



Preliminary developmental challenges of children at risk for specific learning disabilities: Insights from parents and teachers—a qualitative study

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Abstract

This study aims to uncover the preliminary developmental challenges experienced by children from infancy to their primary school years, who are subsequently diagnosed with specific learning disabilities during their primary education. The ultimate goal is to develop an item pool to identify early symptoms of specific learning disabilities. This qualitative descriptive design study employed semi-structured interviews with 20 participants, comprising both parents and teachers of 10 children aged 8–11. The interviews lasted between 45 and 60 min. To ensure the research's quality and reliability, we applied evaluation criteria and performed six-stage thematic analysis framework. The results indicate that children experienced developmental difficulties from infancy to preschool period that impacted their social-emotional development, language and communication, motor and self-care skills, as well as their perception, memory, attention, and self-regulation capabilities. These challenges were exacerbated during the school years by motivation-related issues. Parental observations primarily highlighted difficulties in language and communication, such as pronunciation, initiating conversations, and speech, during the first three years of life. Significant issues in social-emotional development included introversion, a need for physical contact, challenges in maintaining relationships, and adherence to rules. These challenges emerged during the first three years of children and progressively worsened across all developmental domains. This study contributes valuable insights into the literature by providing past observations from parents and teachers, thus enhancing understanding of the preliminary developmental challenges faced by children at risk of specific learning disabilities.

Keywords Specific learning disabilities · Developmental challenges · Qualitative research · Parental observations · Teacher observation · Preschool

Introduction

SLD is classified as a neurodevelopmental disorder characterized by significant disparities between intelligence scores, which are within the normal or above-normal range, and performance in key academic areas such as reading,

mathematics, and written expression (American Psychiatric Association [APA], 2013; Melekoğlu, 2020). SLD encompasses three primary types: dyslexia, dyscalculia, and dysgraphia. Diagnostic criteria are drawn from the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), the International Classification of Diseases (ICD-10), and the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (APA, 2013; World Health Organization, 2019).

Originating from neurobiological factors, SLD's management focuses on early educational interventions rather than pharmacological treatments, highlighting the importance of early assessment and intervention (Thapar et al., 2017). The reason for this is that if children are not intervened in the early period, the difficulties they experience will increase (Sullivan et al., 2017; Zhang et al., 2020).

This study is produced from corresponding author's doctoral thesis.

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Therefore, intervention services provided in the early period can also contribute to reducing the negative effects (Lange & Thompson, 2006). The importance of the situation is further underscored by the prevalence of SLD.

SLD was identified as the most common disability among students aged 6 through 21 in the U.S., with 37.1% of those receiving special education services diagnosed with SLD (U.S. Department of Education, 2021). Additionally, 15% of the European population is affected by SLD (Institute of Entrepreneurship Development, 2019). Despite these striking rates, Turkey reports a notably lower prevalence rate of approximately 3%, highlighting a significant discrepancy in the identification and diagnosis of SLD, and pointing to a need for improved diagnostic tools and data collection methodologies (Melekoğlu, 2020). The fact that children at risk of SLD show similar characteristics to normally developing children makes early diagnosis even more difficult (Steele, 2004).

Research is advancing in early diagnosis by concentrating on identifying children at risk of SLD and preventing issues before they arise. Researches underscore the importance of early indicators in predicting future SLD, focusing on areas such as early literacy, rapid naming, phonological awareness, and working memory (Ozernov-Palchik et al., 2017; Snowling et al., 2019). Moreover, early quantitative challenges, such as deficiencies in understanding number relations, might lead to future difficulties in mathematics for children (Bull et al., 2021; Zhang et al., 2020). When viewed within the framework of developmental domains, early challenges in language, social-emotional development, psychomotor skills, cognitive development, and self-care skills are identified as predictors of SLD (Firat & Bildiren, 2024; İzoğlu-Tok & Doğan, 2022). International researches also focus on intervention programs (Almulla et al., 2021; Aunio et al., 2021; Sakellariou et al., 2020), development of identification tools (Flores et al., 2022; Hellstrand et al., 2020; Navarro Soria et al., 2020), and profiles of children at risk (Bonti et al., 2021; Quiroga Bernardos et al., 2022). These studies emphasize the critical role of early detection and intervention.

The situation in Turkey

In Turkey, the pathway to diagnosing SLD and providing special education services involves a multi-step process that engages both educators and medical professionals. Within the Turkish education system, primary education spans a four-year period following preschool, during which children undergo initial assessments. Notably, when special needs are suspected, classroom teachers play a pivotal role by referring children to medical or guidance and research centers for further evaluation. This diagnostic journey

emphasizes the significance of teachers' insights into the children's academic and developmental profiles.

Specialized educational support requires obtaining a Special Needs Report for Children (SNRC), which is contingent upon a formal medical diagnosis. Importantly, the evaluation of a child's academic progress over a minimum span of six months forms a critical component of this diagnostic framework. Considering that the diagnosis process takes an average of one year, it is obvious that we cannot provide support to children in the early stages. However, both national and international research always emphasizes the importance of early detection (Chordia et al., 2020; Firat & Bildiren, 2024; Kaya-Döşlü & Bağlama, 2022; Roama-Alves et al., 2020; Thapar et al., 2017). Therefore, research on the characteristics of at-risk children is essential to inform the development of intervention programs, evaluation tools, and understanding children's profiles.

The current study

While existing literature underscores the significance of early identification of children at risk of SLD, there remains a noticeable knowledge gap regarding the characteristics of children in Turkey. This gap about which areas and what difficulties children experience is evidenced by the limited availability of early assessment tools (Melekoğlu, 2020). Therefore, the primary sources of information crucial for fill this knowledge gap are the child's parents and teachers, who possess invaluable insights into early indicators of SLD due to their extensive interactions with the child during the preschool and early school years. With this regard, this study aims to identify the difficulties experienced by children diagnosed with SLD in the preschool and school periods, with the ultimate goal of creating an item pool for identifying early symptoms of SLD. The quality of the relationship that professionals establish with parents and school personnel can affect the quality of the children's assessment process (Lange & Thompson, 2006). Engaging with families and teachers for their insights is deemed crucial for a comprehensive understanding of children at risk for SLD, informing strategies for health and education professionals to enhance early intervention services. By addressing these challenges, we expect that this study will enhance the comprehension of the challenges faced by children at risk of SLD, and facilitate the development of assessment tools and intervention strategies. This study offers comprehensive insights into the challenges faced by children, addressing the roles of adults both in school and at home. The research question regarding the challenges experienced by children with SLD in pre-school (0–3 years and 3–6 years) and school periods guided the study.

Method

Study design

This qualitative study employed a qualitative descriptive design aimed at offering descriptions of experiences and perceptions, especially in areas with limited understanding (Sandelowski, 2010). This qualitative study utilized semi-structured interviews and thematic analysis to delve into the experiences and perspectives of parents and teachers regarding children's developmental challenges from infancy up to the present. The reporting guidelines of "Standards for Reporting Qualitative Research- SRQR" (O'Brien et al., 2014) and "Consolidated Criteria for Reporting Qualitative Research- COREQ" (Tong et al., 2007) were followed. The study was adhered to a postpositivist paradigm. In the postpositivist paradigm, researchers integrate the diverse perspectives of participants rather than relying on a singular viewpoint and employ various validity approaches (Creswell & Creswell, 2017). Consequently, in this study, we brought together the perspectives of both parents and teachers and applied validity approaches.

Sampling and participants

Participants were selected through typical case sampling, a targeted method aimed at obtaining a representative cross-section of cases. For parents, the criteria were: (1) having a child diagnosed with SLD in primary school, and (2) no additional diagnoses besides ADHD, given its frequent co-occurrence with SLD (Araz Altay & Gorker, 2017). For teachers, we included those who taught the children of the interviewed parents.

The first author conducted interviews with 20 participants: parents and teachers of 10 children who are currently attending primary school. All participants, including the children, were monolingual Turkish speakers, hence the interviews were conducted in Turkish. Prior to conducting the interviews, arrangements were made to meet primarily with one parent-typically the mother due to their predominant role in care and education involvement. This selection was made acknowledging that recalling past experiences might be affected by the passage of time. Therefore, our focus was on the primary school period, during which the children were first medically diagnosed.

All educators involved were classroom teachers, with the duration of their acquaintance with the children varying due to school changes or different grade levels. Typically, classroom teachers remain with the same group of students from the first to fourth grade unless their assignment changes.

The size of the sample was determined based on data saturation and representativeness (Guest et al., 2006). Coding

commenced concurrently with the interviews and persisted until the parents and teachers of the 10th child were interviewed. The decision to conclude the interviews was made when no new codes emerged, indicating that the data had reached saturation. Details on the participating parents (P) and teachers (T) are provided in Table 1.

Recruiting participants

Approval was obtained from the [Blinded] University Clinical Research Ethics Committee (KA-19141), along with administrative permissions from the Turkish Ministry of National Education (MoNE). The first author contacted school administrators to introduce the study to parents and teachers, focusing on children diagnosed with SLD.

Interviews were initiated following verbal confirmations from parents and subsequent confirmations from teachers regarding the children's diagnosis and inclusive education status.

Written informed consent was then collected via Google Forms. Due to COVID-19 pandemic restrictions, interviews were conducted by phone from September to November 2020, with durations ranging from 45 to 60 min.

Developing interview schedule

We developed two semi-structured interview schedules, distinct for teachers and parents, informed by a comprehensive literature review on developmental stages. These schedules were then refined based on feedback from three faculty members specializing in special needs education. The interview for parents comprised eleven main questions across three categories: general information, past experiences, and current status. Parents were prompted with questions designed to elicit their insights and reflections on their children's development from infancy up to the present, including the diagnostic journey and aspects of school life (detailed in Appendix A). Similarly, the teachers' interview schedule featured six main questions, organized into the same three categories. Teachers, were questioned about the developmental traits, diagnostic procedures, school experiences, and peer interactions they've noted from the commencement of the children's primary education to the present (outlined in Appendix B).

Rigor

To ensure the integrity and reliability of our research, we adhered to Lincoln and Guba (1985) criteria. The interviews were conducted with 20 participants, with the first author allowing flexibility in timing to enhance the *credibility* and internal validity. She probed further when responses

Table 1 Information on parents, children, and teachers

Parents	Children				Teachers								
	Parent's Age	Education Level (M)	Education Level (F)	Working	Siblings	Diagnosis Age	Gender	Gender	Practice Year	Child Recognition	Other SNC in Classroom	Number of CPC	
P1	32	High school	High school	√	2	9	Girl	T1	F	34	4 years	X	30–40
P2	40	University	University	X	3	11	Boy	T2	F	27	4 years	X	30–40
P3	49	University	University	R	1	10	Boy	T3	F	34	4 years	√	20–30
P4	49	University	University	R	1	10	Boy	T4	F	5	5 years	√	20–30
P5	49	University	University	R	1	8	Girl	T5	F	34	3 years	X	10–20
P6	41	High school	High school	√	0	11	Girl	T6	M	10	1 year	X	10–20
P7	35	High school	High school	√	1	11	Boy	T7	M	16	1 year	X	40–50
P8	43	University	University	√	1	9	Boy	T8	F	16	3 years	X	10–20
P9	38	High school	High school	X	1	8	Boy	T9	M	9	1 year	√	40–50
P10	47	University	University	√	1	11	Boy	T10	F	41	4 years	X	30–40

*M Mother, F Father, R Retired, SNC Special Needs Children, CPC Children Participating in Classroom

were unclear, ensuring comprehensive understanding. The diverse perspectives from both teachers and parents enriched the internal validity. Data saturation was confirmed when no new information emerged from the interviews.

For external validity criterion, *transferability*, we meticulously outlined the inclusion and exclusion criteria, aiming to ascertain that our findings could be applicable in various contexts (Lincoln & Guba, 2013, p. 103). Our methodical approach, from participant recruitment to the detailed explanation of our analysis process, supports the study's transferability. The coding process and its rationale are elaborated under the findings section, with clear definitions and descriptions to facilitate understanding.

Dependability was achieved through a rigorous and transparent process, defining key concepts like social-emotional and language development, motor skills, self-care, perception, memory, attention, and motivation based on prior literature. Each participant's experiences were deductively analyzed within these frameworks. An external researcher with expertise in early intervention and qualitative methods reviewed the themes, further validating the study's *reliability* by assessing code accuracy and researcher impartiality (Lincoln & Guba, 1985).

Confirmability and *objectivity* were reinforced through data triangulation, collecting data from multiple sources—teachers and parents—to verify consistency across different perspectives (Lincoln & Guba, 2013, p. 106). The first author meticulously transcribed interviews, with all data securely stored in MAXQDA qualitative research software (version 20.4.1), ensuring a robust framework for our qualitative analysis.

Researcher background

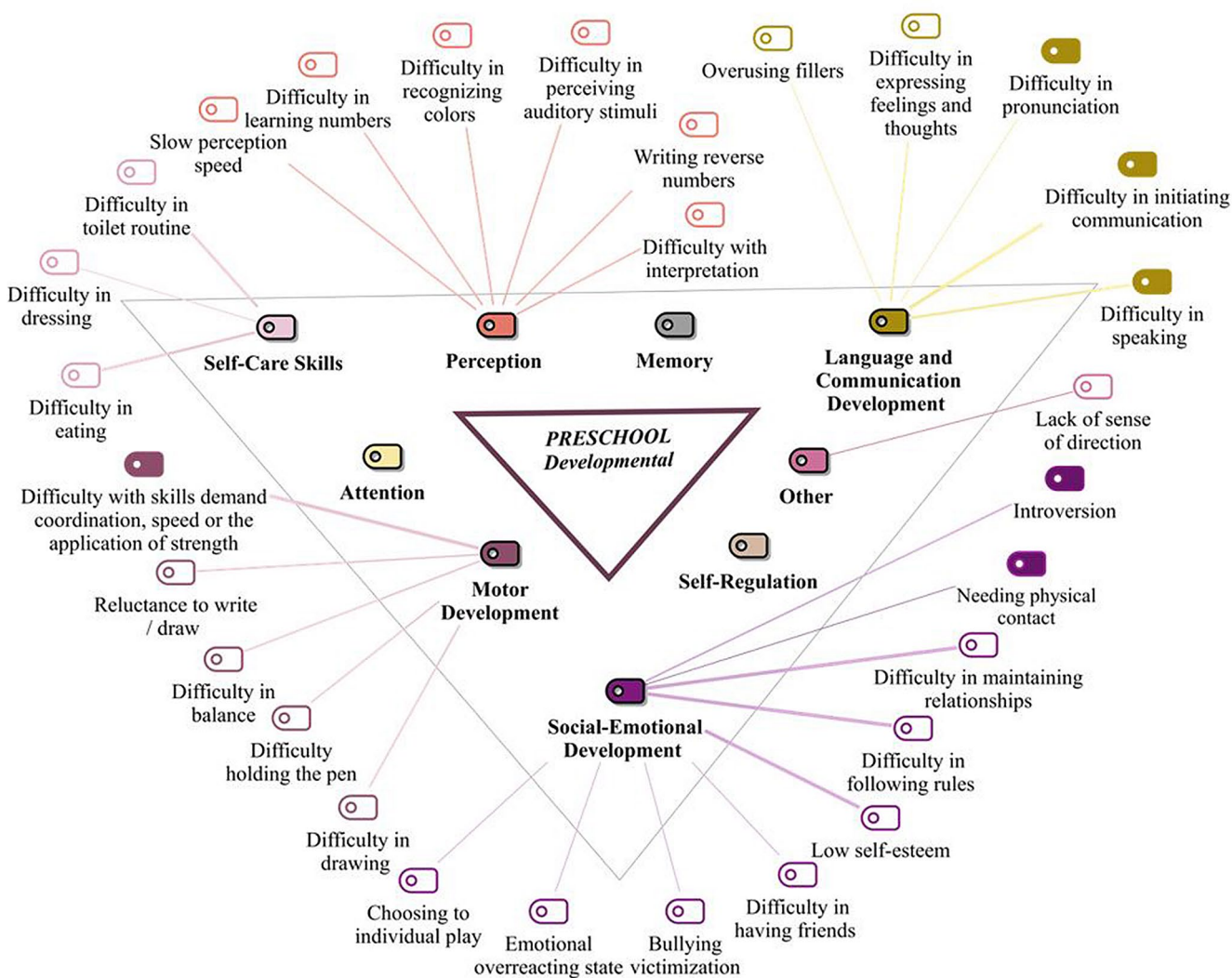
In qualitative research, the experience of researchers is pivotal for knowledge generation (Creswell & Creswell, 2017). Our team, composed of academic staff, undertakes clinical studies to assess and support children and offers family counseling services focused on child development. Acknowledging the influence of our backgrounds and experiences, we endeavored to mitigate potential biases. We documented our initial assumptions, insights from the literature, and our theoretical and practical expertise. Engaging in continuous reflection and dialogue throughout the study (Watt, 2015), we maintained a postpositivist perspective, anticipating a variety of developmental challenges. For instance, we defined the possible areas we expected to emerge by keeping in mind that there may be different areas of development where difficulties may arise.

Data analysis

Following Braun and Clarke (2021) six-stage thematic analysis framework, our approach facilitated both inductive and deductive analysis. To prevent data loss, the first author meticulously transcribed the interviews, resulting in a comprehensive document of 231 pages. This document was analyzed using MAXQDA qualitative research software, starting with a thorough reading to gain an overall understanding of the data.

In the first procedure, *familiarizing with the data*, we read transcripts to look at the data holistically. In the second

procedure, *systematic data coding*, we read and coded the transcriptions line by line. We outlined the distinct early developmental characteristics observed by teachers and parents in children diagnosed with SLD compared to peers. For example, one parent commented: “*He was having too many accidents compared to his peers. He was constantly getting injured. We never missed a visit to the hospital anyway. He still has a scar on his eyebrow. He burned his arm. So, he was always clumsy. He loses his balance and falls on the straight road.*”. We coded this comment as ‘difficulty with balance skills.’



Map 1 Early developmental symptoms of SLD in the preschool period. The filled symbols (●): developmental symptoms from ages 0–3; the empty symbols (○): developmental symptoms from ages 3–6

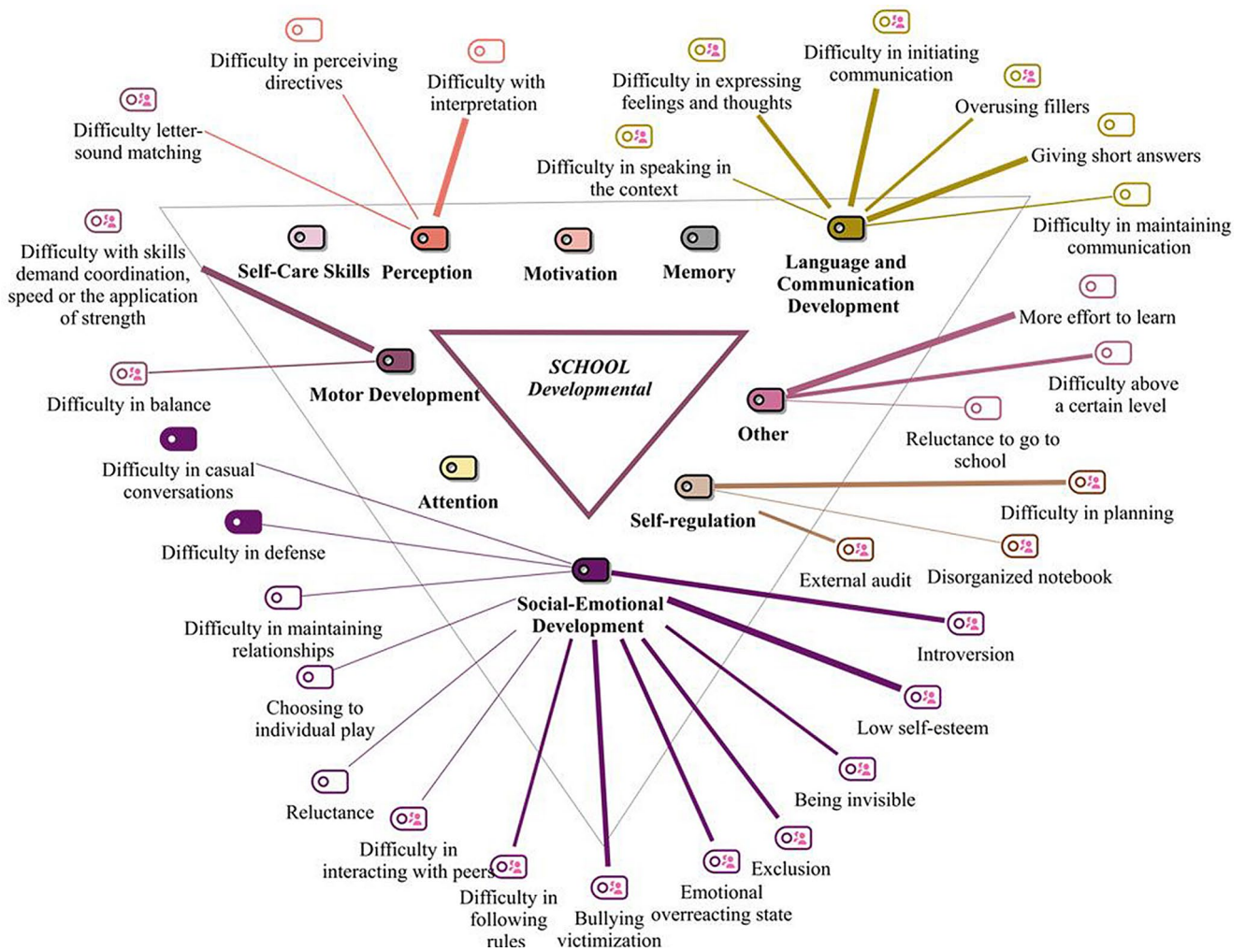
In the third procedure, *generating initial themes from coded and collated data*, we organized the codes into potential themes and sub-themes, ensuring all related codes were considered. In the fourth procedure, *developing and reviewing themes*, we checked coded quotations, potential categories, and themes to see if they were related. We made additions or substructions during this control process. A thematic map was created by establishing a relationship between quotation, code, category, and theme. In the fifth procedure, *refining, defining, and naming themes*, we named each theme so that it could create a related story for the research. In the sixth procedure, *writing the report*, we determined compelling quotations for inclusion in the report. After compiling the study into a report in Turkish, we translated the text into English with an expert support.

Our analysis, presented through thematic maps, adopted a developmental lens, offering a comprehensive view of the

children's developmental indicators for SLD from infancy to the school years. This approach, grounded in a developmental model (Kass & Maddux, 2005), aimed to present a holistic understanding of the identified early symptoms of SLD.

Declaration of generative AI and AI-assisted technologies in the writing process

While composing this work, the authors used Scholar Chat-GPT by Open-AI in order to improve the readability and use of existing language. It is crucial to emphasize that Scholar Chat-GPT was solely employed to enhance the quality of the writing and facilitate better communication of ideas, and not to generate new content. Following the application of this tool, the authors reviewed and edited the content as



Map 2 Early developmental symptoms of SLD in the school period. Filled symbols (●): parents' expressions; empty symbols (○): teachers' expressions; the symbol (◐): parents' and teachers' expressions

needed and takes full responsibility for the content of the publication.

Results

Four maps were created regarding the early symptoms after the data analysis of the interviews. In these maps, categories or periods are indicated by different symbols.

Early developmental symptoms of SLD

In Map 1, the early developmental symptoms of SLD in the preschool period fall under nine categories: social-emotional development, language and communication development, motor development, self-care skills, perception, memory, attention, self-regulation, and other difficulties.

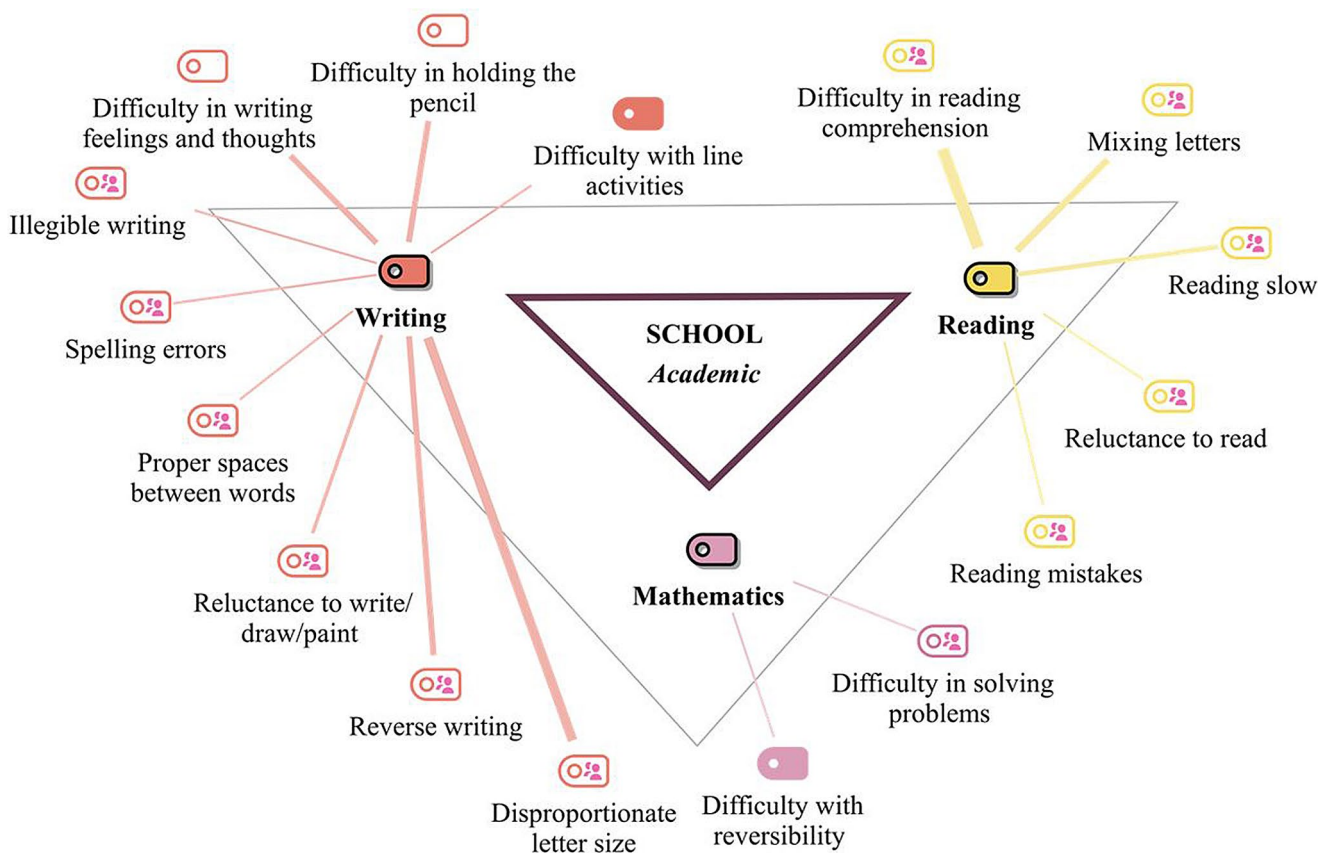
From ages 0–3, parents frequently noticed issues with their children's language and communication development. Problems with speaking, pronunciation, and starting conversations were common in this age group. After turning three, kids started

showing difficulty in expressing their feelings and thoughts, often relying on fillers like "err" and "umm." One parent (P9) shared about their child's struggle to initiate conversation:

“When he wanted to be friends and get closer, but he did not get a reaction, he gave up. So, he was very eager to have friends, but he had difficulty establishing that friendship. He was not a child who communicated a lot with his friends, nor was he social.”

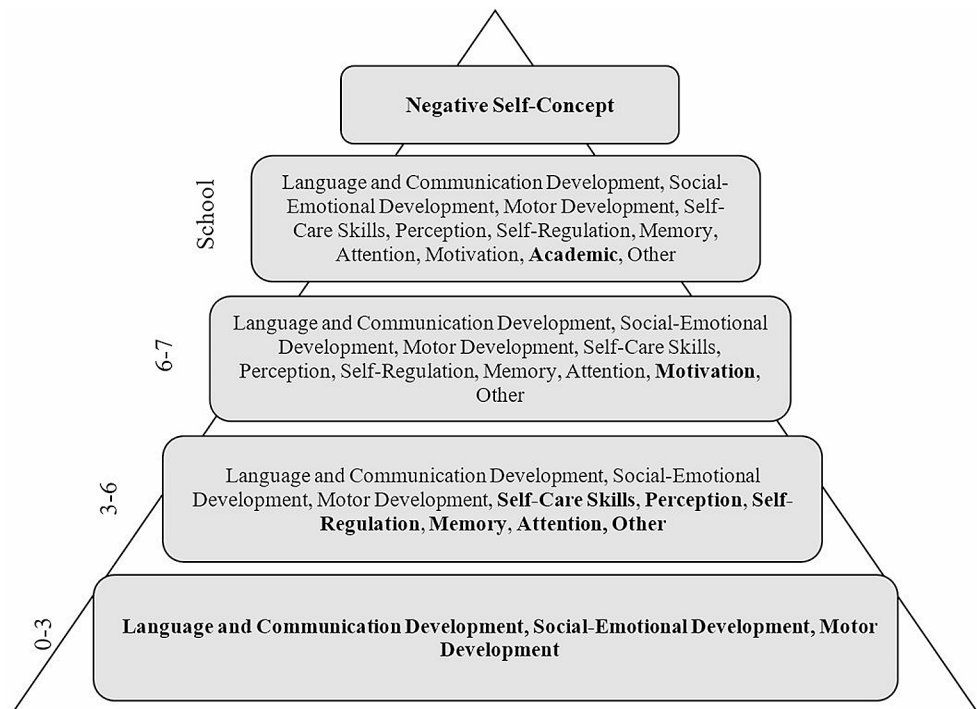
For social-emotional development, parents noticed early symptoms such as a need for physical contact and introverted behavior from ages 0–3. Between the ages of three and six, parents reported their children facing challenges with following rules, sustaining peer relationships, making friends, experiencing low self-esteem, becoming victims of bullying, displaying emotional overreactions, and preferring to play alone.

In the motor development category, parents reported that their children, between the ages of 0–3, encountered



Map 3 Early academic symptoms of SLD in the school period. Filled symbols (●): parents' expressions; empty symbols (○): teachers' expressions; the symbol (⊙): parents' and teachers' expressions

Map 4 Developmental symptoms pyramid of children at risk for SLD



difficulties with activities requiring coordination, speed, or strength. They described these challenges as clumsiness during running or an inability to participate in games like football. Between the ages of 3–6, the difficulties shifted towards activities that demand balance, drawing skills, and holding a pen properly. In the perception category, parents identified issues related to visual and auditory perception, including difficulties in perceiving auditory stimuli, recognizing colors, writing and learning numbers, interpreting visual or auditory inputs, and slow perception speed. These difficulties became apparent to the parents after their children reached the age of three. Additionally, in other areas, parents observed challenges with direction skills.

Parents also highlighted that their children experienced difficulties with memory, attention, and self-regulation. They observed issues with memory, particularly in recalling information. Furthermore, there were struggles with maintaining attention during games or tasks that required concentration. Both parents and teachers shared the belief that the children could accomplish any task if they managed to focus. Challenges in self-regulation were noted as well, especially in terms of being tidy at home and in school settings. One parent (P1), who has twins, with one diagnosed with SLD, discussed memory difficulties by drawing comparisons in the developmental process between her twins:

“...about describing the picture she saw Whenever I asked her, she had a blank stare on her face. Later,

when we read stories together, I used to realize she did not remember anything about the story.”

In general, the challenges identified between the ages of 0–3, with the exception of speaking difficulties, continue into the ages of 3–6. This means that issues such as pronunciation, initiating communication, introverted behavior, and difficulties with tasks requiring coordination, speed, or strength that begin to emerge from ages 0–3 tend to persist through to ages 3–6.

In Map 2, which focuses on the school period, the early developmental symptoms of SLD are categorized into ten areas: social-emotional development, language and communication development, motor development, self-care skills, perception, memory, attention, self-regulation, motivation, and other difficulties. Within the language and communication development category, difficulties were reported in initiating communication, expressing feelings and thoughts, overusing fillers, and speaking in context.

Difficulties in social-emotional development emerged as a category in which parents and teachers predominantly share their observations. The frequency of codes in this field has increased in school age. Parents have observed challenges in engaging in casual conversations and difficulty in defense own rights, while teachers have identified reluctance, choosing to play individual games, and difficulty maintaining communication. Both participant groups have highlighted a range of early symptoms including low

Table 2 Early symptoms of SLD

Area	Period	Difficulty	Area	Period	Difficulty	Area	Period	Difficulty	
Language-Communication Development	1	☐ Difficulty in pronunciation	Motor Development	1	☐ Difficulty with skills demand coordination, speed, or the application of strength	Attention	1	-	
		☐ Difficulty in initiating communication			☐ Difficulty in drawing			2	☐ Difficulty in paying attention to a game/task
		☐ Difficulty in speaking			☐ Difficulty in holding the pen			3	☐ Difficulty in paying attention to a game/task
	2	☐ Difficulty in pronunciation		☐ Difficulty in balance	Memory	1	-		
		☐ Difficulty in initiating communication		☐ Reluctance to write			2	☐ Difficulty in recalling information	
		☐ Difficulty in expressing feelings/thoughts		☐ Reluctance to draw			3	☐ Difficulty in recalling information	
	3	☐ Giving short answers		☐ Difficulty with skills demand coordination, speed, or the application of strength	Other	1	-		
		☐ Difficulty in maintaining communication		☐ Difficulty in balance			2	☐ Lack of sense of direction	
		☐ Difficulty in speaking in context		☐ Difficulty with skills demand coordination, speed, or the application of strength			3	☐ More effort to learn ☐ Difficulty above a certain level ☐ Reluctance to go to school	
Social-Emotional Development	1	☐ Introversion	Self-Care Skills	1	-	Motivation	3	☐ Low self-motivation	
		☐ Needing physical contact			☐ Difficulty in eating			☐ Reluctance about school life	
		☐ Difficulty in maintaining relationships			☐ Difficulty in dressing			☐ Reluctance about social life	
	2	☐ Difficulty in following rules	☐ Difficulty in toilet routine	Reading	3	☐ Difficulty in reading comprehension			
		☐ Low self-esteem	☐ Difficulty in eating			☐ Mixing letters			
		☐ Difficulty in having friends	☐ Difficulty in dressing			☐ Reading slow			
	3	☐ Bullying victimization	☐ Difficulty in toilet routine	Writing	3	☐ Reluctance to read			
		☐ Emotionally overreacting	☐ Perception			☐ Reading mistakes			
		☐ Choosing to individual play	☐ Slow perception speed			☐ Difficulty with line activities			
	Self-Regulation	1	☐ Difficulty in defense	2	☐ Difficulty in learning numbers	Perception	3	☐ Difficulty in holding the pencil	
			☐ Difficulty in casual conversations		☐ Difficulty in recognizing colors			☐ Difficulty in writing feelings and thoughts	
			☐ Reluctance		☐ Difficulty in perceiving auditory stimuli			☐ Illegible writing	
		2	☐ Choosing to individual play	☐ Writing reverse numbers	3	☐ Spelling errors			
			☐ Difficulty in maintaining relationships	☐ Difficulty with interpretation		☐ Proper spaces between words			
			☐ Introversion	☐ Difficulty in perceiving directives		☐ Reluctance to write			
3		☐ Low self-esteem	☐ Difficulty with interpretation	Self-Regulation	3	☐ Reluctance to draw			
		☐ Being invisible	☐ Difficulty in perceiving directives			☐ Reluctance to paint			
		☐ Exclusion	☐ Difficulty with interpretation			☐ Reverse writing			
3	☐ Emotionally overreacting	☐ External audit	Math	3	☐ Disproportionate letter size				
	☐ Bullying victimization	☐ Disorganized notebook			☐ Difficulty with reversibility				
	☐ Difficulty in following rules	☐ Difficulty in planning			☐ Difficulty in solving problems				

*1: ages 0–3, 2: ages 3–6, 3: School; The filled symbols (●): The parents’ expressions; The empty symbols (○): The teachers’ expressions; The symbol (☐): parents’ and teachers’ expressions

self-esteem, bully victimization, exclusion, introversion, emotional overreactive state, willingness to be invisible, and difficulty in following the rules. One child’s parent (P6) and teacher (T6) expressed low self-esteem as follows:

“She constructs barriers in unfamiliar situations, quickly abandoning tasks and expressing self-doubt. She often declares, ‘I cannot do this. Why do you insist? That is enough; it is not working; give up.’” (P6)
 “There was a situation like this where her self-esteem was low and quite challenging. She frequently began sentences by stating, ‘I cannot do it.’ While many students experience this to some degree, she struggled with it more than most.” (T6)

Parents and teachers used the phrase “vulnerable, sensitive, and combative” to describe the emotionally overreactive state of the children. One child’s parent (P8) and teacher (T8) expressed bullying victimization as follows:

“I did not know if he was beaten so much. He suffered a lot from a friend. He was a quiet kid. He was not a kid who defended his rights.” (P8)

“He was an oppressed child. One child in the classroom put him under the pressure. He could not defend himself. When he wanted to protect himself, he was doing it wrong.” (T8)

In the perception category, difficulties with matching letters to sounds were commonly reported by both parents and teachers. Furthermore, teachers noted challenges in interpreting stimuli and understanding instructions. Both parents and teachers reported difficulties in the self-regulation category such as external audit, disorganized notebook, and difficulty in planning. Difficulties in the field of attention, memory, motivation, and self-care skills were expressed by both parents and teachers during the school period as well. They expressed difficulty paying attention to a game/task, difficulty recalling information, reluctance, and low self-motivation about a game/task in the field of attention, memory, and motivation. Considering other difficulties, the teachers emphasized that children made more effort to learn, were reluctant to go to school, and could only learn until a certain difficulty level.

Early academic symptoms of SLD

In Map 3, the early academic symptoms of SLD in the school period appeared under three categories: reading, writing, and mathematics.

In the reading category, reading comprehension was the most emphasized difficulty. Mixing letters, reading slowly, making reading mistakes, and reluctance to read were expressed by both parents and teachers. One child's parent (P1) and teacher (T1) expressed the mixing of letters as follows:

"I turned the house into a map. Because I thought she could not forget letters if she saw them all the time. But she would do a lot of constant b-d shuffling." (P1)
"When I realized she was confusing the letters b-d, I thought this was not a problem. Because my four or five students made the same mistake as her... There was an application in the curriculum that I found very wrong. When I taught the letter groups b-d in the first grade, there was only one letter (s) between them. In other words, children are more confused because these letters are given one after the other... When these two letters are taught in proximity, students often experience confusion. Therefore, there is a need for change in this regard." (T1)

Most of the difficulties in the writing category were expressed by both parents and teachers. Difficulties holding the pencil, writing numbers in the correct direction, leaving appropriate spaces between words, legible writing, the proportionality of letters, and making spelling mistakes emerged in this area. In the mathematics category, both parents and teachers expressed difficulty solving problems.

Overview of developmental symptoms

We created Map 4 by considering the chronological and developmental processes. Firstly, the parents observed differences in their children's language and communication development. In particular, they emphasized difficulties in speaking, pronunciation, and limited vocabulary. In the following process, difficulties in social-emotional development were remarkably noted by the parents. This development area was that what both parents and teachers most expressed. Afterward, they started to mention motor development difficulties. Although parents believed their children had difficulties in motor development in preschool, they determined this to be an issue during school years.

This situation proceeded similarly for self-care, perception, attention, and memory. While self-care skills were tolerated in preschool, the child was expected to become

independent in the first grade. All the difficulties above started to show their effects more clearly in the academic field during school years.

When we look at the developmental process holistically, social-emotional development and motivation challenges become more pronounced in school life. Parents and teachers have reported that children exhibit a notable lack of motivation in addition to other difficulties. They tend to be invisible, become introverted, show reluctance in both their social and academic lives, and strive to be unnoticed.

We also saw the process progress increasingly in the seven steps. For instance, language difficulties emerged in the 0–3 age period and continued to increase and intensify during the school period. The frequency of codes in socio-emotional development has increased in school age. While the difficulties that appeared on the pyramid's base were expanded, new difficulties accrued on top of them. That was why we visualized this process as a pyramid. One child's parent (P2) expressed the increase in difficulties experienced as follows:

"He began speaking later than his peers and entered kindergarten at five. During that time, his speech development lagged, causing communication challenges with his teacher and impacting his ability to form friendships. Even now, he faces difficulties in making friends. When my son started first grade, I became suspicious of his learning difficulties as he struggled with reading words composed of two letters, often reading them backward. I shared my concerns with his teacher, who insisted on waiting. Despite waiting patiently, the difficulties persisted and even worsened. At this point, the formal reporting process was initiated." (P2)

When examining the pyramid, it is evident that there is an increase in the child's symptoms, coupled with a reluctance to understand, difficulty in motivation, and lack of self-esteem. Parents describe this situation as *"He has potential, but he believes he cannot do it," "He gives up quickly,"* or *"It is tough to break his prejudice that he cannot do it."* Consequently, researchers believe that all the difficulties experienced by children point to a theme linked to challenges in their perception of themselves. Hence, we have labeled the final step of the pyramid *"negative self-concept."* Self-concept encompasses an individual's perceptions of themselves across various aspects, including physical appearance, achievements in sports and academics, behavior, social acceptance, and interpersonal relationships (Butler & Gasson, 2005). We referred to the negative self-concept when children held negative perceptions of themselves in these areas.

In general, the findings reveal difficulties across 13 areas. Only parents or teachers reported some of these difficulties. Both parents and teachers expressed some of the other difficulties. Table 2 presents all the difficulties mentioned above, categorized by developmental areas, period, and the individual expressing the difficulty.

Discussion

This study aimed to explore early developmental challenges of children diagnosed with SLD and to contribute to the creation of an item pool for early symptom identification. Through qualitative interviews with parents and teachers, we identified a broad range of developmental symptoms from infancy to primary school, including difficulties in language and communication, social-emotional and motor development, self-care skills, perception, memory, attention, self-regulation, and academic challenges. These findings underscore the multifaceted nature of SLD and the importance of early identification and intervention.

According to the findings, parents and teachers highlighted difficulties in 13 distinct areas. We categorized these difficulties to create an item pool for early symptoms. We created an item pool at the end of the study and organized it by age groups (0–3, 3–6 and school age, outlined in Appendix C).

Early developmental symptoms of SLD

Our results showed that, according to parent observations, children primarily experienced language and communication difficulties—such as challenges with pronunciation, initiating communication, and speaking—during the first three years of their lives. After age three, they also struggled to express their feelings and thoughts and tended to overuse fillers in their speech. Previous studies have consistently identified these difficulties in language and communication development as early symptoms (Aunio et al., 2021; İzoğlu-Tok & Doğan, 2022; Price et al., 2022; Quiroga Bernardos et al., 2022). Longitudinal research emphasizes that children diagnosed with SLD face challenges in both receptive and expressive language skills during early developmental stages. Consistent with our findings, these challenges persist into later years (Carroll et al., 2014; Thompson et al., 2015; van Viersen et al., 2017, 2018). Van Viersen et al. (2017) reported that children diagnosed with SLD begin to lag behind their peers in receptive language skills around the 17th month and in expressive language skills around the 23rd month. Unlike this study, our participants did not report any challenges related to receptive language skills. Parents in Turkey apparently prioritize their children's speech over

their receptive language skills. Thus, it is plausible that parents primarily focus on expressive language skills when considering language development. Consequently, assessing language and communication development skills should be central to identifying risk groups. The literature supports the inclusion of these difficulties in the item pool. However, difficulty in speaking was not reported between the ages of 3 and 6. Lyytinen et al. (2005) found that late-talking toddlers with expressive delays caught up to their peers in language proficiency by the age of 3.5 years. Therefore, we suggest including this difficulty as a topic in preliminary interviews rather than incorporating it into assessment tools.

The most pronounced difficulties identified in our study relate to social-emotional development. Parental observations indicated that children exhibited symptoms such as introversion and a need for physical contact within the first three years of life. After the age of three, challenges in maintaining relationships and adhering to rules became apparent. Both parents and teachers noted an increase in introversion upon the children's entry into first grade, describing them as feeling excluded and invisible. Previous research has highlighted the importance of recognizing difficulties in social-emotional development as early indicators of potential issues (İzoğlu-Tok & Doğan, 2022; Sakellariou et al., 2020; Tercan & Yıldız-Bıçakçı, 2018). In particular, a qualitative study by İzoğlu-Tok et al. (2021) found that children with SLD felt marginalized and invisible due to experiences of bullying, with participation in mainstreaming services often equating to feelings of "rejection" and "not belonging." Reflecting on both our findings and those of previous studies, children were frequently described as "silent," "vulnerable," "sensitive," and "introverted." Thus, it is essential that these characteristics be considered as potential risk factors and integrated into the item pool for developing assessment tools.

Another significant observation was that children showed challenges in motor skills that require coordination, speed, application of strength, balance, and drawing abilities. Parents often described these challenges as clumsiness during physical activities, such as running or playing basketball. These issues were noted to persist throughout the school years. Similar challenges have been highlighted as early indicators of SLD in prior studies (Flores et al., 2022). Westendorp et al. (2011) determined that a greater learning lag in children correlates with poorer motor skill scores. Firat and Bildiren (2024) observed that children with SLD often began walking later than typical in the 0–2 age range and faced challenges in both fine and gross motor skills as they grew older. Although our study provides additional insights from parents regarding motor development issues, there is a general agreement that difficulties in motor skills are critical for identifying children at risk. Hence, it's essential to

include these challenges in the item pool for early identification of SLD.

Parents reported that children faced difficulties with self-care skills after the age of three, a concern that aligns with findings from previous studies (İzoğlu-Tok & Doğan, 2022; Tercan & Yıldız-Bıçakçı, 2018). In Tercan and Yıldız-Bıçakçı (2018) qualitative study, parents emphasized the challenges their children encountered during toilet routines and the dressing process. It was also observed that close relatives often described the child as “unskillful” during early childhood. Consequently, challenges associated with self-care skills should be considered when developing the item pool for an assessment tool.

Our study revealed that children encountered difficulties with perception after age three. According to parents, these challenges were related to visual and auditory stimuli. Previous research on children at risk for or diagnosed with SLD has also underscored the significance of perception skills. Some studies have focused on difficulties in color and shape perception, while others have addressed challenges with numbers (Aunio et al., 2021; Hellstrand et al., 2020; Quiroga Bernardos et al., 2022). Additional research has highlighted challenges in letter knowledge, speech perception, and following instructions (Quiroga Bernardos et al., 2022; Snowling et al., 2019). In our study, parents did not report difficulties with letter knowledge. This may be influenced by the prevailing belief in Turkey that children should not learn letters before formal education begins. However, in the literature, visual perception is connected with reading difficulties and phonological awareness (Baluoğlu et al., 2012; Frostig, 1972). The phonological approach posits that children diagnosed with learning disabilities have trouble recognizing and manipulating phonemes in speech and making letter-sound matches during early phases (Wolf, 2017, p. 173). Therefore, perception skills play a crucial role in the learning process. Thus, we suggest that challenges related to perception should be included in any assessment tool developed on this topic.

Our results also showed that children had significant escalation in self-regulation difficulties during the school period. Parents and teachers reported that children struggled with planning and maintaining the organization of their notebooks, which often required external audits. This finding aligns with findings from other studies in the literature (Tercan & Yıldız-Bıçakçı, 2018; Thompson et al., 2015). A thorough review makes it clear that challenges in this particular area are crucial and, therefore, should be included in the item pool for early identification of SLD.

Moreover, our study has demonstrated that children face challenges with paying attention to games or tasks from preschool onwards, as reported by both parents and teachers. This observation aligns with findings from previous

research, where children exhibited difficulties in initiating, maintaining, or completing activities or tasks (Firat & Bıldiren, 2024; Squarza et al., 2016; Tercan & Yıldız-Bıçakçı, 2018). Our findings indicate that parents and teachers believe that children could achieve any task if they were able to focus their attention. Consequently, problems related to attention could be mistakenly conflated with other difficulties. A common dilemma faced by parents is discerning whether the challenges with attention are a result of learning difficulties or if the inability to complete tasks stems from inherent attention issues. As such, our analysis suggests that difficulties in various domains are often attributed to an overarching issue of attention deficit by both parents and teachers.

In the context of diagnoses accompanying SLD, attention deficiency is commonly identified (Araz Altay & Gorker, 2017; Squarza et al., 2016). Thus, while attention is a necessary condition for any learning activity, it is not sufficient for diagnosing the early symptoms of SLD (Learning Disabilities Association, 2001). Assessing learning disabilities based solely on attention can risk misidentification as Attention Deficit and Hyperactivity Disorder (ADHD), another neurodevelopmental disorder (APA, 2013). Therefore, challenges related to attention should be considered alongside other difficulties when developing an assessment tool.

Our results also indicated that children have faced difficulties with memory recall since preschool, a symptom corroborated by previous research (Bonti et al., 2021). Studies have demonstrated a significant correlation between memory deficits and learning challenges, particularly in reading and mathematics (Mammarella et al., 2018; Moll et al., 2016; Peng et al., 2018). For instance, Moll et al. (2016) found that verbal memory deficits are linked to disorders in reading and mathematics, while visuospatial memory impairments are specifically associated with mathematics disorders. Although our study primarily relied on reports from parents and teachers, thus lacking detailed data on memory, the recurring theme of memory challenges emphasizes its importance. According to the information processing approach, memory plays a crucial role in learning, further highlighting memory as a key symptom to consider when identifying children at risk for SLD (Baddeley & Hitch, 1974). This underscores the necessity of including memory-related difficulties in the item pool for an assessment tool aimed at early detection of SLD.

Our findings showed that children have shown difficulty with location-orientation skills after age three, a challenge highlighted in previous studies (Açıkgöz, 2019; İzoğlu-Tok & Doğan, 2022). Research into the causes of SLD points to communication issues between the brain hemispheres, particularly noting that problems in the right hemisphere can

impede the acquisition of directional concepts (Silver, 1989; Vellutino, 1987). Therefore, this skill is essential for inclusion in the item pool.

After preschool, parents reported that their children exerted more effort to learn, exhibited reluctance to attend school, and could only advance to a certain level of difficulty in other areas. We interpreted these behaviors as outcomes of the cumulative difficulties experienced across all areas. For example, an increased effort to learn may stem from perception challenges (Karakoç, 2020). The DSM-5 also points out a decline in academic performance as a distinguishing feature of SLD from other neurodevelopmental disorders (APA, 2013), suggesting that children may need to work harder to achieve the same performance level as their peers in early stages. These indicators should, therefore, enhance the comprehensibility of the item pool.

Our findings underscore that motivation is a critical early symptom in the developmental process, especially post-preschool. Previous research has identified a lack of motivation as an early indicator of SLD (Firat & Bildiren, 2024; Pesova et al., 2014). The decrease in motivation during the school period may be attributed to ongoing difficulties. Since strong motivation and a positive self-image are essential for learning, challenges in this domain can significantly obstruct educational progress (Aro & Ahonen, 2011). Pesova et al. (2014) observed that many students with SLD often remain unnoticed for extended periods, further complicating their learning, motivation, and confidence. Thus, early detection is vital. Accordingly, challenges related to motivation should be included in the item pool of any assessment tool designed to identify children within the risk group.

Early academic symptoms of SLD

According to our research, difficulties in reading, writing, and mathematics become evident during the school period, as specified in the DSM-5 (APA, 2013). Additionally, similar challenges have been recognized as early symptoms in previous literature (Hellstrand et al., 2020; Navarro Soria et al., 2020; Quiroga Bernardos et al., 2022).

Reading has been the most extensively studied area (Ozerov-Palchik et al., 2017; Quiroga Bernardos et al., 2022; Snowling et al., 2019) as it represents the most common difficulty associated with SLD (APA, 2013). Parents and teachers in our study reported that children faced challenges with reading comprehension, letter mixing, slow reading, frequent reading errors, and reluctance to read. Partanen and Siegel (2014) found that children at risk of reading difficulties in kindergarten scored lower in word and letter recognition, phonological processing, and rapid naming compared to their peers not at risk. Unlike other studies, our research did not identify challenges in early literacy skills, such as

phonological awareness and letter knowledge, among preschool children. This discrepancy may be attributed to the Turkish curriculum, which discourages the teaching of reading and writing, including letter introduction, before formal education begins (Ministry of National Education, 2013). Hence, it's likely that parents did not recognize their children's difficulties in this area as notable challenges during the preschool period. Apart from reluctance to read, all other difficulties align with the DSM-5 diagnostic criteria (APA, 2013), suggesting that reluctance to read may stem from underlying challenges.

One teacher we interviewed suggested revising the curriculum, especially regarding the teaching of certain letters, such as 'b' and 'd'. In Turkish, each sound corresponds to a letter, and when teaching reading, letters are introduced in groups. For example, the third group includes six letters ('ö', 'r', 'ı', 'd', 's', 'b'), taught consecutively, placing 'b' and 'd' close together, which can confuse many children. This curricular approach may influence teachers' perceptions of these issues as early symptoms of SLD in Turkey.

Challenges in writing and mathematics are consistent with DSM-5 diagnostic criteria and existing literature (APA, 2013; Firat & Erdem, 2020; Zhang et al., 2020). Firat and Erdem (2020) found that a significant portion of students who struggled with mathematics in the 1st grade continued to face challenges in the 4th grade, including issues with rhythmic counting, concept comprehension, problem-solving, number knowledge, and making comparisons. Mathematics skills are often less emphasized compared to literacy skills in early education. Thus, difficulties in reading, writing, and mathematics should be integral to the item pool for early SLD detection.

Overview of developmental symptoms

A significant finding from our study is the progressive increase in difficulties experienced by children at risk for SLD, which closely follows the critical stages of their development. Initially, parents noted early symptoms in language and communication skills, identifying developmental language disorders and language skill difficulties as potential indicators of future SLD (Quiroga Bernardos et al., 2022; Thompson et al., 2015; van Viersen et al., 2017, 2018).

We observed that language development difficulties became evident in social settings, potentially impacting children's social development (Sakellariou et al., 2020). Consequently, social-emotional development challenges may arise following difficulties in language and communication. Socialization introduces environments where motor skills are actively utilized, making differences in motor development noticeable as children engage with their surroundings. Similarly, parents did not perceive challenges in perception,

attention, and memory as significant until entering the first grade. These early developmental symptoms can influence academic performance later on.

Our study uncovered developmental symptoms across multiple areas at early life stages, suggesting that accumulating difficulties prevent children from realizing their full potential. This accumulation leads to diminished motivation and self-esteem, driving children towards invisibility—a phenomenon we described as a negative self-concept.

Parents and teachers reported developmental difficulties early on, noting that foundational challenges expanded as new difficulties emerged. We depicted this progression as a pyramid, illustrating the Matthew effect—where initial disadvantages lead to compounded challenges, echoing the adage "the rich get richer, and the poor get poorer" (Gladwell, 2008). This effect, evident in both reading and mathematics, highlights the escalating nature of difficulties in development (Flores et al., 2022; Ozernov-Palchik et al., 2017; Zhang et al., 2020).

Analyzing these challenges, we noted the influence of the developmental model, which suggests a complex interplay of factors in a child's development. Before facing academic challenges, children experience difficulties in multiple developmental areas, underlining the potential long-term impact on learning behaviors (Kass & Maddux, 2005).

Theories from Piaget, Vygotsky, and others highlight critical periods in development. Observations from parents and teachers suggest that learning difficulties are often perceived as delays in achieving expected milestones. For instance, a delay in language development can affect social interactions, emphasizing the importance of recognizing and addressing challenges early. In Turkey, regulations emphasize early intervention for children with diverse needs (Decree-Law No. 573, 1997). However, SLD diagnoses typically occur after the first grade, underscoring the need for earlier assessment and intervention tools.

This study has provided researchers with a crucial item pool sample, facilitating the development of comprehensive screening tools tailored to various age groups (0–3, 3–6, and school age). Collaboration with families, educators, and health professionals ensures the validity and reliability of these tools across different populations. Moreover, the research contributes to expert and educator training, offering sessions on early sign recognition across multiple developmental domains. By identifying specific areas of concern like language, communication and social-emotional skills, the study informs the creation of early intervention programs. Advocating for the integration of screening and intervention protocols into educational systems, including kindergartens and primary schools, underscores the importance of early support for children at risk of SLD. This research sheds light on the needs of children from infancy,

informing policymakers and education officials. Longitudinal tracking of children with difficulties ensures ongoing assessment and progress monitoring, empowering families and educators to intervene early and improve developmental outcomes and educational success for affected children.

Conclusion

The exploration of early developmental challenges among children diagnosed with SLD presented in this study illuminates the multifaceted nature of this condition and underscores the critical importance of early identification and intervention. Through qualitative interviews with parents and teachers, a comprehensive item pool was established, delineating difficulties across various developmental domains from infancy through primary school. The findings highlight that challenges in language and communication emerge as early as infancy, followed by social-emotional, motor, perceptual, attentional, self-regulatory, memory, and academic difficulties during subsequent developmental stages. The study's thorough examination not only contributes to the existing literature on early symptoms of SLD but also emphasizes the necessity of integrating these findings into assessment tools for timely identification and intervention. By elucidating the progression of challenges experienced by children at risk for SLD, this research underscores the cumulative impact of developmental difficulties and advocates for proactive measures to support affected children's holistic development. Moreover, the study's insights hold significant implications for practitioners and policymakers, emphasizing the imperative of early intervention strategies aligned with the developmental needs of children with SLD, ultimately fostering their optimal growth and learning outcomes.

Limitations

This study primarily examined the past observations of teachers and parents. Additionally, it was confined to the research questions formulated by the researchers, which encompass information about the children's preschool and pre-diagnosis school period. A notable limitation of this research is the potential variance in the levels of perception and expression skills among participants in the study group.

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Author contributions 1st author: conceptualization, data curation, formal analysis, investigation, methodology, software, writing – original draft, visualization, validation.

2nd author: visualization, supervision, writing – review & editing.

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Data availability The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Code availability The code conducted from the findings of this study is available on request from the corresponding author. The code is not publicly available due to privacy or ethical restrictions.

Declarations

Ethics approval Ethics approval was obtained from Hacettepe University Clinical Research Ethics Committee (KA-19141), along with administrative permissions from the Turkish Ministry of National Education (MoNE). The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent Informed consent was obtained from all individual participants included in the study.

Declaration of generative AI and AI-assisted technologies in the writing process While composing this work, the authors used Scholar Chat-GPT by Open-AI in order to improve the readability and use of existing language. It is crucial to emphasize that Scholar Chat-GPT was solely employed to enhance the quality of the writing and facilitate better communication of ideas, and not to generate new content. Following the application of this tool, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

Competing interests The authors have no competing interests to declare that are relevant to the content of this article.

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References

- Açıkgöz, G. (2019). *Identifying the characteristics of preschool children with the risk of learning disability according to parent and teacher opinions* [Master's Thesis]. Gazi University.
- Almulla, A. A., Mansour, S. B. M., Afia, A., Aldossary, M., Alshammari, T., Alshammari, R., & Alajmi, E. (2021). The effectiveness of a computerized program in developing visual perception skills among preschool children with specific learning difficulties. *Multicultural Education*, 7(11), 1–18. <https://doi.org/10.5281/zenodo.5640258>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5)* (5th ed.). American Psychiatric Organization.
- Araz Altay, M., & Gorker, I. (2017). Assessment of psychiatric comorbidity and wis-c-r profiles in cases diagnosed with specific learning disorder according to DSM-5 criteria. *Noro Psikiyatri Arsivi*, 55(2), 127–134. <https://doi.org/10.5152/npa.2017.18123>
- Aro, T., & Ahonen, T. (2011). *Assessment of learning disabilities: Cooperation between teachers, psychologists and parents*. NiiloMäki Institute.
- Aunio, P., Korhonen, J., Ragpot, L., Törmänen, M., & Henning, E. (2021). An early numeracy intervention for first-graders at risk for mathematical learning difficulties. *Early Childhood Research Quarterly*, 55, 252–262. <https://doi.org/10.1016/j.ecresq.2020.12.002>
- Baddeley, A. D., & Hitch, G. (1974). Working memory. *Psychology of Learning and Motivation*, 8, 47–89. [https://doi.org/10.1016/S0079-7421\(08\)60452-1](https://doi.org/10.1016/S0079-7421(08)60452-1)
- Baluoti, A. R., Bayat, M. R., & Alimoradi, M. (2012). Relationship between visual perception and reading disability in primary students of Ahwaz city. *Research Journal of Applied and Basic Sciences*, 3(10), 2091–2096.
- Bonti, E., Sofologi, M., Efstratopoulou, M., Katsiana, A., Papantoniou, G., & Kougioumtzis, G. A. (2021). Low auditory-verbal cognitive profile: A “risk factor” for specific learning difficulties in preschool Children in Greece. *Psychology*, 12(02), 181–204. <https://doi.org/10.4236/psych.2021.122012>
- Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, 18(3), 328–352. <https://doi.org/10.1080/14780887.2020.1769238>
- Bull, R., Lee, K., & Muñoz, D. (2021). Numerical magnitude understanding in kindergartners: A specific and sensitive predictor of later mathematical difficulties? *Journal of Educational Psychology*, 113(5), 911–928. <https://doi.org/10.1037/edu0000640>
- Butler, R. J., & Gasson, S. L. (2005). Self esteem/self concept scales for children and adolescents: A review. *Child and Adolescent Mental Health*, 10(4), 190–201. <https://doi.org/10.1111/j.1475-3588.2005.00368.x>
- Carroll, J. M., Mundy, I. R., & Cunningham, A. J. (2014). The roles of family history of dyslexia, language, speech production and phonological processing in predicting literacy progress. *Developmental Science*, 17(5), 727–742. <https://doi.org/10.1111/desc.12153>
- Chordia, S. L., Thandapani, K., & Arunagirinathan, A. (2020). Children ‘At Risk’ of developing specific learning disability in primary schools. *The Indian Journal of Pediatrics*, 87(2), 94–98. <https://doi.org/10.1007/s12098-019-03130-z>
- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approach*. Eğiten Kitap.
- Firat, T., & Bildiren, A. (2024). Developmental characteristics of children with learning disabilities aged 0–6 based on parental observations. *Current Psychology*, 43(4), 2909–2921. <https://doi.org/10.1007/s12144-023-04526-z>
- Firat, T., & Erdem, E. (2020). Views of classroom teachers regarding the processes of 1st and 4th graders having difficulty in learning mathematics. *Erzincan University Journal of Education Faculty*, 22(1), 66–86. <https://doi.org/10.17556/erziefd.504004>
- Flores, P., Teixeira, J. E., Leal, A. K., Ribeiro, J., Monteiro, A. M., Fonseca, R. B., Branquinho, L., Ferraz, R., & Forte, P. (2022). The necessity of a reduced version of the psychomotor battery to screen for learning difficulties in preschool children. *Sustainability*, 14(12), 7263. <https://doi.org/10.3390/su14127263>
- Frostig, M. (1972). Visual Perception, integrative functions and academic learning. *Journal of Learning Disabilities*, 5(1), 5–19. <https://doi.org/10.1177/002221947200500101>
- Gladwell, M. (2008). *Outliers: The story of success*. Penguin Books.

- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. <https://doi.org/10.1177/1525822X05279903>
- Hellstrand, H., Korhonen, J., Räsänen, P., Linnanmäki, K., & Aunio, P. (2020). Reliability and validity evidence of the early numeracy test for identifying children at risk for mathematical learning difficulties. *International Journal of Educational Research*, 102, 101580. <https://doi.org/10.1016/j.ijer.2020.101580>
- İzoğlu-Tok, A., Bozkurt-Yükçü, Ş., Kaymaz, Ç., Güngör, İ., & Metin, N. (2021). Integration from the perspective of children with special needs: A phenomenological study. *The Journal of Social Sciences*, 53(53), 407–430. <https://doi.org/10.29228/SOBIDER.52147>
- İzoğlu-Tok, A., & Doğan, Ö. (2022). Evaluation of the diagnostic process of children with learning disabilities in the context of regulation and decree. *Ankara University Faculty of Educational Sciences Journal of Special Education*, 23(2), 319–343. <https://doi.org/10.21565/ozelegitimdergisi.800586>
- Institute of Entrepreneurship Development. (2019, December 19). *Learning Difficulties in Europe*. IED Team.
- Karakoç, K. (2020). *Assessment of suprathreshold auditory processing skills in children with specific learning disorder* [Master's Thesis]. Hacettepe Üniversitesi.
- Kass, C. E., & Maddux, C. D. (2005). *A human development view of learning disabilities: From theory to practice*. Charles C Thomas Publisher.
- Kaya-Döşlü, P., & Bağlama, B. (2022). Investigation of preschool teachers' views on early symptoms of learning disability. *ULEDER*, 2(2), 361–388. <https://doi.org/10.5281/zenodo.6782850>
- Lange, S. M., & Thompson, B. (2006). Early identification and interventions for children at risk for learning disabilities. *International Journal of Special Education*, 21(3), 108–119.
- Learning Disabilities Association. (2001). *Learning disabilities: A new definition*. https://www.ldao.ca/documents/Definition_and_Supporting%20Document_2001.pdf
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE.
- Lincoln, Y. S., & Guba, E. G. (2013). *The Constructivist Credo*. Routledge.
- Lyytinen, P., Eklund, K., & Lyytinen, H. (2005). Language development and literacy skills in late-talking toddlers with and without familial risk for dyslexia. *Annals of Dyslexia*, 55(2), 166–192. <https://doi.org/10.1007/s11881-005-0010-y>
- Mammarella, I. C., Caviola, S., Giofrè, D., & Szűcs, D. (2018). The underlying structure of visuospatial working memory in children with mathematical learning disability. *British Journal of Developmental Psychology*, 36(2), 220–235. <https://doi.org/10.1111/bjdp.12202>
- Melekoğlu, M. A. (2020). Özel öğrenme güçlüğüne giriş [Introduction to specific learning disabilities]. In M. A. Melekoğlu & O. Çakıroğlu (Eds.), *Özel öğrenme güçlüğü olan çocuklar [Children with specific learning disabilities]* (pp. 1–32). Vize Akademik.
- Milli Eğitim Bakanlığı [Ministry of National Education]. (2013). *Okul öncesi eğitimi program [Pre-school education program]*. Milli Eğitim Bakanlığı.
- Moll, K., Göbel, S. M., Gooch, D., Landerl, K., & Snowling, M. J. (2016). Cognitive risk factors for specific learning disorder. *Journal of Learning Disabilities*, 49(3), 272–281. <https://doi.org/10.1177/0022219414547221>
- Navarro Soria, I., García Fernández, J. M., Inglés Saura, C. J., & Real Fernández, M. (2020). Early detection of learning difficulties using the BADyG-E2r Battery during primary education. *Psicologia: Reflexão e Crítica*, 33(4), 1–11. <https://doi.org/10.1186/s41155-020-00143-y>
- O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research. *Academic Medicine*, 89(9), 1245–1251. <https://doi.org/10.1097/ACM.0000000000000388>
- Özel Eğitim Hakkında Kanun Hükmünde Kararname [Decree Law on Special Education], Pub. L. No. 23011, Milli Eğitim Bakanlığı 857 (1997).
- 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>
- Partanen, M., & Siegel, L. S. (2014). Long-term outcome of the early identification and intervention of reading disabilities. *Reading and Writing*, 27(4), 665–684. <https://doi.org/10.1007/s11145-013-9472-1>
- Peng, P., Barnes, M., Wang, C., Wang, W., Li, S., Swanson, H. L., Dardick, W., & Tao, S. (2018). A meta-analysis on the relation between reading and working memory. *Psychological Bulletin*, 144(1), 48–76. <https://doi.org/10.1037/bul0000124>
- Pesova, B., Sivevska, D., & Runceva, J. (2014). Early intervention and prevention of students with specific learning disabilities. *Procedia - Social and Behavioral Sciences*, 149, 701–708. <https://doi.org/10.1016/j.sbspro.2014.08.259>
- Price, K. M., Wigg, K. G., Misener, V. L., Clarke, A., Yeung, N., Blokland, K., Wilkinson, M., Kerr, E. N., Guger, S. L., Lovett, M. W., & Barr, C. L. (2022). Language difficulties in school-age children with developmental dyslexia. *Journal of Learning Disabilities*, 55(3), 200–212. <https://doi.org/10.1177/00222194211006207>
- Quiroga Bernardos, C., López Gómez, S., Iglesias Souto, P. M., Rivas Torres, R. M., & Taboada Ares, E. M. (2022). The detection of early reading performance and its relationship with biopsychosocial risk factors in the study of learning difficulties. *European Journal of Investigation in Health, Psychology and Education*, 12(8), 1205–1219. <https://doi.org/10.3390/ejihpe12080084>
- Roama-Alves, R. J., de Souza Oliveira, S., Dias, N. M., & Ciasca, S. M. (2020). Test for identification of signs of dyslexia: Convergent validity. *Trends in Psychology*, 28(4), 585–602. <https://doi.org/10.1007/s43076-020-00038-y>
- Sakellariou, M., Strati, P., & Mitsi, P. (2020). Tackling learning difficulties with the art of dance and movement in preschool age in the greek school. *International Research in Higher Education*, 5(1), 1. <https://doi.org/10.5430/irhe.v5n1p1>
- Sandelowski, M. (2010). What's in a name? Qualitative description revisited. *Research in Nursing & Health*, 33(1), 77–84. <https://doi.org/10.1002/nur.20362>
- Silver, L. B. (1989). Learning disabilities. *Journal of the American Academy of Child & Adolescent Psychiatry*, 28(3), 309–313.
- Snowling, M. J., Lervåg, A., Nash, H. M., & Hulme, C. (2019). Longitudinal relationships between speech perception, phonological skills and reading in children at high-risk of dyslexia. *Developmental Science*, 22(1). <https://doi.org/10.1111/desc.12723>
- Squarza, C., Piccolini, O., Gardon, L., Gianni, M. L., Murru, A., Gangi, S., Cortinovis, I., Milani, S., & Mosca, F. (2016). Learning Disabilities in Extremely Low Birth Weight Children and Neurodevelopmental Profiles at Preschool Age. *Frontiers in Psychology*, 7. <https://doi.org/10.3389/fpsyg.2016.00998>
- Steele, M. M. (2004). Making the case for early identification and intervention for young children at risk for learning disabilities. *Early Childhood Education Journal*, 32(2), 75–79. <https://doi.org/10.1007/s10643-004-1072-x>
- Sullivan, A. L., Kohli, N., Farnsworth, E. M., Sadeh, S., & Jones, L. (2017). Longitudinal models of reading achievement of students with learning disabilities and without disabilities. *School Psychology Quarterly*, 32(3), 336–349. <https://doi.org/10.1037/spq0000170>
- Tercan, H., & Yıldız-Bıçakçı, M. (2018). Mothers who children with specific learning difficulties views on children pre-diagnostics

- developmental characteristics. *The Journal of Academic Social Science Studies*, 68(Summer I), 581–591. <https://doi.org/10.9761/JASSS7557>
- Thapar, A., Cooper, M., & Rutter, M. (2017). Neurodevelopmental disorders. *The Lancet Psychiatry*, 4(4), 339–346. [https://doi.org/10.1016/S2215-0366\(16\)30376-5](https://doi.org/10.1016/S2215-0366(16)30376-5)
- Thompson, P. A., Hulme, C., Nash, H. M., Gooch, D., Hayiou-Thomas, E., & Snowling, M. J. (2015). Developmental dyslexia: Predicting individual risk. *Journal of Child Psychology and Psychiatry*, 56(9), 976–987. <https://doi.org/10.1111/jcpp.12412>
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19(6), 349–357. <https://doi.org/10.1093/intqhc/mzm042>
- U.S. Department of Education. (2021). *43th annual report to congress on the implementation of the Individuals with Disabilities Education Act*. U.S. Department of Education.
- van Viersen, S., de Bree, E. H., Verdam, M., Krikhaar, E., Maassen, B., van der Leij, A., & de Jong, P. F. (2017). Delayed early vocabulary development in children at family risk of dyslexia. *Journal of Speech, Language, and Hearing Research*, 60(4), 937–949. https://doi.org/10.1044/2016_JSLHR-L-16-0031
- van Viersen, S., de Bree, E. H., Zee, M., Maassen, B., van der Leij, A., & de Jong, P. F. (2018). Pathways into literacy: The role of early oral language abilities and family risk for dyslexia. *Psychological Science*, 29(3), 418–428. <https://doi.org/10.1177/0956797617736886>
- Vellutino, F. R. (1987). Dyslexia. *Scientific American*, 256(3), 34–41. <https://doi.org/10.1038/scientificamerican0387-34>
- Watt, D. (2015). On Becoming a qualitative researcher: The value of reflexivity. *The Qualitative Report*, 12(1), 82–101. <https://doi.org/10.46743/2160-3715/2007.1645>
- Westendorp, M., Hartman, E., Houwen, S., Smith, J., & Visscher, C. (2011). The relationship between gross motor skills and academic achievement in children with learning disabilities. *Research in Developmental Disabilities*, 32(6), 2773–2779. <https://doi.org/10.1016/j.ridd.2011.05.032>
- Wolf, M. (2017). *Proust and the squid: The story and science of the reading brain* (2nd ed.). Koç University Press.
- World Health Organization. (2019). *International classification of diseases*. <https://icd.who.int/Browse10/2019/En>.
- Zhang, X., Räsänen, P., Koponen, T., Aunola, K., Lerkkanen, M., & Nurmi, J. (2020). Early cognitive precursors of children’s mathematics learning disability and persistent low achievement: A 5-year longitudinal study. *Child Development*, 91(1), 7–27. <https://doi.org/10.1111/cdev.13123>

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