and decoding difficulties observed in the present study were interpreted primarily in relation to the participant's diagnosed dyslexia, whereas ASD was considered relevant to the use of his individual interests and motivational characteristics in designing the intervention. Thus, the findings were interpreted by considering the different functional relevance of both diagnoses within the student's individual learning profile rather than attributing the reading difficulties exclusively to either ASD or dyslexia.

The inclusion of cartoon characters in the reading texts was based on incorporating the student's individual interests into instruction. Mandak et al. (2019) reported that digital books incorporating dynamic text and speech features could improve target-word reading in preschool children with ASD. However, findings from recent studies in which the preferred or restricted interests of students with ASD were embedded in reading texts have not been entirely consistent. Marshall and Myers (2021) reported limited and variable effects of embedding interests in texts on the reading comprehension performance of two participants. Solis et al. (2022) similarly found that interest-based texts supported vocabulary and reading comprehension outcomes for some students, although the effects varied according to student characteristics and the instructional context. Therefore, the improvements observed in the present study should not be attributed solely to the use of cartoon characters. The findings may reflect the combined influence of interest-based adapted texts, guided reading, repeated reading, practitioner support, and the experience gained by the student throughout the intervention.

The pattern of change across phases should also be considered when interpreting the findings obtained from the ABAB design. Improvements in the student's performance continued during the A2 phase, in which non-adapted texts were reintroduced after the B1 phase involving cartoon-adapted texts. The maintenance of gains during the A2 phase may be regarded as educationally positive because it suggests that the improvement transferred to different texts. However, the absence of a return toward baseline performance during A2 makes it difficult to establish a conclusive functional relationship showing that the observed improvements resulted exclusively from the cartoon-adapted texts. Practice effects associated with repeated implementation, learning carried over from previous phases, guided reading, and the student's increasing reading experience over time may also have contributed to the findings. Therefore, the results should be interpreted as preliminary evidence concerning the use of individualized materials alongside structured reading instruction rather than as conclusive evidence of the isolated effect of cartoon-adapted texts.

Reading rate and accuracy are among the principal components of reading fluency. Frey and Fisher (2018) recommend that students read short texts multiple times until they achieve adequate levels of both rate and accuracy during repeated-reading interventions. In the present study, each text was similarly read multiple times, and the student's reading time, number of correctly read words, and reading errors were recorded. The decrease in reading errors accompanying the reduction in reading

time indicates that the student began to read not only more quickly but also more accurately. Recent research indicates that decoding and fluency may contribute to the reading-comprehension performance of children with ASD (Peristeri et al., 2024). However, because reading comprehension was not directly measured as a dependent variable in the present study, it cannot be concluded that the improvements in reading rate and accuracy also transferred to reading comprehension.

The findings also offer several practical implications for teachers and families. Teachers may identify students' individual interests, adapt reading texts according to those interests, and use these materials in combination with structured practices such as guided and repeated reading. Regularly recording reading time, the number of words read correctly, and reading errors may help teachers monitor student progress and adjust instruction according to the resulting data. Families, in collaboration with teachers, may support school-based instruction by using short reading activities at home that incorporate the child's preferred characters and topics. Nevertheless, because students differ in their interests, diagnostic profiles, and reading needs, the practice used in this study should not be assumed to be equally effective for all learners. Instruction should be planned according to each student's assessment results and individual response to the intervention.

4.1. Limitations and future directions

This study has several limitations. First, because it was conducted with a single participant, its findings cannot be generalized to all students with ASD, dyslexia, or co-occurring ASD and dyslexia. The participant's individual diagnostic profile, educational placement, prior reading experiences, and interest in cartoon characters may all have influenced his response to the intervention. Second, although an ABAB design was used, the participant's performance did not return toward baseline during the A2 phase. Consequently, a conclusive functional relationship between the use of cartoon-adapted texts and the observed improvements could not be established. The gains may also have been influenced by cumulative practice, carryover effects, guided reading, and repeated exposure to the texts. Third, the intervention lasted 10 weeks and included only one type of interest-based adaptation. Moreover, the study focused on oral reading time and reading errors; reading comprehension and writing performance were not measured. Therefore, the findings should be interpreted as preliminary, participant-specific evidence rather than proof that cartoon-adapted texts are effective for all learners with similar diagnoses.

Future research should employ replicated single-subject designs or group-based experimental studies involving participants with diverse diagnostic and reading profiles. Studies could compare cartoon-adapted texts with other interest-based and non-adapted materials across different text types, such as stories, poems, fairy tales, and informational texts. Future investigations should also include direct measures of reading comprehension, motivation, and the maintenance and generalization of acquired skills, as well as follow-up assessments conducted after the intervention. These steps would help clarify which components of the intervention are effective, for whom they are effective, and whether the gains persist over time.

4.2. Conclusion

This study found that the participant's reading accuracy increased and oral reading time decreased across the ABAB process, in which guided and repeated reading was implemented while alternating between non-adapted texts and texts adapted using preferred cartoon characters. According to Akyol's (2010) Error Analysis Inventory, the participant's reading performance progressed from the frustration level at baseline to the independent reading level by the end of the study. Noticeable decreases were observed particularly in reversals, repetitions, and misreadings. However, the gains

were maintained during the A2 phase, and the participant's performance did not return toward baseline after the withdrawal of the cartoon-adapted texts. Therefore, the observed improvements cannot be attributed exclusively to the cartoon-adapted materials. The findings provide preliminary, participant-specific evidence that combining interest-based text adaptation with structured reading instruction may support the reading development of a student with co-occurring ASD and dyslexia.

Overall, the results suggest that repeated practice, guided support, and individualized materials may contribute to the development of reading fluency. Teachers may use students' preferred interests to increase engagement while continuing to provide explicit, evidence-based instruction targeting reading accuracy, decoding, and fluency. Families may reinforce school-based instruction through brief and supportive home-reading activities developed in collaboration with teachers. Nevertheless, further research involving designs that demonstrate experimental control more clearly, larger and more diverse participant groups, direct measures of reading comprehension, and follow-up assessments is needed before the effectiveness of cartoon-adapted texts can be generalized.

5. Declarations

5.1. Conflict of interest

The authors declare that there is no conflict of interest regarding this study.

5.2. Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

5.3. Author contributions (CRediT)

All researchers involved in this study contributed equally to every stage of the research. The development of the research idea, implementation process, data collection and analysis, evaluation of the results, and the writing of the article were carried out collaboratively.

Author 1 Berkay Ömer Ünal: Conceptualization; Implementation; Data Curation; Formal Analysis; Writing – original draft.

Author 2 Özsoy: Conceptualization; Methodology; Validation; Resources; Writing – review & editing.

5.4. Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

5.5. Ethics approval

Ethics committee approval was not required for this study, as it was conducted by the first author, a teacher, within their own classroom setting with their student. To ensure confidentiality, the participant's real name and school information have been omitted from the manuscript.

5.6. Use of artificial intelligence (AI) tools

ChatGPT was utilized in the preparation of the reading texts used during the implementation and data collection process of this study. Prior to implementation, the generated reading texts were pedagogically evaluated and refined by the authors.

5.7. Acknowledgements

We sincerely thank the student Deniz, who contributed to the realization of this study, as well as the teachers working at the school where the study was conducted. Their understanding and cooperation throughout the process played a significant role in the success of this study.

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