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Research Article

INTERNALIZING AND EXTERNALIZING PROBLEMS IN PRESCHOOLERS AT RISK FOR SPECIFIC DEVELOPMENTAL DYSLEXIA

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DISCLOSURE STATEMENT

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AUTHOR CONTRIBUTIONS

ZV conceived the idea. ZV designed the research method. The systematic review was done by ChA-M and KS. Manuscript writing was done by ZV, ChA-M, and KS. Final editing of the manuscript was done by ZV, ChP, and SV. All authors read and approved the final manuscript.

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Internalizing and Externalizing Problems in Preschoolers at Risk for Specific Developmental Dyslexia.

ABSTRACT

BACKGROUND. Children at risk of Specific Developmental Dyslexia (SDD) experience early difficulties in the school environment, including language, cognitive and motor functions as well as reduced socio-emotional skills. These multilevel difficulties early affect both the life of the child himself and the functioning of the family system (parents, siblings).

OBJECTIVE. The present study is a systematic literature review aimed to investigate the role of internalizing and externalizing problems regarding the early occurrence of SDD at preschool age.

METHODS. 131 studies retrieved as relevant to this topic. 5 researches met the predetermined inclusion criteria, while 112 out of the 117 article of the original search were rejected.

RESULTS Based on the studies overview, the following results have emerged: (i) a variance regarding the view that internalizing and externalizing problems are prognostic factors for SDD, (ii) a lacking number of reviews referring to the relation of conduct and emotional problems with SDD in preschoolers, and (iii) an absence of data concerning the role of early treatment of internalizing and externalizing problems as an inhibitory factor in the emergence of SDD.

CONCLUSIONS. As a general conclusion, the relation between externalizing, internalizing problems and early identification of SDD is recognized, whereas the exact interaction mechanism is not clearly determined. Moreover, further research is recommended on the combined early treatment of psycho-emotional and behavioral problems along with comprehensive intervention in early reading and writing difficulties.

KEYWORDS

Internalizing problems, externalizing problems, Specific Developmental Dyslexia, preschool age, predictive factors, early intervention.

INTRODUCTION

The acquisition of social and emotional skills begins at birth and changes according to age (Eisenberg, Spinrad, & Eggum, 2010). In the months and years following birth, children's emotional expressions become increasingly organized, conveying a wider variety of more targeted emotional messages (Camras, 2000; Thompson & Lagattuta, 2006).

During preschool, children begin to develop emotional connections outside the family in the form of

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friendships. As they start understanding the difference between socially acceptable and unacceptable behavior (Halle & Darling-Churchill, 2016), they become able to manage their own intense emotions in socially appropriate ways. Occasionally, they can solve some social problems independently (Han & Kemple, 2006).

As preschoolers develop more sophisticated ideas about the causes of emotion, they often focus their attention on the situations that cause the emotions or on how the emotions can be triggered by external events (Thompson & Lagattuta, 2006). Starting from the age of 2 to 3 years, children begin to understand that how people feel is directly affected by their desires (Thompson & Lagattuta, 2006). Specifically, during this period, children's receptive and productive vocabulary expands significantly and therefore, as their language skills increase, they are given opportunities to speak, explain, reflect, and learn not only about their own emotional experiences, but also about other people's feelings in their environment (Bretherton & Beeghly, 1982; Thompson & Lagattuta, 2006; Slee et al., 2012).

However, a wide range of children experience situations of constant disruption in their lives (Heward, 2011). Some of them express aggression to other people, which often have catastrophic consequences, while others are so shy and withdrawn that they seem to live in their own personal world. In any case, playing with others, developing friendly relationships and learning seem difficult for them. In cases of children who exhibit emotional disturbance or they are at risk of it, reading difficulties are often observed, a fact which is confirmed by a variety of studies (Nelson, Benner, & Gonzalez, 2005). These children are characterized by emotional and/or behavioral disorders (Heward, 2011), known as internalizing and externalizing problems (Horbach, Mayer, Scharke, Heim, & Günther, 2019). In case these problems occur early in life, they tend to be persistent (Curtis, Kaiser, Estabrook, & Roberts, 2019; Dahle & Knivsberg, 2014) until school age or even adulthood (Campbell, Shaw, & Gilliom, 2000).

INTERNALIZING PROBLEMS

Internalizing problems reflect symptoms of harmful behavior that is directed to one's self (Burlaka, Bermann, & Graham-Bermann, 2015). Internalizing problems include numerous heterogeneous disorders such as withdrawal, anxiety and depression that affect the child's internal psychological environment (Horbach, Mayer, Scharke, Heim, & Günther, 2019).

These problems are the most commonly diagnosed and chronic childhood psychological disorders (Brauner & Stephens, 2006; Crawford, Schrock, & Woodruff-Borden, 2011). In particular, anxiety disorders are considered one of the most common forms of internalization disorders with an estimated prevalence of 10% - 25% (Kashani & Orvaschel, 1990), while depression, one of the most widespread disorders, has a prevalence of 5% - 15% (Crawford, Schrock, & Woodruff-Borden, 2011).

Risk factors for internalizing problems are considered the child's personality characteristics, maternal characteristics, as well as the family environment (Crawford, Schrock, & Woodruff-Borden, 2011). In particular, Carter et al., (2010) reported that children with internalizing problems were more likely to be raised by parents of lower education than those without internalizing problems (Carter, et al., 2010). In addition, researchers have found a greater risk of developing internalizing problems in children growing in poverty (Burlaka, Bermann, & Graham-Bermann, 2015).

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Regarding the characteristics of each child, several studies show that internalizing problems are more common among girls (Camras, 2000). In fact, it is argued that the internalized psychopathology of girls from early childhood stems from their biological predisposition, rejection and neglect by their caregiver, better perception and empathy skills (Keenan & Shaw, 1997).

In general, students with internalizing behaviors do not tend to disrupt school interactions and therefore they often remain undiagnosed (Carter et al., 2010). Unlike externalizing problems, internalizing problems are much more covert and do not quickly attract the attention of teachers. However, this does not mean that they are less serious (Lane et al., 2016). These problems are an obstacle to the child's academic development and the development of social relationships, referring to a child who cannot live in harmony with himself (Burlaka, Bermann, & Graham-Bermann, 2015).

EXTERNALIZING PROBLEMS

The term externalizing problems refers to outward-directed behaviors and emotional reactions/conditions of a person (e.g. aggression, hyperactivity, non-compliance, anger, oppositional defiance) (Bayer, et al., 2012; Curtis, Kaiser, Estabrook, & Roberts, 2019; Dahle & Knivsberg, 2014; Francis, Caruana, Hudson, & McArthur, 2019; Rourke & Fuerst, 1996; Steenhoff, Tharner, & Væver, 2021), which affect his environment by causing conflicts (Dahle & Knivsberg, 2014; Liu, 2004).

Externalizing problems are particularly common in children (prevalence of 7.3% for 5-7 year-old children (Basten et al., 2016)) and often, the first signs of their onset occur during preschool years, with the prevalence of appearance ranging between 9.0% and 14.9 % for this period (Curtis, Kaiser, Estabrook, & Roberts, 2019). From preschool age and onwards, it seems that boys tend to exhibit more externalizing problems than girls (Basten et al., 2016; Rutter, Caspi, & Moffitt, 2003).

In young children, externalizing problems often seem rooted in a lack of ability to regulate their emotions efficiently (Steenhoff, Tharner, & Væver, 2021). Other prognostic factors identified for the emergence of externalizing problems are: (1) genetic and neurobiological factors, (2) attachment styles (Curtis, Kaiser, Estabrook, & Roberts, 2019), (3) poverty (Qi & Kaiser, 2003), (4) parenting behavior (maternal stress, intrusiveness, strictness) (Bayer et al., 2012; Curtis, Kaiser, Estabrook, & Roberts, 2019; Graziano, Keane, & Calkins, 2010), as well as (5) deficits in reading and dyslexia (Knivsberg & Andreassen, 2008).

Children with externalizing problems are at risk of low academic performance (Arnold et al., 2006; Masten et al., 2005; van Lier et al., 2012), social exclusion and rejection by peers (van Lier et al., 2012), substance use and criminal behaviors (Arnold et al., 2006), as well as with various kinds of psychopathologies (Steenhoff, Tharner, & Væver, 2021).

Since behaviors, which occur as a result of externalizing problems, create significant difficulties for children and their environment (Neece, Green, & Baker, 2012), early intervention in preschool age seems to lead to positive results (Bierman et al., 2002; Curtis, Kaiser, Estabrook, & Roberts, 2019).

SDD and Internalizing and Externalizing Problems

A commonly accepted definition of SDD is given by the International Dyslexia Association (2002): "Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate

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and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge."

Children at risk of SDD experience early difficulties in the school environment, including language, cognitive and motor functions as well as reduced socio-emotional skills (Theodoridou, Christodoulides, Zakopoulou, & Syrrou, 2021). These multilevel difficulties early affect both the life of the child himself and the functioning of the family system (parents, siblings) (Exarchou, Simos, Siafaka, & Zakopoulou, 2020). The onset of symptoms of SDD, while recorded and treated systematically during the school age, starts to become apparent from preschool age onwards (Livingston, Siegel, & Ribary, 2018; Poulsen, Nielsen, Juul, & Elbro, 2017; Thompson et al., 2015). During the preschool years, various studies emphasize the importance of specific areas of psychomotor development as early indicators of SDD. Such areas include the construction of body shape and the individual's perception of it, spatial and temporal orientation, visual-motor coordination, and distinguishing left from right (Zakopoulou et al., 2022). It may also be associated with the form of verbal delay (Thompson et al., 2015) in the form of difficulty in learning names of objects, colors, letters of the alphabet and sounds of letters of the alphabet (Thambirajah, 2010). In order for each child to reach its full potential in the long term, early diagnosis should be a priority for each school and education system (Colenbrander, Ricketts, & Breadmore, 2018).

Besides the risk for academic deficits, social, emotional, and behavioral problems, children with reading disorders often show early evidence of other childhood psychiatric and developmental disorders (Grizzle, 2007) such as Attention Deficit Hyperactivity Disorder (ADHD), stress, depression, emotional and behavioral problems (Baumeister, Storch, & Geffken , 2008; Hendren, Haft, Black, White, & Hoeft, 2018; Mammarella et al., 2016).

The prevalence is high, with more than 60% of children and adults with dyslexia having criteria for at least one additional, emotional, and/or behavioral disorder (Willcutt & Gaffney-Brown, 2004). Despite the strong mutual association between reading disorder and mental disorders in young people, their coexistence often does not receive appropriate diagnosis and therapeutic intervention, resulting in optimal outcomes in all areas of difficulties, including emotion (Hendren, Haft, Black, White, & Hoeft, 2018).

Co-morbidity with ADHD seems to be an explanatory factor for the differentiated scores of behavioral problem between children with and without reading disorder (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Willcutt & Pennington, 2000). Researchers argue that anxiety distracts attention from the learning process, by interfering with the cognitive functions necessary for reading ability (Bryan, Burstein, & Ergul, 2004), and that anxiety may be the result of an experience of failure in school due to a reading disorder (Carroll & Iles, 2006).

Various researches point to the existence of several environmental factors that can influence an individual's genetic predisposition to SDD (Romeo et al., 2018; Theodoridou, Christodoulides, Zakopoulou, & Syrrou, 2021). Among these, stress appears to be a fundamental environmental factor that could lead to SDD or influence the phenotype associated with it,

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regardless of the presence or absence of genetic mutations in key risk genes (Theodoridou, Christodoulides, Zakopoulou, & Syrrou, 2021).

Similar to anxiety disorders, it is possible to explain depressive disorders, which occur at equally high levels (Mammarella et al., 2016). The high incidence of peer bullying and victimization experienced by children and adolescents with reading problems may be an environmental factor that partially explains the comorbidity with depression (Baumeister, Storch, & Geffken , 2008). Finally, with regard to impulse control and behavioral disorders, a correlation between reading disorder and behavioral problems is identified (Hendren, Haft, Black, White, & Hoeft, 2018).

OBJECTIVES

The systematic literature review shows that a range of studies emerges considering the interaction between internalizing and externalizing problems with SDD as a core component of the SDD structure, fundamental to a comprehensive approach to understanding the complex structure of SDD (Dahle & Knivsberg, 2014; Willcutt & Pennington, 2000). However, there are no in-depth studies on the degree and the characteristics of their early interacted co-occurrence, making further investigation rather imperative (Hendren, Haft, Black, White, & Hoeft, 2018).

Adding to the above, the purpose of the current systematic review was to investigate the following questions:

1. Are internalizing and externalizing problems a predictive factor of SDD's onset?

2. Do internalizing and externalizing problems appear as a result of SDD?

3. Does early treatment of internalizing and externalizing problems inhibit the onset of SDD?

METHOD

In order to identify articles relevant to our research questions, the method of systematic literature review was applied.

Initially, the following nine databases were searched: PubMed, Google Scholar, Wiley Online Library, Springer Link, Research Gate, Taylor & Francis Online Library, American Psychological Association PsycNet, Elsevier B.V. Science Direct and SAGE Journals. The search considered only articles in English language, using terms related to internalizing problems, externalizing problems and SDD.

In particular, the following keywords were searched: preschoolers at the risk of specific learning disorder, stress AND early diagnosis of dyslexia, depression AND early diagnosis of dyslexia, early intervention at the risk of dyslexia, internalizing problems AND early intervention of dyslexia, internalizing problems AND dyslexia at preschool children, externalizing problems AND dyslexia at preschool children, comorbidity of internalizing AND externalizing problems AND dyslexia, early conduct problems AND dyslexia, internalizing problems at risk of dyslexia, externalizing problems at risk of dyslexia, internalizing problems AND early intervention of dyslexia, externalizing problems AND early intervention of dyslexia.

Selection of Studies

In the context of the above search process, 131 articles were initially selected, duplicates of which were removed (n=11) as well as those who we failed to recover their full text (n=3). Specific inclusion and exclusion criteria were defined in order to identify the most ideal articles from the 117 that emerged, to

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answer the questions of the current research, as follows: (a) they were written in English, (b) they were written from 2010 and onwards, (c) they were longitudinal or pilot studies, (d) they were only original research, (e) the target age of the sample was preschool age, and (f) the research questions concerned the interaction between internalizing and/or externalizing problems and SDD.

Accordingly, only 5 researches fulfilled the defined criteria, while 112 out of the 117 articles of the original search were rejected, as follows: (a) 18 had been drawn up before 2010, (b) 26 were not original research, (c) 39 concerned older than preschool populations, and (d) 29 did not examine any type of relationship between internalizing/externalizing problems and SDD.

The whole process of selecting the eligible articles is showed in the PRISMA 2020 flow diagram for new systematic reviews (figure 1).

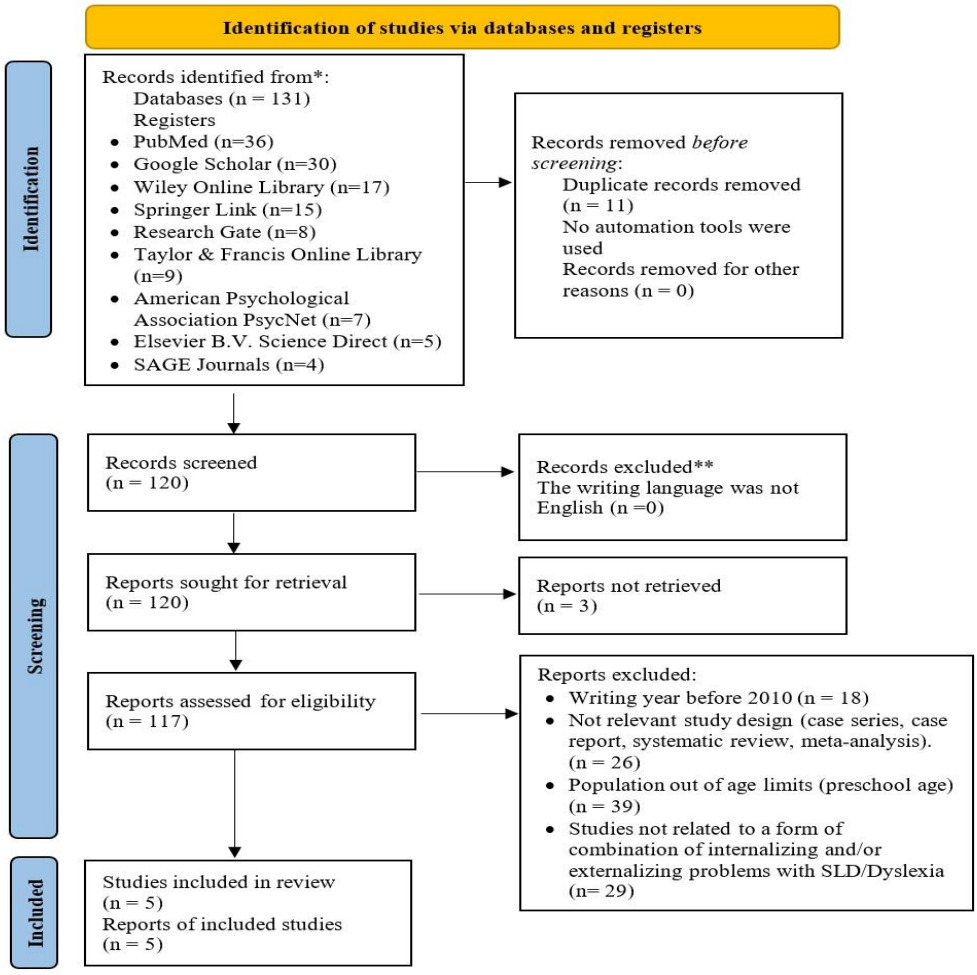

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Fig. 1 PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

The quality of the included studies was assessed using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, a scale which consists of 14 items related to the articles' content. These are answered with a "Yes" a "No" or with an "Other" that contain: "Cannot Determine", "Not recorded' and "Not applicable". For the majority of the articles (3/5), positive answers were given for 13 of the 14 questions on the scale, while for the other two articles the negative answers did not exceed 4 (4/14 for one of them, 2/14 for the other) (see figure 2).

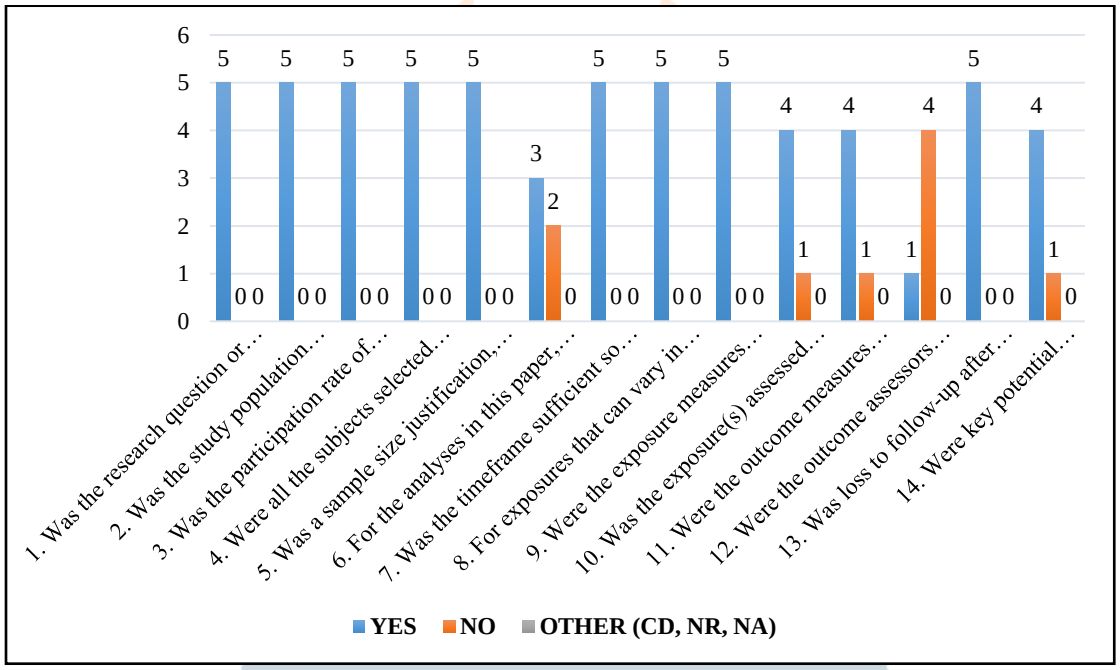

Fig. 2 Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

RESULTS

Although preschool-age children were the target population of this systematic literature review, it was considered appropriate to include longitudinal studies, in which participants were evaluated from preschool to school age, as the emerging results offered useful information to answer our research questions. The surveys selected involved populations that differ from each other in spoken language (table 1).

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Table 1 The characteristics of the five studies finally included in the present systematic review

Author	Study design	Sample size	Children's age	Language
Horbach et al., 2019	Longitudinal study (part of the German project "Lesen ohne Worte")	• n at G0 (preschool) = 292 children (n = 166 male, n= 126 female) • n at G5 (5th grade) = 196 children (n = 106 male, n= 90 female)	G0 (preschool): Mage=6.21 to G5 (5th grade): Mage=11.22	German
McIntosh et al., 2012	Longitudinal study	n = 473 children	Grade K (preschool) to Grade 5 (5th grade)	English (no clear reference)
Jordan & Dyer, 2017	Longitudinal study (part of the Millennium Cohort Study, MCS)	n = 7224 children	3-11 years old	English (no clear reference)
Parhiala et al., 2015	Longitudinal study	n = 170 children	4-8 years old	Finnish
Zakopoulou et al., 2021	Pilot study	n = 20 children	5-6 years old (Mage=65 months and 20 days)	Greek

The main target of all the included studies was the determination of the kind of the relationship between the SDD and internalizing and externalizing problems (table 2).

Table 2 The specific target posed in each study

Author	Study objectives (relative to the present research)	Subjects studied

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Horbach et al., 2019	Investigates the development of emotional and behavioral problems in children with and without SLD in reading and writing.	• Internalizing problems: anxious/depressed, somatic complaints, withdrawn/depressed • Externalizing problems: rule-breaking behavior and aggressive behavior • SDD
McIntosh et al., 2012	Investigates whether reading skills at school entry or change in reading skills over the course of kindergarten were more predictive of chronic problem behavior in Grade 5.	• Externalizing problems: behavior problems (physical aggression or harassment) • SDD
Jordan & Dyer, 2017	Investigates how dyslexia, in absence of co-occurring difficulties, impacts upon the development of psychological well-being problems upon school entry.	• Internalizing problems: emotional problems • Externalizing problems: conduct problems • SDD
Parhiala et al., 2015	Investigates whether there are differences in psychological functioning between children with and without dyslexia before school entry (ages 4 to 6) and/or after school entry (age 9).	• Internalizing problems: anxiety, depression, and somatization • Externalizing problems: aggression and hyperactivity • SDD
Zakopoulou et al., 2021	Investigates the complexity of difficulties/dysfunctions in multiple domains related to SLD and it emphasizes in the lack of a multi-collector diagnostic model for early diagnosis of this disorder.	• Internalizing problems: emotionally reactive, anxious, depressed • Externalizing problems: aggressive behavior • SDD

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For sampling, the researchers established some well specified criteria, based on which individuals would be involved in the study or get rejected (table 3). Common in all studies was the criterion of age (preschool age) (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Jordan & Dyer, 2017; McIntosh, Sadler, & Brown, 2012; Parhiala et al., 2015; Zakopoulou et al., 2021). Bilingualism as well as the presence of chronic diseases (Horbach, Mayer, Scharke, Heim, & Günther, 2019), mental, physical and sensory disabilities (Parhiala et al., 2015), intellectual disabilities, autism spectrum disorders, neurological disorders and the diagnosis of Specific Language Impairment (SLI) (Zakopoulou et al., 2021) were considered as rejection criteria in 3 of the 5 studies.

Table 3 Sampling Criteria

Author	Sampling Criteria
Horbach et al., 2019	• School entry in the following year (i.e. last year of preschool) • Monolingual German-speaking children • No chronical disease
McIntosh et al., 2012	Participant's age
Jordan & Dyer, 2017	Participant's age
Parhiala et al., 2015	• Parental educational level • Finnish as native language • No mental, physical or sensory impairments • **FR GROUP (parents):** one or both were diagnosed with dyslexia and reported reading difficulties in at least one other close relative. • **CONTROL GROUP:** no reading or spelling difficulties and they reported no reading difficulties in close relatives.
Zakopoulou, et al., 2021	• Participant's age (age 5-6, attending kindergarten) • Greek nationality • Monolingual Greek speakers • No Intellectual Disability, Autism Spectrum Disorders, SLI or any neurological disorder

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In terms of the measures used to evaluate the population's language ability, both in preschool and school age, there were variations among the studies. McIntosh et al., (2012) and Zakopoulou et al., (2021) studied language parameters, only in preschool age, Jordan & Dyer (2017) and Parhiala et al., (2015), only in school age, whilst Horbach et al., (2019), in both periods.

Although none of the studies used identically standardized or not-standardized measurements, the factors examined had basic similarities. In particular, in preschool age, letter knowledge was evaluated (Horbach, Mayer, Scharke, Heim, & Günther, 2019; McIntosh, Sadler, & Brown, 2012; Zakopoulou et al., 2021), while in school age reading and spelling competence were assessed (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Parhiala et al., 2015).

In the majority of the studies, evaluation tests for language abilities were administered to the children individually, either in preschool or in school age. An exception was the study by Jordan & Dyer (2017) in which teachers of school-age children were given a questionnaire to determine the educational needs/status of their students (Jordan & Dyer, 2017) (table 4).

Table 4 Diagnostic measures used in each study to assess the language ability

Author	Measures for assessing the language ability		Administered to
	Preschool age	School age	
Horbach et al., 2019	The children were asked to name all 26 upper case letters of the German alphabet.	• Salzburg Reading and Spelling Test (SLRT-II; Moll & Landerl, 2010) • Potsdam-Illinois Test of psycholinguistic abilities (P-ITPA; Esser & Wyschkon, 2010)	Children
McIntosh et al., 2012	Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002) • Initial Sound Fluency (ISF) • Letter Naming Fluency (LNF)	-	Children
Jordan & Dyer, 2017	-	Questionnaire to determine Special Educational Needs (SEN) Status	Teachers

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Parhiala et al., 2015	-	• Words and pseudowords were presented to the children to read. The number of correctly read words and the reading speed were documented. • Children read aloud a short passage (124 words). The average number of words read correctly per minute was used as the measurement of text reading fluency. • Children read a short passage comprised of 19 pseudowords. The number of pseudowords read correctly in 1 min was used as the measurement of reading fluency. • Lukilasse test (Häyrinen, Serenius-Sirve, & Korkman, 1999) • 6 dictated words and 12 pseudowords were presented via headphones. The number of correctly written items was used as the measurement of spelling accuracy.	Children
Zakopoulou et al., 2021	• Early Dyslexia Identification Test (EDIT) (Zakopoulou V., 2003). • ATHINA Test: Diagnosis of Learning Difficulties Paraskevopoulos et al., 1999)	-	Children

In order to determine the psychosocial and behavioral status of children, only standardized measures were administered. This evaluation process regarded preschool age in the study by Zakopoulou et al., (2021), only school age in McIntosh et al., (2012), and both

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preschool and school age in Horbach et al., (2019), Jordan and Dyer (2017), and Parhiala et al., (2015).

Apart from Zakopoulou et al., (2021) and Horbach et al., (2019) who applied the same test (Child Behavior Checklist - CBCL) (for different ages and languages), no other common assessment measures were identified among studies. In all studies, the identification of the children's psycho-emotional and behavioral deficits (internalizing and externalizing problems) was achieved through the parents' answers (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Parhiala et al., 2015; Zakopoulou et al., 2021), the teacher's answers (McIntosh, Sadler, & Brown, 2012) or both (Jordan & Dyer, 2017), respectively.

Lastly, two studies (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Zakopoulou et al., 2021) assessed the children's mental potential in preschool age (table 5).

Table 5 Diagnostic measures used in each study for assessing the psychosocial problems

Author	Measures for assessing psychosocial and behavioral status		Administered to
	Preschool age	School age	
Horbach et al., 2019	The parents' questionnaire Child Behavior Checklist (CBCL) • Nonverbal IQ test: Raven's Coloured Progressive Matrices (CPM; Raven, Bulheller & Häcker, 2002) (only for preschool age)		Parents
McIntosh et al., 2012	-	• Total office discipline referrals (ODRs) • School-wide Positive Behavior Support (SWPBS; Horner, Sugai, Todd, & Lewis-Palmer, 2005)	Teachers
Jordan & Dyer 2017	The Strength and Difficulties Questionnaire (SDQ; Goodman, 1997) • 3 years old: 2 to 4-year-old version • 5, 7 and 11 years old: 4 to 17-year-old version		Parents and teachers

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Parhiala et al., 2015	Parent Rating Scale (PRS) of the Behaviour Assessment System for Children (BASC) (Reynolds & Kamphaus, 1992) • 4 and 6 years old: PRS for preschoolers (PRS-P) • 9 years old: PRS for children (PRS-C)	Parents
Zakopoulou, et al., 2021	• Greek edition of Child Behavior Checklist for Ages 1½ to 5 (CBCL 1½–5) • Greek edition of Wechsler preschool and primary scale of intelligence- third edition (WPPSI-III GR)	- Parents

DISCUSSION

Today, dyslexia and personality traits are known to interact and influence each other's developmental process (Huang et al., 2020; Theodoridou, Christodoulides, Zakopoulou, & Syrrou, 2021).

However, the current systematic review highlighted a critical literature gap regarding the study of the existence of an early interactive relationship between internalizing and externalizing problems and SDD, as well as the importance of this interaction in a multifaceted understanding of the endophenotype and phenotype of SDD. Specifically, ambiguous findings were underlined concerning whether internalizing and externalizing problems occur as a predictor or as a consequence of SDD.

Seeking to answer these questions, the current systematic literature review led us to the following observations:

I. Regarding the question whether internalizing and externalizing problems consider predictors of the early onset of SDD, the common finding of all the studies under review emphasize that these problems tend to coexist with the early onset of SDD, without confirming however their predictive role in a cause-and-effect relationship (Sheehan, 2017; Parhiala et al., 2015). Interestingly, two studies (Zakopoulou et al., 2021; Jordan & Dyer, 2017) stressed that the emotionally reactive and the aggressive behavior were revealed rather as the common and constant component of the profile of children at risk for SDD. To this, more extensive research into the relationship between early behavioral problems and SDD is needed (Jordan & Dyer, 2017).

Regarding internalizing problems, no correlation is found as early sign of the SDD onset (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Jordan & Dyer, 2017; Parhiala et al., 2015; Zakopoulou et al., 2021). However, the statement of Horbach et al., (2019) is considered important that whereas in the group of children with

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specific learning disorder, internalizing problems increased numerically during the transition from kindergarten to 1st Grade, the first significant increase, comparing the two groups of children, occurred in 2nd Grade and peaked in 4th Grade.

II. On whether internalizing and externalizing problems are a result of SDD, the studies (Horbach, Mayer, Scharke, Heim, & Günther, 2019; Jordan & Dyer, 2017; McIntosh, Sadler, & Brown, 2012; Parhiala et al., 2015) led to the following findings:

(i) Regarding internalizing problems, Jordan and Dyer (2017) found that before school entry, children later diagnosed with dyslexia (in school age), compared to their peers without dyslexia, they had no psychological impairment, but some mild conduct problems. The researchers noticed that the psychological problems became more apparent when children entered school (Jordan & Dyer, 2017).

(ii) Similarly, based on their study's findings, Horbach et al., (2019) found that before school entry none of the two groups presented any difficulties. However, on the transition from kindergarten to the first grade, an increase in externalizing as well as in internalizing problems for children with dyslexia, has been detected (Horbach, Mayer, Scharke, Heim, & Günther, 2019).

In the light of these findings, it is concluded that internalizing problems do not cause SDD, but emerged as a result of them, when academic demands increase. However, in terms of the results regarding the externalizing problems, these two studies differ. Both researchers recognize the occurrence of these problems as a result of dyslexia, however they differ regarding the time of their detection. In this, Horbach et al., (2019) stress that internalizing and externalizing problems follow a common course of onset (i.e. on school entry). On the contrary, Jordan and Dyer (2017) conclude that behavioral difficulties are a consequence of dyslexia without being affected by school environment (they are observed even in preschool age), underscoring the need for further investigation.

In essence, a common finding is that this observed exacerbation in emotional (internalizing) and behavioral (externalizing) problems at school age is likely due to various increased challenges that children with SDD will face (Jordan & Dyer, 2017), such as academic underachievement, reading difficulties, bullying, lack of proper support etc.

Interestingly, according to Parhiala et al., (2015) no difference between internalizing and externalizing (aggression, hyperactivity) problems was noticed concerning children later characterized as with or without dyslexia, either prior or after school entry.

The researchers impute the absence of correlation between dyslexia and internalizing and externalizing problems to the young age of the participants (Parhiala et al., 2015). However, in line with Jordan and Dyer (2017), Horbach et al., (2019), and McIntosh et al., (2012), they assumed that preschool children with poor phonological awareness (main ability lacking in SDD) will have low reading performance and potentially, they will experience behavioral problems. Increased social and academic demands in the school environment along with a diagnosis of learning disorders, will have plenty of time to affect children's personality (Parhiala et al., 2015).

In agreement, adding to these, Zakopoulou et al., (2021) underscored that emotionally reactiveness, aggressive behavior, and externalizing problems are a consistent component of early SDD diagnostic profile, rather than an incidental finding.

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III. Investigating the question of whether early treatment of internalizing and externalizing problems contributes to delaying the onset of SDD, none of the reviewed studies addressed this issue. However, a common assumption is that dyslexia can have a long-term effectiveness on the child's emotional and psychological well-being (Jordan & Dyer, 2017). Children with suspected dyslexia and/or literacy difficulties may benefit from closer monitoring in terms of emotional and behavioral development on entry into the school system. Early identification as well as early comprehensive treatment of such problems are considered essential, since they could help not only to mitigate psychological disorders, but also to enhance the academic skills of the child. Exploring and interpreting the complex background of SDD contributes not only to a safe and valid diagnosis but, most importantly, to the creation of effective intervention strategies, even in early childhood (Zakopoulou et al., 2021). In addition, it is emphasized that quality teaching of language skills, early intervention in language problems (McIntosh, Sadler, & Brown, 2012) during kindergarten, and the structure of each educational system (Parhiala et al., 2015) would act as a deterrent to the development of behavioral problems.

Overall, the majority of the studies in this literature review concluded that the emotional and behavioral problems of children with early SDD intensify as school-social demands increase (Giovagnoli et al., 2020). In terms of early intervention, the particular importance of the preschool years in addressing externalizing problems before the demands of school trigger problems was recognized (Arnold et al., 2006; Thambirajah, 2010; Zakopoulou et al., 2021).

LIMITATIONS

This systematic literature review includes articles with a publication date up to September 2021. Therefore, it is likely that articles with useful information for the present investigation were later issued, so that they were not identified and therefore not included.

A further limitation of this review is the language used to search the articles. It is likely that articles in languages other than English contained data relevant to the content of this review.

CONCLUSION

It is interesting to note that the research under review revealed varied and differentiated (to some extent) findings, with the result that there are no uniform answers to the research questions posed in this literature review.

However, the main finding on which the reviewed studies seem to agree is the worsening of the internalizing and externalizing problems of children with SDD during the transition from preschool to school years, due to its increased socio-cognitive demands.

Further research on the topic with longitudinal studies, case studies, and literature reviews is considered beneficial, both for the design of well structured, individualized, and comprehensive diagnostic approaches and for the implementation of well-tailored interventions.

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