



Review article

The fuzzy boundaries of the social (pragmatic) communication disorder (SPCD): Why the picture is still so confusing?

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ABSTRACT

Introduction: Since the introduction of Social (Pragmatic) Communication Disorder (SPCD) in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) in 2013, a debate has arisen in the scientific community about its usefulness in differential diagnosis for other clinical categories such as Autism Spectrum Disorder (ASD) and Specific Language Impairment (SLI). Indeed, SPCD criteria share a common deficit in communication and pragmatic skills with these diagnostic entities. Available assessment tools seem scarce and not sensitive enough to clarify diagnostic criteria and clinical boundaries. This study aims to review the existing literature on diagnostic screening for SPCD to highlight confounding variables in the domains examined, overlap with other diagnostic entities, and lack of specificity of available assessment tools in identifying the core deficits of the disorder.

Methods: The search strategy was defined by combining the following keywords: “social pragmatic communication disorder,” “DSM-5,” “differential diagnosis,” and “child.” The search was performed in three databases: Medline (PubMed), Scopus, and Web of Science. All studies published between 2013 and April 2023, written in English, and with a major focus on SPCD were included in the review.

Results: After the screening for the eligibility, 18 studies were included in the review. Most of these studies aimed to investigate the differential diagnosis between SPCD and other diagnostic categories (e.g., specific language impairment and autism spectrum disorder). Of these researches, only 6 were ad hoc experimental studies, while the others were based on previously collected databases.

Conclusions: SPCD seems to have its own peculiarities and characteristics, indicating its clinical relevance, as emphasized by the DSM-5. However, the lack of specific instruments and a number of confounding variables make it difficult to identify and differentiate SPCD from other diagnostic entities. Further research is needed to overcome the lack of specific clinical instruments and lack of empirical studies.

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1. Introduction

The 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychological Association – APA, 2013) [1] introduced Social Pragmatic Communication Disorder (SPCD) as a new diagnostic category among neurodevelopmental disorders, specifically in the section of communication disorders. SPCD is characterized by difficulties in using language for social purposes, adapting communication to context, following conversational rules, and understanding implicit meanings. The core feature of SPCD lies in pragmatic ability, classically defined as the ability to use language appropriately in a given context and culture [2,3]. More recently, this definition has been expanded to include a multimodal perspective and now includes also the use of other means of expression such as nonverbal/extralinguistic, e.g., gestures and facial expressions, and paralinguistic means, e.g., prosody and tone of voice [4,5].

Regardless of the expressive mean used, pragmatics refers to the ability to fill the gap, which often exists, between the literal and intended meaning of a communicative act, such as is required in indirect speech acts, irony, metaphors, and other forms of figurative language. Pragmatics plays a fundamental role in everyday conversational events, both in production and comprehension, and enables appropriate conversation management [6].

The possibility to detect different pattern of performance at a specific age along pre-schooling and schooling, is well known and documented in the current literature (e.g. [7–11]). At the same time, much of the literature has focused on specific pragmatic delays and impairments that may be identified in certain clinical profiles of atypical development, e.g., autism spectrum disorders (ASD), specific language impairment (SLI), attention deficit hyperactivity disorder (ADHD) [12–14]. Because pragmatics encompasses a variety of different abilities, an investigation in this area can be conducted from a number of different perspectives. Indeed, pragmatic difficulties can be grouped under a variety of terms, such as semantic-pragmatic syndrome [15], semantic-pragmatic disorder [16], and pragmatic language impairment [17]. This enormous variety of terms used over the years by different researchers to identify pragmatic difficulties contributes to further complicate this issue. Inappropriate social communication is also a hallmark of another disorder listed in the DSM-5 under the neurodevelopmental disorders, autism spectrum disorder [1]. Although the precise boundaries between the terms are often not so clear in the current literature, social communication usually refers to a broader ability that takes into account pragmatic skills and also includes the ability to comprehend the mental states of others, i.e., Theory of Mind (ToM) [18].

In addition to the new diagnostic category represented by SPCD, the DSM-5 also introduced some changes to the diagnosis of ASD by moving beyond the previous classification into three subtypes (DSM-IV [19]), i.e., Autism Disorder, Asperger's Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), and referring to a single pervasive disorder characterized by both difficulties in social communication and social interaction and restricted repetitive behaviors or interests. In DSM-5, the presence of repetitive behaviors plays a central role in the diagnosis of ASD, reducing the different conditions that can be classified under this label compared to DSM-IV, which includes broader profiles thanks to the PDD-NOS category. With these changes, individuals with deficits in social communication skills without repetitive behaviors would no longer fit the classification. The introduction of the SPCD provides a solution to the above issue. However, it is essential to point out that the criteria for SPCD differ from those for ASD not only in quantitative but also in qualitative terms. Although deficits in communication are of interest for both clinical profiles, the criteria for the two conditions do not completely overlap. Evidence of difficulties in nonverbal communicative behavior or conversational skills (see for example [20] for ASD) is present in both diagnostic profiles; nevertheless, the focus in ASD is on deficits in social-emotional reciprocity and social interaction, abilities supported by the ToM [21], whereas in SPCD the focus is on more specific aspects of pragmatics involving adherence to context and inferential ability [1].

Pragmatic difficulties can also be observed in language disorders. Pragmatic Language Impairment (PLI), originally called “semantic-pragmatic disorder,” was used to describe children's difficulties in conversational tasks, such as socially inappropriate production. This term has actually been used to identify a population of children who have a specific impairment in pragmatic language. Although the term PLI is frequently used in research, it is not included in either DSM IV or DSM-5. In DSM-5, the diagnostic entity used to identify specific difficulties in pragmatics is SPCD, as noted above. In contrast, the ICD-11 manual [22], uses the term “Developmental language disorder with impairment of mainly pragmatic language”. One finds this disorder in the sixth section of the manual (“Mental, behavioral or neurodevelopmental disorders”) under the category of “neurodevelopmental disorders” like SPCD in DSM-5. However, in this case, this disorder has been classified as a subcategory of respectively “developmental speech and language disorder” and “developmental language disorder”. These differences in the classification of this disorder in the various manuals reflect the ambiguity and lack of consensus among experts in the field.

Although there is not yet a consensus on this topic, some authors hypothesized that PLI may represent a subset of Specific Language Impairment (SLI [23]). Also, the term SLI, although not included in either DSM-IV or DSM-5, is commonly used by researchers and clinicians to refer to a specific developmental language disorder, i.e., when no other disorder or disability such as intellectual disability, hearing loss, and global developmental delay is present [24]. SLI may include difficulties in several language domains, i.e., phonology, semantics, morphology, syntax, and pragmatics. In DSM-5, the term that best fits the definition of SLI is Language Disorder, which is found in the neurodevelopmental disorders section and is described as characterized by difficulties in the development and use of language, in both comprehension and production, and involving different modalities (e.g., spoken or written language) [1]. This

terminology confusion was assessed by the CATALISE consortium in 2016 through a Delphi consensus [25]. Researchers involved in this process proposed the use of the term Developmental Language Disorder to refer to a language disorder that is not accompanied by other medical conditions. This term has also been adopted by ICD-11 [22]. In order to avoid any confusion, we will use the term “SLI” from now on.¹ We have chosen to adopt the term SLI, even though it is not included in DSM-5, because the term is widely used in the literature.

Because of the features shared with ASD, several authors argued that PLI (now SPCD) could be considered a mild form of autistic disorder [26,27]. Bishop and Norbury [23] proposed a classification along a continuum between SLI and ASD. Such a complex scenario in identifying clinical profiles, in addition to the confusion caused by the lack of a unified and common terminology (for a detailed review of this issue see Amoretti and colleagues [28] and Félix et al. [29]), often led to a number of difficulties in the differential diagnosis between the above mentioned disorders.

The fuzzy boundaries, as well as the associated difficulties in clearly identifying diagnostic labels, have been the subject of interest and debate among researchers and clinicians since the introduction of SPCD in DSM-5 [1]. A number of authors have discussed the validity of the newly introduced SPCD criteria and their strengths and limitations in establishing differential diagnoses between the above clinical categories [30–34]. To date, some similarities can be identified between the diagnostic criteria for SPCD and ASD with at least some overlapping symptoms. Indeed, when analyzing the differential diagnosis between SPCD and ASD, it can be noted that the main difference is based on the set of criteria related to repetitive behaviors, while both clinical labels include communicative and pragmatic skills [34]. With this in mind, the majority of studies on SPCD have focused on the differential diagnosis between these diagnostic criteria and ASD [31,34–36]. In addition, some studies have also considered differences with SLI [32,33,37,38]. Norbury [32] suggested that SPCD may fall on a continuum between SLI and ASD, with some authors considering it a set of symptoms rather than a distinct diagnostic entity. Finally, overlap between SPCD and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), has been found and explored. A few studies have been conducted with the goal of identifying overlap between the latter two categories, with ambiguous results and only partial overlap [31,36].

Another neurodevelopmental disorder in DSM-5, which may be related to pragmatic difficulties, is ADHD [1]. This disorder is characterized by the presence of attention difficulties, hyperactivity, and impulsivity that interfere with functioning and development. The difficulties in maintaining attention and in inhibiting impulsivity could actually affect pragmatics, especially in conversations, with great difficulties, for example, in respecting turn-taking, in maintaining the focus of the topic, and in the ability to highlight relevant information.

However, the diagnostic manuals often contain only a brief description of SPCD and PDD-NOS disorders, with a non-specific focus on differential diagnosis of disorders that may display similar symptoms (e.g., ASD, SLI, and ADHD). The lack of an exhaustive description of these disorders may contribute to the ambiguous results of the comparative studies. In addition, it is important to consider how these disorders may change in the same population of children with heterogeneous expression, as well as in the same subject over the years and as the child develops.

Despite the attempt to systematically describe the characteristics of each of the above categories - SPCD, ASD, SLI and ADHD - and to clearly identify differences and similarities, it is noteworthy that the variance in clinical populations is often more subtle and exhibits wide variability within the same disorder.

Another key element to consider is that no assessment tool has yet been identified as a gold standard capable of accurately identifying the clinical profile of SPCD and distinguishing between this clinical population and others, e.g., ASD and SLI [35,37,39,40]. Yuan and Dollaghan [41] analyzed individual items from several assessment instruments commonly used to assess social pragmatic skills, such as the Autism Diagnostic Interview-revised (ADI-R [39]), the Autism Diagnostic Observation Schedule-Second Edition (ADOS-2 [40]), the Children’s Communication Checklist-2 (CCC-2 [41]), the Social Communication Questionnaire-Lifetime (SCQ Lifetime [42]), and others originally developed to identify strengths and weaknesses in disorders such as ASD, rather than specifically for SPCD. The authors classified the items according to criteria listed in the DSM-5 definition of SPCD (e.g., use of communication for social purposes, adaptation of communication to context, following conversational rules, understanding inferences and non-literal meanings). Of the 594 records considered, 220 were assigned by both raters to at least one of the four SPCD characteristics listed above, namely 59 items in the category “Using communication for social purposes” (A1), 15 in the category “Changing communication to match the context” (A2), 113 items in the category A3 “Following rules for conversation and storytelling,” 19 items in the group A4 “Inferences and non-literal meaning,” and 14 in the category “More than one.” The remaining 244 items could not be assigned to any of these categories. These results point to some problems in the specificity of the assessment instruments and may provide an important starting point for the development of new assessment instruments capable of accurately identifying the specific profile of pragmatic functions characteristic of SPCD.

Furthermore, Timler and Covey [43] conducted a comprehensive review of commercially available language and social communication assessment instruments in English, focusing on their accuracy by analyzing the technical manuals of the tests. This study highlights the need to improve test accuracy in order to select the correct assessment for each child’s profile. The study highlights the need to develop diagnostic tools that can distinguish between SLI, ASD, and SPCD. In conclusion, this study highlights the need for further reviews based not only on publishers’ manuals but also on clinical research studies.

¹ Furthermore, for the review we included many studies published before the introduction of the term DLD. Another option could be to use for each paper the specific term adopted, however we excluded this option due to different causes: first of all, as discussed in the introduction the use of the same label does not guarantee the adoption of the same criteria; finally, we considered that this option could add more confusion, in an already complex area.

Other fundamental aspects when assessing pragmatics are more basic aspects of language, namely structural and grammatical language features (e.g., interrogative forms) and cultural background (e.g., politeness expression), since they may affect communicative abilities [44]. Some studies (e.g. [45,46]) have pointed out that culture-related aspects of communication need to be taken into account because they can shape a person's communicative style. Indeed, not only the linguistic aspects of pragmatics, but also non-verbal/extralinguistic and paralinguistic aspects such as the use of gestures and proximity, respectively, can be influenced by linguistic and cultural features.

Moreover, families' Socio Economic Condition (SEC) seems to be able to predict a number of aspects of language development, with a positive correlation between education and, for example, vocabulary skills (e.g. [47]). Moreover, some studies showed an association between family SEC and a number of cognitive outcomes along childhood (e.g., [48]). Less data are available as for pragmatic ability. For example, Bosco et al. [49], in a sample of pre-school and school age children, detected a constant but very slight effect of SEC on the performance at pragmatic tasks regarding both verbal and non-verbal skills. Similar results were found as for the understanding and recovering of communicative failures [50] and for the social-pragmatic contextual comprehension [46]. A very recent study of Schulze and colleagues [51] interestingly highlighted that SEC-variables (i.e., parental education and income) do not relate to children's communication comprehension and that a stronger role seems to be played by socio-cognitive engagement (e.g., joint activities and number of people in the household).

Finally, Simms & Jin [33] suggested in a review that a multidisciplinary assessment that includes cognitive, communication, and social skills is needed to increase the accuracy of the diagnosis. Indeed, pragmatic communication is a high-level process that also relies on the complex interaction of different functions such as Executive Functioning (EF) and ToM (see [52,53]).

EF represents a set of cognitive abilities, i.e., planning, shifting, inhibition, that enable individuals to flexibly and efficiently perform goal-directed behaviors and adapt their actions to the specific demands of the context [54]. ToM is the ability to understand others' mental states [18] and regulate one's own behavior accordingly. Impairment in ToM has been widely shown in ASD (for a review, see [55]; for a meta-analysis, see [56]), and such difficulties appear to contribute to the difficulty of people with ASD to go beyond the literal meaning of an utterance and consider contextual information [57], which impairs their pragmatic performance.

More generally, EF and ToM appear to play a role in the ability to communicate effectively [58–62]. A recent meta-analysis [63] examined the interplay of pragmatics, EF, and ToM in typical and atypical development and suggested that EF and ToM correlate with (some aspects of) pragmatic ability. It should be noted, however, that pragmatics seems to address specific aspects and is not simply the sum of ToM and EF (see also [7,50,52,64,65]).

Given the interaction between these skills, it is clear how important it is to assess all of these areas (i.e., cultural background, EF, and ToM) when examining pragmatic ability; however, there is not yet a precise consensus or guidelines on the skills that should be included in the assessment. Another issue that is not yet well defined when evaluating pragmatics concerns the expressive means that should be included in the assessment in order to identify impairment in this area. Indeed, most available assessments tools for pragmatics focus mainly on the linguistic means, leaving little or no room for examining extralinguistic and paralinguistic ones.

Overall, it seems that the data available in the literature do not yet allow to get a clear picture of the actual usability of SPCD and the thresholds that should be used to accurately distinguish its features from those of other, partially overlapping, clinical profiles. Further research seems necessary in this direction. Since not only language but also other means of expression, such as nonverbal/extralinguistic and paralinguistic, realize pragmatic competence, an accurate and systematic assessment also of these different expressive means could be useful in the differential diagnosis of SPCD.

1.1. Aims

The present study aims to critically review the existing literature on the diagnosis of SPCD and to investigate whether the diagnostic label SPCD allows the identification of a specific clinical population and enables differential diagnosis of ASD, SLI and ADHD. Given the potential source of confounding variables, particular emphasis was placed on the assessment instruments and the specific domains, i.e., pragmatic, social skills (e.g., emotional processing), and cognitive skills (e.g., Executive Functioning), as well as the expressive means, i.e., linguistic, paralinguistic, nonverbal/extralinguistic, that were examined during the diagnostic process. In addition, special attention was paid to the age of the participants, as the development of pragmatic skills begins in early childhood and continues until school age [7,10,50], with a variety of developmental stages that must be considered when assessing delays and impairments. Therefore, it is important to have assessment tools that reflect this development. Given the high-level language skills involved in social communication (e.g., nonliteral language, verbal and nonverbal integration, adherence to social context), SPCD should not be diagnosed until 4–5 years of age [35,66]. Considering the importance of language and cultural background on communicative abilities, the present study takes into account the language in which the study was conducted and the age of the participants in order to review the age range and different languages covered in the existing literature on SPCD assessment.

In order to simplify the picture as much as possible, given the ambiguity and variability of the terminology used by various researchers, we decided to use the following terms from now on: a) SPCD for children with a specific deficit in pragmatics (i.e., also children identified with PLI or a "socio-pragmatic disorder"); b) ASD for children with a diagnosis of autism spectrum disorder according to DSM-5 or autism according to DSM IV; c) SLI for children with difficulties in language skills (i.e., children with SLI and with DLD).

2. Methods

The researchers conducted a narrative review. In order to make the narrative review more reliable, the authors decided to follow

and note every step of the process (Fig. 1).

First of all, the authors identified the following keywords based on the PICO (Population, Intervention, Comparison, Outcome) question: “Social pragmatic communication disorder,” “DSM-5,” “differential diagnosis,” and “child.” Other similar terms were identified by adding possible variations of the terms and searching with the thesaurus. The search was performed in three different databases in April 2023: Medline (PubMed), Scopus, and Web of Science (all databases). Inclusion and exclusion criteria were established before the search. The criteria used for the review are listed below:

Inclusion criteria: Articles published after 2013, when the DSM-5 was published and written in English. SPCD as a diagnostic label as a core topic.

Exclusion criteria: Review, meta-analysis and expert opinions were excluded.

3. Results

18 studies were selected for the narrative review (see Fig. 1). 317 results were found by searching the databases. After selecting “English” as the language filter, 298 remained. After removing duplicates ($n = 117$), 183 were eligible for the first screening, which was performed by reading the title and abstract. Ninety-four articles were excluded from this initial screening for the following reasons: three studies were focused on adults and not on children; two study was conducted before 2013 but published after; one of these studies was excluded because the authors used criteria described in DSM-IV rather than the DSM-5 criteria, and the other study used a preliminary version of the DSM-5 criteria that underwent several additional revisions before publication; 89 studies did not

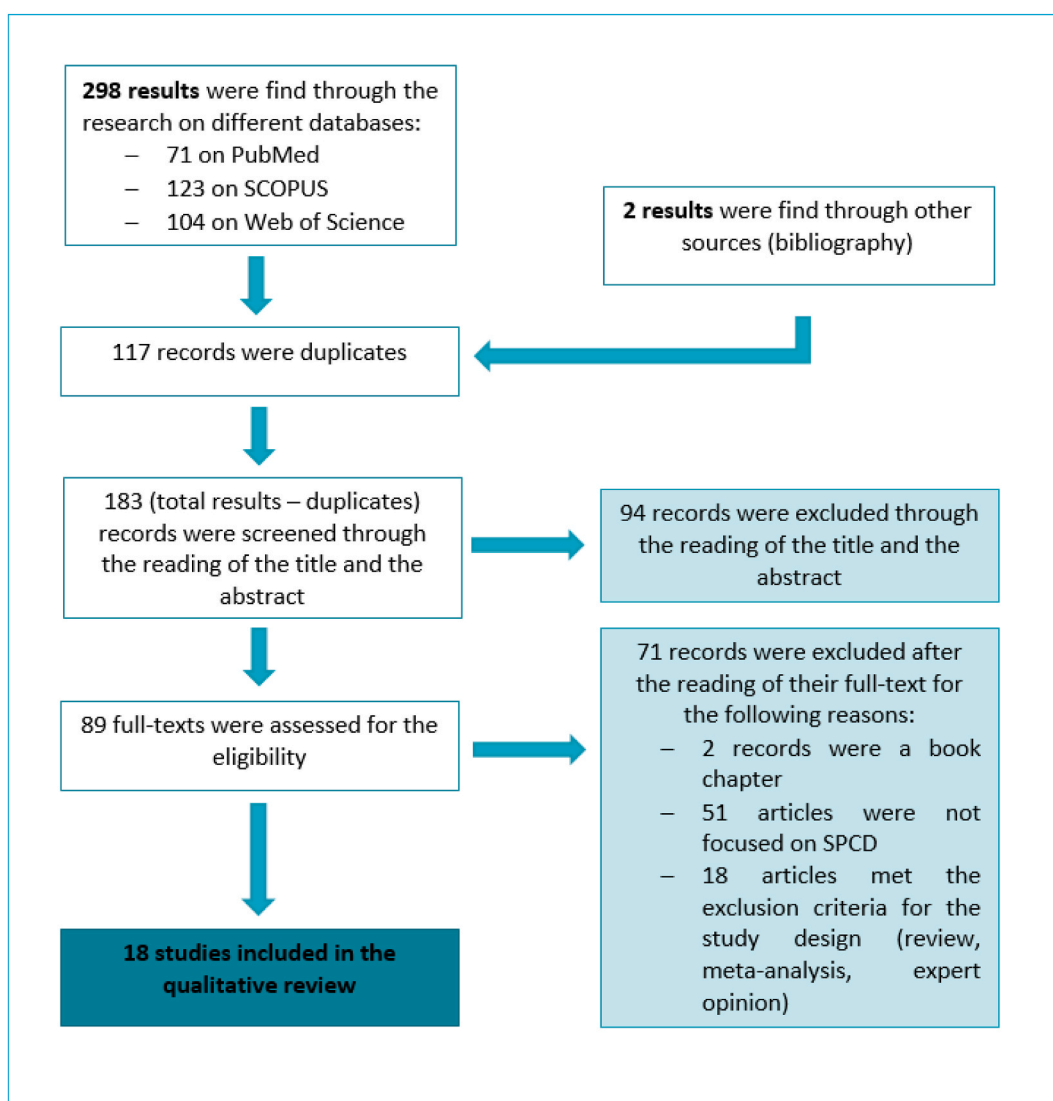


Fig. 1. Flow chart of the review process.

Table 1
List of paper included in the present review, with a focus on the samples and measures used to identify Socio (Pragmatic) Communicative Disorder [92,93], [94–117], [118–139].

Study design	Author(s)	Sample(s)	Assessment tool(s)	Target variable(s)
ANALYSIS ON EXISTING DATASET	Cheon et al., 2016 [86]	Children (N = 154) with ADHD (62%), Disruptive Behavior Disorders (3%), Tic Disorder (12%), Anxiety disorder (8%), Depressive Disorders (7%), others (3%). [25% having multiple diagnoses]	Social Communication Index (SCI) derived from the Social Responsiveness Scale - SRS [87,88].	ASD symptoms
		Typically developing children (N = 790)	The Autism Spectrum Screening Questionnaire - ASSQ; [95].	ASD symptoms
		Children with PDD (DSM-IV) or ASD (DSM-5) (N = 133) SCD (N = 16)	- Korean-Wechsler Intelligence Scale for Children III - K-WISC III [96]. and - Leiter International Performance Scale-Revised - Leiter-R [97].	Cognitive functioning
	Ellis Weismer et al., 2021 [76]	Children with - ASD (N = 642) - Developmental Disorder likely SPCD (N = 117) - Developmental Disorder with some SPCD (N = 126) - Developmental Disorder with possible SPCD (N = 118) - Developmental Disorder with no SPCD (N = 91)	- Autism Diagnostic Observation Schedule – ADOS [98]. - Autism Diagnostic Interview, Revised - ADI-R [42].	ASD symptoms, repetitive behaviors and social communication as for DSM-5 diagnostic criteria
		Age range: 4-6 years old	Mullen Scales of Early Learning – MSEL [99].	Language
			- Daily Living subscale (70 or lower) on the Vineland Adaptive Behavior Scales, Second edition – VABS [100]. - Child Behavior Checklist – CBCL [101].	Socio emotional behaviors
	Flax et al., 2019 [75]	Family members (N = 535) within families having at least one individual on the autism spectrum (DSM-IV diagnostic criteria) with or without a structural language impairment, at least one other individual with a structural language impairment, and unaffected family members.	Social Communication Index, derived from the Social Responsiveness Scale - SRS/SRS-2 [87,88].	ASD symptoms
		Overall age-range: 3-65 years	Subtests from the Comprehensive Assessment of Spoken Language – CASL [102], i.e., Non-literal Language (CASL NL) and Pragmatic Judgement (CASL PJ).	Communication and pragmatic language
			ADI Social Interaction index and ADI- Restricted Interests and Repetitive Behaviors taken from the ADI-R [42].	ASD symptoms referred to DSM-5 criteria
			- Performance IQ scores of the Wechsler Abbreviated Scale of Intelligence - WASI PIQ [103]. - Non-Verbal Reasoning subscales - Developmental Abilities Scale - DAS IQ [104].	Cognitive abilities (non-verbal)
	Foley-Nicpon et al., 2016 [69]	Children & adolescents with - Autistic Disorder (N = 11), - Asperger's Disorder (N = 17), - PDD-NOS (N = 12) based on DSM-IV diagnostic criteria Age range: 5-17 years	- Autism Diagnostic Observation Schedule - ADOS [98] - module 3 and 4. - Autism Diagnostic Interview, Revised - ADI-R [42].	ASD symptoms DSM-5 diagnostic criteria for SCD
	ANALYSIS ON EXISTING DATASET (continue)	Mandy et al., 2017 [73]	Children and adolescents (N = 1081), consecutive referrals at a specialist service (NHS, England) for the assessment of young people with social communication problems. Age range: 4-18	Developmental, dimensional and diagnostic interview (3Di, selection of 122 items; see [105]).
			Children Communication Checklist - CCC [17].	Communication and pragmatic language
			Strengths and Difficulties Questionnaire – SDQ [106].	Conduct problems, hyperactivity (attention deficit/hyperactivity disorder symptoms), emotional and peer problems, prosocial behaviors
Miller et al., 2015 [94]		Younger siblings of children with ASD (high-risk group, N = 188) typical development (low-risk group, N = 119). Age: 36 months	Autism Diagnostic Observation Schedule - ADOS-G [107]. Communication + Social Total algorithm score [107].	ASD symptoms
			Mullen Scales of Early Learning – MSEL[99]. Four subscales: Fine Motor, Visual Reception, Expressive Language, and Receptive Language.	Cognitive functioning
			Language Use Inventory – LUI [108].	Communication and pragmatic language
Ohashi et al., 2015 [83]		Children and adolescents (N = 68) admitted to the University Hospital between 2012-2014 reporting a psychological issue or developmental concern With and w/o PDD-NOS Age range: 6–15 years	Pervasive Developmental Disorders Autism Society Japan Rating Scale – PARS [109].	ASD symptoms, with reference to the DSM-5 diagnostic criteria.
			- Wechsler Intelligence Scale for Children III - WISC III [96] or - Tanaka–Binet test [110].	Cognitive functioning
Redmond 2020 [78]		Children (N = 85) at risk for language impairment: students enrolled in regular education and students receiving speech language, emotional-behavioral, reading, or learning disability services. One or more of our experimental criteria for idiopathic language disorder, S(PC)D, and ADHD. Age range: 6-8 years	- Clinical Evaluation of Language Fundamentals, IV Edition - CELF-4 [111].	Language
			- Naglieri Nonverbal Ability Test – NNAT [112].	Cognitive functioning (non-verbal)
		- Children's Communication Checklist– 2nd Ed. - CCC-2 [44] Subscales: Coherence, Initiation, Scripted Language, Context, Nonverbal Communication.	Communication and pragmatic language	
Ward et al., 2020 [79]	Children (N = 254) previously screened at risk ASD using the Social Communication Questionnaire-Lifetime version - SCQ-L [45]. Age range: 8 – 11 years N = 254	- Demographics and medical history. - Semi-structured parent interview assessing both DSM-IV and DSM-5 symptoms of ASD and DSM-5 symptoms of SCD. - Kaufman Brief Intelligence Test [113] or - Leiter International Performance Scale, Revised [97].	Current and lifetime symptoms in different areas (e.g., nonverbal behaviors, language, repetitive behaviors, peer relationships)	
		- Autism Diagnostic Observation Schedule, Second Edition - ADOS-2 [43]. - Social Responsiveness Scale, Second Edition - SRS-2 [88].	Cognitive functioning ASD symptoms	
		Child Behavior Checklist and Teacher Report Form [114].	Socio emotional behaviors	
		Vineland Adaptive Behavior Scales, Second Edition – VABS [100].	Adaptive behavior	

ANALYSIS ON EXISTING DATASET (continue)	Yuan & Dollaghan, 2020 [89]	Children with ASD (N = 1940) Typically developing children (N = 274), National Database of Autism Research. Age range: N/A (M = 11.37 years)	Items of the Social Communication Questionnaire-Lifetime - SCQ-L [45]. Autism Diagnostic Interview, Revised - ADI-R [42].	Social interaction and communication ASD symptoms
	Ellis Weismer et al., 2021 [77]	- Children with DLD (N = 125), 30% with concomitant SPCD - Children without DLD (N = 268), 9% with concomitant SPCD Age range: 13-14 years old	Children's Communication Checklist, 2nd Ed. - CCC-2 [44]. Wechsler Intelligence Scale for Children III - WISC III [96] subtests Block Design and Picture Completion. - Child Behavior Checklist – CBCL [101]. -Social skills rating survey [115].	Communication and pragmatic language Language Cognitive functioning Socio emotional behaviors
	Hinojosa et al., 2021 [93]	Children with PDD (N = 88), divided as follow: -Autism Disorder (N = 18) -Asperger Disorder (N = 47) -PDD-NOS (N = 23) Children (N = 30) with no PDD and comorbidities as follow: - ADHD (N = 9) - Tics (N = 1) - Tourette (N = 4) - GAD (N = 1) - Social phobia (N = 1) - Learning difficulties (N = 4) - No diagnosis (N = 10) Age range: from 4 to 17 years old (2 groups: 4-10 and 10-17 years)	-Social Communication Questionnaire – SCQ [45]. -Autism Spectrum Screening Questionnaire – ASSQ [95]. -Childhood Asperger Syndrome Test [116].	ASD symptoms
			-Autism Diagnostic Interview, Revised - ADI-R [42].	ASD and SPCD symptoms based on DSM 5
Hollingshead-Redlich scale [117].			Socio Economic Status	
			Wechsler Intelligence Scale for Children – WISC IV [118].	Cognitive functioning
AD HOC EXPERIMENTAL STUDIES	Ash et al., 2017 [72]	Children (N = 208) enrolled in regular education and children receiving services for communication disorder, emotional behavioral disorder, reading disability or learning disability. Age range: 6-10 years	Naglieri Nonverbal Ability Test – NNAT [112].	Cognitive ability (non-verbal)
			Child Behaviour Checklist – CBCL [114].	Socio emotional behaviors
			- Clinical Evaluation of Language Fundamentals, IV Edition - CELF-4 [111]. - Nonword Repetition – NWR [119]. - Rice Wexler Test of Early Grammatical Impairment – TEGI [120].	Language
	Gibson et al., 2013 [70]	Children with (based on DSM-IV): - Pragmatic Language Impairment (N = 19) - High functioning ASD (N = 21) - Specific Language Impairment (N = 22) Age range: 6–11 years	Manchester inventory for playground observation – MIPO [121]. Repetitive Behaviour Questionnaire, Version 2 - RBQ-2 [122]. Clinical Evaluation of Language Fundamentals, IV Edition - CELF-4 [111].	Social interaction Repetitive behaviors Language
AD HOC EXPERIMENTAL STUDIES (continue)	Kaba & Soykan Aysev, 2020 [84]	Children (N = 80) with a PDD diagnosis based on DSM-IV-tr diagnostic criteria Age range: 18-72 months	Sociodemographic questionnaire	Sociodemographic features
			Childhood Autism Rating Scale – CARs [123], Turkish translation [124].	ASD symptoms
			Autism Behavior Checklist – ABC [125], Turkish translation [126].	ASD behaviors
			Aberrant Behavior Checklist – AbBC [127].	Behavioral problems (e.g., irritability, social withdrawal, stereotype, hyperactivity, and inappropriate speech)
	Ketelaars et al., 2016 [71]	Children with Pragmatic Language Impairment (N = 84). No screening for ASD. Typically developing children (N = 81) Age range: 5-7 years old	Children Communication Checklist – CCC [17], Dutch translation [128].	Communication and pragmatic language
			Renfrew Bus Story Test [129].	Narrative ability
	Svindt & Suranyi, 2021 [81]	Children with SPCD (N = 13) Children with ASD (N = 19) Typically developing children (N = 39) Age range: 4-9	- Test of Reception of Grammar – Hungarian version (TROG-H) [130,131] - Peabody Picture Vocabulary Test (PPVT)[132].	Language
			Smarties test [133].	Theory of Mind (ToM)
			Non-Word repetition test [134]. Grammaticalized Implicit Meanings task.	Working Memory Pragmatics
	Saul et al., 2023 [82]	Preschool and school age children with no diagnosis from a longitudinal study (N = 386) Age range 5-6 years	- CCC-S (short form of CCC-2) [135]. - Children's Communication Checklist, 2nd Ed. - CCC-2 [44].	Communication and pragmatic language
			- Receptive and Expressive one-word picture Vocabulary Test [136]. - Test for Reception of Grammar - TROG [137]. - School-age sentence imitation test - SASIT-32 [138].	Language
			Assessment of Comprehension and Expression: narrative retelling subtest, ACE-recall [139]. WIPPSI 3, subtests Block Design and Matrix Reasoning [140].	Narrative ability Cognitive functioning
		Strengths and Difficulties Questionnaire - SDQ [106].	Conduct problems, hyperactivity (attention deficit/hyperactivity disorder symptoms), emotional and peer problems, prosocial behaviors	

focus on SPCD. After this process, 89 articles were identified for full-text screening. 71 articles were excluded after full-text screening because they did not meet the inclusion criteria. Specifically, two articles were a book chapter, 51 articles were not about the differential diagnosis between SPCD and ASD, SLI or ADHD, and 18 articles were reviews, meta-analyses, or expert opinion. These reviews and expert opinions were excluded from the review but are mentioned in the introduction because they provide a useful basis for our research. In case of uncertainty of the inclusion/exclusion of a paper, a decision was made based on a discussion and agreement of all authors. After this selection process, a total of 18 studies was included in the review.

3.1. Core topic of the studies

Based on their main objectives, the studies could be divided into three categories. Most of the studies included in the review aimed to investigate the differential diagnosis between SPCD and other diagnostic categories (such as SLI, ASD, and ADHD). Specifically, eleven studies focused on the differential diagnosis of SPCD as a primary objective [67–78]. Of these eleven studies, seven aimed to differentiate between SPCD diagnosis and ASD [67,70–73,76,78], only one of these studies also examined differential diagnosis with SLI [67] and another [74] investigated only the differential diagnosis between SPCD and SLI. Redmond's [75] study instead analyzed the differential diagnosis in children with SPCD, ADHD, and idiopathic language impairment. The other three studies focused on identifying and analyzing the features that characterize SPCD [68,69,79].

Another main objective of the different studies included in the review was to compare SPCD with the diagnostic categories previously listed in DSM-IV [19] and examined by four studies [66,77,80,81]. In particular, Kaba and Soykan Aysev [81] included children with a diagnosis of pervasive developmental disorder (PDD), based on DSM-IV [19]. Ohashi and colleagues [80] compared the diagnosis of SPCD with the previous diagnostic entity of PDD-NOS. Foley-Nicpon and colleagues [66] examined other diagnostic categories from DSM-IV [19] in addition to PDD-NOS, namely Autistic Disorder, Asperger Syndrome. Lastly, Hinojosa and colleagues [77], compared the diagnostic stability between DSM IV-TR [82] and DSM-5 [1] criteria, including in their samples also children with ADHD and ASD.

Finally, a third target was identified in two of the studies included in the review. Indeed, two of the studies aimed to test the effectiveness of some assessment tools in identifying SPCD [41,83]. Cheon and colleagues [83] analyzed the effectiveness of the Social Responsiveness Scale (Korean version), SRS-2 [84,85], including children with various diagnoses such as PDD or ASD, ADHD, Disruptive Behavior Disorder, Tic Disorder, Anxiety Disorder, and Depressive Disorder in the study. Yuan and Dollaghan [86], on the other hand, reviewed the effectiveness of the SCQ-L test [87] in distinguishing between children with SPCD and ASD.

3.2. Age range

The studies included in the review are heterogeneous in terms of the age of the recruited participants. Most studies have a wide age range covering student ages (primary and secondary) [66–70,75,76,79,80,83,88]. Only one study covers only adolescents [74], only one includes both adults and children [72] and three focus on preschool age [71,81,89]. Another study includes both preschoolers and scholar age children [78]. Only one study does not clearly specify the age range [86].

3.3. Languages

Considering the influence of cultural and linguistic aspects on pragmatics, it is important to be aware of these differences [44,46,90]. Although all of the studies included in this review were published in English, some of them were conducted in another language. Specifically, one study involved Turkish children [81], one involved Japanese children [80], one involved South Korean children [83], one involved Dutch children [68], one included Hungarian children [78] and another one included Spanish children [91].

3.4. Domains and expressive means investigated (multimodal communication)

The large heterogeneity of studies in terms of sample characteristics, e.g., age, native language, and diagnosis, is mainly due to the fact that the higher percentage of studies identified for the present review were based on analyses performed on existing clinical datasets rather than specifically on children who may or may not have been diagnosed with SPCD. This has certainly led to a wide variance in the assessment tools used, which also reflects the lack of guidelines on which test is more appropriate for the detection of SPCD. Tests used by the various authors include tasks focusing on emotional skills, analysis of repetitive behaviors (mainly to detect ASD), tests examining general pragmatic skills as assessed by the children's caregivers, language assessment instruments, and cognitive functioning tasks (see Table 1). Only two studies included an examination of socioeconomic condition (SEC) through administration of a specific questionnaire [81,91].

Considering the domains assessed in each research, some differences across the studies can be observed. Two studies [66,86], included only tests developed in order to detect ASD symptoms. In other three studies, the researchers added to the assessment of ASD symptoms also measures of cognitive functioning [80,83,91]. On the other hand, Mandy and colleagues [70] combined the assessment of ASD symptoms with the analysis of communication and pragmatic language. In other two studies the ASD symptoms and the communication pragmatic skills were assessed as well, including also the investigation of the participants' cognitive functioning [72,140]. Other authors like Kaba & Soyakan Aysev [81] used measures of ASD symptoms in addition to the assessment of socio emotional behaviors. In addition to these domains, Ellis Weismer and colleagues [73] analyzed also language abilities, while Ward and colleagues [76] added not only measures of language skills but also of cognitive functioning. There are then studies in which authors administered tests to investigate language, communication and pragmatic abilities; in particular, Ketelaars and colleagues [68] employed tests developed to assess these domains. Other researchers assessed these domains, adding respectively the evaluation of socio emotional behaviors [67] and cognitive functioning [75]. Finally, other authors [69,74,79] administered tests that aim to assess the following domains: language, communication and pragmatic language, cognitive functioning and socio emotional behaviors. Svindt and Suranyi [78] in their study investigated language and pragmatic abilities, in addition to ToM and working memory.

It is noteworthy that in these studies pragmatic ability was mainly investigated by focusing on the linguistic means of expression, while none specifically adopted a multimodal approach to communication, i.e., the use of nonverbal/extralinguistic - gestures - or

paralinguistic - tone of voice and prosodic cues - skills. More in detail, only three of the eighteen studies included in the review [69,72,75] paid attention to other means of expression and adopted measures of nonverbal cognitive and reasoning skills, thus focusing on cognitive skills that do not involve the use of language.

4. Discussion

The results of the studies included in the review reflect some of the concerns and considerations about SPCD that are being discussed in the scientific community. Overall, all of the studies included in this review reported difficulty in making an accurate differential diagnosis for SPCD. Moreover, despite differences in perspectives and frameworks, all authors emphasized the need for further studies in this area and for the development of assessment tools that specifically address the core features of this diagnostic entity.

Furthermore, the majority of the studies included in the review (twelve out of eighteen) were based on the analysis of data sets previously collected for other purposes (see Table 1) and were not designed in an ad hoc manner to empirically investigate the possible presence of SPCD in a cohort of children.

Some authors [73] of the studies included in this review, noted that there are still some difficulties in the differential diagnosis of SPCD and speculated about the possibility of placing this category on a continuum between SLI and ASD [23,32,37]. Specifically, some authors suggested that SPCD could be considered a mild form of autism, encompassing all children who fall just below the thresholds for an ASD diagnosis [70,72,76,79,83,91]. However, this hypothesis should be taken with caution and requires further investigation; indeed, none of the above-mentioned studies included a comprehensive assessment of the following domains: language, pragmatics, socio-emotional behavior, repetitive behaviors, and cognitive abilities.

Based on their findings, Ellis Weismer and colleagues [74] proposed that SPCD is a separate diagnostic entity from SLI, ADHD, or Intellectual Disabilities, but did not rule out a possible overlap with ASD. On the other hand, Redmond [75] hypothesized that SPCD might be a transdiagnostic cluster of symptoms rather than a diagnostic entity.

However, five out of six ad hoc experimental studies [67–69,78,81], that empirically investigated the diagnosis of SPCD, highlighted that this category is a clear and distinct diagnostic entity that does not overlap with other diagnostic categories such as ASD and SLI, thus suggesting a potential clinical utility of this diagnostic category. In particular, Svindt and Surányi [78] pointed out that although samples of children with ASD and SPCD exhibit a similar quantitative performance, they differ in a number of qualitative aspects of pragmatics and in the underlying cognitive mechanisms that cause pragmatic difficulties. These authors found that the pragmatic ability of children with ASD was related to ToM skills, whereas the pragmatic performance of children with SPCD was related to grammatical comprehension and, finally, that of the control group was not related to any of the above-mentioned components.

It is noteworthy that only one study [75] examined differential diagnosis also between SPCD and ADHD as a main feature, given the overlap documented in the literature regarding the pragmatic ability of children with these disorders. The author confirmed this overlap and noted that sometimes these disorders and SLI can manifest alone, while in other cases there is a co-occurrence.

One of the key findings of the present review is that most of the work on SPCD has been based on the analysis of existing datasets, originated from larger samples derived from national health screenings and mainly related to individuals on the autistic spectrum, which has likely contributed to the ambiguity regarding the diagnostic category of SPCD. Given the heterogeneity of the samples, it is not surprising that very different assessment tools were used to determine compliance with the SPCD DSM-5 [1] criteria, which are not always accurate in identifying specific difficulties in pragmatic communication, as shown in the study by Yuan & Dollaghan [41]. On the other hand, this is also justified by the lack of guidance on the assessment tools that should be used for differential diagnosis. In particular, there is a large heterogeneity between studies in the domains investigated, with only two studies [71,72] including all the domains considered in the present review: socio-emotional abilities, repetitive behaviors, communicative-pragmatic, language, and cognitive functions. However, even in these studies, some areas were not investigated in more detail with specific assessment tools for each domain. In addition, many studies included in the present review used assessment instruments specifically designed to examine and detect ASD traits (i.e., ADOS and ADI-R) without adding the administration of instruments that focus more on pragmatic communication. This deficiency may be due to the lack of clear recommendations for the assessment tools that should be used to detect SPCD features and to the fact that many studies are based on previously collected databases.

In addition, the presence of six studies conducted in a language other than English, and the lack of validated instruments for assessing communicative pragmatic skills adapted to different languages and cultures, may have led to even greater variability in the current literature. However, given the influence that cultural and linguistic features may have on communicative pragmatic ability, it is extremely important for a deeper understanding of SPCD, to consider the contribution of studies conducted in languages other than English, particularly Turkish [81], Japanese [80], South Korean [83], Dutch [68], Spanish [91], and Hungarian [78].

Moreover, it seems noteworthy that in the reviewed papers, only a very limited space was devoted to a multimodal approach to pragmatic communication, which takes into account the fact that pragmatic skills include the use of various means of expression other than language per se, such as gestures and paralinguistic cues [4,5]. Indeed, the DSM-5 criteria for SPCD [1] also refer to difficulties (A3) in using nonverbal cues to regulate communicative interaction. However, in the studies analyzed, the focus was on the linguistic means of expression, and no study specifically analyzed extralinguistic or paralinguistic skills. One partial exception is represented by three studies [69,72,75] that measured nonverbal cognitive and reasoning abilities and thus examined cognitive abilities that are not based on language as a means of expression. Nevertheless, no specific assessment was conducted focusing on pragmatic communication realized through means of expression other than language, i.e., nonverbal/extralinguistic and paralinguistic. A full assessment that includes all the communicative expressive means could provide important information about the presence or absence of SPCD and

help distinguish this clinical condition from others in a broader perspective (see e.g. [49]).

Finally, the lack of homogeneity in the target variables studied, as well as in the perspectives applied to identify and evaluate individuals with SPCD, contributes to make the picture even more muddled. A vast body of literature on various clinical populations (e.g. [7,64,141]), including ASD and SLI (e.g. [142,143]) suggest a complex interplay of pragmatics with other cognitive variables, i.e. ToM [18] and EF [54]. However, it is interesting and quite surprising to note that these capabilities were not specifically assessed in basically any of the studies included in the review. ToM abilities were investigated in only one study [78]. This lack of specific tasks for the evaluation of ToM skills in the majority of the studies in which the starting point of analysis was a large cohort of participants with ASD is particularly surprising. Indeed, one might expect the scores obtained on such specific ToM tasks to be indicative of differential diagnosis, given the well-documented impairments of ToM in ASD (see Refs. [55,56]) and the evidences suggesting that ToM and pragmatics correlate without a complete overlap (see [63,144]), as showed in the study of Svindt & Surányi [78]. Regarding the other cognitive variables, an exception is represented by those studies [71,72,76,79,80,83,91] that included a cognitive battery and those (e.g. [73,74,76]) that used tasks to assess some aspects of socio-emotional ability, emotional processing. However, none of the aforementioned studies analyzed the results of the cognitive and social cognition tasks in relation to participants' pragmatic performance, nor did they attempt to explain and verify the possibility of a differential diagnosis based on the results also obtained in the cognitive and social cognition tasks. Therefore, a comprehensive and more detailed assessment of pragmatic skills and related cognitive components could favor the identification of different diagnoses such as SPCD, SLI, ASD and ADHD (see [40,145]).

A limitation of the present review reflected a limitation in the literature on this topic itself, and relied on the small number of available studies, which did not enable a more solid analysis and to consider more in detail some aspects, such as the possible variability in children's performance according to their linguistic and cultural background. More studies are, indeed, needed to fill this gap.

This review also highlighted limitations associated with the use of assessment tools developed prior to the publication of DSM-5 that are not specifically designed to assess the SPCD diagnostic category. The lack of validated assessment tools for this new diagnostic entity could lead to misclassification of SPCD. Indeed, some authors have suggested that the tests used to detect SPCD may not capture relevant aspects of social and pragmatic skills [80,86]. Consistent with this view, several studies have reviewed the measures available to detect SPCD and have reached the same conclusion, namely that a specific assessment tool is needed [37,41,43] that is capable of sensitively and specifically detecting pragmatic impairments.

Potential overlap between SPCD diagnostic criteria and those of other diagnostic entities, such as learning disabilities, needs to be further explored and examined. In this regard, these populations share a common difficulty in inferential ability, i.e., the ability to fill the gap that often exists between literal and intended meaning [146]. An impairment in inferential ability is explicitly mentioned among the diagnostic criteria for the SPCD (*A4 - Difficulties understanding what is not explicitly stated*, e.g., *making inferences*, [1]); however, the same inferential impairment underlies also Learning Disabilities, specifically as for criterion A "*Difficulty understanding the meaning of what is read* (e.g. - *may read text accurately but not understand the sequence, relationships, inferences, or deeper meanings of what is read*" [1]). Further studies are advisable in this direction to clarify the weaknesses and discrepancies in the current literature highlighted by this review.

Finally, it would be interesting to see more research papers focusing on the role of sociodemographic aspects in pragmatic abilities (and difficulties), with a particular attention to SEC, in order to better understand whether this variable might have a specific role in pragmatic development and – symmetrically - in atypical pragmatic processing.

5. Conclusions

The current literature casts a shadow on the diagnostic specificity and clinical utility of SPCD. However, the development and validation of more specific assessment tools and a larger number of empirical studies seem necessary to be able to evaluate the clinical usability of this diagnostic category. Some of the few studies available suggest that it is possible to identify individuals belonging to SPCD and thus distinguish them from other diagnostic entities, i.e., ASD and SLI. However, some authors also emphasize that such a procedure may not be entirely accurate, as the tasks used to identify SPCD may not be able to fully capture relevant aspects of social and pragmatic skills that would be relevant to the diagnostic process. The further step after diagnostic identification, i.e., the clinical usability of the label, seems to be more controversial and still unclear. The majority of the studies reviewed applied their analysis to pre-existing datasets consisting mainly of data on individuals with ASD or PDD - NOS based on DSM-IV criteria. This sampling may indeed represent a bias that needs to be addressed in future studies, as does the application of SPCD criteria to the results of assessment tools (e.g., ADOS, ADI) that were developed and used for other purposes and that may not have accurately captured relevant factors. Furthermore, more studies are warranted to allow the conduction of a meta-analysis, which can provide more solid results on this topic. Moreover, all studies focused on the linguistic means of communication and mostly neglected nonverbal skills, which still play a central role in pragmatics. Moreover, the present review also shows the lack of data on the relationship between the pragmatic aspects studied and other cognitive abilities, such as ToM or EF, which play an important role in communicative pragmatic interactions. A thorough investigation of such aspects could help reduce confusion about overlapping diagnostic categories and disentangle confounding variables.

Ethics approval

Not applicable.

Consent to participate

Not applicable.

Availability of data and materials (data transparency)

Not applicable.

Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

Data availability statement

No data was used for the research described in the article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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