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The Relationship Between Rapid Automatized Naming and Reading Skills Across Learner Groups

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Reading difficulties represent a significant challenge in early primary education, particularly among students with special education needs. Although Rapid Automatized Naming (RAN) has been widely studied as a predictor of reading skills, comparative evidence across heterogeneous learner groups remains limited. The aim of this study is to compare the naming performance of typically developing students and students with special needs using the Rapid Automatized Naming (RAN) test and to provide evidence regarding the psychometric properties of RAN. Employing a correlational survey model, one of the quantitative research methods, the study examined the naming times of RAN subtests (color, number, letter, object) and the relationship between these performances and reading speed. The study group consisted of 50 typically developing students and 47 students with special education needs enrolled in Grades 2 to 4 of primary school. Accordingly, RAN cards comprising four subtests color, number, letter, and object were utilized, and these cards were prepared by the researchers in consideration of the children's age and developmental characteristics. Data collection was conducted individually in a quiet environment, and internal reliability was reinforced by introducing the visual stimuli before administering the test. Data were analyzed using descriptive statistics and Pearson correlation analysis in SPSS 27. The Cronbach's alpha coefficient of the RAN subtests was found to be .94, indicating high internal consistency. The findings revealed that students with special education needs demonstrated significantly slower naming performance across all RAN subtests and that RAN completion times were strongly associated with reading speed (r values ranging from .72 to .92, $p<.05$). The findings suggest that RAN can serve as an effective screening tool for the early identification of reading difficulties and may support the development of targeted intervention and instructional strategies.

Keywords: students with special education needs, typically developing students, Rapid Automatic Naming Test (RAN), reading skills

INTRODUCTION

Reading development is a complex process that plays a fundamental role in students' academic success, particularly in the early years of primary education. The acquisition of fluent reading skills requires the integration of visual recognition, phonological processing, and cognitive coordination processes. Reading, recognized as one of the keys 21st-century competencies, represents a fundamental domain of learning that students rely on throughout their educational trajectories. The education system positions the development of effective reading skills particularly from the onset of primary schooling as a central objective (Demirtaş, 2022). In alignment with this goal, the 2024 Türkiye Century Education Model Primary School Turkish Curriculum aims to ensure that students

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acquire initial literacy skills, cultivate positive attitudes toward reading and writing, and develop proficiency in the four foundational language skills (MoNE, 2024). Consequently, reading is conceptualized both as a primary tool for learning and as an indispensable component of the broader educational process (Alyılmaz vd., 2018).

Reading is a complex cognitive activity that involves the visual perception of written symbols, their mental processing, and the construction of meaning (Balcı, 2016; Schroeder vd., 2015).This process, which requires the simultaneous interaction of visual, linguistic, cognitive, and psychological components, has a multidimensional structure extending from the sensory intake of the text to its mental interpretation (Karatay, 2018; Kaya & Kardaş, 2020; Şeker & Çetin, 2022). For children to acquire reading skills, it is essential that they reach a certain level of developmental maturity and readiness (H. Akyol & Tuncay Avşar, 2021).

Reading skills can develop gradually, and this basic skill, which is aimed to be acquired in primary school, can play a decisive role in all stages of the educational process (Uğurelli & Orhun, 2023). It is frequently emphasized in the literature that the academic, social and linguistic development of children with developing reading skills is also positively affected; in particular, reading fluency and reading comprehension skills are related to academic success (Kanık Uysal & Duman, 2020; White & Vallejo Peña, 2025).

Fluent reading refers to the uninterrupted reading of a text with appropriate speed, intonation, and stress (M. Akyol & Baştuğ, 2015). Reading fluency also encompasses the predictive effects of word recognition, vocabulary knowledge, and cognitive processing speed on reading comprehension (Muijselaar vd., 2017). Reading comprehension, on the other hand, is a fundamental process based on the effective interaction between the eyes and the mind, fostering children's abilities to interpret and analyze texts (Balcı, 2016; Orellana vd., 2024). Supporting this skill at an early stage positively influences children's academic achievement and self-perception (Güven, 2020). This process is closely related to cognitive processing speed and automaticity, which enable readers to allocate cognitive resources to higher-level comprehension processes.

From a theoretical perspective, reading fluency and comprehension are closely associated with the automaticity of lower-level cognitive processes. Contemporary models of reading development emphasize that efficient reading depends not only on linguistic knowledge but also on the rapid and automatic coordination of visual recognition, phonological access, and executive control mechanisms. In this regard, processing speed and automaticity are considered central components that enable readers to allocate cognitive resources to higher-order comprehension processes. This is directly relevant to rapid automatized naming (RAN), as naming speed tasks are considered indicators of the efficiency of these automatic cognitive processes.

However, even when children are within the same age group, they may differ in terms of developmental pace, learning styles, and individual needs. In some cases, these differences may indicate special needs, and special education support services may be required for these individuals (Arı vd., 2018; Kandır vd., 2012). In the Regulation on Special Education Services of the Ministry of National Education (2018), individuals with special needs are defined as those who exhibit significant differences from their peers in developmental and individual characteristics. Among these groups are individuals with intellectual disabilities, hearing and visual impairments, speech and language disorders, orthopedic impairments, multiple disabilities, autism spectrum disorder, specific learning disabilities, ADHD, emotional and behavioral disorders, and giftedness (Kırıcı & Melekoğlu, 2022). These differences are particularly important for understanding variations in reading development, as processing speed and cognitive efficiency may differ significantly across special education groups.

The inclusion of students with special education needs and typically developing students in the same educational environments is supported by the inclusive education (maintenance) approach (Salas

García & Rentería, 2024). However, literature shows that reading skills develop more slowly in many special needs groups compared to their peers. It has been determined that children with intellectual disabilities have difficulties in reading fluency and comprehension (Afacan & Wilkerson, 2024) and students with specific learning disabilities show significant performance differences in reading, writing, and mathematics (Kırıcı & Melekoğlu, 2022). Poor language development in individuals with hearing impairments has been associated with low reading and comprehension skills (Günhan & Güldenoğlu, 2024). Difficulties in attention and memory processes in children with autism spectrum disorder can also negatively affect reading skills; However, significant development can be achieved with structured teaching methods such as visual cues (Kılıç vd., 2024). It is also observed that children with emotional behavioral disorders perform lower than their peers in phonological awareness and reading comprehension levels (Alnoaim, 2025; Chitiyo vd., 2025).

These findings suggest that reading difficulties observed in students with special education needs should not be interpreted as a homogeneous phenomenon. Rather, different categories of special needs may be associated with distinct cognitive constraints affecting reading development, such as deficits in phonological processing, attentional control, working memory, or processing speed. Therefore, identifying cognitive indicators that can differentiate these underlying mechanisms is essential for both theoretical understanding and instructional planning.

Considering this information, the early identification of reading-related difficulties in students with special education needs is of critical importance. The literature emphasizes that Rapid Automatized Naming (RAN) tests are an effective tool for predicting reading difficulties and supporting early intervention programs (Baron vd., 2025; Giazitzidou vd., 2024, 2025). Therefore, comparing the rapid automatized naming performance of typically developing students and students with special education needs in relation to reading skills is considered a significant area of research for the early diagnosis of reading difficulties and the planning of effective instructional processes.

Within this framework, rapid automatized naming is not conceptualized merely as a behavioural measure of naming speed, but as a theoretically grounded indicator reflecting the efficiency of automatic cognitive processing. Variations in RAN performance may thus provide insight into the distinct cognitive profiles underlying reading development across typically developing students and different students with special education needs groups.

Rapid Automatic Naming (RAN) Tests

Early identification of reading difficulties is critical for planning interventions. In this context, Rapid Automatic Naming (RAN), or RAN (Rapid Automatized Naming) tests, are considered an important predictor for assessing children's reading skills (Chen vd., 2021; Gray & Powell-Smith, 2025). The relationship between serial naming tests and literacy development has been researched since the 19th century, and these tests are reported to provide valid and reliable measures of reading performance (Alves vd., 2016).

Rapid automatized naming (RAN) tests are based on the accurate and rapid naming of visual stimuli such as letters, numbers, colors, and objects. Because this process requires the swift retrieval of phonological representations stored in long-term memory, it is directly related to the cognitive underpinnings of reading (Papadopoulos vd., 2016).Therefore, serial naming skills are regarded as a strong predictor, particularly in terms of reading speed and fluency (Georgiou vd., 2022; Margheri vd., 2025; Stampoltzis vd., 2020). Therefore, RAN performance is widely considered an indirect measure of processing speed and automaticity in reading-related cognitive functions.

From the perspective of dual-route and automaticity-based models of reading, RAN performance is closely linked to the efficiency of the lexical route, which enables rapid and effortless word

recognition. Deficiencies in RAN may signal disruptions in this automatic processing pathway, thereby constraining fluent reading and subsequent comprehension.

The foundations of RAN tests can be traced back to the neurological studies of Geschwind and Fussillo (Siddaiah & Padakannaya, 2015). Subsequently, Denckla and Rudel (1970s) developed color-naming cards and expanded their work by adding picture, number, and letter cards, leading to the four-subtest RAN format used today. With the contributions of Denckla and Wolf (2005), the test reached its current form (Bakır & Babür, 2007).

Current RAN tests consist of four subtests (color, picture, number, and letter) designed to identify reading difficulties and assess reading performance in children aged 5–10 years (Bakır & Babür, 2019). Research indicates that students with weak naming speed tend to fall behind their peers in reading performance in subsequent years (Kirby vd., 2003).These findings demonstrate that RAN is a significant indicator of reading performance among typically developing students (Denckla & Rudel, 1974a; Karadağ vd., 2019).

Despite the extensive body of research highlighting the role of rapid automatized naming (RAN) in reading development, several important gaps remain. First, the majority of existing studies have focused predominantly on typically developing populations or on specific diagnostic groups such as dyslexia and ADHD, limiting the generalizability of findings across diverse students with special education needs. Second, there is a lack of comparative research that simultaneously examines RAN performance across heterogeneous special needs groups within the same study design. Third, although RAN has been widely acknowledged as a predictor of reading fluency, fewer studies have explored its differential associations with subcomponents of reading, such as processing speed variations across stimulus types (e.g., color, object, letter, and number naming). In addition, the psychometric properties of researcher-developed RAN instruments, particularly in non-Western educational contexts, remain underreported. This limitation restricts the interpretability and applicability of findings in different linguistic and cultural settings. Addressing these gaps is essential not only for strengthening theoretical models of reading development but also for improving early screening and intervention practices in inclusive educational environments. Therefore, the present study contributes to the literature by (a) comparing RAN performance between typically developing students and a heterogeneous group of students with special education needs, (b) examining differences across multiple RAN subtests, and (c) providing empirical evidence regarding the reliability and construct validity of a contextually adapted RAN instrument.

Studies conducted with students with special education needs, however, are more limited. Existing research predominantly focuses on groups such as specific learning disabilities, attention-deficit/hyperactivity disorder, mild intellectual disability, and autism spectrum disorder. These studies have shown that RAN performance is associated with word reading skills in children diagnosed with dyslexia, ADHD, and mild intellectual disability, and that phonological deficits negatively affect naming speed (Alhwaiti, 2024). Another study reported that children with attention deficits demonstrated poor performance on RAN tasks, which was reflected in their reading skills (Gomaa vd., 2021). Additionally, research has indicated that children with autism spectrum disorder exhibit high rates of naming errors and a tendency to mislabel stimuli (Nayar vd., 2021). Nevertheless, the extent to which RAN reflects different underlying cognitive mechanisms across diverse students with special education needs remains insufficiently explored. Taken together, these theoretical and empirical findings highlight the critical role of rapid automatized naming in reading development; however, several important issues remain unresolved. In addition, comparative studies across different orthographic systems may further strengthen the generalizability of rapid automatized naming research. Addressing this gap is essential for advancing theoretical models of reading development and for refining the use of RAN as a differential diagnostic and instructional planning tool. Consequently, there is still a lack of comprehensive knowledge regarding the extent to which RAN

predicts reading skills across various types of special needs. Given that RAN is a strong predictor for the early identification of reading difficulties and considering that reading performance may manifest differently among typically developing and students with special education needs, this study aims to examine performance differences between these two groups. In this regard, the study seeks to address the following main research question and its sub-questions:

Problem Statement

Is there a significant difference between the performance of typically developing students and students with special education needs on the Rapid Automatic Naming (RAN) Test?

Sub-Problems

1. Is there a significant difference between the application times of typically developing students and students with special education needs in the HOTI subtests (color, number, letter, and picture)?

2. Do students' HOTI performances show a statistically significant difference with respect to gender and grade level variables?

3. Is there a significant difference between the application times of the HOTI test for students with special education needs according to their disability types?

4. Is there a significant difference between the HOTI subtests (color, number, letter and object)?

METHOD

This section includes the research model, study group, data collection process, data collection tools and data analysis.

Research Design

This study examined the HOTI test performances of typically developing students and students with special education needs studying in 2nd, 3rd, and 4th grades. In line with the purpose of the research, the study was conducted using the relational screening (correlational) model, a quantitative research method. The relational screening model is a research design that aims to determine the state of change between two or more variables and the degree of this change (Akarsu & Akarsu, 2019; Creswell & Creswell, 2018; Fraenkel vd., 2025; Garip, 2023; Gürbüz & Şahin, 2018). Correlational studies can examine the direction and strength of the relationships between variables and, when necessary, can also focus on predictive relationships (Mertennes, 2019). In this respect, the aim of the study was to compare the HOTI performances of typically developing students and students with special education needs and to reveal how these performances differ in terms of reading skills. The participants were selected using convenience sampling from accessible schools during the 2025–2026 academic year.

Procedure and Sample

The HOTI test, also known as the "Serial Naming Test" in the literature, began to be widely used with the studies of Denckla and Rudel (1974). The test is used as an important tool for assessing the reading skills of children from preschool to age 18 and for the early identification of students with reading difficulties (Beck vd., 2025; Margheri vd., 2025). The strong correlation between HOTI performance and reading skills has led to its widespread use, particularly in preschool and primary school. For example, in a study conducted with 71 second- and third-grade students, Margheri (2025) found that students in the dyslexia group showed significant improvement in HOTI fluency and visual fluent reading skills after a four-week intervention. Similarly, in a study conducted with a total of 70 students, including 14 students diagnosed with ADHD and 40 students with typical development, aged 8–11, Alves (2016) reported that the ADHD group performed lower on the color and letter subscales, while the dyslexia group scored significantly lower than their typically developing peers.

Bakır and Babür's (2019) study with 277 children aged 5–10 revealed that HOTI completion times decreased with age. The participants' mean age ranged between approximately 7 and 10 years, corresponding to Grades 2–4, and no formal socioeconomic stratification was applied in the sampling process.

Based on this information, the study population consisted of 2nd, 3rd, and 4th-grade primary school students. The sample consisted of 97 participants, including 50 typically developing students and 47 students with special education needs, attending a public school in Turkey during the 2025–2026 academic year. Demographic information about the participants is presented in Table 1, Figure 1, and Figure 2.

Table 1
Class level distribution of typically developing and students with special education needs

		N	%
Grade Level of Typically Developing Students	2. Class	13	26.0
	3. Class	22	44.0
	4. Class	15	30.0
	Toplam	50	100.0
Grade Level Of Students with special education needs	2. Class	13	27.7
	3. Class	22	46.8
	4. Class	12	25.5
	Total	47	100.0
Total		97	100.0

As presented in Table 1, a total of 97 students from 2nd, 3rd, and 4th grades participated in the study. Among the typically developing students, 13 were in 2nd grade, 22 were in 3rd grade, and 15 were in 4th grade. Among the students with special education needs, 13 were in 2nd grade, 22 were in 3rd grade, and 12 were in 4th grade.

Figure 1
Gender distribution of typically developing and students with special education needs

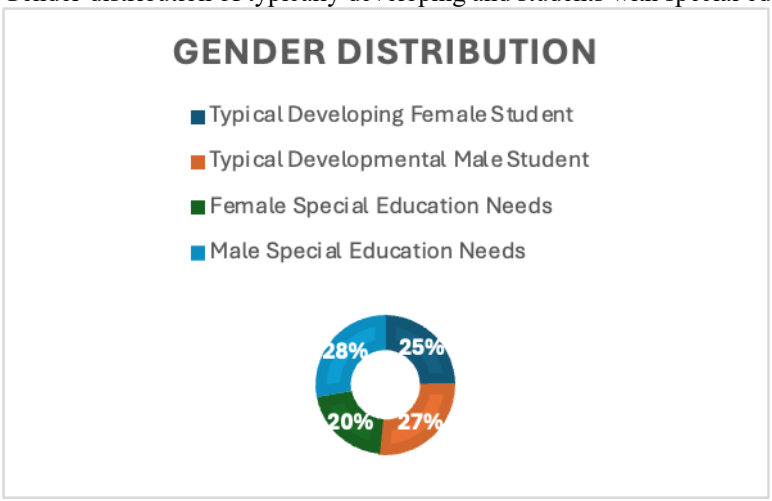


Figure 1 indicates that a total of 50 typically developing students 24 females (25%) and 26 males (27%) participated in the study, while a total of 47 students with special education needs 20 females (20%) and 27 males (28%) were included. Fraenkel et al. (2012) state that REACHİNG at least 30 participants in quantitative research is important for ensuring an adequate sample size. In this context, it can be concluded that the sample size of the present study was sufficient.

Figure 2
Distribution of disability types in children with special needs

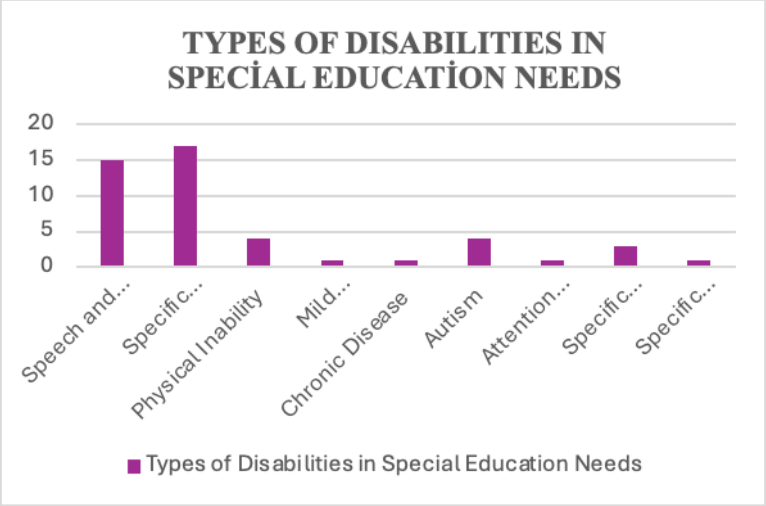
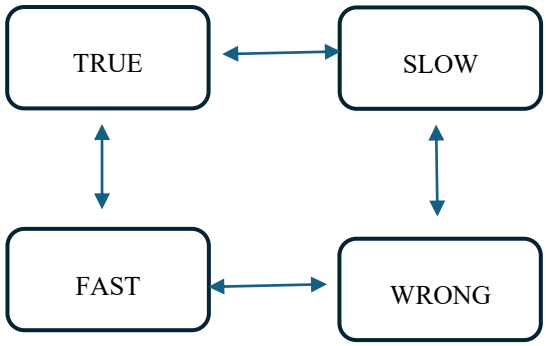


Figure 2 shows the distribution of disability types among 47 students with special education needs studying in grades 2-4. Within the scope of the study, it was determined that the most common disability types in schools in the Selçuklu and Karatay districts of Konya province were specific learning disabilities and speech and language disorders. These groups were followed by students with autism spectrum disorders and emotional-behavioral difficulties. Studies on HOTI performance in the literature also focus mostly on children with specific learning disabilities, speech disorders, autism spectrum disorders, and behavioral difficulties (Chambrier vd., 2021; Graziani vd., 2025; Nayar vd., 2021). However, it is known that these disability types are not limited to these groups. Therefore, the study evaluated the disability types of students with special education needs in the schools without any restrictions, and the HOTI performances of all groups were comparatively examined. The classification of special education needs was based on official school records and guidance and counseling service reports rather than clinical diagnostic assessments.

Data Collection Tool

In this study, HOTI refers to the Rapid Automatized Naming (RAN) test. The term "HOTI subtests" is used to refer to its component tasks (color, number, letter, and object), while "HOTI performance" refers to the total naming time obtained from each subtest. All analyses were conducted using continuous time scores measured in seconds. In this study, the HOTI test was used as the data collection instrument. The HOTI test is based on the rapid and accurate naming of colors, numbers, letters, and objects presented in a serial format. The test assesses cognitive processes such as stimulus recognition and retrieval from short-term memory (Chen vd., 2021; Georgiou vd., 2022; Gomaa vd., 2021; Gray & Powell-Smith, 2025; Margheri vd., 2025; Nayar vd., 2021).

Figure 3
The duration of the HOTI test



As shown in Figure 3, HOTI performance can be evaluated under four categories based on the components of speed and accuracy: fast–correct, slow–correct, fast–incorrect, and slow–incorrect (Gomaa vd., 2021). These categories indicate that the test assesses both processing speed and the accuracy of the visual cognitive process. In this study, reading time was recorded as the total duration (in seconds) from the first stimulus naming to the completion of each subtest. No separate classification such as "fast" or "slow" performance was used in statistical analysis; all analyses were based on continuous time scores.

Since HOTI performance reveals how quickly students can recognize and name visual stimuli, slow naming often indicates a reduced cognitive processing speed. Therefore, the test is used as an important screening tool for the early identification of children experiencing reading difficulties. The literature reports strong correlations between HOTI performance and both reading accuracy and reading fluency (Chen vd., 2021). Ethical approval was obtained from the relevant university ethics committee, and written informed consent was obtained from parents, along with verbal assent from participating students. All procedures were conducted in accordance with ethical standards for research involving minors.

HOTI Subtests

The HOTI test consists of four subtests: Color, Number, Letter, and Object. The test cards used in the study were arranged as follows:

Color Card: Circles in red, blue, yellow, green, and orange

Number Card: Numbers 3, 7, 1, 2, and 4

Letter Card: Letters E, I, S, M, and O

Object Card: Images of a cup, pencil, t-shirt, vase, and teapot

The stimuli on the cards were selected from visuals that students easily recognize and frequently encounter in their daily lives, as in the original implementation by Denckla and Rudel (1974). Each subtest has a five-line structure, each consisting of 10 items, and the stimuli are placed in a random order.

Figure 4
Rapid automatic naming cards used in the study

HOTI Color Card HOTI Number Card HOTI Letter Card HOTI Object Card

HOTI Subtests

The HOTI test cards to be used in the study (color, number, letter, and object) were prepared by the researcher, considering the children's age and developmental characteristics. During the data collection process, four HOTI cards, a stopwatch, and a test recording form were utilized. Prior to administration, the researchers showed each HOTI card to the students individually to check whether they could recognize the visual stimuli. This brief introduction conducted before the test aimed to minimize reliability errors that might arise from students' lack of familiarity with the materials (Torgesen vd., 2001). After the visual familiarization was completed, the test administration began. The HOTI test was administered sequentially using the color, number, letter, and object cards. The duration for each card was measured separately with a stopwatch, and the children's naming performances were recorded on the test form in minutes and seconds.

Data Analysis

The data obtained in the study were analyzed in accordance with the sub-problems defined within the scope of the research. The naming durations for the HOTI subtests (color, number, letter, object) of students with typical development and those with special needs were transferred into the SPSS 27 program. In the first stage, descriptive statistics (mean, standard deviation, etc.) were calculated for the data belonging to both groups. Subsequently, correlation analyses were conducted to determine the relationships among the HOTI subtests, and comparative analyses were performed to examine performance differences between the groups. Based on the HOTI test results, the study aimed to determine whether students who demonstrated performance above or below the average reading level experienced reading difficulties (Siddaiah & Padakannaya, 2015). The literature indicates that the HOTI test is highly correlated with word reading and strongly predicts reading accuracy and fluency (Song vd., 2016). Therefore, a correlational survey model was adopted as the basis for data analysis in the present study.

Various studies have demonstrated that the Rapid Automatic Naming test strongly predicts reading success (Ozernov-Palchik vd., 2017). It is also known that reading performance in the early years of primary school significantly predicts reading success later in life (Kirby vd., 2003). In this context, the analysis process also examined the changes in HOTI performances by grade level. It is frequently emphasized in the literature that HOTI test performance varies among students at different developmental and cognitive levels. Because the HOTI test is directly related to cognitive speed, it has been stated that individuals with lower cognitive processing speed may exhibit slower naming and poorer reading performance (Gomaa vd., 2021). This suggests that significant differences may emerge between groups because students with special education needs tend to exhibit lower reading performance compared to their typically developing peers. In addition, it is stated in the literature that the subcategories of the HOTI test (color, number, letter, object) yield different reading performance results depending on the developmental levels of the students (Beck vd., 2025; Gomaa vd., 2021;

Nayar vd., 2021). Therefore, the relationship between each of these subtests and the students' reading performances was discussed separately in the study.

Validity and Reliability

The validity and importance of the HOTI test have been supported by various studies since the 19th century (Alves vd., 2016). To ensure the validity and reliability of the data collection tools used in the study, the measurement tools were meticulously prepared and implemented. The sub-dimensions of the HOTI test used in the study (color, number, letter, and object) were based on the original test structure developed by Denckla and Rudel (1974). The symbols used in the HOTI tests were selected from simple and familiar visuals that children are familiar with in their daily lives, thus ensuring the content validity of the test (Denckla & Rudel, 1974a; Margheri vd., 2025).Since the HOTI test assesses visual and verbal processing speed, the relationship between the subtests is one of the important indicators supporting the test's construct validity (Bakır & Babür, 2019).During the application process, a quiet and distraction-free environment was created for each student, and the tests were administered one-on-one. Having the symbols introduced to the students by the researcher before the test contributed to the internal reliability of the study by reducing errors that may arise from inexperience in the measurement process (Creswell & Creswell, 2018).In the literature, it is stated that a reliability coefficient of the HOTI test above .80 is sufficient, and .90 and above represents a very high level of reliability (Aiken, 2000).In this direction, the Cronbach Alpha reliability coefficient for the four sub-dimensions of the HOTI test was calculated in the study and the results are presented in Table 2.

Table 2
HOTİ test cronbach alpha coefficient

Cronbach's Alpha	HOTI Test Sub-Dimension
0.941	4

As presented in Table 2, the Cronbach's alpha reliability coefficient for the four sub-dimensions of the HOTI test (color, number, letter, and object) is .941. Considering the criteria specified by Aiken (2000), it can be said that this coefficient indicates that the test has a high level of reliability.

FINDINGS

In this section, the statistical findings obtained regarding the research problem and its sub-problems are presented and interpreted.

HOTI Test Administration Times for Typically Developing and Students with Special Education Needs

Under this section, the reading times of students with typical development and those with special needs for the HOTI test sub-dimensions (color, number, letter, object) were examined. Table 3 presents the mean reading performance scores of both groups.

Table 3
HOTI test administration times for typically developing and students with special education needs

		Color Time (sec)	Number Time (sec)	Letter Time (sec)	Object Time (sec)
Typically Developing	Average	40.71	30.42	31.22	56.78
	N	50	50	50	50
Special Needs Student	Average	57.11	42.17	43.89	80.16
	N	47	47	47	47

As presented in Table 3, the mean completion times of typically developing students are 40.71 seconds for color, 30.42 seconds for number, 31.22 seconds for letter, and 56.78 seconds for object naming tasks. In contrast, the mean reading performance durations of students with special needs are measured as: color: 57.11 seconds, number: 42.17 seconds, letter: 43.89 seconds, and object: 80.16 seconds. In both groups, the longest duration was observed in the object subtest, whereas the shortest durations appeared in the number and letter subtests. These findings indicate that students with special education needs exhibit slower reading performance across all subtests compared to their typically developing peers. Although statistically significant differences were observed, the practical magnitude of these differences should be interpreted with caution, as effect size indicators were not calculated in this study.

HOTI Test Reading Performances by Gender

The reading performance times of typically developing and students with special education needs in the HOTI test sub-dimensions are compared by gender in Table 4 below.

Table 4
HOTI test reading performances by gender

Cinsiyet		Color Time (sec)	Number Time (sec)	Letter Time (sec)	Object Time (sec)
Typically Developing Girl	Average	44.04	30.99	30.74	57.23
Typically Developing Male	Average	44.75	29.89	31.67	56.37
Special Needs Girl	Average	58.45	42.00	43.73	82.42
Special Needs Male	Average	56.11	42.30	44.01	78.49

As presented in Table 4, among typically developing students, the average reading times for boys and girls are quite similar. This suggests that gender does not have a significant effect on HOTI performance. Among students with special education needs, while the reading times for boys and girls are similar, the average reading time for boys is slightly faster than for girls. However, both groups perform slower than typically developing students.

HOTI Test Reading Performances by Grade Level

The reading performance times of typically developing and students with special education needs in the HOTI test sub-dimensions are compared according to their grade levels in Table 5 below.

Table 5
HOTI test reading performances by grade level

	Grade Level		Color Time (sec)	Number Time (sec)	Letter Time (sec)	Object Time (sec)
Typically Developing Student	2nd Grade	Average	45.79	31.93	30.22	57.62
		N	13	13	13	13
	3rd Grade	Average	43.39	29.95	31.72	57.75
		N	22	22	22	22
	4rd Grade	Average	44.69	29.81	31.36	54.64
		N	15	15	15	15
Special Needs Student	2rd Grade	Average	67.47	52.01	53.02	93.45
		N	13	13	13	13
	3rd Grade	Average	55.85	41.19	42.58	77.86
		N	22	22	22	22
	4rd Grade	Average	48.17	33.32	36.38	69.99
		N	12	12	12	12

As presented in Table 5, as the grade level increases, the reading times of both typically developing students and students with special education needs generally decrease, indicating an improvement in reading speed. This finding is consistent with the positive relationship between cognitive processing speed and HOTI performance reported in the literature (Gomaa vd., 2021).However, while the expected increase in speed is observed between the 2nd → 3rd grades among typically developing students, the reading time in the color subtest shows a slight increase from the 3rd → 4th grade. Similarly, in the letter subtest, 2nd-grade students appear to perform faster than 3rd-grade students. This pattern may be attributed to individual differences within classrooms, variations in reading experience, and fluctuations in visual auditory processing speed. These results suggest that although grade level generally contributes to faster naming performance, individual variability appears to moderate this developmental trend.

HOTI Performances of Students with special education needs According to Types of Disabilities

The average times of students with special education needs on the HOTI subtests are presented in Table 6.

Table 6
HOTI test performances of students with special education needs based on disability types

Type of Disability		Color Time (sec)	Number Time (sec)	Letter Time (sec)	Object Time (sec)
Speech and Language Difficulty	Average	53.80	38.84	39.94	78.34
	N	15	15	15	15
Specific Learning Disability	Average	57.66	43.00	44.26	81.94
	N	17	17	17	17
Physical Inability	Average	58.78	39.36	40.58	82.89
	N	4	4	4	4
Mild Intellectual Disability	Average	51.73	36.78	39.06	74.78
	N	1	1	1	1
Chronic Disease	Average	32.25	23.73	33.30	38.56
	N	1	1	1	1
Autism	Average	74.27	61.17	64.78	94.79
	N	4	4	4	4
Attention Deficit + Specific Learning	Average	50.95	31.91	38.75	69.28
	N	1	1	1	1
Specific Learning + Language and Speech Difficulties	Average	57.58	44.63	45.16	76.31
	N	3	3	3	3
Specific Learning + Emotional Behavior Disorder	Average	56.80	40.03	43.15	77.50
	N	1	1	1	1
Total	Average	57.11	42.17	43.89	80.16
	N	47	47	47	47

As presented in Table 6, the types of disabilities of students with special education needs and their reading performances on the HOTI subtests are shown. In line with this information.

HOTİ Color Subtest Performances

Students' reading times ranged from 32.25 to 74.27 seconds.

The average reading time was 57.11 seconds.

Students in the chronic illness group had the fastest reading time. Students in the autism spectrum disorder group performed the slowest.

HOTI Number Subtest Performances

Reading times ranged from 23.73 to 61.17 seconds.

The average time was 42.17 seconds.

Students with chronic illnesses had the fastest reading time, while students with autism spectrum disorder had the slowest reading time.

HOTİ Letter Subtest Performances

Times ranged from 33.30 to 64.78 seconds.

The average time was 43.89 seconds.

Students with chronic illnesses performed the fastest, while students on the autism spectrum performed the slowest.

Object Subtest Performances

The reading time range was 38.56–94.79 seconds.

The average reading time was 80.16 seconds.

The fastest reading performance was observed in the student with a chronic illness. The slowest reading performance was observed in the autism spectrum disorder group.

Based on these findings, students with chronic illnesses were found to read faster than students with other disabilities on all subtests. Students with autism spectrum disorders had the slowest performance on all subtests. Students with special education needs were generally faster on the letter and number subtests and slower on the color and object subtests. However, these findings should be interpreted cautiously due to the heterogeneity of the special education needs group and the unequal distribution of participants across disability categories.

Correlational Relationship Between HOTI Subtests

This section of the study presents the Pearson correlation coefficients for the four subtests (color, number, letter, and object) of the HOTİ test in Table 7 below.

Table 7
Correlational relationship between HOTI subtests

		Colour	Figure	Letter	Object
Colour	Pearson Correlation	1	0.902**	0.909**	0.923**
	Sig. (2-tailed)		0.000	0.000	0.000
	N	97	97	97	97
Figure	Pearson Correlation	0.902**	1	0.909**	0.724**
	Sig. (2-tailed)	0.000		0.000	0.000
	N	97	97	97	97
Letter	Pearson Correlation	0.909**	0.909**	1	0.741**
	Sig. (2-tailed)	0.000	0.000		0.000
	N	97	97	97	97
Object	Pearson Correlation	0.923**	0.724**	0.741**	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	97	97	97	97

In addition to statistical significance, the correlation coefficients indicate strong practical relationships among RAN subtests, suggesting that all subtests share a common underlying processing speed mechanism.

As presented in Table 7:

There are positive and highly significant correlations among all subtests ($p < .05$).

The color subdimension is highly correlated with the other three subdimensions ($r = .90–.92$).

The correlation between the number and letter subdimensions is quite high ($r = .909$).

The object subtest is positively correlated with the number and letter tests, but shows a lower correlation compared to the color test ($r = .724–.741$).

These findings indicate that the subdimensions of the HOTI test are related to the same cognitive processes, but the object subdimension requires more complex processing than the others. These strong correlations also suggest that rapid automatized naming reflects a unified cognitive processing speed construct rather than isolated subskills. Overall, the findings not only demonstrate statistically significant differences but also suggest meaningful implications for early identification of reading difficulties in educational settings.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In this study, the Rapid Automatic Naming (RAN) performance of typically developing and students with special education needs was compared in terms of various variables, and the findings were evaluated in line with the literature. The RAN test is a powerful measurement tool reflecting visual and verbal processing speed and is considered an important predictor of reading skills (Bakır & Babür, 2019; Gomaa vd., 2021). In this context, the results obtained regarding the problem statement and sub-problems are presented.

The findings of the present study can be more deeply understood within the framework of automaticity-based and dual-route models of reading. According to these models, fluent reading depends on the rapid and efficient coordination of lower-level cognitive processes, including visual recognition, phonological retrieval, and lexical access. In this context, the significantly slower RAN performance observed among students with special education needs may reflect disruptions in the automatic activation of phonological representations and reduced efficiency in accessing lexical information from long-term memory. Furthermore, the strong correlations observed among RAN subtests suggest that these tasks tap into a shared underlying cognitive mechanism, primarily processing speed and automaticity. However, the relatively lower correlations involving the object naming task may indicate that this subtest requires additional semantic processing and visual complexity, thereby imposing a greater cognitive load. This finding aligns with theoretical perspectives suggesting that not all RAN components rely on identical cognitive pathways. From a broader perspective, these results support the notion that reading difficulties, particularly among students with special education needs, may not solely stem from phonological deficits but also from inefficiencies in domain-general cognitive processes such as processing speed and attentional control.

The study found that typically developing students performed faster on all HOTI subtests compared to students with special needs. The faster completion of the number and letter subtests in both groups indicates that familiarity with symbols directly impacts processing speed. The significantly lower performance of students with special education needs supports previous findings that limitations in processing speed negatively affect the reading process (Alves vd., 2016; Gomaa vd., 2021). In line with the literature, it appears that low processing speed is one of the key factors limiting the development of reading automaticity. In particular, deficits in processing speed and automatic retrieval of phonological representations may limit the development of reading fluency and automatic word recognition.

According to the gender-based evaluations, the performance levels of typically developing students were found to be similar, whereas in the group of students with special education needs, male students performed slightly faster than female students. While a general increase in reading speed was observed among typically developing students as grade level increased, this improvement did not progress at the same rate for students with special education needs. The observation that fourth-grade students performed more slowly than third-grade students in certain subtests suggests that cognitive processing speed and the automaticity of symbol recognition are variables that exhibit substantial individual differences. Studies conducted by Ergül and Demir (2021) and Alves (2016) indicate that age and grade level have a positive effect on RAN performance.

When students with special education needs were evaluated according to their type of disability, it was found that those with specific learning disabilities, speech and language impairments, and autism spectrum disorder exhibited slower performance across all four subtests. These findings indicate that RAN performance is closely associated with neurodevelopmental characteristics. Studies conducted with students diagnosed with ADHD (Gomaa vd., 2021), dyslexia (Nadiyah vd., 2022; Novianti vd., 2024), specific learning disabilities (Chambrier vd., 2021) and emotional behavioral disorders (Alnoaim, 2025; Chitiyo vd., 2025), have consistently demonstrated notable reductions in processing speed among these groups, thereby supporting the findings of the present research.

The high level of positive correlation among the HOTI subtests indicates the structural integrity and high level of validity of the test. These results are consistent with previous studies indicating that the HOTI subtests are compatible with each other (Bakır & Babür, 2019; Denckla & Rudel, 1976; Papadopoulos vd., 2016). In particular, the lower level of correlation between the object subtest and letters and numbers is an expected pattern noted in the literature. Therefore, it can be said that the HOTI exhibits a robust structure in both typical and special needs groups.

When the research findings are evaluated as a whole, students with special education needs performed slower than their typical peers on all subtests of the HOTI. While gender did not create a significant difference, grade level was found to improve performance in typically developing students. The type of disability strongly affected HOTI performance, with a significant decrease in performance observed particularly in students with specific learning disabilities and speech-language difficulties. The high positive correlations between the subtests support the structural validity of the test.

Based on the results of this study, the following recommendations are presented:

It is recommended that the HOTI test be used systematically in schools to assess reading speed and processing skills.

The systematic integration of RAN-based assessments into early literacy processes by teachers, special education practitioners, school counselors, and policymakers may significantly contribute to the early identification of students at risk of reading difficulties and the development of appropriate intervention strategies.

Individual intervention programs can be prepared for subtests where HOTI performance is low in students with special education needs.

Future research with larger samples including different socioeconomic groups will increase the generalizability of the findings.

LIMITATIONS

The sample of this study consisted of students from a single school and a limited age range. In addition, the cross-sectional design of the study did not allow for monitoring changes in reading development over time. It is therefore recommended that future research include different age groups and employ longitudinal designs. It should also be noted that the cross-sectional design of the study limits causal interpretations, and the unequal distribution of disability subgroups may influence the generalizability of the findings. While the study provides meaningful contributions to understanding reading processes, its interpretations should be considered in light of sample limitations and the correlational nature of the design.

REFERENCES

Afacan, K., & Wilkerson, K. L. (2024). Predicting reading achievement of students with ıntellectual disability from early reading achievement: Are they related? *Interchange*, *55*(4), 459-473.

Aiken, L. (2000). *Psikolojik test ve değerlendirme* (10. Baskı).

Akarsu, B., & Akarsu, B. (2019). *(PDF) Bilimsel araştırma tasarımı: Nicel, nitel ve karma araştırma yaklaşımları*. Cinius Yayınları. https://www.researchgate.net/publication/333372639_Bilimsel_Arastirma_Tasarimi_Nicel_Nitel_ve_Karma_Arastirma_Yaklasimlari

Akyol, H., & Tuncay Avşar, A. (2021). *İlkokulda eğitim ve öğretim* (1. Baskı). Pegem Yayıncılık.

Akyol, M., & Baştuğ, M. (2015). Yapılandırılmış akıcı okuma yönteminin üçüncü sınıf öğrencilerinin akıcı okuma ile okuduğunu anlama becerilerine etkisi. *Trakya Üniversitesi Sosyal Bilimler Dergisi*, *17*(1), 125-141.

Alhwaiti, M. M. (2024). Phonological awareness and rapid automatized naming: The mediating effect of word reading and spelling in children with developmental dyslexia, attention deficit hyperactivity disorder, and mild ıntellectual disability. *Folia Phoniatrica et Logopaedica*, *76*(1), 58-67. https://doi.org/10.1159/000531221

Alnoaim, J. (2025). Improving Oral Reading Fluency for Students with Emotional and Behavioral Disorders. Içinde M. Alaali, A. M. A. Musleh Al-Sartawi, & A. S. Aydiner (Ed.), *The paradigm shift from a linear economy to a smart circular economy: The role of artificial ıntelligence-enabled systems, solutions and legislations* (ss. 681-695). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-87550-2_42

Alves, L. M., Siqueira, C. M., Ferreira, M. do C. M., Alves, J. F. M., Lodi, D. F., Bicalho, L., & Celeste, L. C. (2016). Rapid naming in Brazilian students with dyslexia and attention deficit hyperactivity disorder. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00021

Alyılmaz, S., Karahan Ürün, B., Atalay Demir, T., Durukan, E., Er, O., Toksun Erdağı, S., & Şengül, K. (2018). *Okuma eğitimi* (1.Baskı).

Arı, M., Bayhan, P., Dönmez, N., Doğan, Ö., Mağden, D., Metin, N., Şahin, S., Turan, F., & Yücel, E. (2018). *Özel gereksinimli çocuklar* (N. Metin, Ed.; 2.Baskı). Anı Yayıncılık.

Bakır, F. H., & Babür, N. (2019). Hızlı otomatik isimlendirme testi'nin Türkçeye uyarlanması. *Bogazici University Journal of Education*, *35*(2), 35-51.

Balcı, A. (2016). *Okuma ve anlama eğitimi* (2. Baskı). Pegem.

Baron, L. S., Ehrhorn, A. M., Shlanta, P., Ashby, J., Bell, B. A., & Adlof, S. M. (2025). Orthographic influences on phonological processing in children with and without reading difficulties: An eye-tracking study. *Reading and Writing*, *38*(7), 1925-1948. https://doi.org/10.1007/s11145-024-10567-y

Beck, J., Beck, K., de Białynia Woycikiewicz, M., & Jednoróg, K. (2025). The trajectory of letter and speech sounds association in children: Insights from a cross-sectional study. *Reading and Writing*, 1-21. https://doi.org/10.1007/s11145-025-10645-9

Chambrier, A.-F., Sermier Dessemontet, R., Martinet, C., & Fayol, M. (2021). Rapid automatized naming skills of children with intellectual disability. *Heliyon*, *7*(5). https://doi.org/10.1016/j.heliyon.2021.e06944

Chen, Y.-J. I., Thompson, C. G., Xu, Z., Irey, R. C., & Georgiou, G. K. (2021). Rapid automatized naming and spelling performance in alphabetic languages: A meta-analysis. *Reading and Writing*, *34*(10), 2559-2580.

Chitiyo, A., Sciuchetti, M. B., Finch, H. W., & Dzenga, G. C. (2025). A Meta-analysis of Reading Interventions for Students with Emotional/Behavioral Disorders. *Journal of Behavioral Education*.

Creswell, J., & Creswell, J. D. (2018). *Research desıgn qualitative, quantitative, and mixed methods approaches* (5.Baskı).

Demirtaş, E. (2022). *Prozodi öğretiminin okuma güçlüğü olan bir İlkokul üçüncü sinif öğrencisinin okuma akiciliğive okuduğunu anlama becerileri üzerindeki etkisi* [Yüksek Lisans Tezi]. Bartın Üniversitesi.

Denckla, M. B., & Rudel, R. (1974a). Rapid "automatized" naming of pictured objects, colors, letters and numbers by normal children. *Cortex*, *10*(2), 186-202.

Denckla, M. B., & Rudel, R. (1974b). Rapid "automatized" naming of pictured objects, colors, letters and numbers by normal children. *Cortex*, *10*(2), 186-202. https://doi.org/10.1016/S0010-9452(74)80009-2

Denckla, M. B., & Rudel, R. G. (1976). Rapid 'automatized' naming (R.A.N.): Dyslexia differentiated from other learning disabilities. *Neuropsychologia*, *14*(4), 471-479.

Ergül, C., & Demir, E. (2021). Anasınıfından dördüncü sınıfa kadar olan çocuklar için geliştirilmiş hızlı isimlendirme testi'nin geçerlik ve güvenirliği. *Trakya Eğitim Dergisi*, *12*. https://doi.org/10.24315/tred.883688

Fraenkel, J., Wallen, N., & Hyun, H. (2012). *How to design and evaluate research in education* (3.Baskı).

Fraenkel, J., Wallen, N., Hyun, H., & Senler, B. (2025). *Eğitimde Araştırma Tasarlama ve Değerlendirme [How to Design and Evaluate Research in Education] —Çeviri*. Nobel Akademik Yayıncılık.
https://www.researchgate.net/publication/393228192_Egitimde_Arastirma_Tasarlama_ve_Degerlendirme_How_to_Design_and_Evaluate_Research_in_Education_-_Ceviri

Garip, S. (2023). Sosyal bilimlerde nicel araştırma geleneği üzerine kuramsal bir inceleme. *International Journal of Social Science Research*, *12*(1), 1-19.

Georgiou, G. K., Cardoso-Martins, C., Das, J. P., Falcón, A., Hosokawa, M., Inoue, T., Li, Y., Martinez, D., Padakannaya, P., Parrila, R., Pollo, T. C., Salha, S. S., Samantaray, S., Shu, H., Tanji, T., Tibi, S., & Vieira, A. P. A. (2022). Cross-language contributions of rapid automatized naming to reading accuracy and fluency in young adults: Evidence from eight languages representing different writing systems. *Journal of Cultural Cognitive Science*, *6*(2), 151-168.

Giazitzidou, S., Mouzaki, A., & Padeliadu, S. (2025). How orthographic knowledge is related to efficient word reading? Testing competing hypotheses. *Reading and Writing*, *38*(2), 531-556.

Giazitzidou, S., Simos, P., Bachoumis, A., Papadimitriou, V., & Mouzaki, A. (2024). Spelling development of children with and without reading difficulties throughout elementary grades: Evidence from the Greek orthography. *Annals of Dyslexia*, *74*(2), 197-221. https://doi.org/10.1007/s11881-024-00309-8

Gomaa, D. A. E.-H., Bassiouny, S., Ghandour, H. H., & ElFiky, Y. H. (2021). Rapid automatized naming assessment in Egyptian children with attention-deficit/hyperactivity disorder. *The Egyptian Journal of Otolaryngology*, *37*(1), 1-6.

Gray, J. S., & Powell-Smith, K. A. (2025). Rapid automatized naming: What it is, what it is not, and why it matters. *Annals of Dyslexia*, *75*(1), 1-18.

Graziani, D., Capodieci, A., Casalini, C., Giaccherini, S., Scali, V., Luccherino, L., & Pecini, C. (2025). Training rapid automatized naming in children with developmental Dyslexia. *Child Neuropsychology*. https://www.tandfonline.com/doi/full/10.1080/09297049.2024.2414019

Günhan, G., & Güldenoğlu, B. (2024). Examining difficulties of students with hearing ımpairments in reading comprehension according to teacher opinions. *Çukurova Üniversitesi Eğitim Fakültesi Dergisi*, *53*(1), 1-32. https://doi.org/10.14812/cuefd.1245304

Gürbüz, S., & Şahin, F. (2018). *Sosyal bilimlerde araştırma yöntemleri felsefe-yöntem-analiz* (5.Baskı). Seçkin Yayınları. https://ws1.turcademy.com/ww/webviewer.php?doc=72628

Güven, A. Z. (2020). *Türkçe eğitimine genel bir bakış* (2. Baskı). Pegem Akademi.

Kandır, A., Yaşar, M. C., İnal, G., Yazıcı, E., Ceylan, Ş., Yazıcı, Z., Çalışandemir, F., Özbey, S., & Uyanık, Ö. (2012). *Dil etkinlikleri* (Ayrıntı Basımevi).

Karadağ, Ö., Keskin, H. K., & Arı, G. (2019). Hızlı otomatik isimlendirme ve okuduğunu anlama ilişkisinde okuma becerisinin aracılık etkisi. *Eğitim ve Bilim Dergisi*, *44*(197), 353-366.

Karatay, H. (2018). *Okuma eğitimi* (3. Baskı).

Kaya, M., & Kardaş, M. N. (2020). *Okuma eğitimi* (1. Baskı). Pegem Akademi.

Kılıç, K., Birkan, B., & Karaca, M. A. (2024). Uyarana ipucu ekleme ve ipucunu silikleştirmeyle öğretim yönteminin otizmli öğrencinin sözcük okuma öğrenimine etkisinin incelenmesi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*, *24*(1), 90-111. https://doi.org/10.17240/aibuefd.2024..-1314166

Kırıcı, E., & Melekoğlu, M. (2022). Özel öğrenme güçlüğü olan öğrencilerin okuma becerilerinin OKA2DEP ile değerlendirilmesi. *Milli Eğitim Dergisi*, *51*(236), 2830-2850. https://doi.org/10.37669/milliegitim.983749

Kirby, J., Parrilla, R., & Pfeiffer, S. (2003). Naming speed and phonological awareness as predictors of reading development. *Journal of Educational psychology*, *95*(3), 453-464.

Margheri, V., Frascari, A., Baiocchini, G., Scalambra, D., Tambaro, C., & Pecini, C. (2025). Empowering reading decoding through training rapid automatised naming (RAN) in primary school: Insights on methods and underpinning processes. *Reading and Writing*, 1-23. https://doi.org/10.1007/s11145-025-10667-3

Mertennes, D. (2019). *Eğitim ve psikolojide araştırma ve değerlendirme* (İ. Seçer & S. Ulaş, Ed.; 5.Baskı). Anı Yayıncılık. https://ws1.turcademy.com/ww/webviewer.php?doc=125117

MoNE (2024). *Türkiye yüzyılı maarif modeli.*

MoNE (2018). *Özel eğitim hizmetleri yönetmeliği,* 30471.

Muijselaar, M., Swart, N., Ekim, E., Düşüşü, M., Verhoeven, L., & Jong, P. (2017). Developmental relations between reading comprehension and reading strategies. *Scientific Studies of Reading*, *21*(3), 194-209.

Nadiyah, S., Tukimin, S., Susetyo, B., Tarsidi, I., Novianti, R., Hutasuhut, F. H., & Widia, A. (2022). The effect of rapid automatic naming on reading readiness for children with reading difficulties in elementary school. *Inclusive Educatıon*, *1*(1), 93-109. https://doi.org/10.57142/inclusion.v1i1.14

Nayar, K., Kang, X., Xing, J., Gordon, P. C., Wong, P. C. M., & Losh, M. (2021). A cross-cultural study showing deficits in gaze-language coordination during rapid automatized naming among individuals with ASD. *Scientific Reports*, *11*(1), 1-13.

Novianti, R., Nadiyah, S., Pratama, A., Santosu, Y., Mustika, A., & Ridwan, P. (2024). *Öğrenme güçlüğü çeken çocuklar için hızlı otomatik isimlendirme (RAN) tabanlı okuma müdahalesi | Novianti | ICSAR Dergisi*. *8*(1). https://journal2.um.ac.id/index.php/icsar/article/view/43683

Orellana, P., Silva, M., & Iglesias, V. (2024). Students' reading comprehension level and reading demands in teacher education programs: The elephant in the room? *Frontiers in Psychology*, *15*.

Ozernov-Palchik, O., Norton, E. S., Sideridis, G., Beach, S. D., Wolf, M., Gabrieli, J. D. E., & Gaab, N. (2017). Longitudinal stability of pre-reading skill profiles of kindergarten children: Implications for early screening and theories of reading. *Developmental Science*, *20*(5). https://doi.org/10.1111/desc.12471

Papadopoulos, T. C., Spanoudis, G. C., & Georgiou, G. K. (2016). How Is RAN related to reading fluency? A comprehensive examination of the prominent theoretical accounts. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.01217

Salas García, V. B., & Rentería, J. M. (2024). Students with special educational needs in regular classrooms and their peer effects on learning achievement. *Humanities and Social Sciences Communications*, *11*(1), 521.

Schroeder, S., Hyönä, J., & Liversedge, S. P. (2015). Developmental eye-tracking research in reading: Introduction to the special issue. *Journal of Cognitive Psychology*, *27*(5), 500-510. https://doi.org/10.1080/20445911.2015.1046877

Siddaiah, A., & Padakannaya, P. (2015). Rapid automatized naming and reading: A review. *Psychological Studies*, *60*(1), 70-76.

Song, S., Georgiou, G. K., Su, M., & Hua, S. (2016). How Well Do Phonological awareness and rapid automatized naming correlate with Chinese reading accuracy and fluency? A meta-analysis. *Scientific Studies of Reading*. https://www.tandfonline.com/doi/full/10.1080/10888438.2015.1088543

Stampoltzis, A., Plakida, E., & Peristeri, E. (2020). Hızlı otomatik isimlendirme (RAN) ve fonolojik farkındalık ve okuma ile ilişkisi: Disleksili öğrencilerden oluşan Yunan örnekleminde bir pilot çalışma. *Open Journal of Modern Linguistics*, *10*(3).

Şeker, Z. C., & Çetin, D. (2022). Okuma eğitimi alanında yapılan ölçek geliştirme çalışmalarının incelenmesi: Bir meta-sentez çalışması. *Uluslararası Türkçe Edebiyat Kültür Eğitim Dergisi*, *11*(3), 1193-1209.

Torgesen, J. K., Alexander, A., Wagner, R., & Rashotte, C. (2001). Intensive remedial ınstruction for children with severe reading disabilities ımmediate and long-term outcomes from two ınstructional approaches. *ResearchGate*, *34*(1), 33-58. https://doi.org/10.1177/002221940103400104

Uğurelli, Y., & Orhun, B. (2023). *Türkçe öğretiminde okuma el kitabı* (1. Baskı). Pegem Akademi.

Uysal Kanık, P., & Duman, A. (2020). Akıcılık odaklı okuma eğitiminin okuma becerileri üzerindeki etkileri. *Pegem Eğitim ve Öğretim Dergisi*, *10*(4), 1111-1146.

White, K. W., & Vallejo Peña, E. (2025). Leveling up reading engagement among nontraditional community college students. *College Teaching*, *0*(0), 1-10.