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ORIGINAL ARTICLE

Associations between language skills and emotional and behavioural problems: A systematic review

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Abstract

The association between emotional and behavioural problems and language skills is well documented. However, specific links between these developmental domains remain unclear. This review synthesises associations between components of language skills and emotional and behavioural problems in children aged 6–11 years. PRISMA guidelines were followed. After an extensive database search, studies were screened using Covidence according to predefined criteria. $N = 21$ studies were included. Systematic data extraction resulted in 97 statistical values. Ambiguous results with varying proportions and strengths of significant associations were found. The highest proportion of significant results was found for the association between symptoms of conduct disorders and language skills (88%), and the lowest for internalising problems (50%). Associations tended to be stronger for receptive than expressive skills. Results suggest the relevance of inattention in the interrelation with language skills. This review lays the groundwork for more detailed research on the interdependence of these domains. Implications for practice include monitoring language difficulties in children with symptoms of inattention. The comparability and validity of the results are limited by their heterogeneity.

KEYWORDS
association, externalising problems, internalising problems, language skills, review, school age

Key points

- This systematic review highlights the diversity of methodological approaches used to explore bivariate associations between language skills and emotional and behavioural problems, including correlational analyses, group comparisons and cross-sectional and longitudinal designs.
- Results reveal that externalising problems were more frequently studied than internalising problems, with significant gaps in research on the differentiated associations between components of emotional and behavioural problems and language skills, highlighting a need for further research.
- Receptive language skills tend to show stronger associations with externalising problems, hyperkinetic disorders and internalising problems compared to

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expressive language skills. This suggests the need for practitioners to monitor receptive language in children with emotional and behavioural problems and for future research to further explore these associations.
- Evidence suggests a link between language skills and inattention, a symptom of hyperkinetic disorders. This relationship should be particularly considered in school practice and in future research.

INTRODUCTION

Language skills and emotional and behavioural problems

Oral language skills are required to master everyday school life, which is characterised by linguistic requirements (Chow, 2018). They enable students to comprehend instructional discourse, engage in academic discussions and articulate their thoughts effectively, while difficulties in language skills can impede learning, hinder peer interactions and compromise social integration, ultimately affecting both academic achievement and overall development (Chow, 2018). Oral language skills encompass two modalities, receptive (comprehension) and productive (expression), along with multiple domains, including phonetic, phonological, vocabulary, grammar and pragmatic skills (Crystal, 2015; Owens, 2016). Phonetic skills involve the production and articulation of speech sounds, while phonological skills refer to the understanding and organisation of sounds within a language's sound system (Crystal, 2015). Vocabulary skills cover concept formation and organising entries in the mental lexicon, including receptive and expressive vocabulary (Crystal, 2015). Grammar skills encompass decoding and applying rules for word and sentence construction, with morphological skills focusing on words and syntactic skills on sentences (Owens, 2016). Pragmatic-communicative skills involve context-appropriate language use, ensuring cohesion and coherence in conversations (Crystal, 2015; Owens, 2016). Together, these modalities and domains form components of language skills. If children exhibit significant difficulties in reaching language development milestones in terms of timing and quality, this is referred to as developmental language disorder (DLD) or, in previous terminology, specific language impairment (SLI). Both are clinical diagnoses that require the fulfilment of additional diagnostic criteria (Driver & Nelson, 2021; Bishop, 2017; American Psychiatric Association (APA), 2013; World Health Organization (WHO), 1993; World Health Organization (WHO), 2019). The term SLI was used to describe children whose severe language problems could not be explained by co-occurring disorders, with the absence of difficulties in other developmental areas, such as non-verbal cognitive skills, being a prerequisite for this diagnosis (Driver & Nelson, 2021). The new terminology reflects a broader understanding of DLD compared to SLI. Beyond these clinical terms, we address a wider spectrum, including language difficulties in unimpaired development that are characterised by below-average language skills.

The term emotional and behavioural problems is used in this review to describe symptoms according to DSM-V (American Psychiatric Association (APA), 2013), ICD-10 (World Health Organization (WHO), 1993) and ICD-11 (World Health Organization (WHO), 2019) emotional and behavioural disorders (Table 1) (Ringeisen et al., 2020). Accordingly, terminology such as emotional and behavioural disorders (EBD), mental disorders or behavioural disorders, such as disruptive behaviour disorder (DBD), is considered. Addressing emotional and behavioural problems and their underlying factors is a major concern (Forness et al., 2012). In this context, the association between language skills and emotional and behavioural problems is gaining increasing attention.

The link between emotional and behavioural problems and language skills has been studied, referring to categorical diagnoses of difficulties in one or both developmental domains (Toppelberg & Shapiro, 2000), with a focus on the effects of SLI on psychosocial development (Yew & O'Kearney, 2013). More recent research adopts a dynamic, dimensional perspective to explore the interrelationships between these domains, independent of clinical diagnoses and aims to understand the factors contributing to their bidirectional association (Chow & Wehby, 2018; Hentges et al., 2021). However, research on the associations between language skills and emotional and behavioural problems components remains limited (Salmon et al., 2016).

Conceptual frameworks

Various conceptual frameworks shape research on the associations between language skills and emotional and behavioural problems theoretically. The direction and origin of this relationship have not yet been entirely clarified. Chow and Wehby (2018) and Helland et al. (2020) summarised current explanations for the emergence of associations between the two developmental areas.

1. Most prominently, a direct association was stated, suggesting that language difficulties underlie emotional and behavioural problems or that language difficulties might contribute to emotional and behavioural problem symptoms. Externalising and

TABLE 1 Targeted disorders and their core emotional and behavioural symptoms.

Externalising problems		Internalising problems	
Hyperkinetic disorders	**Conduct disorders**	**Depressive disorders**	**Anxiety-related disorders**
• Inattention • Hyperactivity • Impulsivity	• Aggressive behaviour • Destruction of property • Oppositional behaviour • Dissocial behaviour	• Depressed mood • Sadness • Anhedonia • Reduced energy or lethargy • Social withdrawal	• Excessive fear/anxiety • Avoidance and withdrawal behaviour

internalising behaviours are understood to be the result of maladaptive coping strategies that mask or compensate for linguistic overload (Hollo & Chow, 2015). Similarly, Redmond and Rice (1998) suggested that the repertoire of socioemotional behaviours in children with SLI reveals their social adaptations to their limited language skills.

2. Emotional and behavioural problems might affect language development. Empirical results allow for the tentative assumption that, for example, the psychological stress experienced by children with severe emotional and behavioural problems may lead to difficulties in language processing and word retrieval (Sirianni, 2004).
3. Several indirect associations have been hypothesised. Salmon et al. (2016) concluded from their narrative review that emotional knowledge, understanding and self-regulation can be mediators of the association. Thus, language skills were shown to be linked to, for example, Theory of Mind (Astington & Jenkins, 1999). Since language acquisition takes place largely in social situations, the consequences of emotional and behavioural problems for social relationships, such as withdrawal, are also hypothesised to reduce opportunities for language learning. They thus may negatively affect language acquisition (Helland et al., 2022).
4. The association between these developmental domains is thought to originate from internal and external factors that both influence the acquisition of language skills and the occurrence of emotional and behavioural problems. These may include aspects such as interactions and relationships (Fearon et al., 2020; Nunes et al., 2013), low socioeconomic status (SES) (Husky et al., 2018; Pace et al., 2017), genetic and family factors (Helland et al., 2020; Toseeb et al., 2022), male gender (Husky et al., 2018; Klipker et al., 2018; Rice & Hoffman, 2015), (nonverbal) cognitive skills (Gilliam & de Mesquita, 2000; Tomasello, 2005) and working memory more specifically (Gathercole & Baddeley, 2014; Lui & Tannock, 2007; Maehler & Schuchardt, 2016; Ramos et al., 2020).

Overall, it can be assumed that complex bidirectional transactional influences exist between the different developmental factors (Farmer et al., 2020). Thus, a mutual reinforcement of the two developmental domains and a permanent influence of other internal subsystems, behavioural functions and socio-ecological environments on the associations can be derived (Farmer et al., 2020). In the following, results of systematic reviews and meta-analyses on associations between language skills and emotional and behavioural problems are referred to, through sorting their results by the specificity of the components of emotional and behavioural problems.

Evidence on associations between language skills and emotional and behavioural problems

Associations between language skills and comprehensive emotional and behavioural problems

The general association between language skills and emotional and behavioural problems has been well established through previous systematic reviews and meta-analyses (Benner et al., 2002; Chow et al., 2018; Chow & Wehby, 2018; Curtis et al., 2018; Hentges et al., 2021; Hollo et al., 2014; Yew & O'Kearney, 2013). Small statistically significant correlations were found between comprehensive language skills and emotional and behavioural problems ratings and emotional and behavioural problems ratings were statistically significantly higher for children with language difficulties than for typically developing (TD) groups (Chow et al., 2018; Chow & Wehby, 2018; Curtis et al., 2018). The prevalence in children with EBD varied from 91% (LS ≥1.5 standard deviations [SD] below average) to 66% (LS 2 SD below average), averaging 71% of children with emotional and behavioural problems experiencing clinically significant language difficulties (Benner et al., 2002). Among children with emotional and behavioural problems without previously identified language difficulties, 81% showed below average language skills (≥1 SD below average), 34% showed mild difficulties (≥1–2 SD below average) and 49% showed severe difficulties (≥2 SD below average) (Hollo et al., 2014). On average, emotional and behavioural problems have been found in 57% of children with comprehensive language difficulties (Benner et al., 2002).

By distinguishing between language skills components, small and statistically significant correlations were observed between emotional and behavioural problems and both receptive and expressive language skills (Chow

& Wehby, 2018). However, Chow et al. (2018) reported a stronger link between emotional and behavioural problems and receptive skills compared to expressive skills. Prevalence rates for receptive and expressive difficulties in children with emotional and behavioural problems show mixed results regarding which modality is more affected (Benner et al., 2002; Hollo et al., 2014).

Associations between language skills and components of emotional and behavioural problems

Meta-analytic findings indicated small and statistically significant correlations between externalising problems, internalising problems and comprehensive language skills (Chow & Wehby, 2018; Hentges et al., 2021). Children diagnosed with SLI were 2.26 times more likely to meet the criteria for externalising problems and 1.84 times more likely to meet the criteria for internalising problems in their further development compared to groups without SLI. The severity of the later problems was similar on average in internalising and in externalising problems, indicating mild-to-moderate problems. Children with SLI were found to exhibit more pronounced internalising and externalising symptoms. At follow-up, they were positioned at the 72nd percentile (95% CI: 65–79) for internalising symptoms and at the 69th percentile (95% CI: 63–74) for externalising symptoms, relative to the average typically developing child at the 50th percentile (Yew & O'Kearney, 2013). Included studies found significantly higher risks for more severe internalising and externalising outcomes in children with receptive or mixed receptive and expressive difficulties. No increased risks were reported in children with expressive language difficulties only (Yew & O'Kearney, 2013).

More specifically, longitudinal studies indicated that children with SLI are 1.78 times more likely to meet ADHD criteria and have 10 percentile points higher ADHD symptoms than those with typical language development (Yew & O'Kearney, 2013). Hentges et al. (2021) found no significant differences between the strength of association between ADHD symptoms and comprehensive language skills versus aggressive symptoms.

Regarding anxiety, children with SLI showed significantly higher symptoms compared to peers with typical development (Yew & O'Kearney, 2013). No significant differences were found in the association between comprehensive language skills and anxiety versus depression (Hentges et al., 2021).

Evidence on factors influencing the strength of association

In the following, the participant characteristics gender, age and socio-demographic risk and specifics of study design (e.g. cross-sectional or longitudinal design) are addressed since they were considered in previous systematic reviews and meta-analyses, with implications for our methodological approach. Including longitudinal studies only, a stronger association between earlier language skills and later emotional and behavioural problems was found in samples with a higher proportion of females (Chow et al., 2018). Conversely, moderation analyses revealed that the association between language skills and externalising problems was stronger in boys than in girls (Hentges et al., 2021). Yew and O'Kearney (2013), however, found male subjects with SLI to be at higher risk for developing conduct problems, unlike females. There was no gender difference in the strength of the association between language skills and overall internalising problems, though language skills were more strongly related to depression in boys (Yew & O'Kearney, 2013). Based on this synthesis, the overall role of gender in this relationship remains unclear.

Benner et al. (2002) found that the prevalence of emotional and behavioural problems in children with language difficulties was consistent across ages 4–14, affecting about half of the children. Other studies revealed an impact of age on the strength of associations. A moderator analysis indicated that correlations between early language skills and later emotional and behavioural problems were stronger in younger children compared to older ones (Chow et al., 2018). Conversely, Curtis et al. (2018) found that the link between language difficulties and emotional and behavioural problems appeared to grow stronger with age. Hentges et al. (2021) reported that age was not a significant moderator for the association between language skills and either externalising or internalising problems. Thus, the relevance of age in this association remains inconclusive.

Unlike the framework's predictions, language skills were more strongly associated with externalising problems in samples with lower sociodemographic risk, but still, SES was not a significant moderator for internalising problems (Hentges et al., 2021). Additionally, stronger links between emotional and behavioural problems and language skills were found in studies where parents rated emotional and behavioural problems compared to those using teacher ratings (Chow et al., 2018). The disparity in emotional and behavioural problems between children with and without SLI was more pronounced in studies with parental ratings (Curtis et al., 2018).

Neither the study design (cross-sectional vs. longitudinal) nor the time interval between the assessments of language and emotional and behavioural problems significantly moderated the association between externalising or internalising problems and language skills (Chow & Wehby, 2018; Hentges et al., 2021). Additionally, a categorical versus dimensional approach did not affect the strength of these associations (Hentges et al., 2021).

Research gaps

Previous reviews and meta-analyses reveal increasing research interest in the associations between language skills and emotional and behavioural problems. Conceptual frameworks suggest potentially complex mechanisms of action. Existing evidence indicates a heterogeneity of results on bivariate associations, but overall small statistically significant effects. A closer examination points out that earlier systematic reviews and meta-analyses often considered both developmental areas in broader terms, leading to inconclusive empirical evidence on the strength of the association between components. The statistical significance and strength of associations may vary depending on various factors, including components of language skills and emotional and behavioural problems (Hentges et al., 2021), which may have important implications for school practice. This motivates a more differentiated investigation. To address this gap and as called for in various reviews and meta-analyses (Chow & Wehby, 2018; Hollo et al., 2014; Toppelberg & Shapiro, 2000), this systematic review investigates the association between language skills and emotional and behavioural problems more precisely, focussing on components. In this way, our findings may offer important evidence for research and school practice by linking two developmental areas (language skills and emotional and behavioural problems) in more detail which are of considerable importance for everyday school life and children's educational and overall developmental opportunities.

To examine the bivariate associations between components of language skills and emotional and behavioural problems in a systematic and differentiated way, our review addresses two key research questions. First, we investigate the extent to which previous quantitative studies have explored these associations, considering the specific components assessed and the methodological approaches used. Second, we explore whether differences emerge in the strength of statistically significant associations between components of language skills and emotional and behavioural problems.

Based on previous reviews and meta-analyses, a tendency towards stronger associations between emotional and behavioural problems and receptive skills than expressive skills can be cautiously assumed (Chow et al., 2018; Yew & O'Kearney, 2013). Yew and O'Kearney (2013) indicate that externalising problems are more strongly correlated with emotional and behavioural problems than internalising problems. Similarly strong associations between language skills and symptoms of hyperkinetic disorders versus symptoms of conduct disorders and depressive versus anxiety symptoms are likely (Hentges et al., 2021).

METHOD

Search strategy and data sources

This review followed current guidelines and recommendations for the conduct and design of systematic reviews (Page et al., 2021). The search for and selection of relevant studies involved several steps:

Phase 1: The PSYNDEX, PsycInfo, TOC Premier, PsycArticles, Medline and ERIC databases were searched using the EBSCO Host search platform on November 12, 13 and 15, 2021. The search was renewed on February 22, 2023,[i] focusing on studies published in English and German and therefore using thematically relevant search terms in the English and German languages (Table 2). Unpublished manuscripts, conference papers and dissertations were excluded.

Phase 2: Subsequently, the titles and abstracts of the studies were examined using the digital tool Covidence and filtered according to the inclusion and exclusion criteria outlined below. This involved the independent corating of a systematic selection of 10% of the titles and abstracts by a previously trained research assistant, resulting in high inter-rater reliability ($\kappa = 0.96$). Conflicts were resolved through group discussions.

Phase 3: In addition to original research reports, the search also revealed systematic reviews and

TABLE 2 Search terms and their categorisation.

Category of search terms	English search terms
Age group	(child* OR infant*) AND
EBP	(((behavio* OR conduct* OR emotional OR mental OR psych* OR persistent OR internali* OR externali* OR devian* OR problem* OR maladaptive) AND (disorder OR disabilit* OR difficult* OR disturbance* OR issue* OR symptom* OR conflict OR problem* OR insecurit* OR instabilit* OR behavio*)) OR EBD OR ED OR CD OR 'attention deficit' OR hyperact* OR hypercinet* OR inhibit* OR ADHD OR 'impulse control' OR *social* impulsive OR violen* OR aggressi* OR oppositional OR disruptive OR delinquen* OR affective OR depressi* OR dysthym* OR anx* OR *phobi*) AND
Language skills	(language OR speech OR verbal* OR phonetic* OR phonological* OR semanti* OR lexic* OR vocabulary OR gramma* OR morpholog* OR synta* OR pragmatic* OR communicati*) AND
Association	(relation* OR associat* OR predict* OR influence*)

Abbreviation: EBP, emotional and behavioural problems.

meta-analyses relevant to the research questions in this review. The first author screened the included studies and selected those meeting inclusion criteria for further consideration.

Phase 4: All full texts were reviewed by the first author. A co-author or research assistant at the bachelor's level screened all full-text studies in a partially blinded co-rating process regarding the inclusion and exclusion criteria. The co-rating process resulted in an almost perfect agreement ($\kappa = 0.98$). Conflicts were resolved through discussions.

Inclusion and exclusion criteria

To capture the current state of research, only studies published since January 2010 were included. Aligning with previously established criteria (Chow & Wehby, 2018; Hentges et al., 2021), studies were excluded if primary disorders or medical histories other than the problems and disorders focused on in this review were reported for the children examined. Existing systematic reviews and meta-analyses predominantly examined studies with broad age ranges and drew inconclusive findings on the relevance of age in the association between language skills and emotional and behavioural problems (Benner et al., 2002; Chow et al., 2018; Curtis et al., 2018; Hentges et al., 2021). Also, this systematic review is particularly concerned with relevance to school practice. This justifies our focus on a school-relevant age group, including only studies that reported results for children age between 6 and 11 years, since this is the typical age for primary school attendance in Germany. If no age rage was defined, the average age ±SD had to be within the age range outlined, or the children had to be attending a grade corresponding to this age group. Studies were excluded if they did not pertain to children aged 6–11 years, or if the average age (±SD) fell outside the target range. If the children's age was not specified, the grade served as a reference. Studies were subsequently excluded if the grade level did not correspond to the targeted age group.

Studies with quantitative study designs were included, while qualitative and single-case study designs were excluded. Furthermore, studies had to report at least one specified component of oral language skills (receptive or expressive skills, phonetic-phonological skills, vocabulary, grammar, pragmatics) for inclusion. Similarly, studies needed to report at least one specified emotional and behavioural problem (externalising or internalising problem, core symptom). In consequence, studies were excluded if they did not specifically report on one of these components or if these were reported as mixed scores (e.g. with reading skills or non-language performance, such as pattern recognition). Studies were required to provide statistical outcomes on the isolated association between language skills and emotional and behavioural problems, with results specific to children aged 6–11 years and perform inferential statistical analyses. If studies did not isolate scores on bivariate associations between language skills and emotional and behavioural problems in children aged between 6 and 11 years or did not employ inferential statistical methods, they were excluded.

To ensure a minimum methodological standard across the included studies, we implemented several inclusion criteria related to quality. Only peer-reviewed journal articles were deemed eligible, ensuring a fundamental level of scientific scrutiny in the selection process. In addition, we placed qualitative requirements on the assessment instruments used in the primary studies.

Language skills had to be assessed using standardised and psychometrically validated procedures, such as norm-referenced tests or diagnoses made by qualified professionals based on ICD or DSM criteria. Emotional and behavioural problems had to be evaluated using either standardised questionnaires with an internal consistency of Cronbach's $\alpha \geq 0.70$, or a clinical diagnosis provided by qualified professionals in accordance with ICD or DSM criteria.

This approach reflects our strong emphasis on the quality of measurement instruments, which we consider essential for evaluating associations between language skills and emotional and behavioural problems across the broad range of quantitative study designs targeted by our review. In sum, we applied specific quality criteria, focusing on the appropriateness of assessment tools, the clarity of sample descriptions and the relevance of each study to our research questions.

Data extraction and analysis

Data extraction included sample characteristics and key methodological features (see Tables S1–S4). Cohen's d was converted to r for better comparability with other studies.[ii] Effect sizes were categorised as very small ($r \geq 0.00$), small ($r \geq 0.10$), moderate ($r \geq 0.30$) and large ($r \geq 0.50$).

Description of the included studies

Figure 1 shows the detailed study selection process. This review includes $N = 21$ studies on the significance and strength of associations between the components of language skills and emotional and behavioural problems.

An overview of the language assessments used is detailed in Table 3.

Sample characteristics are presented in Table 4.

Sample sizes range from 50 to 8756 and male proportions from 44.9% to 80%. Most studies reported mixed

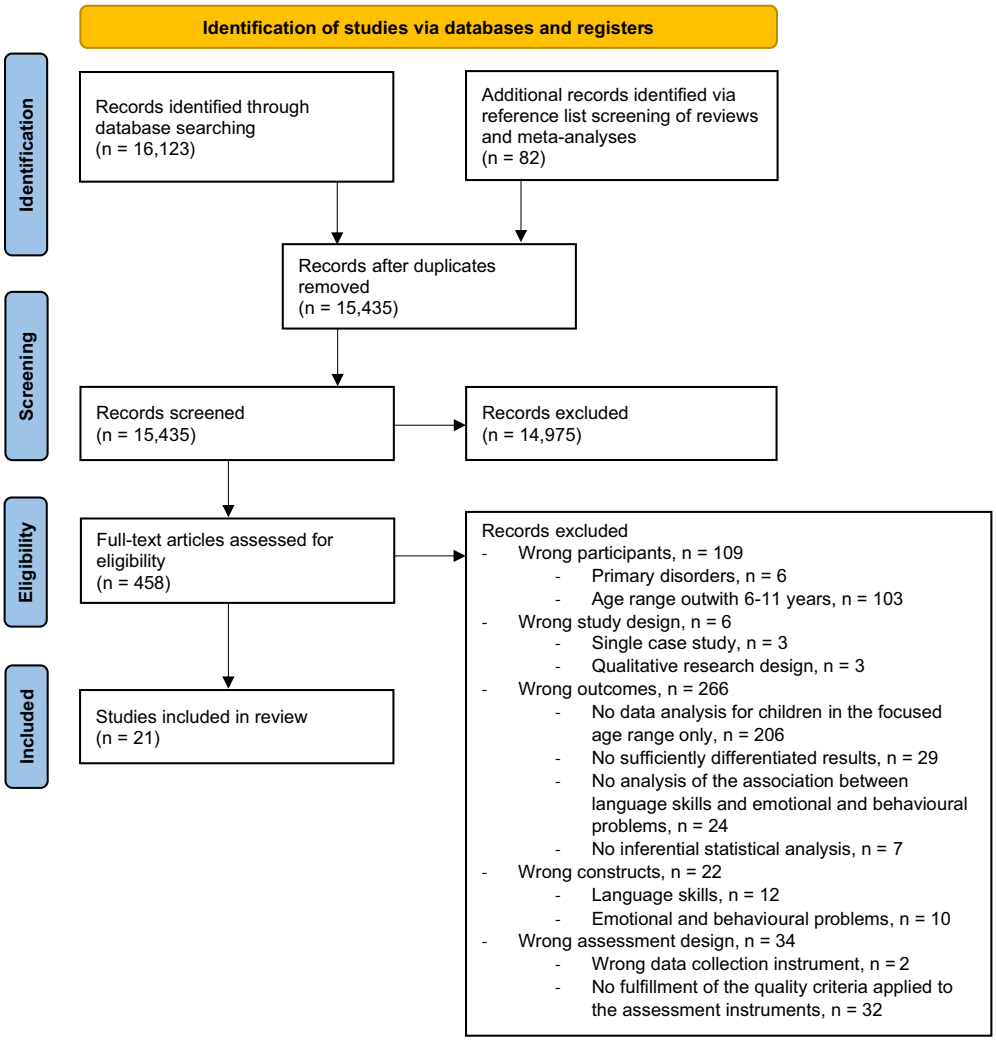

FIGURE 1 PRISMA flow diagram of papers included in review.

SES, with the majority referring to the representativeness or diversity of the sampling areas (Bryant et al., 2022; Eadie et al., 2018; Gut et al., 2012; Lundy et al., 2010; Westrupp et al., 2020), or school catchment areas (Cain & Bignell, 2014; Papaeliou et al., 2015; Petersen et al., 2013), while a few used specific SES indicators such as family income (Koltermann et al., 2020; McKean et al., 2017; Plourde et al., 2018; Spilt et al., 2015; Staikova et al., 2013). Exceptions to the mixed SES included the low SES reported by Barini and Hage (2015) and studies that did not report on SES (Cardy et al., 2010; Plourde et al., 2018). Language inclusion criteria varied, including first language assessments (Cain & Bignell, 2014; Hutchinson et al., 2012; Papaeliou et al., 2015) and monolingual status (Redmond, 2011; Redmond et al., 2011, 2015).

Detailed sample characteristics and potentially influencing variables are outlined in Table 5.

The Tables S1–S4 lists the diagnostic tools for emotional and behavioural problems and LS. The Woodcock-Johnson Test of Cognitive Ability – Revised (WJ-R) (McGrew et al., 1991) was used for both receptive and expressive vocabulary, while the CELF-3 (Semel et al., 1995a, 1995b) and CELF-4 (Semel et al., 2003) was used to assess cross-level receptive and expressive language skills.

RESULTS

Associations between language skills and emotional and behavioural problems

Of the 21 studies that met our criteria, 97 statistical values (SVs) on the associations between language skills and emotional and behavioural problems were included. Six SVs addressed both receptive and expressive language skills related to ADHD (Cardy et al., 2010, SVs 3–8), while four SVs focused on receptive and expressive vocabulary skills associated with internalising problems (Bryant et al., 2022, SVs 1–4). This totals 107 reported scores for emotional and behavioural problems and language skills components. Specific distributions included four SVs for externalising problems, 56 for hyperkinetic disorders, 25 for conduct disorders and 22 for internalising problems.

TABLE 3 Overview of language assessment tools used in the included studies.

Language assessment	Instrument	Amount of studies	Study
Receptive language skills			
Combination of receptive tasks challenging both vocabulary and grammar skills resulting in a composite score	CELF-3	1	Cardy et al. (2010)
	CELF-4/a	2	Eadie et al. (2018) and Plourde et al. (2018)
Expressive language skills			
Combination of expressive tasks challenging both vocabulary and grammar skills resulting in a composite score	CELF-3	1	Cardy et al. (2010)
	CELF-4/a	3	McKean et al. (2017), Eadie et al. (2018) and Hutchinson et al. (2012)
Receptive vocabulary skills			
Indicating the right image	BPVS-II (group admistered version)	1	Cain and Bignell (2014)
	PPVT-III	2	Westrupp et al. (2020) and Spilt et al. (2015)
	PPVT-R	1	Petersen et al. (2013)
	Tvfusp	1	Barini and Hage (2015)
	WJ-R	1	Bryant et al. (2022)
	WWT 6-10	1	Schöfl et al. (2016)
Expressive vocabulary skills			
Naming images	WWT 6-10	1	Schöfl et al. (2016)
	DVIQ	1	Papaeliou et al. (2015)
Defining words	WISC-III	1	Plourde et al. (2018)
Naming images or defining words and finding similarities	WASI	1	Risser (2013)
Receptive grammar skills			
Indicating the right image	TROG-D	1	Schöfl et al. (2016)
	DVIQ	1	Papaeliou et al. (2015)
Concepts and following directions/following instructions/acting out spoken sentences	CELF-4	1	Staikova et al. (2013)
	TT	1	Barini and Hage (2015)
	IDS	1	Gut et al. (2012)
Expressive grammar skills			
Repeating sentences / recalling sentences	HSET-IS	1	Schöfl et al. (2016)
	DVIQ	1	Papaeliou et al. (2015)
Elicitation of the application of grammatical rules to verbs	TEGI	3	Redmond et al. (2011), Redmond et al. (2015) and Redmond (2011)
Completing sentences	DVIQ	1	Papaeliou et al. (2015)
Formulated sentences	CELF-4	1	Staikova et al. (2013)
	IDS	1	Gut et al. (2012)
Skills in phonetics and phonology			
Phoneme elision task	PET	1	Koltermann et al. (2020)
Skills in pragmatics and communication			
Presuppositions	CASL & TOPL-2	1	Staikova et al. (2013)
Narrative language ability index/oral narration	TNL	1	Redmond et al. (2011)
Narrative comprehension	TNL	1	Redmond et al. (2011)

Abbreviations: BPVS-II, British Picture Vocabulary Scale – Second Edition (Dunn et al., 1997); CASL, Comprehensive Assessment of Spoken Language (Carrow-Woolfolk, 1999); CELF-3, Clinical Evaluation of Language Fundamentals – Third Edition (Semel et al., 1995a); CELF-3/u, Clinical Evaluation of Language Fundamentals – Third Edition UK Version (Semel et al., 1995b); CELF-4 (Semel et al., 2003); CELF-4/a, Clinical Evaluation of Language Fundamentals – Fourth Edition Australian Version (Semel et al., 2006); DVIQ, Diagnostic Test of Verbal Intelligence (Stavrakaki & Tsimpli, 2000); IDS, Intelligence and Development Scales (Grob et al., 2009); PET, Phoneme Elision Task (Barbosa-Pereira et al., 2020); PPVT-R, Peabody Picture Vocabulary Test – Revised (Dunn & Dunn, 1981); PPVT-III, Peabody Picture Vocabulary Test Third Edition (Dunn & Dunn, 1997); TEGI, Test of Early Grammatical Impairment (Rice & Wexler, 2001); TLC-E, Test of Language Competence – Expanded Edition (Wiig & Secord, 1989); TNL, Test of Narrative Language (Gillam & Pearson, 2004); TOPL-2, Test of Pragmatic Language – Second Edition; TT, Token Test (De Renzi & Faglioni, 1978); TVfusp, Teste de Vocabulario por Figuras USP [2011]; WASI, Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999); WISC-III, Wechsler Intelligence Scale for Children – Third Edition (Wechsler, 1991); WJ-R, Woodcock-Johnson Test of Cognitive Ability – Revised (McGrew et al., 1991); WPPSI-R, Wechsler Preschool and Primary Scale of Intelligence – Revised (Wechsler, 1989); WWT 6-10, Wortschatz- und Wortfindungstest für 6- bis 10-Jährigie (Glück, 2007).

TABLE 4 Sample characteristics.

First author (year)	Age at assessment		Boys %	*n*	Location; assessment language	Assessment in first language	Study design
	Emotional and behavioural problems	Language skills					
Barini and Hage (2015)	NR (diagnosis)	7–10	80	40	Brazil; Portuguese	NR	Cross-sectional descriptive case control study
Bryant et al. (2022)							
SV 1	First grade		52	1.364	USA; English	NR	Longitudinal large-scale correlational study
SV 2	First grade	Third grade					
SV 3	Third grade	First grade					
SV 4	Third grade						
Cain and Bignell (2014)	7–11		66.67	66	UK; English	Yes	Cross-sectional small-scale correlational study
Cardy et al. (2010)	6–11		73.21	56	Canada; English	Mostly yes 94.64%	Cross-sectional small-scale descriptive study
Eadie et al. (2018)	7		48.71	872	Australia; English	NR	Longitudinal large-scale correlational study
Gut et al. (2012)	$M = 9$		78	69	Switzerland, Germany, Austria; German	NR	Cross-sectional small-scale correlational study
Hutchinson et al. (2012)	NR (diagnosis)	6–9	65.22	69	Australia; English	NR	Cross-sectional small-scale descriptive study
Koltermann et al. (2020)	8–11		44.9	216	Brazil; Portuguese	NR	Cross-sectional correlational study
Lundy et al. (2010)	6–11		48.66	335	USA; English	NR	Cross-sectional correlational and descriptive study
McKean et al. (2017)	7		48.1	1.204	Australia; English	Mixed	Longitudinal large-scale descriptive study
Papaeliou et al. (2015)	6–11		66	50	Greece; Greek	Yes	Cross-sectional descriptive study

(Continues)

TABLE 4 (Continued)

First author (year)	Age at assessment: Emotional and behavioural problems	Age at assessment: Language skills	Boys %	*n*	Location; assessment language	Assessment in first language	Study design
Petersen et al. (2013)							
SV 1	6–7		NR (51 at whole sample)	8.756	USA; English	Mixed	Longitudinal large-scale correlational study
SV 2	6–7	8–9					
SV 3	6–7	10–11					
SV 4	8–9	6–7					
SV 5	8–9						
SV 6	8–9	10–11					
SV 7	10–11	6–7					
SV 8	10–11	8–9					
SV 9	10–11						
Plourde et al. (2018)	6–7	7–8	NR	962 (inattention scores) 919 (vocabulary scores)	Canada; French and English	Yes	Longitudinal large-scale correlational study
Redmond et al. (2011)	7–8		63.33	60	USA; English	NR	Cross-sectional descriptive study
Redmond (2011)	7–8		63.33	60	USA; English	NR	Cross-sectional descriptive study
Redmond et al. (2015)	7–9		64	57	USA; English	NR	Cross-sectional descriptive and correlational study
Risser (2013)	Fourth grade		50.23	1.067	USA; English	NR	Longitudinal large-scale correlational study
Schöfl et al. (2016)	6–9		63	100	Austria; German	Yes	Cross-sectional descriptive and correlational study
Spilt et al. (2015)							
SV 1	6–7		NR (51 at W 1)	NR (4.983 at W 1)	Australia; English	Mostly yes 88.5%	Longitudinal large-scale correlational study
SV 2	6–7	8–9					
SV 3	8–9	6–7					
Staikova et al. (2013)	7–11		NR	63	USA; English	NR (proficiency in English was a requirement for participation)	Cross-sectional descriptive study
Westrupp et al. (2020)							
SVs 1, 5, 9	8–9	6–7	NR (59 at baseline)	NR (4.983 at W 1)	Australia; English	NR	Longitudinal large-scale correlational study
SVs 2, 7, 10	10–11	6–7					
SVs 3, 6, 11	8–9						
SVs 4, 12	10–11	8–9					
SV 8	10–11						

Abbreviations: NR, not reported; TD, typically developing children; W, wave.

TABLE 5 Detailed description of the samples.

	Presenting problems in the sample		Report on nonverbal cognitive skills (IQ)		
First author (year)	**EBP**	**LS**	**Measures SVs (SD)**	**Result**	**Medication**
Barini & Hage (2015)	ADHD $n=20$ TD $n=20$	NL	NR		All children with ADHD under medication
Bryant et al. (2022)	NL	NL	NR		NR
Cain & Bignell (2014)					
SV 1	Hyperactivity $n=11$ TD $n=11$	NL	MAT-SF hyperactivity 5.36 TD 5.64	NSD between groups	NM
SV 2	Inattention $n=11$ TD $n=11$	NL	MAT-SF inattention $M=4.45$ TD $M=4.73$		
	Hyperactivity, inattention $n=11$ TD $n=11$	NL	MAT-SF hyperactive, inattention $M=4.55$ TD: $M=4.64$		
Cardy et al. (2010)	ADHD $n=14$ TD $n=28$	SLI $n=14$	WISC-III ADHD $M=101$ (13) TD $M=$NR	Average nonverbal IQ in ADHD group	NM during the testing sessions
Eadie et al. (2018)	NL	LS deficits $n=70$	WASI $M=92.64$ (10.72)	Average nonverbal IQ in the sample	NR
Gut et al. (2012)	ADHD $n=23$ TD $n=23$		NR		NR
Hutchinson et al. (2012)					
SV 1	ADHD $n=16$ TD $n=24$	SLI $n=18$	WISC-IV nonverbal IQ scores at least in average range	At least average nonverbal IQ in the sample	NM during the testing sessions
SV 2	ADHD $n=16$ ADHD, SLI $n=11$	SLI $n=18$			
Koltermann et al. (2020)	NL	NL	CMP scores above the 15th percentile	Nonverbal IQ above low average rank	NR
Lundy et al. (2010)	Borderline/clinical referral range $n=58$	NL	NR		NR
McKean et al. (2017)					
SVs 1, 3, 5	NL TD $n=1006$	RL deficits $n=198$	NR		NR
SVs 2, 4, 6	NL TD $n=1093$	EL deficits $n=111$			

(Continues)

TABLE 5 (Continued)

First author (year)	Presenting problems in the sample		Report on nonverbal cognitive skills (IQ)		Medication
	EBP	**LS**	**Measures SVs (SD)**	**Result**	
Papaeliou et al. (2015)	ADHD $n=25$ TD $n=25$	NL	NR		NM
Petersen et al. (2013)	NL	NL	NR		NR
Plourde et al. (2018)	NL	NL	NR		NR
Redmond et al. (2011)	ADHD $n=20$ TD $n=20$	SLI $n=20$	NNAT-I standard score ≥80	At least average nonverbal IQ in the sample	Most under behavioural medication
Redmond (2011)	ADHD $n=20$ TD $n=20$	SLI $n=20$	NNAT-I standard score ≥80	At least average nonverbal IQ in the sample	Most under behavioural medication
Redmond et al. (2015)	TD $n=19$ ADHD, LI $n=19$	SLI $n=19$	NNAT-I standard score ≥80	At least average nonverbal IQ in the sample	NM during the testing sessions
Risser (2013)	NL	NL	NR		NR
Schöfl et al. (2016)	NL TD $n=53$	SLI $n=47$	WISC-IV WLD SLI $M=106.2$ (9.4) TD $M=99.8$ (12.6)	Average nonverbal IQ in both groups, significance of difference NR	NR
Spilt et al. (2015)	NL	NL	NR		NR
Staikova et al. (2013)	ADHD $n=28$ TD $n=35$	NL	NR		Medication with stimulants was no exclusion criterion
Westrupp et al. (2020)	NL	NL	NR		NR

Abbreviations: CMP, Matrizes Progressivas Coloridas de Raven (Angelini et al., 1999); EBP, emotional and behavioural problems; LS, language skills; MAT-EF, Matrix Analogies Test – Long Form (Naglieri, 1985a); MAT-SF, Matrix Analogies Test – Short Form (Naglieri, 1985b); NL, not limited; NM, no medication; NNAT-I, Naglieri Nonverbal Ability Test – Individual (Naglieri, 2003); NR, not reported; NSD, no statistically significant difference; TD, typically developing; WASI, Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999); WISC-III, Wechsler Intelligence Scale for Children – Third Edition (Wechsler, 1991); WISC-IV, Wechsler Intelligence Scale for Children – Fourth Edition (Petermann & Petermann, 2011); WLD, Indexwert Wahrnehmungsgebundenes Logisches Denken.

No results were found on language skills associations with depression or anxiety. Figure 2 shows the number of SVs related to each language skill. Most SVs were available for the associations between conduct disorders and receptive vocabulary skills. Overall, results were missing for 25 of 48 investigated associations.

From the results obtained, 62 statistical values drew upon correlation analyses, 43 of which were statistically significant. The remaining studies followed a categorical approach based on diagnoses. Comparisons of language skills between children with and without emotional and behavioural problems included 27 SVs, with ten showing statistically significant differences. For comparisons between children with language difficulties and typically developing peers, 18 SVs were analysed, with 11 revealing statistically significant differences.

Associations between components of emotional and behavioural problems and language skills

Statistically significant associations between at least one language skills component and one of the specified emotional and behavioural problems were reported in 17 of the 21 studies. Out of 107 reported SVs, 64 were statistically significant, yielding a percentage of 59.81%.

Externalising problems

Of the four reported correlations, associations between externalising problems, receptive vocabulary skills, expressive vocabulary skills and receptive grammar skills were small and statistically significant as presented in Table S1. Only the correlation between externalising problems and expressive grammar skills was not statistically significant, revealing a statistically significant association percentage of 75% (Schöfl et al., 2016, SVs 1–4).

Hyperkinetic disorders

28 of the 46 SVs for the association between hyperkinetic symptoms and language skills were statistically significant (60.87%). Figure 3 shows the percentages of statistically significant results for the association with language skills, with the lowest for expressive grammar skills and the highest for receptive grammar skills. Partially separate results are available for language skills according to the core symptoms of hyperkinetic disorders, such as inattention, hyperactivity and impulsivity.

Receptive and expressive language skills

A detailed overview is presented in Table S2. Eadie et al. (2018), SV1 identified a small correlation between receptive language skills and hyperactivity. Two studies showed statistically significant lower receptive language scores in children with ADHD compared to typically developing (TD) groups, with moderate to strong effect sizes (Cardy et al., 2010, SV1; Hutchinson et al., 2012, SV1). Children with low receptive language skills also had higher combined hyperactivity and inattention scores than those with TD receptive language skills (McKean et al., 2017, SV1).

Moderate correlations were observed between expressive language skills and hyperactivity symptoms in children with persistent language difficulties (Eadie et al., 2018, SV2). No statistically significant group differences in expressive language skills were reported

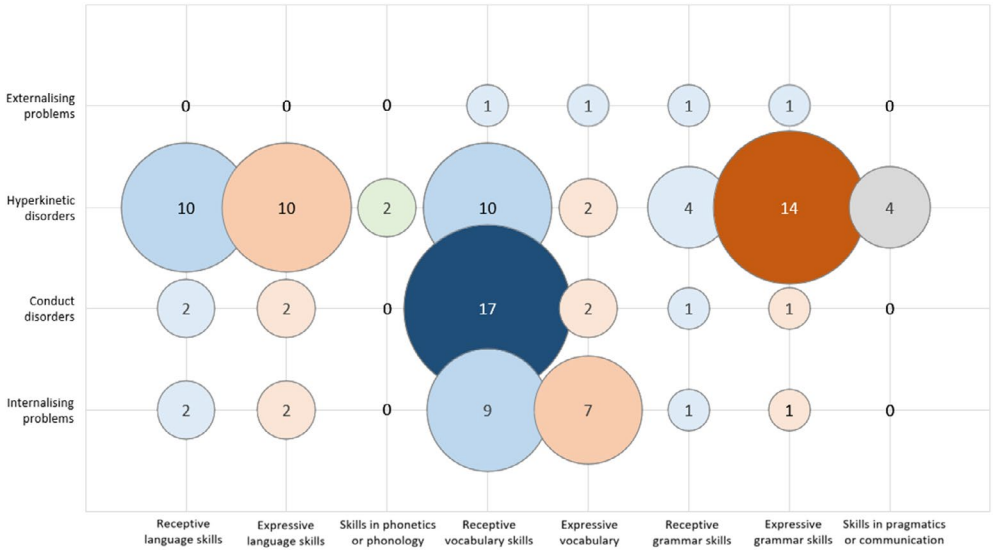

FIGURE 2 Total quantity of statistical values reported on the associations between language skills and emotional and behavioural problems.

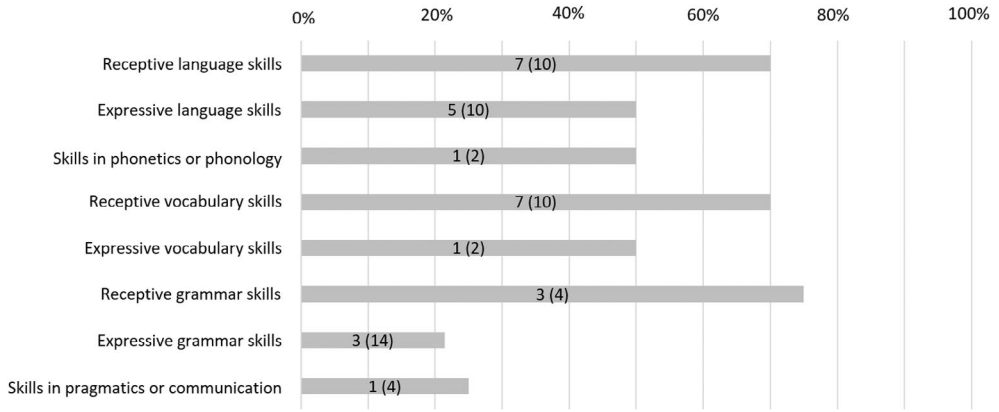

FIGURE 3 Proportions of statistically significant statistical values on associations between hyperkinetic disorders and language skills.

between children with ADHD and TD children, and children with ADHD and SLI compared with children with SLI (Cardy et al., 2010, SV2; Hutchinson et al., 2012, SV2). However, children with expressive difficulties had higher combined hyperactivity and inattention ratings compared to TD children (McKean et al., 2017, SV2).

Cardy et al. (2010), SVs 3–8 reported six values for the difference in ADHD symptoms in children with both low receptive and expressive language skills compared to children with typical language development. Overall, parent-rated ADHD symptoms were statistically significantly worse in children with difficulties in both receptive and expressive skills, revealing a strong association (Cardy et al., 2010, SV3). Inattention rated by parents and teachers was statistically significantly worse in children with low receptive and expressive language skills than in TD ones (Cardy et al., 2010; SVs 4, 7), with a moderate effect size. No statistically significant differences were found in ADHD symptoms rated by teachers or hyperactive–impulsive symptoms rated by parents or teachers between the two groups (Cardy et al., 2010, SVs 5–8).

Skills in phonetics or phonology

A correlation analysis for phoneme elision skills and the severity of inattention symptoms yielded small statistically significant results. No significant correlation was found between phoneme elision skills and ratings on a combined scale of hyperactivity and impulsivity (Koltermann et al., 2020, SVs 1, 2).

Receptive and expressive vocabulary skills

A non-significant correlation was found between hyperactivity symptoms rated by teachers and receptive vocabulary skills (Cain & Bignell, 2014, SV4). In contrast, there was a strong non-parametric correlation between inattention rated by teachers and receptive vocabulary skills (Cain & Bignell, 2014, SV5). All four correlations examining the link between symptoms of hyperkinetic disorders and receptive vocabulary skills calculated from assessments in a longitudinal study were both small and significant (Westrupp et al., 2020, SV1 – SV4).

The receptive vocabulary skills in children with a clinical ADHD diagnosis were significantly lower than those in TD children, indicating a strong association (Barini & Hage, 2015, SV1). Cain and Bignell (2014), SV2 revealed significantly worse receptive vocabulary skills in children with high inattention ratings, suggesting a strong relationship between these two constructs. In contrast, no difference in receptive vocabulary skills was observed in children with high hyperactivity ratings or a combined high rating of hyperactivity and inattention compared to TD children (Cain & Bignell, 2014, SV1, 3).

The only study reporting correlational results revealed a small correlation between expressive vocabulary skills and inattention symptoms in a large sample (Plourde et al., 2018, SV1). Group comparisons of expressive vocabulary skills in children with ADHD and TD children were not significant (Papaeliou et al., 2015, SV1).

Receptive and expressive grammar skills

Moderate correlations were revealed between ADHD symptoms and receptive grammar skills and expressive grammar skills in a sample of almost half of the children diagnosed with ADHD (Staikova et al., 2013, SVs 1, 2). Receptive grammar skills in children with ADHD were statistically significantly worse than those in TD children, indicating moderate-to-strong associations (Barini & Hage, 2015, SV2; Papaeliou et al., 2015, SV2), except for one study with no statistically significant association (Gut et al., 2012, SV1). Expressive grammar skills did not statistically significantly correlate with ADHD symptoms in a sample diagnosed in equal parts with ADHD and combined language impairment (LI), SLI, and a third condition without a diagnosis (Redmond et al., 2015, SVs 1, 3, 5, 7). Seven group comparisons of expressive grammar skills showed no statistically significant results, with three comparing expressive grammar skills in children with ADHD versus TD children (Papaeliou et al., 2015, SV4; Redmond et al., 2011, SV1; Redmond, 2011, SV1), and four comparing language skills in children with ADHD and LI versus

children with SLI (Redmond et al., 2015, SVs 2, 4, 6, 8). Three group comparisons of expressive grammar skills in children with ADHD and TD children showed statistically significant differences, revealing weak-to-strong associations (Gut et al., 2012, SV2; Papaeliou et al., 2015, SV3).

Skills in pragmatics and communication

Staikova et al. (2013), SV3 found a moderate and statistically significant correlation between ADHD symptoms and pragmatics and communication skills, with half of the sample showing problematic hyperactivity levels. Using a composite score from a principal component analysis, they evaluated skills in assumptions about the conversational partner, the specific social context and ToM. Regarding knowledge of multiple meanings in context, no statistically significant differences between children with inattention symptoms, children with hyperactivity symptoms, and TD children were detected (Cain & Bignell, 2014, SVs 4, 5). In contrast, children with combined problems of hyperactivity and inattention performed statistically significantly worse on this assessment than TD children, indicating a moderate association (Cain & Bignell, 2014, SV6). In narrative skills, no significant differences were found between children with ADHD and TD children (Redmond et al., 2011, SV2; Redmond, 2011, SVs 2, 3).

Conduct disorders

As shown in Figure 4, 22 of the 25 reported results on the association between conduct disorders and language skills were statistically significant, yielding an 88% proportion.

Receptive and expressive language skills

Table S3 provides a detailed overview. No statistically significant correlation was found between conduct problems and overall receptive language skills or expressive language skills (Eadie et al., 2018, SVs 3, 4). However, children with low receptive and expressive language skills exhibited conduct disorders significantly more often than typically developing children, with both language difficulty groups showing nearly equal percentages of conduct disorders (McKean et al., 2017, SVs 3, 4).

Receptive and expressive vocabulary skills

Correlations between receptive and expressive vocabulary skills and conduct disorder ratings at different time points were generally small statistically significant, except for two values showing a very weak association with receptive vocabulary skills (Petersen et al., 2013, SVs 1–9; Risser, 2013, SVs 1, 2; Spilt et al., 2015, SVs 1–4; Westrupp et al., 2020, SVs 5–8). Post-hoc tests revealed a statistically significant difference in receptive, but not in expressive vocabulary skills, in children with DBD compared to typically developing children, with a moderate association between DBD and receptive vocabulary skills.

Receptive and expressive grammar skills

Only one study was included, which examined receptive and expressive grammar skills in children with DBD without a co-occurring diagnosis of ADHD. The results suggested that expressive grammar skills, more than receptive grammar skills, were stronger in typically developing (TD) children than in the DBD sample (Gut et al., 2012, SVs 3, 4).

Internalising problems

Figure 5 displays that eleven of the 22 reported results regarding the association between internalising problems and language skills were statistically significant, resulting in 50% of associations being statistically significant.

Receptive and expressive language skills

As noted in Table S4, no statistically significant correlation was reported between overall receptive or expressive language skills and internalising problems (Eadie et al., 2018, SVs 5, 6). However, children with receptive

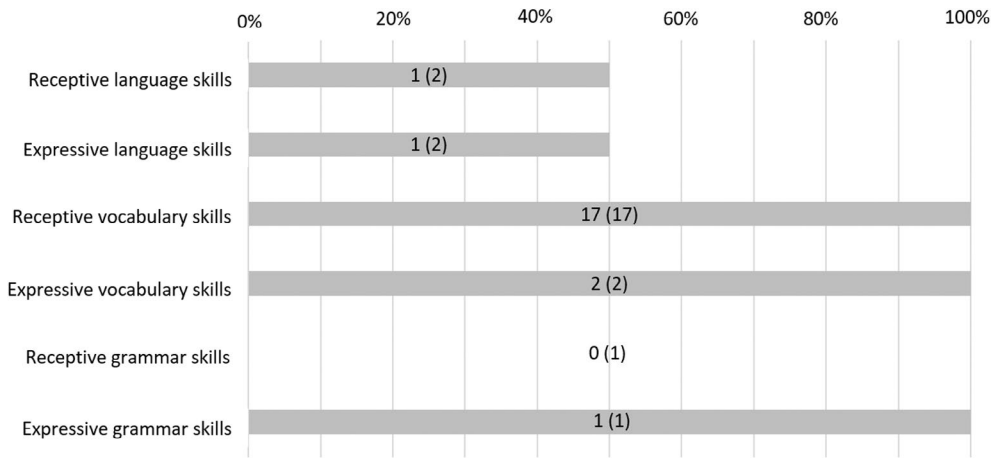

FIGURE 4 Proportions of statistically significant statistical values on associations between conduct disorders and language skills.

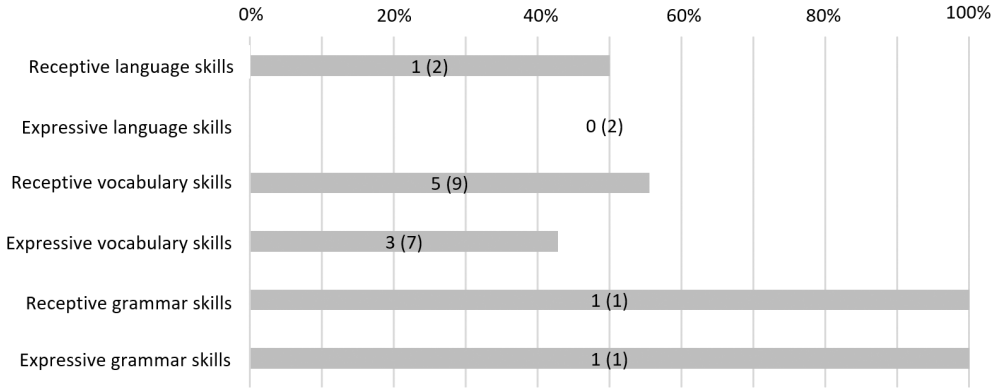

FIGURE 5 Proportions of statistically significant statistical values on associations between internalising problems and language skills.

language difficulties had significantly higher internalising problems scores compared to typically developing children (TD), while those with expressive language difficulties did not show such a difference (McKean et al., 2017, SVs 5, 6).

Receptive and expressive vocabulary skills

Small statistically significant correlations were observed between internalising problems and receptive vocabulary skills in children aged 8–11. For younger children (6–7 years), the correlations were very small statistically significant (Westrupp et al., 2020, SVs 9–12). Expressive vocabulary skills also showed small but significant correlations with internalising problems (Lundy et al., 2010, SV1). Group comparisons indicated that children with borderline or clinical internalising problems had significantly lower language scores than TD children, revealing a weak association (Lundy et al., 2010, SV2). In another study with children aged 6–9 years, moderate correlations were found between receptive vocabulary skills and internalising problems, with slightly lower correlations for expressive vocabulary skills (Schöfl et al., 2016, SVs 5, 6). Bryant et al. (2022) assessed both receptive and expressive vocabulary using a mixed-score scale but found no significant correlations (Bryant et al., 2022, SVs 1–4).

Receptive and expressive grammar skills

Only one study examined the link between internalising problems and grammar skills, showing small correlations. The association between expressive grammar skills and internalising problems was moderate and slightly stronger than the corresponding association for receptive grammar skills. (Schöfl et al., 2016, SVs 7, 8).

DISCUSSION

Associations between language skills and emotional and behavioural problems

This systematic review explored the bivariate associations between language skills and emotional and behavioural problems. It focused on the components addressed and the methodological approaches used in previous quantitative studies. The results reveal a variety of approaches in researching associations between language skills and emotional and behavioural problems, encompassing correlational analyses, group comparisons and both cross-sectional and longitudinal designs. With regard to the components of language skills and emotional and behavioural problems, more than half of the possible bivariate associations addressed in this review have not yet been explored, such as the links between depression symptoms and language skills components. The limited number of reported SVs could be due to the specificity of our inclusion criteria. Externalising problems were more frequently studied than internalising problems, possibly because they pose greater challenges for teachers (Chow & Wehby, 2018).

Our strict inclusion criteria may explain why receptive vocabulary skills dominate the results, as they are commonly and time-efficiently assessed in large-scale studies (Petersen et al., 2013; Spilt et al., 2015; Westrupp et al., 2020). Most associations with emotional and behavioural problems involve hyperkinetic disorders, reflecting increased research in recent years (Kim et al., 2020; Wüstner et al., 2019). Over half of all SVs found pertained to linear relationships, aligning with the growing trend towards a dimensional approach.

The associations between emotional and behavioural problems and language skills are to be discussed in more detail. Overall, 59.81% of the reported SVs were statistically significant, supporting the general link between language skills and emotional and behavioural problems, but to a limited extent. Notably, the highest percentage of statistically significant SVs was found for the association between language skills and conduct disorders (88%) and the lowest with internalising problems (50%), suggesting more robust associations with externalising problems. For language modalities, there was a tendency towards stronger associations between receptive language skills and externalising problems, hyperkinetic disorders and internalising problems, compared to expressive skills. A more detailed analysis explores these relationships, starting with externalising problems,

followed by hyperkinetic and conduct disorders and internalising problems. Potentially influencing factors, such as gender ratios and quality characteristics of the studies (e.g. sample size) are discussed when possible.

Associations between components of emotional and behavioural problems

Externalising problems

Only four SVs from the same study are available (Schöfl et al., 2016, SVs 1–4). Small and statistically significant correlations (Schöfl et al., 2016, SVs 1–3) are in line with the previously found statistically significant association between language skills and externalising problems (Chow & Wehby, 2018; Hentges et al., 2021). The study sample displayed an average IQ, suggesting a relevant association without cognitive deficits. The correlation between externalising problems and expressive grammar was not significant, indicating a clear association between receptive grammar rather than productive grammar and externalising problems. However, sentence repetition does not comprehensively reflect expressive grammar skills (Polišenská et al., 2015).

Hyperkinetic disorders

The results (Cardy et al., 2010, SVs 1, 2; Hutchinson et al., 2012, SVs 1, 2) support the findings of stronger associations with receptive than expressive skills (Chow et al., 2018). This is only partially contradicted by the findings reported by McKean et al. (2017), SVs 1, 2 and the correlations calculated in a sample with LD (Eadie et al., 2018, SVs 1, 2), which show a slightly stronger statistical association between hyperactivity and expressive than receptive language skills in large samples. When comparing findings across studies, it is important to consider that the sample sizes in Cardy et al. (2010) and Hutchinson et al. (2012) were relatively small ($n=56$ and $n=69$, respectively). Accordingly, their results should be interpreted with caution, particularly in relation to those of Eadie et al. (2018) and McKean et al. (2017), which are based on substantially larger samples ($n=872$ and $n=1204$, respectively). Thus, it would be premature to conclude that expressive skills are unrelated to ADHD.

Additional findings suggest differences depending on ADHD symptoms. Results (Cardy et al., 2010, SVs 3–8) indicate a stronger link between receptive and expressive language skills and inattention compared to hyperactivity. The study by Cardy et al. (2010), which included a high proportion of boys (73.21%), suggests that sex might possibly influence this association (Hentges et al., 2021). A similar trend towards stronger associations with inattention is observed with phonological awareness skills (Koltermann et al., 2020, SVs 1, 2) and receptive vocabulary skills (Cain & Bignell, 2014, SVs 1–5; Westrupp et al., 2020, SVs 1–4).

The fact that a strong association between hyperkinetic disorders and receptive vocabulary skills was shown independent of medication and SES (Barini & Hage, 2015, SV1; Cain & Bignell, 2014, SV2) contradicts the theoretical assumption that SES might influence the strength of this association. Still, the clarity and comparability of these findings is limited by small sample sizes ($n=40$, $n=66$, $n=22$), varying medication statuses and inconsistent reporting of cognitive skills (Barini & Hage, 2015; Cain & Bignell, 2014).

For expressive vocabulary skills, group comparisons did not reveal statistically significant differences between children with and without ADHD (Papaeliou et al., 2015, SV1). Overall, the higher proportion of statistically significant associations suggests a stronger association with receptive vocabulary skills than with expressive vocabulary skills (Figure 3). However, the statistically significant correlation between inattention symptoms and expressive vocabulary skills reported by Plourde et al. (2018), SV1 indicates a relevant association at least with inattention symptoms.

The statistically significant association found primarily with inattention could be explained by the hypothesis that working memory performance, particularly central executive performance, contributes to language difficulties and ADHD symptoms (Lui & Tannock, 2007). Alternatively, linguistic overload could lead to inattention, or attention deficits might disturb language acquisition or assessment. Regarding grammar skills, the results generally show a stronger link with receptive than with expressive skills (Papaeliou et al., 2015, SV2; Staikova et al., 2013, SV1, 2; Barini & Hage, 2015, Redmond 2011; Redmond et al., 2011, 2015; SV2; Redmond et al., 2015, SVs 1, 3, 5, 7). The only exception was the results of Gut et al. (2012), SV1), which could be explained by the fact that acting out spoken sentences may require more attention than indicating pictures.

Children with ADHD performed statistically significantly worse than TD children in a task intensively challenging the phonological loop, a component of working memory (Papaeliou et al., 2015, SV3). The lack of significant differences in tasks with less explicit demands on the phonological loop, such as marking tenses or third-person singular (Redmond et al., 2011, SV1; Redmond, 2011, SV1; Redmond et al., 2015, SVs 2, 4, 6, 8), suggests that the phonological loop might be particularly relevant to this association. This implies that expressive morphological skills may be less closely related to ADHD than expressive syntactic skills (Gut et al., 2012, SV2; Papaeliou et al., 2015, SVs 3, 4; Redmond et al., 2011, SV1; Redmond et al., 2015, SVs 2, 4, 6, 8; Redmond, 2011, SV1).

In total, statistically significant associations with grammar skills were less frequent if only children with

at least average nonverbal IQ were included (Redmond et al., 2011, SV1; Redmond et al., 2015, SVs 1–8; Redmond, 2011, SV1). This suggests that higher nonverbal cognitive performance may weaken the association between grammar skills and hyperkinetic disorders, possibly highlighting the role of nonverbal cognitive skills, like pattern recognition, in grammar acquisition. A confounding factor might be that the children in some studies received medication that attenuated the symptoms of hyperkinetic disorders. They may have been able to perform better in language assessments.

Focusing on skills in pragmatics and communication, less than 30% of the SVs related to hyperkinetic disorders were statistically significant, suggesting a rather weak association. Skills necessary for immediate interaction and related to Theory of Mind, such as presuppositions (Staikova et al., 2013, SV3), seem more closely linked to ADHD symptoms than narrative skills (Redmond et al., 2011, SV2; Redmond, 2011, SVs 2, 3). Additionally, a stronger association is observed when both hyperactivity and inattention are present compared to when only one of them is exhibited (Cain & Bignell, 2014, SVs 4, 5).

Conduct disorders

The results derived from the findings on associations between comprehensive receptive and expressive language skills and conduct disorders are ambiguous (Eadie et al., 2018, SVs 3, 4; McKean et al., 2017, SVs 3, 4). The particularly large number of results on the correlation between receptive vocabulary skills and conduct disorders enables a differentiated discussion. However, since both Spilt et al. (2015) and Westrupp et al. (2020) refer to the same sample, their results must be compared with caution. Correlations suggest that the strength of association between conduct disorders and receptive and expressive vocabulary skills is similar (Risser, 2013, SVs 1, 2). The association between conduct disorders and vocabulary skills is weak overall, but with statistically significant results only, it can be well validated against coincidence.

No statistically significant associations were found between receptive grammar skills and conduct disorders (Gut et al., 2012, SV3), which could indicate that the lower correlation between grammatical skills and vocabulary skills results in non-significant correlations with comprehensive language skills (Eadie et al., 2018, SVs 3, 4). Yet, evidence that expressive grammar skills are most strongly associated with conduct disorder symptoms among all reported associations with language skills (Gut et al., 2012, SV4) contradicts this assumption. Since all children in the sample had average nonverbal IQ, these correlations cannot be attributed to nonverbal cognitive deficits. The results align with findings that the association between language skills and externalising problems is particularly strong in boys, as the sample comprised 78% males (Hentges et al., 2021).

In summary, both vocabulary and grammar skills showed statistically significant associations with conduct disorders, aligning with frameworks that link conduct disorder symptoms with language skills (Redmond & Rice, 1998). No significant difference was found between receptive and expressive vocabulary skills. However, expressive grammar skills showed a stronger association with conduct disorders. This may be explained theoretically by the framework that children who struggle to express themselves clearly at the sentence level might resort to aggressive behaviour to compensate or assert their self-efficacy.

Internalising problems

The results suggest an overall stronger association between internalising problems and receptive language skills than with expressive language skills (Eadie et al., 2018, SVs 5, 6). This result is consistent with the findings of Yew and O'Kearney (2013), who underlined the relevance of receptive skills in internalising problems. Nevertheless, the lack of statistically significant correlations with comprehensive language skills contradicts the meta-analytical results of Hentges et al. (2021) and Chow and Wehby (2018).

Regarding the association between internalising problems and vocabulary and grammar skills, other conclusions can be drawn. The strongest correlations with receptive and expressive vocabulary skills were found in studies in which half of the children were diagnosed with SLI (Schöfl et al., 2016, SVs 5–8). This suggests that severe vocabulary difficulties may be linked to higher internalising problems, especially when compared to samples without language limitations (Bryant et al., 2022, SVs 1–4; Westrupp et al., 2020, SVs 9–12). The hypothesis that a statistically significant association is present between severe internalising problems and vocabulary difficulties, and possibly not in the middle spectrum of language skills and internalising problems, is further supported by the results reported by Lundy et al. (2010), SV 1. They only included children in the borderline or clinical referral ranges of internalising problems. The correlation was statistically significant, in contrast to those shown in an unlimited sample by Bryant et al. (2022), SVs 1–4. Against the background of the frameworks presented, several explanations are possible. Children with severe internalising problems could face particularly difficult conditions for language processing, possibly due to the associated psychological stress (Sirianni, 2004). Another explanation would be that children with severe language difficulties tend to withdraw and manifest internalising symptoms (Helland et al., 2022).

Comparing the correlations between vocabulary skills and grammar skills, it initially appears that grammar skills are more strongly associated with internalising problems than vocabulary skills (Bryant et al., 2022,

SVs 1–4; Lundy et al., 2010, SV1; Schöfl et al., 2016, SVs 5–8; Westrupp et al., 2020, SVs 9–12). However, only two SVs reported on grammar skills (Schöfl et al., 2016, SVs 7, 8; Schöfl et al., 2016, SVs 5, 6) reported slightly higher correlations with vocabulary skills in the same sample. When comparing the results, it must be noted that the sample size of the study conducted by Schöfl et al. (2016) with $n = 100$ was considerably smaller than the sample sizes of the other samples.

Overall, an association of similar strength between vocabulary and grammar skills and internalising problems can be assumed. The results indicate a slight tendency for stronger associations in children on the spectrum of language difficulties or in case of severe internalising problems than in unlimited samples and a tendency for stronger associations with receptive skills compared to expressive skills. One explanatory hypothesis is that language difficulties may maintain and reinforce internalising problems, as children might further withdraw due to linguistic overload (Hollo & Chow, 2015).

Limitations

Limitations inherent to the included studies must be considered. Variability in the assessment of language skills and emotional and behavioural problems, ranging from standardised tests and clinical diagnoses for language skills to parent or teacher ratings and clinical diagnoses for emotional and behavioural problems, complicates comparability (Genachowski et al., 2022). Moreover, the included studies differed in design (cross-sectional and longitudinal designs), sample size (ranging from 40 to 8.756) and methodological approach (correlational analyses and group comparisons), posing additional challenges for comparisons. Additionally, some authors, such as Plourde et al. (2018), did not focus on the associations between language skills and emotional and behavioural problems as their primary research question, but still reported results that were relevant to our review. Consequently, methodological aspects such as sample selection may not have been optimised for investigating these specific relationships. Factors potentially relevant to the associations were not considered consistently in included studies, such as working memory (Gathercole & Baddeley, 2014; Lui & Tannock, 2007; Maehler & Schuchardt, 2016; Ramos et al., 2020) or interaction and relationship aspects (Fearon et al., 2020; Nunes et al., 2013). Overall, it is important to highlight, both at the level of the individual studies and across our systematic review, that the interplay between language skills and emotional and behavioural problems may be shaped in a complex manner by mutual, internal and external factors (Chow & Wehby, 2018; Helland et al., 2020), which may also include development in other developmental domains.

Conceptualisation of the examined constructs also presents limitations. While our review differentiated between various components of language skills to provide a more detailed perspective and orientation for school practice, these skills are interconnected (Hoff, 2018). Similarly, emotional and behavioural problems often co-occur, yet comorbidities were rarely addressed in detail within the included studies, with few exceptions (Verhulst & van der Ende, 1993). These factors contribute to variability in the reported findings and should be considered when interpreting our results.

Further limitations arise from the methodology of our systematic review. Although we aimed to provide a comprehensive overview of studies addressing the associations between language skills and emotional and behavioural problems considering their components, the heterogeneity of the included studies posed challenges for a fully consistent quality assessment. We included studies with varying designs, sample sizes, study focuses and methodological approaches, which required the use of a flexible strategy for data extraction and analysis. While our strict inclusion criteria ensured a certain methodological rigour in the quality of assessment instruments, and our nuanced consideration of components constitutes a key strength and central contribution of this review, our methodological approach inevitably constrained the validity of our findings. For example, we quantified the number of statistically significant results for the examined associations and applied transformations to enhance comparability. Furthermore, we accounted for factors such as sample size and potential confounding variables only in our discussion. This strategy was justified by the heterogeneity of the included studies, the level of descriptive detail it allowed, and the exploratory nature of our review. However, it also has limitations. For instance, this approach does not clearly indicate the extent to which moderating factors influence different associations. Moreover, transforming effect sizes does not account for differences in study quality. While certain key quality aspects, such as sample sizes, were discussed, other methodological variations may still influence the interpretation of our findings. But given the previously underexplored role of components in the associations between language skills and emotional and behavioural problems, we view these limitations as a trade-off that enables the depth and specificity of our findings.

Implications

Several practical implications emerge from these findings. The tendency towards stronger associations between externalising problems, hyperkinetic disorders, internalising problems and receptive language skills than expressive language skills should remind practitioners to pay special attention to receptive language skills in children with emotional and behavioural problems. Even if receptive difficulties in students do not attract

TABLE 6 Overview on key findings on strength of associations between subcomponents.

Subcomponent of EBP	Key findings on associations with LS
Externalising problems	• Evidence supports an association between LS and externalising problems. • Weaker associations were shown with expressive grammar skills compared to receptive vocabulary skills, expressive vocabulary skills and receptive grammar skills.
Hyperkinetic disorders	• Receptive skills appear to be more strongly associated than expressive skills. • Inattention, a core symptom of hyperkinetic disorders, may have a stronger relationship with both receptive and expressive skills compared to hyperactivity or impulsivity. • Grammatical skills showed stronger associations when assessing syntactic skills compared to morphological skills. • Skills strongly related to Theory of Mind (ToM) showed stronger associations than narrative skills.
Conduct disorders	• Associations between conduct disorders and LS were well validated, especially for receptive vocabulary skills. • However, it remains unclear whether receptive or expressive language skills are more strongly associated with conduct disorders. • There are tentative indications that expressive grammar skills might be relevant.
Internalising problems	• There is less evidence for associations with internalising problems compared to externalising problems. • Receptive language skills showed stronger associations than expressive language skills. • The strength of associations with language skills appears to be greater in case of more severe symptoms of internalising problems.

Note: This table summarises key findings drawn from the Results and Discussion sections.
Abbreviations: EBP, emotional and behavioural problems; LS, language skills.

a lot of attention, they are still common and need to be recognised and counteracted. Within educational settings, systematic screening of receptive language skills may contribute to the early identification of subtle or masked language difficulties that might otherwise remain unrecognised. Furthermore, practitioners should be encouraged to take into account not only observable behavioural symptoms but also underlying language profiles when evaluating students' difficulties, particularly in cases characterised by symptoms such as inattention, as highlighted in our findings.

Following the prominent framework that assumes a direct or indirect effect of language skills on the development and maintenance of emotional and behavioural problems, there may be particular potential in supporting children at risk or those diagnosed with emotional and behavioural problems by improving their language skills. Structured interventions targeting language comprehension may strengthen children's capacity to engage with verbal input and reduce symptoms of inattention, as indicated by the associations highlighted in our findings.

It is possible that improving the fit between environmental language demands and children's abilities can alter the trajectory of maladaptive behaviour (Chow et al., 2020). On the other hand, prevention and intervention in emotional and behavioural problems might support language skills by improving the conditions for language acquisition.

Given the predominance of statistically significant associations between language skills and emotional and behavioural problems identified in this review, the findings underscore the importance of systematically addressing both developmental domains within educational contexts.

In this regard, the necessity of interdisciplinary collaboration becomes evident to ensure appropriate support for students presenting with co-occurring difficulties. The implementation of differentiated, component-specific prevention and intervention strategies requires the integration of specialised expertise. Providing effective support in educational settings depends on coordinated efforts among teachers, speech and language therapists, school psychologists and other relevant professionals.

CONCLUSIONS

This systematic review aimed to investigate the associations between components of language skills and emotional and behavioural problems. The analysis revealed that more than half of the associations addressed lacked reported results. Thus, an important revelation is the substantial gap in differentiated research on associations between most components of language skills and emotional and behavioural problems, both in categorical and dimensional research on these associations. Furthermore, considering other influencing variables could be valuable in the investigation of the effects between language skills and emotional and behavioural problems.

The general link between language skills and emotional and behavioural problems was supported by the results. The overall significance and strength of associations between language skills and emotional and behavioural problems were heterogeneous. We were able to highlight differences in the associations between several specific emotional and behavioural problems and language skills, with key findings summarised in Table 6.

Our results do not provide sufficient indication of the direction of the effects shown in accordance with the frameworks. Thus, it remains unclear whether specific

language difficulties underlie a specific emotional and behavioural problem, whether there are common underlying factors, or whether specific emotional and behavioural problems interfere with the acquisition of language skills. By differentiating language skills and emotional and behavioural problems, the results lay a foundation for further differentiated research on the direction of the effects between specific language skills and emotional and behavioural problems.

Despite the limitations discussed, our results are relevant to educational practice and have high relevance for further research. They represent an important, more differentiated addition to previous reviews and meta-analyses in terms of the associations between components of language skills and emotional and behavioural problems. Our findings provide indications of the contexts in which specific effect mechanisms might be found that need to be investigated in further cross-sectional and longitudinal research.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

Data are provided in Tables S1–S4.

ETHICS STATEMENT

Ethics approval was not required.

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Endnotes

[i] A final search was conducted on June 5, 2024, due to extended review processes, with no additional inclusions.

[ii] This methodological approach is based on Borenstein et al. (2009). The calculation was supported and is transparent via the platform provided by Lenhard and Lenhard (2022).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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