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RESEARCH REPORT

How language affects social cognition and emotional competence in typical and atypical development: A systematic review

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Abstract

Background: The ability to understand the mental state of others (social cognition), as well as language, is crucial for children to have good social adaptation. Social cognition (SC) has been shown to be a hierarchical model of three factors (Cognitive, intermediate and affective SC) interrelated with linguistic processes. Children on the autism spectrum and children with developmental language disorder (DLD) or social communication disorder (SCD) manifest language and SC difficulties, albeit in different ways.

Aims: This systematic review aims to find how language and SC interact with each other and identify linguistic and socio-affective profiles in the target population.

Methods: About 1593 articles were systematically reviewed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guide in November 2022, obtaining, through inclusion/exclusion criteria, a total of 38 articles for qualitative assessment. The majority of them were on autism (26) or DLD (14) and to a lesser extent SCD (3).

Main Contribution: Although SC is related to all components of language, SC is strongly related to narrative and morphosyntax and partially related to lexicon. Pragmatics shows a complex relation with SC due to greater sensitivity to other factors such as age or task, and prosody appears to be more related to emotional processes. Besides, autistic, SCD and DLD children showed differences in their language and socio-affective performance. Mainstream DLD children have lower performance in general language, where autistic and SCD children have more linguistic variation and are lower in pragmatic and SC tasks, SCD children being more associated with language production difficulties and autistic children with both receptive and productive language.

Conclusion: Each language component has a different interaction with SC. Likewise, different linguistic profiles are partially found for each disorder. These results are important for future lines of research focusing on specific components of interaction and socio-emotional processes, as well as for clinical and educational treatment.

KEYWORDS
autism spectrum disorder, emotional competence, language, language development disorder, social cognition, social communication disorder, typical and atypical development

What this paper adds

What is already known on the subject

- The hierarchical model of Schurz et al. (2021), divide social cognition into three brain constructs: cognitive social cognition (CSC), affective social cognition (ASC) and intermediate social cognition (ISC). They observe a large relationship between language and ISC, a fact that has been corroborated with some other studies. Studies have also found lower linguistic and socio-affective abilities in children with autism and language and communication disorders compared with children with neurotypical development, and large behavioural and neurocognitive overlaps between these disorders (Durrleman et al., 2019; Löytömäki et al., 2019).

What this paper adds to existing knowledge

- This is the first review that relates all linguistic components (narrative, lexicon, morphosyntax, pragmatic and prosody) with the three constructs of social cognition (Cognitive, intermediate and affective). Moreover, it is the first review that studies the socio-linguistic factors comparing autism, developmental language disorder and social communication disorder with each other and with neurotypical development in children aged from 4 to 9 years.

What are the potential or actual clinical implications of this work?

- Understanding how language and social cognition interact with each other in autism spectrum disorder, developmental language disorder and social communication disorder allows us to trace socio-linguistic profiles for each of the studied disorders, understand better children with these difficulties, and, with this, find specific potential intervention points to improve and prevent these difficulties.

INTRODUCTION

To perform and understand social interaction with others, we must develop and adequately stimulate language and other socio-emotional mental processes such as social cognition and emotional competence during childhood (Schurz et al., 2021). Language is the primary communication system that people use to transmit thoughts to others (Fernández & Smith, 2011). Some studies show that language is a system that helps to represent thoughts and abstract categories, as well as enabling the metacognition of these thoughts (Langland-Hassan et al., 2021). The

components of language that are studied can be structured according to form (phonology, syntax and morphology), content (lexicon and semantics) and use (pragmatics).

Social cognition (SC), on the other hand, refers to cognitive processes related to perceiving and interpreting the environment in order to develop a knowledge of our own mind and that of others (Martins-Junior et al., 2011). Although interest in this construct has increased in the last years, SC is difficult to define, and even today scientists do not find a clear consensus, not only for the vocabulary used to name its components but also to know what techniques must be used to measure them adequately (Quesque & Rossetti, 2020). Following the hierarchical model of Schurz et al. (2021), SC is made up of three brain constructs: cognitive social cognition (CSC), affective social cognition (ASC) and intermediate social cognition (ISC). CSC encompasses cognitive processes such as mentalizing and Theory of Mind (ToM), that is, the ability to attribute cognitive mental states to oneself and others (Premack & Woodruff, 1978) to explain and predict the behaviour of others (Cardillo et al., 2021). Some of the tasks used to study CSC are false-belief tasks, trait judgment and strategic games (Schurz et al., 2021). On the other hand, ASC includes mental processes of empathy, which is defined as the ability to share and feel others' emotional states. ASC is studied with tasks such as pain observation and identifying emotions in faces or with poor context stimuli (Schurz et al., 2021). These tasks evaluate lower levels processes such as recognition of perceptual emotions on the reading the mind in the eyes test (Baron-Cohen et al., 2001) and not mentalisation processes (Oakley et al., 2016; Quesque & Rossetti, 2020). Similarly, ISC is characterised by mental processes that overlap cognitive and affective social functions, giving emphasis to linguistic processing (expression and understanding of language). The tasks that activate ISC neural networks are contextualised emotion assessment and empathic reasoning tasks (Schurz et al., 2021). Finally, emotional competence (EC) refers to several processes based on identifying, understanding, expressing, and regulating emotions in oneself and towards others (Beck et al., 2012). It is necessary to mention that having a consensus among scientists in clearly differentiating the components and measuring them appropriately is especially relevant when establishing the affectations in some disorders, such as in autistic individuals (Marocchini, 2023).

The relationship between language and social cognition

The study by Schurz et al. (2021) shows a high interconnection between language and brain activation of ASC and ISC, thus indicating an interconnection between language development and SC. The systematic review by Hertrich et al. (2020) corroborates these results by indicating that the neural processing of language is closely related to other brain networks such as emotional processing, ToM, contextualised meaning and cognitive control.

Besides brain studies, a strong relationship between language and social cognitive abilities is well-documented also in theoretical and behavioural studies of typical and atypical development (Kaltefleiter et al., 2021). However, there are no clear conclusions about this relationship (Bigelow et al., 2021). One theory proposes that language may be dependent on SC, suggesting that young children develop a false belief understanding before the abstract language acquisition, while another theory suggests that SC may be dependent on language because language development may provide young children skills (like word meaning) that facilitates the false belief understanding (Astington & Jenkins, 1999; Bigelow et al., 2021; Tomasello, 2018). Further to this, the Milligan et al. (2007) meta-analysis reveal that although both predictive associations were notable, the impact of language abilities on subsequent false belief understanding was more pronounced than the reverse relationship.

The linguistic environment in which a child develops is also relevant. Schick et al. (2007) observe significant delay on ToM tasks in deaf children of hearing parents, compared to deaf children from deaf parents, who in contrast with the first, provide natural access and exposure to Sign Language. Thus, general language ability allows early children access to mental terms (such as 'think', 'know', and 'guess') which provide a direct support for mentalising, and facilitates the child's participation in social interactions, which indirectly let them understand other's mental states (Huang et al., 2022).

It is also important to mention that studies of different ages subgroups show that language mediates CSC and ASC differently across developmental periods (Bigelow et al., 2021; Ebert, 2020). Bigelow et al. (2021) find that for children aged 5–8 years, language mediates the relationship between age and both CSC ASC, but for children aged 9–12 years, language mediates only the relationship between age and CSC, not for ASC.

Language, communication and social disorders

Due to the high heterogeneity of each of the neurodevelopment disorders, overlaps appear in terms of characteristics and difficulties of these domains (Gibson et al., 2013; Taylor & Whitehouse, 2016). According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed., DSM-5, American Psychiatric Association, 2013), autism

spectrum disorder (ASD)[1] is based on persistent difficulties in communication and social interaction, as well as restrictive and repetitive patterns of behaviour. According to Bal et al. (2017) 'low-functioning autistic children' and 'high-functioning autistic children' are used for a wide range of characteristics within the autism spectrum: autistic children with or without severe language, cognitive (IQ) and/or socio-communication difficulties. Although these terms have a lack of precision and seem pejorative, we decided to keep them, since the studies included in this review classift some samples in this way, and due to its wide denotative range, it is difficult to use other terminology. Developmental language disorder (DLD) presents persistent difficulties in the acquisition and use of language due to impairments in language comprehension or production (reduced vocabulary, grammatical structure and limited speech). Santana et al. (2019) found, in the linguistic profile of autistic and DLD children, difficulties in production and comprehension (both due to morphosyntax and lexical-semantics), compared to control children. Likewise, children with DLD and autistic children have a lower performance in SC tasks compared to children with neurotypical development (Durrleman et al., 2019; Löytömäki et al., 2019). Schwartz and Segal (2022) find that autistic children have a fundamental difficulty in SC that is independent of their language abilities, while children with DLD show difficulties in social interactions that involve SC. They suggest that different developmental routes affect the acquisition of CSC in these disorders.

Finally, according to the DSM-5 (5th ed., American Psychiatric Association, 2013), social communication disorder (SCD) shows difficulties in the use of verbal and nonverbal communication and its use for social purposes. Owing to clear overlaps with the diagnostic criteria for DLD and ASD, SCD is used for children with primary difficulties in using language in context (social or linguistics) that did not meet the others diagnostic standard criteria (Norbury, 2013). Regarding children with SCD, Gibson et al. (2013) found that they have more atypical social interactions and fewer language difficulties than children with DLD, and fewer repetitive behaviours and more difficulty in social interaction and expressive (pragmatic) language than high-functioning autistic children. Although we wanted to incorporate this disorder, few studies were found that compared language and SC in this specific population. This may be because few children have isolated social-communication difficulties (0%–1.3%) and usually they are associated with other language difficulties or autistic symptoms; this makes it difficult to study and generates also significant clinical and theoretical discussions regarding the validity of this diagnosis and the role that language might play in social-pragmatic deficits (Norbury, 2013; Pichardo et al., 2023; Saul et al., 2023).

From the most classical to the current studies, most have investigated SC or language separately in these disorders (Baron-Cohen et al., 1985; Bishop, 2017; Happé, 1995; Leekam & Perner, 1991). Nevertheless, there is a lack of studies that compare these neuropsychological disorders to each other (Taylor & Whitehouse, 2016) and focus on how specific language and socio-affective components interact with each other during development. No systematic review has been done to date that considers all components of language and SC to study how they interact during development in children with these three disorders.

Objectives and hypotheses

This systematic review aims to summarise the findings of studies that answer the following PICO[2] (adapted version of Miller, 2001) question: "Do autistic, DLD or SCD children aged 4–12 (Population), with a specific language assessment (Exposure) and compared to a control sample of typical development and/or among themselves (Comparator), have a clinically differentiated social cognition or emotional competence performance (Results)?". Therefore, the main objective of the review is identifying which components of language relate significantly to SC and EC components, and if autistic, DLD or SCD children with a specific language profile have also a specific SC and EC profile.

METHODS

The review process was carried out according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement (Page et al., 2021) which consists of a 27-item checklist and revised flow diagrams that provide a guidance for systematic review.

Search strategies

The search was conducted in November 2022, on three different databases: PsycINFO, Web of Science and SCOPUS. These databases have been chosen by references of other systematic reviews and meta-analyses in the study field. Thus, the search strategy used was developed based on keywords of the PICO question and Boolean combinations: *((DLD or 'developmental language disorder' or SLI or 'language impairment' or 'language disability' or 'language disorder') OR (Autism* or Asperger* or ASD) OR ('SCD' or 'social communication disorder')) AND (('theory of mind'*

or ToM or mentaliz or emotion or 'emotion regulation' or 'social cognition' or 'socioemotional') AND (language or ling* or communication or speech) AND (grammar or grammatic* or prosody or prosodic or pragmatic* or lexic* or morphosyntax or morphology or syntax or phonology or phonologic* or phonetic* or narrative or discursive))*.

Eligibility criteria

Only articles that met the following inclusion criteria were selected: (1) year of publication between 1992 and 2022. This year was chosen according to the new definition of DLD proposed by Rapin and Allen (1983), which for the first time excludes other affects that could confuse the diagnosis (e.g., sensory/motor deficit, mental deficiency, psychopathology, socio-emotional deprivation, injuries and/or dysfunctions); (2) English language for the written article; (3) sample aged between 4.0 and 12.11 years. In fact, there is a general consensus that children begin to develop cognitive social cognition by 3 or 4 years of age (Bigelow et al., 2021; Wellman et al., 2001). It was chosen to start at this age because at 41 months (3 years and 5 months) children perform ToM tasks below chance and they fail to overcome the false belief understanding. Nevertheless, from 48 months (4 years) and older, children perform above chance and significantly achieve false belief understanding (Wellman et al., 2001), and get more consolidated in adolescence, the period in which both linguistic and socio-emotional development become more complex and begin to be affected by other factors such as hormones (Muscatello and Corbett, 2018); (4) type of publication must be an original research study; (5) all study design except cases and reports; (6) type of disorder studied must be autism, DLD or SCD according to their clinical diagnoses; (7) control group (need to compare it to typical development); and (8) having adequate outcomes of the two main variables (linguistic and socio-emotional outcomes). As for the following criteria, all studies that incorporated other medical conditions or other disorders (attention deficit hyperactivity disorder, dyslexia…) are excluded, as are disorders that incorporate comorbidities (e.g., ASD with and without learning disorder).

Data collection

Independent authors carried out the selection processes using the Rayyan program, and a final agreement was reached between the first and the third author. The data were extracted manually by the first author. The extracted information was author(s), year of publication, country, characteristics of the sample (age, gender percentage, type of diagnosis or if they have normal development), the specific studied components of language and SC, results.

Quality assessment

The included studies were assessed for risk of bias by the first and second authors using the Modified Newcastle-Ottawa Scale (Wells et al., 2012), a tool for assessing bias in a case-control study. It has the selection, comparability and exposure category. As per this scale, every study received a maximum score of 9, and a score of <5 represented a high risk of bias (Luchini et al., 2017). A 97.04% agreement was obtained between the two independent researchers.

RESULTS

Identification and selection of the studies

Figure 1 shows the flow chart of the identified studies from the databases and the selection procedure. The reasons for exclusion are reported. A total of 38 studies were obtained. Twenty-two articles (57.89%) compared autistic children with typically developing (TD) children, and 11 articles (28.95%) compared children with DLD with TD. One study (Ketelaars et al., 2012) compared SCD with TD children (2.63%) and another study (Svindt & Surányi, 2021) compared social communication disorder children with autistic children and TD children (2.63%). Two studies (Bauminger-Zviely et al., 2019; Loukusa et al., 2014) compared autistic children children with DLD and TD children (5.26%). Finally, only one study (Norbury & Bishop, 2003) compared all three disorders (autism, DLD and SCD) with a control sample of TD children (2.63%). Table 1 shows characteristics of all included articles. The risk of bias assessment for all included studies is summarised in Table 1. A 97.04% agreement was obtained between the two independent researchers who performed the assessment. Table 1 shows that there was no high risk of bias for all included studies. Figure 2 is a graphic representation of the table.

Narrative assessment

In autistic studies, a total of six articles related narrative to SC. Of these studies, four articles related the narrative task to CSC, one article also related it to ISC, and one article considered both CSC and ISC tasks. No studies have been found that evaluate ASC or EC.

Four of these studies (Baixauli-Fortea et al., 2017; Hilvert et al., 2016; Peristeri et al., 2017; Siller et al.,

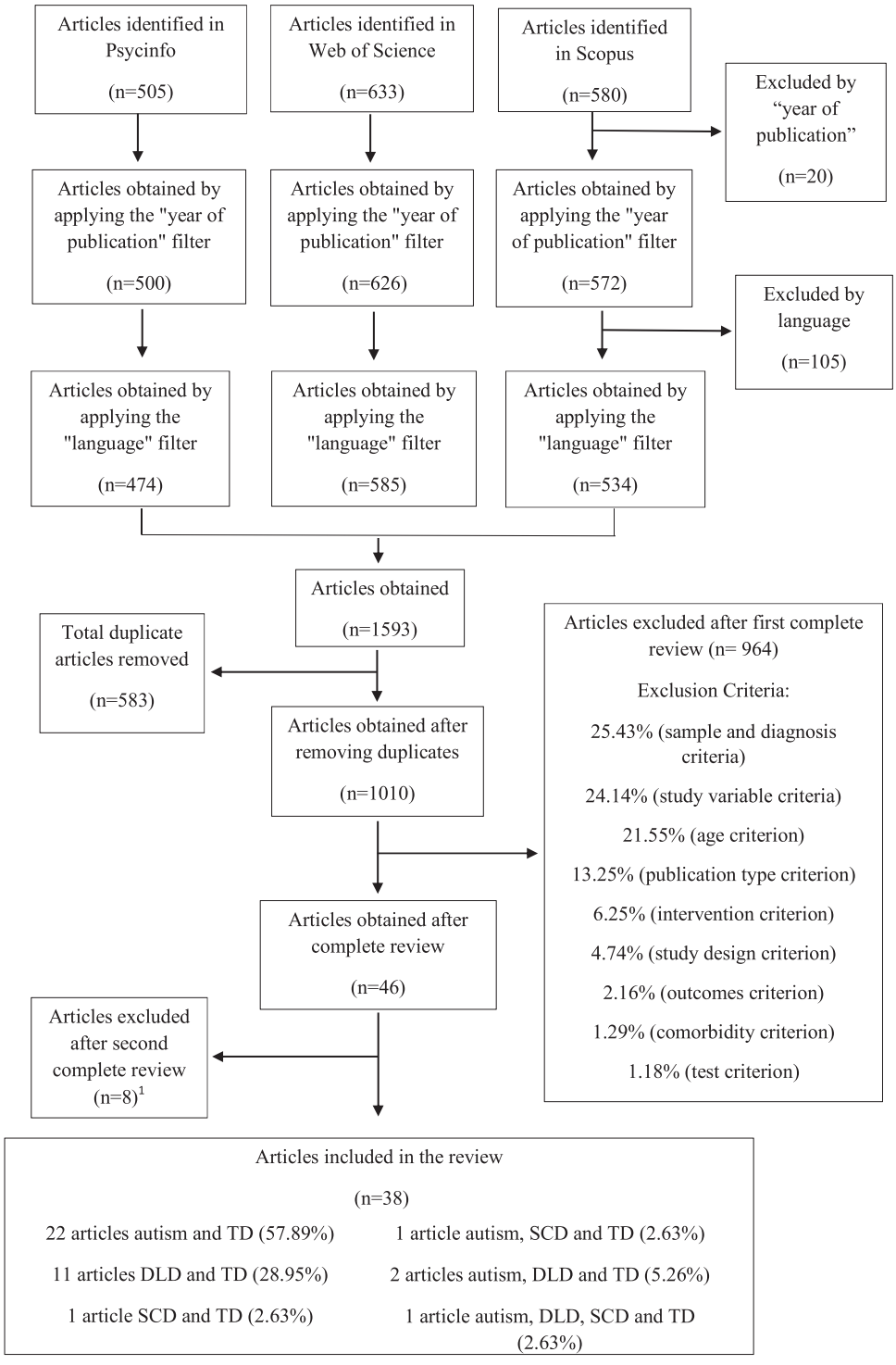

FIGURE 1 Flow chart of the selection process of the articles. Articles excluded after second complete review ($n = 8$) because of age criteria, sample and diagnosis criteria, specifically, non-group control studies group decompensation Autism Spectrum Condition, broad autism conceptualisation outcomes criterion, no clear differentiation of semantic and emotional results. DLD, developmental language disorder; SCD, social communication disorder; TD, typically developing.

TABLE 1 Characteristics of the included studies that compare autism spectrum disorder and typical development.

		Characteristics of the samples							Quality assessment of studies			
		ASD			TD							
Articles ($N = 22$)	Country	*N*	Ages	Sex (% male)	*N*	Ages	Sex (% male)	Study variables	Selection	Comparability	Exposure	Total score
Adornetti et al. (2020)	Italy	12 HF	8–11.02	11	15	8–11.04	9	Narration ISC	Low	Low	Moderate	7
Baixauli-Fortea et al. (2017)	Spain	52 HF	7–11	79.7%	37	7–11	79,7%	Narration, Morphosyntax, pragmatics CSC and ISC	Low	Low	Moderate	7
Sah and Torng (2019)	China	9	11.29	9	13	10.01	13	Narration Morphosyntax, lexic CSC	Low	Moderate	Moderate	5
Wang and Tsao (2014)	Taiwan	25	6–11	25	22 25	6–11	25	Pragmatics Prosody EC	Low	Low	Moderate	7
Whyte et al. (2014)	United States	26	5–12	21	26 CA 26 LA	5–12	18 CA 14 LA	Morphosyntax, lexic Pragmatics CSC and ISC	Low	Low	Moderate	7
Paynter and Peterson (2009)	Australia	24 AS 19 HF	5–12	p >.10.	20	5–12	$P > 0.10$	Morphosyntax, Lexic CSC and ISC	Low	Low	Moderate	7
Lind & Bowler (2009)	United Kingdom	48 LF 53 HF	7–12	42LF 44HF	48 53	7-12	33 35	Morphosyntax CSC	Low	Low	Moderate	7
Mazzaggio et al. (2021)	Italy	26	4–10	24	26	4–10	15	Pragmatics CSC	Low	Low	Moderate	7
Huang (2020)	United States	19	5–8.11	13	48	5–10	23	Morphosyntax Pragmatics CSC	Low	Low	Moderate	8
Li and Leung (2019)	China	17	5–7.33	14	17	5.25–7.5	10	Morphosyntax, Lexic CSC	Low	Low	Low	8
Loukusa et al. (2018)	Finland	16	6–9.4	15	16	6.1–9.1	15	Morphosyntax Pragmatics CSC and ISC	Low	Low	Moderate	7
Berenguer et al. (2017)	Spain	52 HF	7–11	62.1%	37	7–11	92.3%	Pragmatics CSC	Low	Low	Moderate	7

(Continues)

TABLE 1 (Continued)

		Characteristics of the samples							Quality assessment of studies			
		ASD			TD							
Articles ($N = 22$)	Country	*N*	Ages	Sex (% male)	*N*	Ages	Sex (% male)	Study variables	Selection	Comparability	Exposure	Total score
Huang et al. (2015)	Japan	50 HF	7.7–12.6	42	50	7.4-12.5	42	Pragmatics Lexic CSC	Low	Low	Serious	6
Whyte and Nelson (2015)	United States	27	5–12	21	69	5–12	39	Morphosyntax Lexic Pragmatics ISC	Low	Moderate	Moderate	6
Siller et al. (2014)	United States	21	5.6–8.71	17	24	5.18–8.45	19	Narration Lexic CSC	Moderate	Moderate	Moderate	5
Hilvert et al. (2016)	United States	19	8.6–12	17	26	8–11.4	18	Narration Lexic CSC	Low	Moderate	Moderate	6
Overweg et al. (2018)	Holland	48	6–12.5	39	43	6.2-12.7	34	Morphosyntax CSC	Low	Low	Moderate	7
Panzeri et al. (2022)	Italy	26	3.75–10.25	24	26 CA 26 LA	4–10.25	17 CA 14 LA	Pragmatics CSC	Low	Low	Moderate	7
Peristeri et al. (2017)	Greece	14 LF 16HF	6.1–12 6.7–12.4	14 16	15	7.1–12	15	Narration CSC	Low	Low	Moderate	7
Rosello et al. (2020)	Spain	30HF LSC 22 HF HSC	7–11	–	37	711	–	Morphosyntax Pragmatics CSC and ISC	Low	Low	Moderate	7
Teh, Yap & Liow (2018)	Singapore	20	5–12	18	20	512	18	Morphosyntax Lexic CSC and EC	Low	Low	Moderate	7
Marocchini et al. (2021)	Italy	14HF	9–12	12	19 28	56 912	13 8	Pragmatics CSC	Low	Low	Moderate	7

Characteristics of the included studies that compare developmental language disorder and typical development

		Characteristics of the samples							Quality assessment of studies			
		DLD			TD							
Articles ($N = 11$)	Country	*N*	Ages	Sex (% male)	*N*	Ages	Sex (% male)	Study variables	Selection	Comparability	Exposure	Total
Griffiths et al. (2020)	United Kingdom	67	5–6 11–12 (long)	37	272	5–6 11–12 (long)	129	General language EC	Low	Low	Low	9

(Continues)

TABLE 1 (Continued)

Articles ($N = 11$)	Country	Characteristics of the samples: DLD *N*	DLD Ages	DLD Sex (% male)	TD *N*	TD Ages	TD Sex (% male)	Study variables	Quality assessment of studies: Selection	Comparability	Exposure	Total
Farmer (2000)	United Kingdom	8 SS 8 RS	10–11	8 SS 7 RS	8 8	10 11	5 CA 5 LA	General language CSC and EC	Low	Low	Moderate	7
Spanoudis (2016)	Cyprus	20	8.9–12.2	8	20 CA 18 LA and CA	9.10–11.10	8 9	Morphosyntax lexic pragmatics CSC	Low	Low	Moderate	7
Davies et al. (2016)	Spain	18	5.1–10.11	11	18	5.0–10.11	11	Morphosyntax lexic Pragmatics CSC	Low	Low	Low	8
Mäkinen et al. (2013)	Finland	19	4.11–7.7	14	19	4.11–7.7	14	Narration Pragmatics CSC	Low	Low	Moderate	7
Fujiki et al. (2007)	United States	19	7.9–10.10	8	19	7.9–10.10	8	Morphosyntax Prosody EC	Low	Low	Moderate	7
Creusere et al. (2004)	United States	26	4.2–6.5	20	26	4.0–6.5	20	Prosody EC	Moderate	Low	Moderate	6
Miller (2001)	United States	10	4.5–7.1	9	10	4.6–7.2	5	Morphosyntax CSC	Moderate	Low	Moderate	6
McCabe and Meller (2004)	United States	36	4–10	30	35	4–7	18	Morphosyntax EC	Low	Moderate	Moderate	6
Van Der Meulen et al. (1997)	Holland	30	4.4–6.11	24	30	4–6	24	Prosody EC	Low	Low	Moderate	7
Delaunay-El et al. (2009)	France	12	5.6–10.5	11	12	5.6–10.9	10	Lexic EC	Low	Low	Moderate	7
Characteristics of the included studies that compare social communication disorder and typical development												
Articles ($N = 1$)	**Country**	**Characteristics of the samples: SCD *N***	**SCD Ages**	**SCD Sex (% male)**	**TD *N***	**TD Ages**	**TD Sex (% male)**	**Study variables**	**Quality assessment of studies: Selection**	**Comparability**	**Exposure**	**Total**
Ketelaars et al. (2012)	Holland	77	4.11–6.1	59	77	4.11–6.1	59	Narration CSC	Low	Low	Low	8
Characteristics of the included studies that compare autism spectrum disorder, social communication disorder and typical development												

(Continues)

TABLE 1 (Continued)

		Characteristics of the samples										Quality assessment of studies			
		ASD			SCD			TD							
Articles (*N* = 1)	**Country**	***N***	**Ages**	**Sex (n male)**	***N***	**Ages**	**Sex (n male)**	***N***	**Ages**	**Sex (n male)**	**Study variables**	**Selection**	**Comparability**	**Exposure**	**Total**
Svindt and Surányi (2021)	Hungary	19	4–9	16	13	4–9	11	9	4–9	24	Morphosyntax Lexic CSC	Low	Low	Moderate	7

Characteristics of the included studies that compare autism spectrum disorder, developmental language disorder and typical development

		Characteristics of the samples										Quality assessment of studies			
		ASD			DLD			TD							
Articles (N=2)	**Country**	**N**	**Ages**	**Sex (n male)**	**N**	**Ages**	**Sex (n male)**	**N**	**Ages**	**Sex (n male)**	**Study variables**	**Selection**	**Comparability**	**Exposure**	**Total**
Loukusa et al. (2014)	Finland	14	5.1–9.0	13	18	5.0–7.7	13	25	4.11–8.8	20	Morphosyntax, Lexic CSC and EC	Low	Low	Moderate	7
Bauminger et al. (2019)	Israel	25	9.1–12	25	38	9–11.5	38	33	9–11.4	33	Morphosyntax CSC	Low	Low	Moderate	7

Characteristics of the included studies that compare autism spectrum disorder, developmental language disorder, social communication disorder and typical development

		Characteristics of the samples									Quality assessment of studies			
		HF ASD		DLD		SCD		TD						
Articles (n=1)	**Country**	**n**	**Ages**	**n**	**Edat**	**n**	**Ages**	**n**	**Ages**	**Study variables**	**Selection**	**Comparability**	**Exposure**	**Total**
Norbury and Bishop (2003)	United Kingdom	12	6–10	17	6–10	21	6–10	18	6–10	Narration Morphosyntax Lexic Pragmatics ISC	Low	Low	Moderate	7

Abbreviations: AS, Asperger syndrome (unlike ASD of high functioning, this sample does not present linguistic problems during the development and current state); ASD, autism spectrum disorder; LSC, low social cognition; HSC, high social cognition; CA, chronological age (comparative group according to the age); CSC, cognitive social cognition; DLD, developmental language disorder; EC, emotional competence; HF, high function; ISC, intermediate social cognition; LA, language age (comparative group according to the results of the linguistic profile); LF, low function; long, longitudinal study (measured at two different period of times); SCD, social communication disorder (in some articles it is called social pragmatic communication disorder or social pragmatic disorder); RS, regular school (that mixes children with or without language difficulties); SS, special school (for children with language difficulties); TD, typical development.

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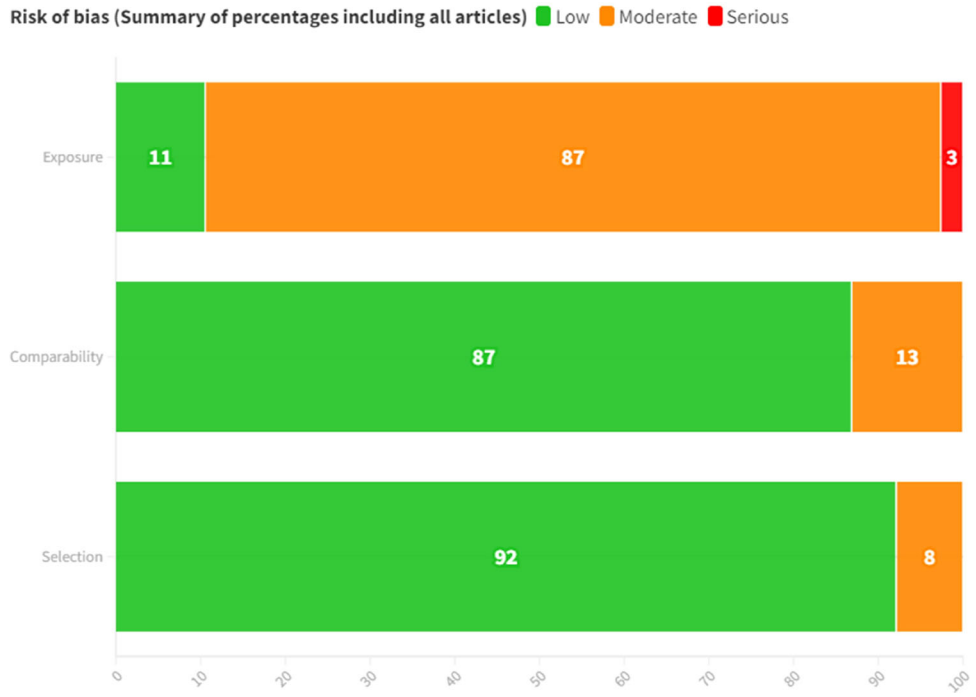

FIGURE 2 Summary of risk of bias percentages of all included articles.
Risk of bias of each of the specific criteria of the check list of Sterne et al. (2016) in non-randomised studies of interventions (ROBINS-I). Green: low risk (scoring between 3–4 in selection; two in comparability and three in exposure); Orange: moderate risk (scoring between two in selection; one in comparability and two in exposure); Red: Serious risk presence of important problems (scoring between 0–1 in selection; 0 in comparability and 0–1 in exposure). It is recalled that the overall risk of most of the articles/studies is low, since there have not been any with an overall score of less than 5.
[Colour figure can be viewed at wileyonlinelibrary.com]

2014) showed a significant relationship between narrative aspects and social cognition, and two (Adornetti et al., 2020; Sah & Torng, 2019) showed non-significant relationships. Peristeri et al. (2017) obtained a significant relationship between the number of mental state expressions and syntactic narrative complexity, but a non-relationship with general language or general narrative complexity in autistic children. There was significant low performance in macro and microstructure narrative tasks in autistic children compared to typical development (n = 3), with no clinical case finding a completely preserved ability (low but non-significant low performance). Two articles showed significantly affected SC performance (mostly number of mental state expressions), but the other studies observed SC performance preservation ($n = 3$).

Referring to DLD studies, Mäkinen et al. (2013) related CSC (use of mental state expressions) to narrative tasks in DLD children compared to TD. In general, in DLD studies a significant relationship was found between SC and narrative performance. Children with DLD used significantly fewer mental state expressions and had significantly less narrative microstructure (grammatical and referential accuracy, omission of third person, order errors, irrelevant grammatical usage, relevant grammatical omissions and less complex syntax).

Regarding children with SCD compared to TD, only Ketelaars et al. (2012) related narrative aspects to CSC. A non-significant relationship was found between CSC and macrostructure narrative performance (organisation and coherence) in SCD and TD children. But a significant relationship was observed between microstructure and CSC in TD children, although not in SCD children. In general, the results showed significant impact on narrative performance (macro and microstructure) in SCD children compared to TD. There was no preserved and no affected social cognition performance.

For comparative studies, Norbury and Bishop (2003) compared language and CSC performance in autism, DLD, SCD and TD in ages 4 to 12. Non-significant relationships with narrative performance (macrostructure and microstructure) and SC (words referring to 'mental states') were found in the three groups. The results showed no significant lower performance in global narrative structure. However, significant differences appeared in clinical groups and TD when local structure was assessed (related to syntactic abilities), but no significant differences were found when clinical groups were compared to each other.

The results of all collected articles referring to narrative assessment are summarised in Table 2.

Morphosyntax assessment

Regarding ASD studies, a total of 13 articles related morphosyntax to SC or EC. Six studies related it to CSC only, one to ISC, four studies related it to CSC and ISC, one related it to CSC and ASC, and another one to CSC and EC. There were no studies comparing morphosyntax with social cognition in children with SCD.

In these studies, Loukusa et al. (2018) and Sah and Torng (2019) obtained a non-significant relationship between SC, EC and morphosyntax. However, in Sah and Torng (2019), the samples were matched according to verbal IQ and general linguistic competence. The other articles (n = 9) presented a significant relationship between the variables for autistic children. In Overweg et al. (2018) when the samples were matched for language performance, the relation was significant only for TD children. For Lind and Bowler (2009) the relation was significant only for low-functioning autistic children, not for high-functioning autistic children or 5E children. A significant impact on language and morphosyntax ability was shown in autistic children (n = 6); nonetheless, two studies (Huang, 2020; Lind & Bowler, 2009) show conserved ability in complement syntax tasks and in indirect response comprehension tasks. The other studies obtained a low morphosyntax performance in autistic children but not a significant difference from the egroup. In general, a significant impact on SC performance was seen (n = 8). Paynter and Peterson (2009) observed preservation in ToM ability only for high-functioning autistic children, but not for low-functioning autistic children. Similarly, Rosello et al. (2020) found equal SC performance for TD and high-functioning autistic children and with a high WD, but also observed an impact on high-functioning autistic children and with a low wd.

For studies with children with DLD, a total of seven articles related morphosyntax to SC or EC. Of these studies, three articles related morphosyntax to CSC and three related it to EC. One article related the two variables (CSC and EC) with morphosyntax. Half of the studies obtained a significant relationship between morphosyntax and SC and EC (n = 3), while the other half did not show a significant relationship between these variables (n = 3). Two of the three articles studying CSC (Miller, 2001; Spanoudis, 2016) obtained a positive relationship, while only one of the three articles (Griffiths et al., 2020) obtained a significant relation with EC (in this case, recognising facial and vocal emotions). For the DLD condition, all children presented significant impact on morphosyntax compared with TD children, and only Spanoudis (2016) observed the same language performance when DLD children were compared to TD children matched for language age. In general, a significant impact on SC and EC performance is shown in DLD children (n = 6). Miller (2001) observed significant SC lower performance in DLD children only when the ToM tasks had an important verbal component. For Davies et al. (2016), DLD and TD children performed ToM tasks equally well.

In comparative studies, Bauminger-Zviely et al. (2019) and Loukusa et al. (2014), related the component of morphosyntax to SC in autistic, DLD and TD children. Moreover, Svindt and Surányi (2021) compared the variables in children with SCD, children on the autism spectrum and TD children. Only Norbury and Bishop (2003) compared all three disorders. Three studies compared morphosyntax with CSC, while one study compared it with CSC and EC.

In these studies, a significant relationship has been shown between morphosyntax and SC and EC (n = 3). Nevertheless, one study (Svindt & Surányi, 2021) showed a non-significant relationship between morphosyntax (grammatical meaning comprehension) and SC performance in autistic children and children with SCD. Sociocognitive performance was shown to be significantly affected in autistic children n (= 3), and also for DLD children (n = 2), especially when the tasks had a verbal component. For SCD there was low but not significant SC impact. In terms of language, DLD children presented a significant language impact (n = 4), and autistic children also had alterations in general language and syntactic complexity (n = 2), while preservation was found in understanding implicit grammatical meaning (Svindt & Surányi, 2021). Of the two studies comparing SCD children, one article showed more impact on morphosyntax and implicit grammatical meaning than in autistic children (Svindt & Surányi, 2021), while the other article showed preservation in morphosyntactic errors and syntactic complexity compared with autistic and DLD children, although, for general language, a similar impact to autistic children was found (Norbury & Bishop, 2003). The results of all collected articles referring to morphosyntax assessment are summarised in Table 3.

Lexicon assessment

For autistic studies, a total of 10 articles related ocial cognition (SC and EC to lexical performance. Of these studies, six articles related it to CSC, one to CSC and EC, another one to ASC and CSC, one to CSC and ISC, and one to only ISC. There were no studies comparing this language component with SC in only SCD.

TABLE 2 Studies that compare narrative in relation to social cognition and/or emotional competence.

		Comparative groups		
		Autistic spectrum disorder and typical development		
Articles ($n = 6$)	**SC variables**	**Preserved ability in ASD**	**Significantly affected ability in ASD**	**Relationship between variables**
Adornetti et al. (2020)	Social understanding (ISC)	Social understanding task.	Narrative coherence and cohesion (in visual task)	Non-significant.
Baixauli-Fortea et al. (2017)	Theory of Mind (CSC)	SC performance.	Narrative performance (macrostructure, attributions, episodic sequence, inclusion of irrelevant details and ambiguity).	Significant.
Sah and Torng (2019)	Theory of Mind (CSC)	CSC performance.		Non-significant.
Siller et al. (2014)	Theory of Mind (CSC)		Number of mental state expressions. ToM tasks.	Significant.
Hilvert et al. (2016)	Theory of Mind (CSC)		Narrative microstructure and macrostructure (coherence and cohesion).	Significant.
Peristeri et al. (2017)	Mental state expressions (CSC)		Number of mental state expressions.	Significant in syntactic complexity of narration. Non-significant with general linguistic profile and general narrative complexity.
		Comparative groups		
		Developmental language disorder and typical development		
Articles (n = 1)	**SC variables**	**Preserved ability in DLD**	**Significantly affected ability in DLD**	**Relationship between variables**
Mäkinen et al. (2013)	Mental state expressions (CSC)	Non-significant performance in production of communication units.	Narration task (grammatical and referential accuracy, third-person omission, order errors, grammatical inflation and omissions, and less complex syntax). Number of mental state expressions.	Significant relationship.
		Comparative groups		
		Social communication disorder and typical development		
Articles ($n = 1$)	**SC variables**	**Preserved ability in SCD**	**Significantly affected ability in SCD**	**Relationship between variables**
Ketelaars et al. (2012)	Theory of Mind (CSC)		Narrative organisation and cohesion. Narrative production and greater number of irrelevant terms.	Significant (only in children with TD, not in SCD children). Non-significant for narrative organisation and coherence (SCD and TD children).
		Comparative groups		
		Autistic spectrum disorder, developmental language disorder, social communication disorder and typical development		
Articles ($n = 1$)	**SC variables**	**Preserved ability in clinical groups**	**Significantly affected ability in clinical groups**	**Relationship between variables**
Norbury and Bishop (2003)	Mental state expressions (CSC)	Global narrative structure.	Local narrative structure.	Non-significant relationship.

Abbreviations: ASD, autism spectrum disorder; CSC, cognitive social cognition; DLD, developmental language disorder; ISC, intermediate social cognition; SC, social cognition; SCD, social communication disorder (in some articles it is called social pragmatic communication disorder or social pragmatic disorder); TD, typical development; ToM, Theory of Mind.

TABLE 3 Studies that compare the morphosyntax variable in relation to SC and/or EC

		Comparative groups		
		Autistic spectrum disorder and typical development		
Articles ($n = 13$)	**SC variables**	**Preserved ability in ASD**	**Significantly affected ability in ASD**	**Relationship between variables**
Baixauli-Fortea et al. (2017)	Theory of Mind (CSC)		Language structure in form and content (speech, syntax, semantics and coherence). SC performance	Significant
Whyte et al. (2014)	Theory of Mind and Reading the Mind in the Eyes task (CSC/ASC)	Identify emotions through the eyes	Linguistic performance (morphosyntax, lexicon). ToM performance	Significant
Paynter and Peterson (2009)	Theory of Mind and belief-emotion test (CSC/ISC)	ToM performance of autistic children without previous language difficulties when matched according to age and language level	SC tasks performance of autistic children with previous difficulties in language development	Significant. Syntax represents a great predictor of SC
Lind and Bowler (2009)	Theory of Mind (CSC)	Complement syntax	Theory of Mind performance	Significant relationship in low-functioning autistic children (not for TD or high-functioning autistic children)
Huang (2020)	Theory of Mind (CSC)	Indirect response comprehension task		Non-significant if the task contains a verbal or pragmatic component. Morphosyntax, not SC as a predictor of pragmatic performance
Li and Leung (2019)	Theory of Mind (CSC)		Complement and predicate tasks. ToM performance	Significant
Loukusa et al. (2018)	Theory of Mind and contextual inference (CSC/ISC)	Low but non-significant performance on ToM tasks. Low but not significant performance in language skills		Non-significant
Whyte and Nelson (2015)	Nonliteral language (ISC)	Lower but not significant in general language and morphosyntax		Syntax and ToM predict pragmatic performance. Syntax predicts pragmatic performance in autistic children and children with TD. When matched for language performance, the relationship is only significant for children with TD
Overweg et al. (2018)	Theory of Mind (CSC)		Interpreting pronouns and pronominal reversal in direct language (especially first and second person versus third) (especially younger aged). ToM performance	Significant relationship and predicts pronominal comprehension in direct language in autistic children and children with TD.

(Continues)

TABLE 3 (Continued)

Articles ($n = 13$)	SC variables	Comparative groups: Autistic spectrum disorder and typical development — Preserved ability in ASD	Significantly affected ability in ASD	Relationship between variables
Peristeri et al. (2017)	Mental state expressions (CSC)	Non-significantly lower performance on syntactic complexity only in high-functioning autistic children	Syntactic complexity in low-functioning autistic children. Subordinate language. SC (expression of mental states)	Significant.
Rosello et al. (2020)	Theory of Mind and Affect Recognition (CSC/ISC)	High-functioning autistic children and with a HSC perform similarly to TD children in verbal ToM tasks.	High-functioning autistic children but with a LSC perform significantly less well in Social Cognition tasks (CSC and ISC) and much less in tasks with a verbal component. High-functioning autistic children but with a LSC show significantly lower performance in emotion recognition. High-functioning autistic children but with a LSC show significantly lower performance in language, communication and coherence	Significant relationship in performance of SC and communication in general (as well as ASD symptomatology)
Teh, Yap, & Liow (2018)	Theory of Mind and emotional valence (CSC/EC)		Language ability, CSC and emotional self-regulation	Significant.
Sah and Torng (2019)	Theory of Mind (CSC)	Equal SC performance.		Non-significant if groups are matched according to verbal IQ and general linguistic competence.
Articles ($n = 7$)	**SC variables**	**Comparative groups: Developmental language disorder and typical development — Preserved ability in DLD**	**Significantly affected ability in DLD**	**Relationship between variables**
Griffiths et al. (2020)	Emotion recognition from facial and vocal cues (EC)		Language performance. Recognising facial and vocal emotions	Significant.
Farmer (2000)	Theory of Mind, "Strange Stories" and prosocial and social behaviour (CSC/EC)	Non-significant differences in ToM performance in children with DLD NS	Language performance. Second-order false belief performance in DLD SS Not from DLD NS children. General social behaviour in DLD SS children	Non-significant. Same between EC and SC.
Spanoudis (2016)	Theory of Mind (CSC)	Language and ToM ability in children with DLD when compared with TD LA	ToM performance compared to TD CA but not in TD LA. Language performance	Significant. Morphosyntax predicts ToM performance
Davies et al. (2016)	Theory of Mind (CSC)	ToM performance	Language performance: linguistic underproduction and more errors in the tasks	Non-significant. Significant relationship only between morphosyntax and pragmatic performance (comprehension and judgment)

(Continues)

TABLE 3 (Continued)

Articles ($n = 7$)	SC variables	Comparative groups: Developmental language disorder and typical development — Preserved ability in DLD	Significantly affected ability in DLD	Relationship between variables
Fujiki et al. (2007)	Prosodic emotion understanding (EC)		Language performance. Identifying the speaker's emotions (significantly better for the emotion of joy and significantly lower for the emotion of fear)	Non-significant relationship
Miller (2001)	Theory of Mind (CSC)	ToM performance when there is a low verbal component in the tasks	Language performance. SC performance when the verbal component is high and the morphosyntax is complex	Significant.
McCabe and Meller (2004)	Emotional knowledge (EC)	Morphosyntax performance. EC performance: cooperation, affirmation and responsibility (parent's responses). Emotional control and cooperation (teacher's responses). Emotional identification in both groups	Emotional control (parent's responses). Significantly lower performance for affirmation (according to teachers). Receptive and expressive language tasks (especially grammatical meaning, i.e., semantic processing)	Non-significant.

Articles (n = 2)	SC variables	Comparative groups: Autistic spectrum disorder, developmental language disorder and typical development — Preserved ability in clinical groups	Significantly affected ability in clinical groups	Relationship between variables
Bauminger-Zviely et al. (2019)	Social information processing (CSC)		Linguistic ability and social information processing: identifying social problems and clues (for autistic children and with DLD) Greater difficulties in social processing (in autistic children) Describe fewer vignettes and add more information (in children with DLD)	Significant
Loukusa et al. (2014)	Theory of Mind and emotion identification (CSC/EC)	ToM performance when the task has a low verbal component	ToM performance when there is a verbal component in the task	Significant

Articles ($n = 1$)	SC variables	Comparative groups: Autistic Spectrum disorder, social communication disorder and typical development — Preserved ability in clinical groups	Significantly affected ability in clinical groups	Relationship between variables
Svindt and Surányi (2021)	Theory of Mind (CSC)	Understanding implicit grammatical meaning (in autistic children) SC performance (in children with SCD)	Morphosyntax and implicit grammatical meaning comprehension task (in children with SCD). SC performance (in autistic children)	Non-significant

(Continues)

TABLE 3 (Continued)

Articles ($n = 1$)	SC variables	Comparative groups: Autistic spectrum disorder, developmental language disorder, social communication disorder and typical development — Preserved ability in clinical groups	Significantly affected ability in clinical groups	Relationship between variables
Norbury and Bishop (2003)	Mental state expressions (CSC)	Number of syntactic units compared (all groups present the same amount of information). Morphosyntactic errors or syntactic complexity (SCD). Use of mental state expressions	General productive and receptive language (children with SCD being less impaired than children with DLD in terms of receptive language). No differences between autistic and SCD children in general language. Lower syntactic complexity of sentences and greater morphosyntactic errors (autistic and DLD children) More pronominal errors and more use of ambiguous names (in autistic children)	Significant relationship between syntactic complexity and number of mental terms used during narration

Abbreviations: ASC, affective social cognition; ASD, autism spectrum disorder; CA, chronological age (comparative group according to the age); CSC, cognitive social cognition; DLD, developmental language disorder; EC, emotional competence; HSC, high social cognition (without intellectual disability); ISC, intermediate social cognition; LA, language age (comparative group according to the results of the linguistic profile); LSC, low social cognition (without intellectual disability); NS, normal schooling; SC, social cognition; SCD, social communication disorder (in some articles it is called social pragmatic communication disorder or social pragmatic disorder); SS, special schooling; TD, typical development; ToM, Theory of Mind.

Six of these studies showed a significant relationship between lexical performance and SC in autistic children. In the other two studies (Huang et al., 2015; Whyte & Nelson, 2015) there was a significant relation between vocabulary and pragmatic performance (metaphor), which can overlap with SC processes. Additionally, two studies did not show a significant relationship with the two variables (Paynter & Peterson, 2009; Sah & Torng, 2019). A general impact was found in SC tasks in autistic children. For the lexical performance, there was a partial affectation ($n = 5$) and a partial preservation ($n = 5$).

Regarding DLD studies, a total of three articles related SC and EC to lexical performance. Of these studies, two articles relate lexical performance to CSC, and one study to EC. Significant relationship between lexical and semantic performance to SC was found in children with DLD ($n = 3$). In one study (Davies et al., 2016) the relation was found only in severe DLD children. The results showed that children with DLD had a lower performance in SC tasks compared to TD children; in the mentioned study, this occurred only in severe DLD. The study of Delaunay-El et al. (2011) showed preservation in the ability of emotion category classification (EC) but confusion in specific emotion performance (fearversus sadness).

Finally, Norbury and Bishop (2003) related lexical performance with SC in autism, DLD and SCD. The results showed a non-significant relationship between variables. In general, each group performed similarly but with high variability. The results of all collected articles referring to lexicon assessment are summarised in Table 4.

Pragmatic assessment

For ASD studies, a total of 12 articles related SC and/or EC with pragmatic performance. Of these studies, six articles had CSC tasks, three had CSC and ISC tasks, one had ASC and CSC tasks, one article related it to ISC tasks and another one to EC. There were no studies comparing this language component with SC in only SCD.

In general, a significant relationship was found between pragmatics and SC in autistic studies ($n = 11$). One study (Huang, 2020) found a non-significant relationship between the ToM task and the tasks of understanding indirect answers if they do not contain a verbal and pragmatic component. Pragmatics performance was shown to be significantly lower in autistic children compared to children with TD. However, variance in task performance was shown: preservation in direct, indirect or high indirect responses (Huang, 2020; Marocchini et al., 2022), literal (Panzeri et al., 2022) and non-literal comprehension (Whyte & Nelson, 2015). An impact is found on scalar and ad-hoc implications (Mazzaggio et al., 2021), socio-pragmatic context understanding (Loukusa et al., 2018), metaphors, irony, sarcasm and indirect questions and answers (Huang et al., 2015), but not when lexical

TABLE 4 Studies that compare the lexic variable in relation to SC and/or EC.

		Comparative groups		
		Autistic spectrum disorder and typical development		
Articles ($n = 10$)	**SC variables**	**Preserved ability in ASD**	**Significantly affected ability in ASD**	**Relationship between variables**
Sah and Torng (2019)	Theory of Mind (CSC)	Use of mental state lexicon (internal language of mental states). SC performance		Non-significant (matched by verbal IQ and general linguistic competence)
Whyte et al. (2014)	Theory of Mind and Reading the Mind in the Eyes task (CSC/ASC)	Identify emotions through the eyes.	Lexical performance. False belief task performance	Significant.
Paynter and Peterson (2009)	Theory of Mind and belief-emotion test (CSC/ISC)	Lexical performance.		Non-significant
Li and Leung (2019)	Theory of Mind (CSC)		Lexical performance. ToM performance	Significant. (SC with semantics and factuality of the verb)
Huang et al. (2015)	Theory of Mind (CSC)	Receptive vocabulary		Significant: lexical (receptive), verbal IQ and pragmatic performance (only for metaphors)
Whyte and Nelson (2015)	Nonliteral language (ISC)	Lower but not significant lexical performance		Significant for pragmatic performance in autistic children and children with TD
Siller et al. (2014)	Theory of Mind (CSC)		Number of expressions (utterance), number of words, verbs and adjectives, and number of emotional or cognitive states. ToM performance	Significant (SC and number of descriptors of mental and emotional states). Also with age, receptive and expressive language
Hilvert et al. (2016)	Theory of Mind (CSC)	Lexical performance (despite being less complex)		Significant (only for autistic children)
Peristeri et al. (2017)	Mental state expressions (CSC)		Number of mental states expressions. Expressive lexicon and semantic errors (only for autistic children with language and cognitive difficulties). Similar performance in lexical diversity for low and high-functioning autistic children	Significant
Teh, Yap, & Liow (2018)	Theory of Mind and emotional valence (CSC/EC)		Language ability, CSC and emotional self-regulation. Use of emotional terms (positive and negative valenced)	Significant
		Comparative groups		
		Developmental language disorder and typical development		
Articles ($n = 3$)	**SC variables**	**Preserved ability in DLD**	**Significantly affected ability in DLD**	**Relationship between variables**
Spanoudis (2016)	Theory of Mind (CSC)		ToM performance compared to TD CA but not in TD LA	Significant
Davies et al. (2016)	Theory of Mind (CSC)	ToM performance (not for children with more severe DLD)	Lexical performance (lexical errors). ToM performance for severe DLD children	Significant (only for children with severe DLD)

(Continues)

TABLE 4 (Continued)

Articles ($n = 3$)	SC variables	Comparative groups: Developmental language disorder and typical development — Preserved ability in DLD	Significantly affected ability in DLD	Relationship between variables
Delaunay-El et al. (2011)	Facial emotion labelling (EC)	Use/production of emotional categories. Confuse equally the emotion of fear or surprise	Semantic categorisation of emotions. Confuse fear and sadness	Significant (especially for negatively valenced emotions)

Articles ($n = 1$)	SC variables	Comparative groups: Autistic spectrum disorder, developmental language disorder, social communication disorder and typical development — Preserved ability in clinical groups	Significantly affected ability in clinical groups	Relationship between variables
Norbury and Bishop (2003)	Mental state expressions (CSC)	Low but not significant use of "mental state" terms in autistic children, children with DLD and SCD compared to children with TD. In terms of semantics, there is a lot of intragroup variation and no significant differences between groups		Non-significant. Moderate and negative relationship between vocabulary and SC (use of mental terms)

Abbreviations: ASD, autism spectrum disorder; CA, chronological age (comparative group according to the age); CSC, cognitive social cognition; DLD, developmental language disorder; EC, emotional competence; LA, language age (comparative group according to the results of the linguistic profile); SC, social cognition; SCD, social communication disorder (in some articles it is called social pragmatic communication disorder or social pragmatic disorder); TD, typical development; ISC, intermediate social cognition; ToM, theory of mind.

and morphosyntactic comparisons are made (Whyte et al., 2014). General SC impact is seen in autistic children ($n = 7$).

Regarding DLD studies, a total of three articles relate CSC with pragmatic tasks. All relate lexical performance to CSC. No study has been found that, in this case, examines CSC, ISC or EC. A significant relationship was found between pragmatics and SC in DLD children compared to typical development ($n = 2$). In one article there was a non-significant relationship (Davies et al., 2016). There was also a general impact on pragmatic performance ($n = 3$) in DLD children compared to TD, and a general preservation of SC in DLD children compared to DT ($n = 3$), especially when compared to children with language equivalence (Spanoudis, 2016).

Only Norbury and Bishop (2003) compares pragmatic and SC in the three disorders. A non-significant relationship was found. However, significantly lower performance is shown for the clinical groups compared to TD, especially for autistic and SCD children. The results of all collected articles referring to pragmatic assessment are summarised in Table 5.

Prosody assessment

There were no studies comparing prosody assessment with SC in only SCD, nor comparative studies between the three disorders. One article relates EC to prosodic tasks in autistic children.

For autistic studies, a significant relationship between identifying emotions and prosodic clues is shown in Wang and Tsao (2014), with an impact on the prosodic identification of joy, but not for neutral or relevant emotions (anger or sadness).

On the other side, for DLD studies, a total of three articles relate EC to prosodic tasks in DLD children. A non-significant relationship between the two variables is shown ($n = 2$), while one article shows a significant relationship (Creusere et al., 2004). Different results are shown: emotion recognition with unfiltered voice ($n = 2$) is affected, while Van Der Meulen et al. (1997) show an impact on prosodic imitation but not on emotional prosodic identification. The results of all collected articles referring to prosody assessment are summarised in Table 6.

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TABLE 5 Studies that compare the pragmatic variable in relation to SC and/or EC.

		Comparative groups		
		Autistic spectrum disorder and typical development		
Articles (n = 12)	**SC variables**	**Preserved ability in ASD**	**Significantly affected ability in ASD**	**Relationship between variables**
Baixauli-Fortea et al. (2017)	Theory of mind (CSC)		Pragmatic performance. SC performance	Significant
Wang and Tsao (2014)	Prosodic emotion identification (EC)	Non-significantly different performance in recognising neutral emotions (prosody of words and sentences) or relevant emotions (sadness and anger)	Significantly lower performance for the auditory recogniser of happy emotions	Significant and positive relationship between emotional competence (recognition of emotions of joy in the voice), with pragmatics and social adaptation
Whyte et al. (2014)	Theory of mind and reading the mind in the eyes task (CSC/ASC)	Low but non-significant in identify emotions through the eyes	Understanding of metaphors (when was a lexical and morphosyntactic equivalence, the understanding of metaphors was no longer significant). ToM performance	Significant relationship between morphosyntax, vocabulary level and ToM in understanding metaphors (pragmatics)
Mazzaggio et al. (2021)	Theory of mind (CSC)		Pragmatic performance (scalar implication and ad-hoc tasks).	Significant relationship between ToM and scalar implications (not for ad-hoc).
Huang (2020)	Theory of Mind (CSC)	Non-significant for indirect response comprehension task		Non-significant
Loukusa et al. (2018)	Theory of Mind and contextual inference (CSC/ISC)	ToM-only tasks	Significantly lower performance in the total socio-pragmatic tasks. Inference tasks using context and ToM were especially affected, with no significant difference for the other more specific tasks	Significant
Berenguer et al. (2017)	Theory of mind (CSC)		ToM performance. Pragmatic performance (coherence, initiation, non-verbal language)	Significant

(Continues)

TABLE 5 (Continued)

Articles ($n = 12$)	SC variables	Comparative groups Autistic spectrum disorder and typical development Preserved ability in ASD	Significantly affected ability in ASD	Relationship between variables
Huang et al. (2015)	Theory of mind (CSC)		Understanding and applying metaphors, ironies, sarcasm, indirect questions and answers	Significant. No relationship was found between concrete types of false beliefs (first or second order) and types of pragmatics (irony, metaphors, indirect questions or answers). Understanding metaphors correlates more with language than with other figurative forms
Whyte and Nelson (2015)	Nonliteral language (ISC)	Low but no significant pragmatic performance and non-literal comprehension		Significant (ToM predicts non-literal comprehension performance)
Rosello et al. (2020)	Theory of mind and affect recognition (CSC/ISC)	ToM and pragmatic performance in autistic children with HSC	Pragmatic and ToM performance in autistic children with LSC	Significant (as well as in ASD symptomatology)
Panzeri et al. (2022)	Theory of mind (CSC)	Literal stories performance	ToM performance (first and second order FB tasks). Ironic stories (in relation to literal stories) and ironic compliments (in relation to ironic criticism)	Significant relationship between SC and pragmatics (compliment and ironic criticism) for autistic children. In TD children, partial relation: only significant relationship in second-order ToM task and ironic compliments (not for ironic criticism)

(Continues)

TABLE 5 (Continued)

Articles (n = 12)	SC variables	Comparative groups: Autistic spectrum disorder and typical development — Preserved ability in ASD	Significantly affected ability in ASD	Relationship between variables
Marocchini et al. (2022)	Theory of mind (CSC)	A differential pattern in comprehension of indirect responses: preservation of comprehension of direct and indirect responses. Better performance on indirect than direct or highly indirect responses relative to the TD group	ToM performance (age-matched only, not in younger TD children)	Significant (only for highly indirect responses, for direct or indirect ones there is no significant relationship) and only for older TD children, not for ASD or younger TD samples
Articles (n = 3)	**SC variables**	**Comparative groups: Developmental language disorder and typical development — Preserved ability in DLD**	**Significantly affected ability in DLD**	**Relationship between variables**
Spanoudis (2016)	Theory of mind (CSC)	Language and ToM performance in children with DLD when compared to LA TD	Language and ToM performance in DLD children when compared with CA TD but not in LA TD	Significant
Davies et al. (2016)	Theory of mind (CSC)	ToM performance	Pragmatic performance (comprehension and judgment)	Non-significant
Mäkinen et al. (2013)	Mental state expressions (CSC)	Number of mental expression words	Making inferences	Significant
Articles (n = 1)	**SC variables**	**Comparative groups: Autistic spectrum disorder, developmental language disorder, social communication disorder and typical development — Preserved ability in clinical groups**	**Significantly affected ability in clinical groups**	**Relationship between variables**
Norbury and Bishop (2003)	Mental state expressions (CSC)		Significantly lower pragmatic performance (especially for autistic and SCD children)	Non-significant relationship between pragmatics and SC (use of mental terms)

Abbreviations: ASC, affective social cognition; ASD, autism spectrum disorder; CA, chronological age; CSC, cognitive social cognition; DLD, developmental language disorder; EC, emotional competence; FB tasks, false belief tasks; ISC, intermediate social cognition; LA, language age; SCD, social communication disorder (in some articles it is called social pragmatic communication disorder or social pragmatic disorder); TD, typical development; SC, social cognition; ToM, theory of mind.

TABLE 6 Studies that compare the prosody variable in relation to SC and/or EC.

Articles ($n = 1$)	SC variables	Comparative groups: Autistic spectrum disorder and typical development — Preserved ability in ASD	Significantly affected ability in ASD	Relationship between variables
Wang and Tsao (2014)	Prosodic emotion identification (EC)	Recognising neutral emotions (prosody of words and sentences) or relevant emotions (sadness and anger)	Identifying emotional prosody when the stimulus is joy	Significant
Articles ($n = 3$)	**SC variables**	**Comparative groups: Developmental language disorder and typical development — Preserved ability in DLD**	**Significantly affected ability in DLD**	**Relationship between variables**
Creusere et al. (2004)	Facial expression identification (EC)	Emotion recognition in facial, auditory and facial input tasks with filtered voice	Emotion recognition in faces with unfiltered voice.	Significant.
Van Der Meulen et al. (1997)	Prosodic emotion identification and imitation task (EC)	Identification of emotions by voice intonation	Prosodic imitation (expression of emotional prosody)	Non-significant.
Fujiki et al. (2007)	Prosodic emotion identification (EC)		Identifying the speaker's emotions (higher for the emotion of joy and lower for fear)	Non-significant.

Abbreviations: ASD, autism spectrum disorder; DLD, developmental language disorder; EC, emotional competence; SC, social cognition.

DISCUSSION

The current systematic review summarises the results of 38 studies published between 1992 and 2022 that focus on the relationship between language and SC and EC in autistic, DLD or SCD children compared to TD children, from 4 to 12 years.

Relationship between Narrative, SC and EC

The results show a significant relation between narrative and SC, however, with a different performance in each of the clinical disorders. Studies agree that autistic children show problems in narrative coherence and cohesion (Baixauli-Fortea et al., 2017; Hilvert et al., 2016; Peristeri et al., 2017). Additionally, children with DLD show greater difficulty in language structure compared to autistic children or those with SCD (Mäkinen et al., 2013), while the latter show greater difficulty in SC. As well, children with DLD have more difficulties in narrative microstructure (language structure), while children with communication disorder have difficulties in the macrostructure, such as in the organisation and cohesion of discourse (Ketelaars et al., 2012). In the case of autistic children there are different results according to the severity, or if there is presence of additional language difficulties. This is in line with Taylor and Whitehouse (2016) who consider that children on the autism spectrum and severe language difficulties can be diagnosed with ASD and associated DLD. Likewise, several studies find a relationship between narrative, CSC, age and children's vocabulary, indicating that, as children grow, they acquire greater SC ability, greater vocabulary and better narrative skills (Hilvert et al., 2016; Siller et al., 2014).

Relationship between morphosyntax, SC and EC

The results indicate that language performance of children with and without disorders has a significant relationship with SC. In the studies, despite finding that performance in DLD and autistic children is significantly lower compared to the control group, as other studies also mention (Georgiou & Spanoudis, 2021; Vacas et al., 2021), they perform differently (Bauminger-Zviely et al., 2019): while autistic children process social information less accurately, children with DLD describe and narrate vignettes less well, and both have greater difficulties with syntactic complexity and make more morphosyntactic errors than children with SCD (Norbury & Bishop, 2003). This is in line with Taylor and Whitehouse (2016) who consider that, although both have language difficulties, each presents a differenti-

ated linguistic pattern. For example, while children with DLD have a deficit in language structure and, sometimes, also pragmatic ones, autistic children have pragmatic difficulties and, sometimes, also difficulties with language structure. Thus, autistic children also show poor performance in structure and morphosyntactic complexity (Baixauli-Fortea et al., 2017; Loukusa et al. 2018; Peristeri et al., 2017; Whyte et al., 2014). This leads us to think that performance in SC is also having an important effect on children's language development. In parallel, greater correlation has been found between SC and specific functions of morphosyntax (complement extraction) in autistic children with greater sociocognitive difficulty, indicating that complement syntax can be an important compensatory strategy to improve SC in these children (Lind & Bowler, 2009). For example, knowing 'what the wife said to her husband' (complement) can be useful for knowing what the husband believes regardless of what actually happened to the wife. When the comparative groups are equated for language performance, the relationship between variables is no longer significant (Spanoudis, 2016). Likewise, the dependence increases with the greater severity of each one (Davies et al., 2016; Farmer, 2000).

Relationship between lexicon, SC and EC

Independently of the disorder, the results show a partial relationship between the lexicon and the social cognition. In Spanoudis (2016) it is observed how children with DLD have a ToM and lexical performance equivalent to younger children with the same language level, indicating that language deficits not only affect the acquisition of vocabulary but also socio-cognitive maturation. In relation to what happens to autistic children, the study by Davies et al. (2016) indicates that the relationship between the lexicon and the CSC is significant only for children with DLD of greater severity, indicating, again, that the degree of the deficit of the functions can be decisive to find a correlation between the variables either for one disorder or another. Norbury and Bishop (2003) corroborate the results indicating that autistic children, children with DLD and children with SCD make less use of 'mental state' terms, but none of them is significantly less than the control group. Likewise, they find a moderately negative correlation between the variables, indicating that the greater the vocabulary, the less they use 'mental state' terms, since, according to the authors, children may find it more necessary to fill in their speech with another type of lexicon.

At the level of EC, Teh et al. (2018) found an interesting fact: when autistic children need to apply SC in a descriptive task, they use less positive emotional vocabulary, possibly indicating that it is more difficult for them to process this type of emotion. This is in line with the study by Sato et al. (2017) who find that young children with autism find it significantly more difficult to detect the facial expression of joy compared to those with typical development. At the same time, children with TD have a lexicon that correlates with age, which is not the case in autistic children. In children with DLD a relationship is found between emotional semantics and emotional identification, seeing that children with DLD, despite making the same emotional categories as children with TD do, at the same time, with more semantic categorisation errors of emotions.

Relationship between pragmatics, SC and EC

Pragmatics is one of the components that most seems to interfere between language and CSC, while it correlates positively with age and language level in most autism and DLD studies. In general terms, autistic children and children with SCD show a significantly lower performance in pragmatics compared to children with DLD or TD, while at the same time, DLD is significantly lower in children with TD (Norbury & Bishop, 2003). This is in line with studies that find that pragmatic difficulties are related to specific socio-cognitive difficulties, such as a low tendency to integrate information, and a low inference of the mental state of others (Andrés-Roqueta & Katsos, 2017; Andrés-Roqueta & Katsos, 2020). The relationship between the variables, however, is partial. Studies comparing children on the autism spectrum and with TD initially find a significant relationship between pragmatic performance and CSC, ISC and EC. Specifically, they find that autistic children have a lower performance in understanding metaphors (Whyte et al., 2014), irony and sarcasm, and indirect questions and answers (Huang et al., 2015). In some cases, however, when the groups are matched by age and lexical and morphosyntactic level, the difference in some functions, such as metaphors, ceases to be significant (Whyte et al., 2014). In the same way as with children with DLD, they show a partial relationship between pragmatics and SC (Mäkinen et al., 2013; Spanoudis, 2016), since, when the samples are matched for linguistic performance, the relationship ceases to be significant (Spanoudis, 2016). In some studies, the relationship between SC and pragmatics occurs only in some specific tasks or for a particular severity of the disorder (Huang, 2020; Loukusa et al., 2018; Mazzaggio et al., 2021). This suggests that the pragmatic function does not depend only on SC but also on other factors that play an important role, such as the age of the children or the language.

Relationship between prosody, SC and EC

Few articles have studied the relationship between prosody and SC or EC in autistic, DLD or SCD children. The study by Wang and Tsao (2014) finds that autistic children identify emotional prosody worse when the emotion is joy, compared to neutral or negatively valenced utterances. These results agree with Teh et al. (2018) who observed that autistic children use less positively valenced lexicon when the descriptive tasks have a greater socio-cognitive component. For DLD children, they all agree that they have a lower performance in prosodic tasks, but only Creusere et al. (2004) found a significant relationship. This may indicate that prosody helps to identify and process emotions, especially in children with language difficulties. This, however, is not clear according to the systematic reviews that study autism and aphasia (McCann & Peppé, 2003).

Limitations

This review tries to encompass all language and socio-affective components, but although its broad coverage is positive, it is limited in terms of being able to specify the concrete results. However, the objective of the review was to prioritise the multiple comparisons between disorders and variables. Another limitation found is that SCD remains to be diagnosed due to its high overlap with the autism spectrum. Due to this, it is currently under debate, and little has been studied yet in this regard.

Implications and future perspective

The review enhances the importance of studying the specific components that comprise language and SC, since there are great differences between them and not all of them are affected equally in the various developmental disorders. Future studies should explore these aspects in more detail since only a limited number of studies have investigated ISC and ASC in relation to language development. Regarding the results, specific research is needed for each of the linguistic and SC components.

Moreover, there are few studies that compare these disorders with each other or also consider SCD, which is needed for a deeper understanding the disorder and make a better differential diagnosis, with the ultimate goal of providing an intervention that best adapt to the needs of each child. Likewise, a continuum is observed for the difficulties of each variable within each disorder, as well as different effects of them also appeared depending on the profile, severity of each disorder or characteristics of the task. This must not only be considered for the sample methodologies and classifications of future research, but also as an objective for future studies to better define these disorders and effects. Apart from this, many studies are still missing, not only those that relate morphosyntax to emotional and affective competence and cognition, but also studies that compare these neurodevelopmental disorders with each other.

Finally, these insights have practical applications for clinical and educational approaches, since it allows delimiting and drawing links between ASD, DLD and SCD. Knowing which specific components are most affected and how they interact in development allows us to design specific actions that can promote a general development at these ages. Additionally, this also help prevent and intervene in a clinical and educational way with adapted support for the needs of each child and for all these developmental disorders and difficulties.

CONCLUSIONS

The results of this systematic review indicate that language plays an important role in SC and EC, although each of the components correlate differently. In terms of general language, linguistic structure and syntactic complexity of speech do show a significant relationship with SC. At the lexical level, the results show that, although autistic children and children with DLD and SCD have a smaller lexicon, it is not significantly different from the control group. At the pragmatic level, a partially significant relationship is observed with SC in autistic children and children with SCD, due to the dependence on other factors such as children's general language or age. Prosody has shown to have a significant relationship with EC in autistic children and children with DLD, but there is a lack of studies relating it to children with SCD. Based on the results, autistic children and children with DLD and SCD have a significantly lower CSC and ISC compared to children with typical development. In addition, children with DLD have significant difficulties with many components of language, especially morphosyntax and narrative microstructure. Autistic children present a more varied linguistic profile, with greater pragmatic difficulties, albeit modulated by language level. Finally, children with SCD show impairment in all components, especially in narrative macrostructure and pragmatics. All this calls for a new line of research focusing on specific components of language and SC to see their specific relationships and points to the need for further comparative studies on these three disorders.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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ENDNOTES

[1] According to Bottema-Beutel et al. (2020), the language we use to refer to things shapes and perpetuates ideologies and has impact in the way we understand them. Therefore, we decided to use the identity-first term ('autistic children' or 'children on the autism spectrum') as it is found to be substantially less offensive than the person-first term ('children with autism') by the autistic community (Botha et al., 2023).

[2] According to the PIRAMID guide (Page et al., 2021), which has been used as a guide for the preparation of this systematic review, before carrying out the search for the articles, it is necessary to pose a clear and precise question. This question has been prepared using the four components of the PICO acronym (Population, exposure, comparator and results).

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