



On markers of linguistic impairment in autism and their implementation

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Abstract

Language abilities in autism show considerable variability across linguistic domains: vocabulary, grammar/structural language, and pragmatics (language in context) may be affected to differing degrees and not always simultaneously, as is the case in other neurodevelopmental conditions (NDCs), e.g. Down syndrome, Williams syndrome, or Developmental Language Disorder. This selective review synthesises empirical markers of language impairment across linguistic domains in autism, sometimes in comparison to other NDCs, while also evaluating theoretically driven assessment tools, both established and currently under development, that implement these markers. Core linguistic markers across the autism spectrum include ‘social pragmatic’ difficulties, i.e. challenges with irony comprehension, referential expression use, and narrative coherence. Impairment in grammar/structural language, such as morphosyntax (e.g., tense marking, passives, relative clauses) and phonology (e.g., consonant clusters, as in *str*), is observed in a substantial subset of autistic individuals and many other NDCs. Aspects of ‘linguistic pragmatics,’ such as understanding metaphor and indirect requests, tend to be impaired mainly in autistic individuals who also have structural language difficulties. Other challenges have been reported, including in prosody, semantics and lexical-pragmatics (e.g., mental state terms such as *think*, *fear*, *happy*), but remain underexplored. We further evaluate several existing and emerging screening tools that target specific linguistic markers and accommodate a wide range of populations, including males and females, multilingual speakers, minimally speaking individuals, and those with varying intellectual abilities. Grounded in theoretical linguistics, these tools are designed to facilitate detailed profiling of language strengths and challenges in autism. Their cross-linguistic design and applicability make them well-suited for cross-syndrome comparisons and the development of tailored interventions.

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Introduction

Language domains

Research in the field of language development and neurodevelopmental conditions (NDCs) has long sought to identify markers of linguistic impairment across languages. While the world's languages differ and may exhibit language-specific patterns of linguistic impairment, they also have patterns in common, opening up the possibility of identifying markers of linguistic impairment that hold across many languages. Language involves several key dimensions, including spoken vs. signed modalities, production vs. comprehension, and oral vs. written forms, each encompassing linguistic (sub)domains (e.g. Fromkin et al. 2021):

- (i) Lexicon (vocabulary): storage of words and their properties (e.g. concrete vs. abstract properties);
- (ii) Grammar/Structural Language:
 - a. Phonology: structure of sounds (e.g. syllabic structure: *strea-mer*), or prosodic structure: interrogative tone in *Lisa kissed Max?* vs. declarative tone in *Lisa kissed Max.*);
 - b. Morphology: structure of words (e.g. noun+plural: *song-s*);
 - c. Syntax:¹ structure of sentences (e.g. active: *Lisa kissed Max* vs. passive: *Max was kissed by Lisa*);
 - d. Semantics: sentence meaning derived from these structures (e.g. the difference in meaning between *All your friends did not come* and *Not all your friends came*).
- (iii) Pragmatics: language in context (e.g. irony: saying *What a beautiful day!* on a day that it is cold and rainy).

As each domain can be affected independently (Curtiss 2013), the term 'language impairment' is best understood as an umbrella term covering difficulties in vocabulary, any subcomponent of grammar, pragmatics, or any combination of these. However, it is essential to precisely define the specific domain(s) that may be affected. This also has consequences for the term 'marker of linguistic impairment', as these may concern different levels. Markers of linguistic impairment can refer to (a) an entire dimension (spoken language, signed language, language production, language comprehension); (b) one or more of the linguistic

(sub)domains mentioned in (i)-(iii); (c) a specific linguistic construction or phenomenon within a given linguistic (sub) domain (e.g., passives or consonant clusters such as *str*).

Why identifying precise markers of language impairment matters

Identifying precise markers of linguistic impairment carries both theoretical and clinical significance. Theoretically, such markers speak to the broader goal of linguistic theory, i.e. characterising how language is structured and acquired, including universal patterns observable across both typical and impaired language. Theories of language and language acquisition should also account for the varied ways impairment manifests across different conditions. In addition, identifying markers of linguistic impairment contributes to our understanding of language development trajectories across NDCs. Clinically, assessing and supporting language needs and identifying strengths of individuals with NDCs benefits from precise indications of where linguistic weaknesses and strengths are located and what phenomena can be targeted in intervention/support: in the lexicon, in (any of the subcomponents of) grammar/structural language, in pragmatics, or in more than one of these domains.

Why vocabulary scores are insufficient proxies for language ability

While monitoring early word counts is a natural starting point for clinicians, given that vocabulary is among the first measurable signs of language development in infants, vocabulary represents only one of several distinct linguistic domains. In individuals with Autism Spectrum Disorder (ASD), vocabulary is neither typically nor globally impaired (Naigles and Fein 2017; Sukenik and Naigles 2025). In contrast, autistic people typically have difficulties with certain aspects of pragmatic language (Dennis et al. 2001; Katsos and Vicente 2025). This may be accompanied by an additional impairment in structural aspects of language (e.g. Kjelgaard & Tager-Flusberg 2001; Eigsti et al. 2007; Roberts et al. 2004; Terzi et al. 2014; Wittke et al. 2017), commonly found in Developmental Language Disorder (DLD) (e.g. Conti-Ramsden et al. 2001; Leonard 2014; Rice et al. 2004). As in many other populations, vocabulary skills are not predictive of abilities in other linguistic domains in autism (Kwok et al. 2015; Sukenik and Tuller 2021). As

¹ Throughout this paper, morphology and syntax are often discussed together as 'morphosyntax' because many constructions in a sentence involve both word-internal structure and sentence-level structure simultaneously (e.g. verb inflection marks both word-internal structure and agreement between subject and verb).

such, performance on standardised vocabulary tests should not be used as a proxy for overall linguistic level.²

Limitations of current assessment approaches

Although language difficulties are no longer included in the diagnostic criteria for autism (DSM-5, APA 2013; ICD-11, WHO 2022), clinicians must still specify whether language impairment is present. This specification demands careful consideration of which language domains may be affected. Yet in practice, clinicians' descriptions of language impairment in autism do not always identify the precise domain(s), due to, for example, time constraints or absence of adequate screening tools.

While the clinical field has developed numerous instruments intended to assess different linguistic domains, many are too broad to pinpoint the specific challenges faced by autistic individuals. For example, language is often assessed via omnibus tests in which diverse linguistic structures and/or domains yield a single composite score, obscuring more fine-grained patterns of ability and difficulty. Moreover, language assessment tools frequently rely on capacity to take pragmatic context into account and on working memory skills, making it difficult to identify specific lexical, phonological, or morphosyntactic skills.

Spontaneous language samples can be informative, but participants may avoid producing more challenging structures, as these tend to be the very structures that are affected by impairment, limiting their diagnostic value. Moreover, they may avoid talking, and, as a result, produce simpler sentences even when they have no difficulties with complex syntax. In other words, complex constructions can be avoided as the result of syntactic impairment or of hypo-responsiveness (see Tuller et al. 2017).

Linguistic research has played an important role in complementing and refining clinical testing, as illustrated by an example from the field of DLD: by focusing on specific structures within a linguistic domain, finiteness marking (markers of tense and agreement encoded in verb endings, e.g. '-s' in *Mary runs*, or '-ed' in *John jumped*) became a well-established clinical marker of DLD (Rice and Wexler 1996). By controlling for memory and other skills,

researchers have developed targeted assessments that can identify selective impairments with far greater precision.

What cross-syndrome comparisons reveal about language impairment

Cross-syndrome comparisons offer a valuable framework for interpreting linguistic patterns in autism. Contrasting profiles across NDCs help distinguish language-specific deficits from the broader effects of intellectual disability, and establish whether vulnerable linguistic domains/structures are syndrome-specific or shared across conditions. Where syndromes have identifiable genetic causes, as in Down syndrome and Williams syndrome, such comparisons also allow consideration of how genetic factors shape language acquisition. Even among NDCs that share features such as intellectual disability, linguistic profiles can differ markedly. Individuals with Down syndrome typically show a distinct pattern of strengths and weaknesses, where grammar is particularly compromised relative to stronger concrete vocabulary and at least some aspects of pragmatic ability (Mattiuda et al. 2024; Panzeri et al. 2020). This makes Down syndrome an informative point of comparison for examining grammatical vulnerability in autism. Williams syndrome presents a contrasting profile, with relative strengths in grammar and vocabulary alongside difficulties with pragmatics (Mervis and John 2010), though recent research shows notable difficulties in complex late-acquired syntactic structures to be discussed below (Perovic and Wexler 2007, 2019).

Although many NDCs are characterised by delays in the emergence of first words and utterances, the ultimate linguistic outcomes of these individuals can vary widely with respect to which domain is most affected: lexicon, grammar/structural language, pragmatics, or some combination (Filipe et al. 2023; Perovic and Wexler 2025). This underlines the importance of specifying the domain of linguistic impairment, rather than treating language ability as a unitary construct.

Scope and aims of the current review

Rather than reviewing all studies on language difficulties in autism (see Schaeffer et al. 2025a for this), this review focuses on what is currently known about markers of impairment in the production and comprehension of spoken language in autistic individuals. In other words, we will concentrate on those aspects of language in autism which emerge in the literature as specific linguistic vulnerabilities. We suggest a research agenda in which hypotheses about potential markers are first constructed, then tested through custom-designed assessment tools, which, in turn, allows

² One exception is mental state terms (to be discussed in more detail below), which occupy an interface between lexical and pragmatic knowledge and warrant separate consideration: e.g. verbs such as *think*, *fear*, adjectives: *happy*, *sad*, nouns: *boredom*, *complaint*, can be challenging to autistic people as well as those with other NDCs (Brown et al. 2012; Eilon and Novogrodsky 2025a; Rumpf et al. 2012; Siller et al. 2014). Their comprehension and production also require understanding of one's own, and others' mental states, which may be linked to broader challenges with social cognition, i.e. Theory of Mind (ToM) - the ability to attribute mental states, such as intentions or beliefs, to oneself and to others (Premack and Woodruff 1978).

linguists to further refine the markers. As such, there is a reciprocal relationship between identifying and assessing markers of linguistic impairment.

This review differs from previous syntheses in three key ways: first, it reviews empirical markers of language impairment in autism across multiple languages. Second, it critically appraises the feasibility of using these markers in assessment tools suitable for autistic individuals from diverse backgrounds, including those with or without structural language impairment, with or without intellectual disability, multilingual and minimally speaking populations, as well as both male and female individuals (with sex differences expected primarily in pragmatics, based on current evidence). These are multiple dimensions of diversity that are rarely considered simultaneously in the literature. Third, it illustrates how these markers can be mapped to screening tools by examining a number of existing or emerging assessment instruments. We suggest that tools such as these could lay the groundwork for development of a standardised cross-linguistic baseline battery. Such a linguistic battery would initially serve to streamline comparative research on language in autism and, ultimately, could be adapted for clinical use, to improve identification of the nature of language difficulties in autistic individuals.

Markers of linguistic impairment through the prism of autism

Heterogeneity in autism

Identifying markers of language impairment in autism and other NDCs can be complicated by factors such as age, comorbid conditions, and heterogeneity of language and other cognitive skills. Particularly relevant here is heterogeneity of language abilities. Before discussing specific markers of impairment in each linguistic domain, it is important to note that several broad language profiles have been identified in autism.

About 30% of autistic individuals are minimally speaking (National Research Council 2001), producing no speech or only a few words and short phrases, though definitions vary (Koegel et al. 2020). While this may indicate impairment, little is known about the lexical, grammatical and pragmatic knowledge of these individuals. Importantly, absence of language production does not necessarily imply absence of language comprehension (see Chen et al. 2024; Schaeffer et al. 2023 for references).

In addition, a subgroup of autistic people, estimated at around 40% (Nolan et al. 2022), have autism with accompanying language impairment (variously referred to as ASD-LI ‘ASD with language impairment’ or ALI ‘autism with

language impairment’). This typically refers to structural language (see also ICD-11). Although these autistic people may have fluent speech, their grammar, or structural language, differs from neurotypical patterns, often resembling that observed in DLD (Loucas et al. 2008; Kjelgaard and Tager-Flusberg 2001), or Down syndrome (Perovic et al. 2013). Linguistic studies of ASD-LI suggest difficulties with sound structure (phonology), word structure (morphology), sentence structure (syntax) and/or sentence-level meaning derived from these structures (semantics).

A further group have typical (‘normal’) structural language skills (variously referred to as ASD-LN or ALN), comparable to neurotypical peers. However, this does not imply that skills in other language domains (e.g. pragmatics, lexicon) are typical. The following sections review some markers of impairment in each linguistic domain, highlighting distinctions between autistic individuals with and without accompanying structural language impairment.

Besides heterogeneity of language abilities, heterogeneity of intellectual abilities characterises autism as well: co-occurring Disorder of Intellectual Development (DID) is frequent in ASD. It is currently estimated to affect about 31% of autistic children (Wolff et al. 2022). Contrary to what is sometimes assumed, there is no straightforward association between co-occurring DID and co-occurring language impairment, whereby absence of DID coincides with typical structural language and presence of DID entails impaired structural language. Although prevalence rates of the relevant profiles remain uncertain due to under-representation of DID in studies on language in autism, evidence now indicates that both discrepant profiles can be observed: unaffected nonverbal intellectual abilities alongside language impairment, and the reverse (Silleresi and Tuller 2025). Failla et al.’s (2024) study on 60 young autistic children (aged 35–120 months) corroborates this: children with average IQ still showed weaker verbal comprehension than typical peers. Whether conditions frequently associated with ASD (DID, but also other NDCs, such as Attention-Deficit/Hyperactivity Disorder (ADHD), and medical conditions such as epilepsy further exacerbate language impairment remains to be established.

Markers of pragmatic impairment

Turning now to markers of linguistic impairment, we start with pragmatics. A common characteristic even among autistic individuals who produce fluent spoken language is a difficulty in comprehending or producing pragmatic (implicit) meaning. Pragmatic interpretation allows language producers (speakers and writers) and language comprehenders (listeners and readers) to go beyond the literal interpretation of statements. For example, irony occurs

when the intended meaning is the opposite of the literal one, as in the remark *What a beautiful day!* uttered during heavy rain. A recent meta-analysis of 29 articles confirms that autistic individuals show lower irony comprehension than non-autistic peers, tending to interpret irony literally (Pang et al. 2024). Panzeri et al. (2022), for instance, found that autistic Italian-speaking children ($n=26$, mean age 7;3) lagged behind not only age-matched non-autistic peers, but also younger peers matched for grammatical ability. A similar pattern is reported for adults by Deliens et al. (2018), who compared 24 autistic French-speaking adults with 24 non-autistic participants matched for age and gender.

Some autistic individuals may find it challenging to recognise what is relevant in a conversation and to interpret indirect or implied meanings in everyday interactions, deriving so-called particularised conversational implicatures. For instance, if someone asks whether they may sit in an empty seat, some autistic people may interpret the response *My daughter just went to find a bathroom* as purely factual, missing the implied refusal (Katsos and Vicente 2025). The refusal is derived via the assumption that the speaker wanted to be cooperative and to provide an answer (i.e. to be relevant), conforming to the Gricean Principle of Cooperation and conversational maxims (Grice 1975). The pivotal study of Surian et al. (1996) found that English-speaking autistic children ($n=8$, mean age 12;11) showed greater difficulty detecting violations of conversational maxims than peers with DLD ($n=8$, mean age 11;10), despite comparable grammatical competence (the grammar comprehension age equivalent for ASD was 5;7 and for DLD 5;9, indicating language impairment in both groups: ASD-LI and DLD). With regards to adults, Wilson and Bishop (2021) found that English-speaking autistic adults ($n=71$) were over twice as likely as non-autistic people ($n=120$) to choose the infelicitous inference in a task assessing the derivation of conversational implicatures: they tended more to record “do not know” responses when given the opportunity, possibly signaling a preference for more certain, explicit information. In contrast, Jary et al. (2025) found that autistic and non-autistic adults performed similarly on a laboratory task assessing conversational implicature comprehension ($n=78$ in each group). The authors speculated that the discrepancy between their results and those typically reported in the literature (the difficulties in comprehending implicitly communicated information in autism) could reflect differences between the demands of real-world interactions and those of laboratory-based experiments. These findings suggest that perhaps a more ecological assessment of these types of abilities is needed.

Other important aspects of holding a conversation include turn-taking (i.e. when is it appropriate to speak?), maintaining the topic of the conversation, knowing when it

is appropriate to change the topic, providing the expected amount of information, dealing with inferences, prosody, figurative speech and reference, and interpreting nonverbal cues (Cummings 2014). For many autistic individuals, this is overwhelming, even for those who may do well in assessments of specific pragmatic skills or have good structural language, lexical, and intellectual abilities. A recent study with 100 autistic English-speaking individuals with no intellectual disability (age range 10–37) shows difficulties in the aspects mentioned above in a conversational task (Landau et al. 2026). Furthermore, Sng et al. (2018) conducted a literature review spanning 18 studies on a wide range of conversational abilities in autistic individuals, including one study with adults. They report that autistic individuals with and without intellectual disability had more difficulties preserving a conversation than individuals with typical development and tended to resist topic shift (e.g. through perseveration).

In other cases, understanding the intended meaning requires reference to linguistic or situational context. For example, linguistic expressions such as pronouns (*she/her/it, they/them*) refer to previously mentioned or contextually identifiable individuals or objects. In *Lisa is a teacher. She is smart*, the pronoun *she* refers to *Lisa*. Autistic individuals may produce sentences in which the referent of the pronoun is unclear to the hearer. For example, they might use the pronoun *he* in the sentence *Once upon a time there was a frog and he said, “Frog, where are you?”*... when referring to a boy pictured in a storybook who has not yet been introduced. This was shown in, for example, a study by Novogrodsky and Edelson (2016) on a group of 24 English-speaking autistic children age 6;1–14;3 with relatively high levels of cognitive ability. Autistic people may also avoid using pronouns altogether, repeating names instead, as reported by Arnold et al. (2009) in a study with 23 autistic participants age 9–17 without intellectual disability. The underlying difficulty may not be because of a lack of knowledge about pronouns per se (i.e., not a problem with morphosyntax), but because of challenges with discourse coherence, shared knowledge, and perspective-taking, all part of pragmatics.

The choice between a definite article (*the*) and an indefinite article (*a*) is also related to reference. Dutch-speaking autistic children have been shown to use an indefinite article where a definite article is expected, as in *Look, there is Ernie and a ball. Ernie is rolling a ball* (Schaeffer et al. 2018: $n=27$, age range 5–14, IQ in typical range). Autistic individuals may also avoid using articles altogether in languages that only have definite articles, such as Hebrew (Meir and Novogrodsky 2023: $n=21$, age range 4–9). Similar to the Dutch findings, this renders indefinite instead of definite meaning.

The use of connectives to indicate causes (e.g. *because*), temporal order (e.g. *before*) or goals (e.g. *so that*) is also part of pragmatics, as they add to the coherence of stories. Research on narrative production in English shows that this is also an area of difficulty for autistic individuals (Diehl et al. 2006: $n=17$, age range 9–17, no intellectual disability). Autistic children may use fewer connectives to indicate causes, temporal order or goals, leading to narratives that sound fragmented, as shown by, for example, Peristeri et al. (2017) in Greek ($n=30$, age range 6–11, no intellectual disability). For example, they might say: *The elephant-girl started running, she wanted to arrive first at the swimming pool, she slipped*.

The pragmatic challenges described above are closely related to Theory of Mind (ToM): to comprehend irony, interpret referential expressions or produce coherent narratives, speakers must reason about the listener's knowledge and intentions. Such skills are increasingly referred to as 'social pragmatics' (Andrés-Roqueta and Katsos 2017). Other pragmatic phenomena rely more heavily on grammatical (structural language) competence, sometimes referred to as 'linguistic pragmatics' (Andrés-Roqueta and Katsos 2017). Here, the presence or absence of structural language impairment plays an important role. Crucially, the pragmatic difficulties described above, in the comprehension of irony, the use of reference, and in the production of narratives, are observed across the autism spectrum, including in individuals with ASD-LN. The linguistic pragmatic phenomena discussed below, e.g. indirect requests, scalar implicatures, and metaphor comprehension, show a different pattern: difficulties emerge primarily in individuals with ASD-LI, suggesting these challenges stem from structural language deficits rather than from autism per se. This is corroborated by findings from individuals with DLD, who have been reported to have difficulties with indirect requests (Giberga et al. 2025), scalar implicatures (Katsos et al. 2011), and metaphor comprehension (Norbury 2005; Bühler et al. 2018).

For example, recent studies have found that autistic individuals with ASD-LN correctly interpret indirect requests (e.g., *Can you pass me the salt?*) as a request rather than a yes/no question, given the context (Marocchini et al. 2022: $n=14$, age range 9–12, no intellectual disability, Italian). Earlier studies concluding that indirect requests were misinterpreted in autism (e.g. Paul and Cohen 1985) likely involved participants who would now be classified as ASD-LI suggesting that it is the presence of a language impairment, rather than autism per se, that accounts for this pragmatic difficulty (see Prinz and Ferrier 1983).

A related pattern is found for scalar implicatures. A scalar implicature is derived when someone chooses a weaker word (like *some*) instead of a stronger word (like *all*), which makes the listener think the stronger statement is probably

not true. For example, using *some* in the sentence *Some birds are white* implicates that not all birds are white. Individuals with ASD-LN generally have no difficulty deriving scalar implicatures (Andrés-Roqueta and Katsos 2020; Pijnacker et al. 2009; but cf. Mazzaggio et al. 2021 for different results). However, there are currently no data to establish whether children with ASD-LI have difficulties in this domain.

Some instances of figurative language, e.g. commonly used metaphors (*a tsunami of emails*), idioms (*kick the bucket*), proverbs (*Every cloud has a silver lining*), or metonyms (*the crown*, when referring to the monarchy), can pose challenges. Again, research suggests that difficulties, especially with metaphors, are strongly linked to language ability: individuals with ASD-LN typically understand metaphors well, while those with ASD-LI struggle more (Norbury 2005: $n=31$ ASD-LI, $n=29$ ASD-LN, age range 8–15, English). Kalandadze et al.'s (2018) meta-analysis of 41 studies on figurative language comprehension (including metaphor comprehension and idioms) in autism in English, Hebrew, Japanese, Taiwanese, Korean, Cantonese, Chinese, Danish, French, German, and Dutch, concludes that core language skills are a strong predictor of figurative-language performance in autism.

These pragmatically enriched meanings (i.e. interpreting *Can you...* question as a request, strengthening *some* to 'not all,' interpreting commonly used metaphors, metonyms and idioms) are conventionalised through frequent use (Andrés-Roqueta and Katsos 2020). As such, they are accessible to autistic individuals with good structural language skills, and do not necessarily require reasoning about other people's intentions (as social-pragmatic phenomena do).

In sum, while social pragmatic difficulties appear to be a core feature of autism across language and cognitive profiles, linguistic pragmatic challenges seem more closely tied to the presence of structural language impairment. More research is needed across the pragmatic phenomena described above, in both ASD-LN and ASD-LI, to reach stronger conclusions.

Markers of grammatical/structural language impairment

Markers of impairment in morphosyntax

Individuals with ASD-LI experience difficulties with a range of morphosyntactic structures. One example involving verbs and verb phrases in English is the prolonged omission of tense and agreement (finiteness) markers, where the child produces a bare infinitival form, rendering the utterance ungrammatical, e.g. *Mommy work*. For example, Roberts et al. (2004) showed that a subgroup of 5–15-year-old

autistic children with language impairment ($n=19$) showed high rates of finiteness omission, whereas autistic children of similar ages without language impairment ($n=27$) performed much better. This pattern was replicated by Modyanova et al. (2017), assessing 46 autistic children with language impairment and 37 without language impairment aged 4–16 on finiteness marking and broader morphosyntactic abilities.

In the nominal domain (involving nouns and noun phrases), the morphosyntax of pronouns (e.g. *they/them/themselves*, *she/her/herself*) often gives rise to difficulty. Children with ASD-LI acquiring French often omit clitic pronouns in the object position (*l'ours le pousse* – *the bear him pushes* – ‘The bear is pushing him’) (Prévost et al. 2018: $n=14$ ASD-LI, $n=5$ ASD-LN, age range 6;3–12;9). English-speaking autistic children and adolescents with ASD-LI but not ASD-LN have been reported to struggle with the interpretation of reflexive pronouns (*herself*, *himself*). Instead of interpreting the reflexive pronoun as coreferential (e.g., *Mary washes herself*, where *Mary* and *herself* refer to the same person), they may interpret it as referring to someone else in the discourse (e.g., *Mary washes her*, where *her* refers to another person) (Perovic et al. 2013: $n=26$ ASD-LI, $n=22$ ASD-LN, age range 6;1–18;6). Further examples, involving the morphosyntax of both the verbal and the nominal domain, include the reverse interpretation of both short and long passives by autistic children, such as *The dog was chased (by the cat)* where the passive subject, *the dog*, is incorrectly understood as the agent, ‘the chaser’ (English: Tager-Flusberg 1981: $n=18$, age range 3;11–13; Perovic and Wexler 2026: $n=26$ ASD-LI, age range 6;1–18;6; French: Durrleman et al. 2017: $n=20$ ASD, age range 7;8–10;11). Passives involving psychological verbs prove more difficult still, as in *Kim is loved by Robin* (French: Durrleman et al. 2017; English: Perovic and Wexler 2026). Comprehension of ‘raising’ structures, in which the subject has raised to sentence-initial position from a position further down (*Kim seems to Robin to be driving a car*), has also been shown to be more problematic than the equally long, but syntactically simpler, unraised structures (*It seems to Robin that Kim is driving a car*) (Perovic et al. 2007: $n=11$ ASD; age range 6–16). Additionally, complex *wh*-questions, such as *wh*-object questions (e.g. *Who did the mother hug?*) are found to be more difficult than *wh*-subject questions (e.g. *Who hugged the mother?*) (French: Durrleman et al. 2016: $n=15$ ASD, age range 6–16; Prévost et al. 2017: $n=20$ ASD, age range 6–12). A related structure is the object relative clause, e.g. *We know the child that the mother hugged*, which has been found to be more difficult to interpret for autistic individuals than the subject relative clause: *We know the child that hugged the mother* (Riches et al. 2010: $n=16$ ASD-LI, age range 14–15;4).

It is likely that the challenges reported in the studies above reflect the inclusion of children with ASD-LI in the same sample. More recent research which formally distinguishes between ASD-LN and ASD-LI suggests that the markers discussed above are present in ASD-LI but absent in ASD-LN (for passives, see Perovic and Wexler 2026).

Finally, we would like to draw attention to a proposed linguistic marker of autism that has received considerable attention in the literature and is also frequently reported in clinical practice: an apparent advantage of language production over language comprehension in autistic individuals with expressive language (see Boucher 2012; Davidson and Weismer 2017; Gernsbacher et al. 2016; for reviews). However, empirical support for a production advantage in autism remains inconclusive. In their review of studies directly comparing language production and comprehension, as well as studies focusing on either modality separately, Kwok et al. (2015) found no consistent evidence for such an advantage. Similarly, Prévost et al. (2017) reported no evidence of a production-comprehension discrepancy in their study of *wh*-question production and comprehension in autistic children, including children with DID. These findings are consistent with those of Kjelgaard and Tager-Flusberg (2001), who found no receptive-expressive discrepancy in vocabulary, semantics, or syntax among 89 autistic children aged 4 to 14 years, both with and without DID. The findings of Prévost et al. (2017) are particularly important because they concern specific aspects of structural language rather than broad language measures. In contrast, the studies reviewed by Kwok et al. (2015) overwhelmingly relied on vocabulary tests or composite language scores. As a result, the available evidence does not provide strong support for the claim that language production is systematically stronger than language comprehension in autism.

Markers of impairment in sentence-level semantics

The field of semantics is severely under-investigated in autism. Semantics explains how the meaning of a sentence is derived from combining the meanings of words according to the combinatorial rules of words, phrases and sentences (morphosyntax). For example, the meaning of the sentence *All the children are not in the pool* depends on how the word *not* is combined with the word *all*. If *not* ‘takes scope’ over *all*, it means ‘not all the children are in the pool’ (‘inverse scope’). If *all* ‘takes scope’ over *not* (consistent with the linear order of *all* and *not*) it means ‘none of the children are in the pool’. As such, the meaning of the sentence is ambiguous, although (English and French) neurotypical adults usually prefer the inverse scope meaning ‘not all the children are in the pool’ (Foppolo and Panzeri 2025).

A study by Noveck et al. (2007) showed that French-speaking autistic adolescents ($n=15$) understood sentences with two interacting function words such as *All the children are not in the pool*. Nevertheless, 40% of them consistently preferred the meaning ‘none of the children are in the pool’ whereas neurotypical adult control groups preferred the other, ‘inverse scope’ meaning ‘not all the children are in the pool’. This may suggest that some autistic individuals prefer to rely on linear word order (*all* precedes *not*). Unfortunately, the study does not provide information about the structural language skills of the autistic participants, so we do not know whether the linear order meaning (‘none of the children are in the pool’) was provided mainly by individuals with ASD-LI or whether ASD-LN participants also preferred this meaning.

Since semantics is closely tied to syntactic and morphological processes, individuals with ASD-LI may find it more difficult to understand the meaning of complex expressions. For example, English-speaking autistic adolescents with lower language scores in Brock et al.’s (2008) study (subgroup of $n=7$) demonstrated reduced ability to integrate verbal and visual cues (that is, they did not show anticipatory looks at an animate object – a hamster – upon hearing the verb *stroke*). Furthermore, Kambanaros et al. (2019) showed that, although autistic Greek-speaking children ($n=4$ ASD-LI, age range 6;3 to 8;9) could recognise the components of a compound expression (e.g. *tomato juice*; *mouse trap*), some struggled to explain its meaning, similar to children with DLD.

As discussed in Foppolo and Panzeri (2025), the little existing research (often with small samples) suggests that autistic individuals with typical structural language abilities generally do not face significant difficulties with semantics. For example, autistic children with typical structural language skills can integrate the meaning of a verb to predict its object: upon hearing *Kim ate...*, they would look for an edible item (Brock et al. 2008; subgroup of $n=11$, adolescents; Bavin et al. 2016: $n=48$ ASD-LN, age range 5–9). They can also understand semantic roles, not only in a language like English, where the relatively rigid word order subject-verb-object (SVO) often mirrors the order of the semantic roles (agent-patient/theme) (Swensen et al. 2007: $n=10$, age range 27–41 months), but also in Mandarin Chinese, which permits omissions and various combinations of the elements of the sentence and so cannot rely on word order alone to signal who did what to whom (Su and Naigles 2019: $n=70$, variable language skills, age range 4;4–5;9). In this last study, better language ability predicted stronger performance.

Evidence from online methods suggests that autistic individuals, even those with strong structural language skills, may show slower or less efficient real-time sentence

processing (Brock et al. 2008; Bavin et al. 2016), and that comprehension of complex logical structures involving multiple operators (e.g. quantifiers and disjunction: *Every child got a star fish or a shell*) can show developmental delays or increased variability (Noveck et al. 2007; Su and Su 2015).

Markers of impairment in phonology and prosody

Similar to morphosyntax and semantics, phonology is part of structural language competence and is concerned with the building blocks of sounds: abstract units, e.g. phonemes (vowels and consonants) and syllables, and the rules that govern them, both language-universally and language-specifically. The phonological impairments discussed here reflect difficulties with these abstract units and rules, and are distinct from speech-sound disorders (these involve motor execution rather than phonological knowledge), though comorbidity between the two is possible.

A number of studies report significant rates of phonological impairment in autistic children (e.g. Rapin et al. 2009: $n=82$, age range 7–9, English; Tuller et al. 2017: $n=20$, age range 6–12, French). During the babbling stage, when consonant-vowel sequences are typically produced (e.g. *dadada*), babies that are autistic or at risk for ASD produce fewer speech-like vocalizations, fewer syllables, and less variety in syllable types (Paul et al. 2011: $n=85$, age range 6–24 months, English; Schoen et al. 2011: $n=30$, age range 18–36 months, English). Many autistic children experience prolonged difficulty with complex syllable configurations, such as those containing consonant clusters (Tuller et al. 2017), such as *str* and *ct* in the word *strict* or complex vocalic sounds such as diphthongs, e.g. *ou* in *stout* (Wu et al. 2020: $n=16$, age range 3–6, Mandarin Chinese). This is also evidenced by low performance on nonword repetition tasks designed to assess a range of complex syllables in French-speaking children (Silleresi et al. 2020: $n=51$, age range 6–12, French).

Prosody is linked to phonology, as it builds on sound structure and refers to rhythm, stress assignment, and intonation. It conveys emotion, irony, and sarcasm (interacting with pragmatics), and emphasis or focus (interacting with morphosyntax). Research suggests that autistic people may use prosody differently from neurotypicals, and that this affects their ability to communicate (Paul et al. 2005: $n=27$, age range 14–21, English; Peppé et al. 2011: $n=31$, age range 6–13, English). For example, prosody helps distinguish interrogative sentences (e.g., *Anne walked to school?* spoken with a rising intonation) from declaratives (e.g., *Anne walked to school.* spoken with falling or level intonation). Mandarin-speaking children with ASD-LI were found to fail to use such prosodic cues appropriately (Huang et al. 2025: $n=32$ ASD-LI, age range 4–6). Prosody also

distributes prominence within words and sentences, determining rhythm in a language, which, in turn, supports word and sentence structure. For instance, at the sentence level, prominence marks new information: in the sentence *Bill did the laundry*, the higher pitch is on *Bill* if it is used to answer the question *Who did the laundry?*, and on *laundry* if it is the response to *What did Bill do?*. Atypicalities in rhythm synchronization and duration processing have been identified in autistic individuals (Franich et al. 2021: $n=10$ ASD without intellectual disability, age range 22–31, Cantonese).

Markers of impairment at interfaces

Autistic people also struggle with certain linguistic phenomena that are at the ‘interface’ between pragmatics and another language domain, i.e. pragmatics and the lexicon, or pragmatics and syntax. In particular, storytelling, or narrative production requires integration of a range of linguistic skills: forming grammatically correct sentences (morphosyntax), sequencing events logically (pragmatics), using appropriate vocabulary and including mental state terms to convey story characters’ thoughts, feelings and intentions (lexicon), while keeping track of listeners’ knowledge (pragmatics).

Autistic individuals’ comprehension and production of mental state terms, which sit on the interface between lexicon and pragmatics (and even ToM), often diverge from neurotypical patterns. Baron-Cohen et al. (1986) reported that autistic children ($n=21$, age range 6–16) performed typically on sequencing tasks for stories requiring mechanical understanding (e.g., rolling a ball into the sea) or behavioral understanding (e.g., grabbing an ice cream from someone). In contrast, they struggled with stories requiring mental state reasoning (understanding others’ intentions), such as ToM scenarios where a character’s knowledge differs from reality or from another character’s knowledge (e.g., a boy takes a teddy from a girl *without realizing* she sees him).

Studies also show that autistic individuals use fewer mental state terms in their narratives (e.g. Brown et al. 2012: $n=30$, age range 6–14, English; Siller et al. 2014: $n=21$, mean age 7;2, English). However, findings are not uniform. Methods sometimes conflate mental state terms with related but distinct physical terms: *happy* (mental state) and *smile* (physical state), potentially masking selective difficulties (Losh and Capps 2003). Evidence nonetheless shows that autistic children produce fewer cognitive (*think*, *want*) and emotional (*worry*, *fear*) verbs than peers, and that gaps persist with age. Performance correlates with syntax and ToM skills, but autism diagnosis predicts unique variance, suggesting that mental state terms may serve as sensitive, cross-linguistic markers of lexical–pragmatic difficulty (Eilon and Novogrodsky 2025b: $n=59$, age range 3–10;7, Hebrew).

Furthermore, there are phenomena that, in and of themselves, sit on the syntax-pragmatics interface and pose problems for autistic individuals. An example is pronouns, which are discussed above in both the sections on pragmatics and on morphosyntax. As pronouns (e.g. *they*, *her*, *himself*) are linguistic expressions that refer to a person or object in the world and contribute to story coherence, they have pragmatic properties. At the same time, they have syntactic properties, such as their position in the sentence and person, number and gender marking. As such, difficulty with pronouns can be considered a marker of impairment at the syntax-pragmatics interface. Further investigation is needed to determine whether difficulties with pronouns (reflexive pronouns; object clitics) in autism are indeed morphosyntactic in nature or whether they may result from the pragmatics skills of autistic individuals.

Finally, some studies suggest that even individuals with ASD-LN may show subtle difficulties with more complex grammatical structures, such as center-embedded object relative clauses (*The dog [that the cat is chasing] is brown*, Durrleman et al. 2015; Manenti et al. 2023). It is not clear whether this is a real impairment in structural language or a ‘spill-over’ of (social) pragmatic difficulties that are common to autistic people. Tasks that test this grammatical phenomenon may involve pragmatically infelicitous contexts that confound performance on the complex grammatical structure.

Summary: markers of linguistic impairment in autism

To sum up, linguistic impairment in autism may occur in pragmatics, in grammar/structural language, including morphosyntax, semantics, phonology and prosody, or in interfaces between pragmatics and other language domains. Table 1 provides an overview of these markers as identified to date in research on autistic individuals with (ASD-LI) and without (ASD-LN) structural language difficulties across languages.

Screening for language impairment in autism

Preliminary remarks

Before providing details of specific assessment approaches, we would like to clarify the scope and rationale of the tools we recommend in this section. Our focus is primarily on linguistically-grounded assessments that have been developed or adapted to target the markers of impairment in each linguistic domain. The immediate goal of these tools is for

Table 1 Overview of markers of linguistic impairment in autism

Domain	Marker (=difficulty with)	Example	ASD-LI	ASD-LN
Pragmatics				
<i>Social Pragmatics</i>				
	Irony comprehension	<i>What a beautiful day!</i> (uttered during heavy rain)	✓	✓
	Reference	<i>Lisa is a teacher. She is smart. Look, there is Ernie and a ball. Ernie is rolling the ball.</i>	✓	✓
	Connectives	<i>because, although</i>	✓	✓
<i>Linguistic Pragmatics</i>				
	Figurative language	Metaphors (<i>atsunami of emails</i>), idioms (<i>kick the bucket</i>), proverbs (<i>Every cloud has a silver lining</i>), metonyms (<i>the crown</i> – ‘the monarchy’)	✓	-
	Scalar implicatures	<i>Some birds are white</i> → not all birds are white	✓	-
	Indirect requests	<i>Can you pass me the salt?</i>	✓	-
Structural language/grammar				
<i>Morphosyntax</i>				
	Finiteness marking on verbs	<i>Robin cleans/cleaned</i>	✓	-
	Passives with actional and psychological verbs	<i>The dog was chased by the cat</i> <i>Kim was loved by Robin</i>	✓	-
	Object clitics (French)	<i>L'ours le pousse</i> – ‘The bear is pushing him’	✓	-
	Object relative clauses	<i>We know the child [that the mother hugged]</i>	✓	?
	Raising	<i>Kim seems to Robin to be driving a car</i>	✓	?
	Reflexive pronouns	<i>Lisa washes herself</i>	✓	-
	Object wh-questions	<i>Who did the mother hug?</i>	✓	-
<i>Semantics</i>				
	Sentences with multiple operators	<i>Every child got a star fish or a shell</i> <i>All the children are not in the pool</i>	✓	-
<i>Phonology</i>				
	Syllable variety in babbling	<i>dadada – gagaga</i>	✓	-
	Consonant clusters	<i>strict</i>	✓	-
<i>Prosody</i>				
	Intonation, stress, rhythm	<i>Kim kissed Robin?</i> vs. <i>Kim kissed Robin.</i>	✓	-
<i>Interfaces</i>				
	Lexicon–pragmatics interface	Mental state terms <i>think, fear, happy, sad, boredom</i>	✓	✓
	Syntax–pragmatics interface	Pronouns <i>she/her, I/me, they/them</i>	✓	✓

Markers apply to languages that have the relevant structure or phenomenon

ASD-LI Autism Spectrum Disorder with Language Impairment, ASD-LN Autism Spectrum Disorder without Language Impairment, ✓ impaired, – not impaired or not applicable

use in research, so that cross-laboratory/cross-linguistic research can be conducted. The long-term goal is to refine and adapt these tools for use in clinical contexts and thus contribute to better identification of the specific language needs of each autistic person. Many of these tools are recent developments, some still in planning stages, and we acknowledge that empirical evidence for several remains

limited. We highlight them not because they represent the only viable assessment approaches, but because they exemplify systematic, internationally-coordinated efforts by linguists to build assessment tools directly from theoretical insights about language and impairment patterns in autism. As such, they constitute illustrations of the work

being carried out by linguists in a number of countries and research laboratories.

The task designs proposed in this section follow the basic criteria adopted by the LACA (Language Abilities in Children with Autism) network and outlined in Schaeffer et al. (2025b).³ Specifically, they are intended to: be short; assess the relevant linguistic domain with minimal influence of other cognitive domains; require a minimal amount of verbal instruction so that individuals with poorer language skills can participate; be appropriate for individuals of different ages and levels of functioning; be applicable across languages and cultures, across NDCs (which enables direct comparison of results in transdiagnostic studies); suitable for both monolingual and multilingual speakers; intended to be available to researchers and, ultimately, clinicians. Existing tasks often do not meet these criteria and may therefore be less suitable. One commonly used standardised assessment targets syntax production: the Recalling Sentences subtest from the Clinical Evaluation of Language Fundamentals 5 (CELF-5, Wiig et al. 2013). It requires the test-taker to repeat sentences of unequal length that sometimes contain difficult words, meaning it does not test syntax alone but also phonological (short-term verbal) memory and vocabulary. Furthermore, it does not systematically assess morphosyntactic structures that have been identified as markers of language impairment: it covers finiteness and long passives with actional verbs, while omitting object *wh*-questions, reflexive pronouns and passives of psychological verbs, and severely underrepresenting object relative clauses (e.g. one object relative clause vs. five subject relative clauses in the English version, and none in the Dutch version).

Another example is the Test of Reception of Grammar, 2nd edition (TROG-2, Bishop 2003), testing grammar comprehension with a picture selection task. Like CELF, it does not include key markers of morphosyntactic impairment such as passives of psychological verbs, reflexive pronouns, and object *wh*-questions. Moreover, its picture selection format places a high nonlinguistic cognitive load on the participant, requiring visual processing and comparison of four pictures before pointing at the target, which may mask actual morphosyntactic knowledge in autistic individuals.

Furthermore, existing pragmatic tests (e.g. the Assessment Battery for Communication, AbaCo, Angelieri et al. 2016) typically focus on general communication skills such as turn-taking, staying on topic, prosody, gesturing, politeness, etc., while pragmatic (implicit) meaning and irony (often problematic for autistic individuals) feature minimally or not at all. Not knowing exactly what the scores

on these tests reflect (e.g. syntax, vocabulary or pragmatic skills, or visual processing, memory, or turn-taking abilities) hinders the development of adequate, targeted intervention strategies.

The sparsity of research on certain linguistic domains in autism, such as semantic abilities, prevents the identification of clear markers specific to autism in this area. As a result, there are no tests to assess sentence-level semantic skills in autistic individuals to date.

The tools presented in this section are intended to provide a more valid initial profile of language strengths and challenges in autism and other NDCs than existing standardised language assessment tools. However, many are still under development or in the process of validation, and not yet ready for clinical use. Depending on the researcher's or clinician's needs, the respective tests can be administered in isolation or in combination. For each tool, we present the motivation and constraints behind its development, preliminary results where available, and the current state of progress. Clinicians seeking validated tools for immediate clinical use should continue to rely on established standardised batteries.

Screening pragmatic impairment – work in progress

As outlined in Sect. "Markers of pragmatic impairment", research shows that pragmatics is the language domain that raises difficulties for most autistic people. Nevertheless, there are no assessments that systematically target the markers of pragmatic impairment discussed above.

Existing tests, such as the Assessment Battery for Communication (AbaCo, Angelieri et al. 2016; Traetta et al. 2025), test general (nonverbal) communication skills (e.g. turn-taking, topic maintenance, gesturing) rather than the social and linguistic pragmatics markers for autism identified in Sect. "Markers of pragmatic impairment".

Sng et al.'s (2018) systematic review of 18 studies on conversational abilities in autistic individuals reveals some further issues with existing methodologies. The authors report that variables are sometimes conflated, making it difficult to isolate specific factors and potentially masking differences between autistic and non-autistic individuals. To illustrate, in their discussion of the only study involving autistic adults (Eales 1993), Sng et al. noted that one single variable (impairment of relevant communicative intention) spanned over different types of utterances, including utterances with inappropriate persistence on a topic, irrelevant on-topic information, and utterances that are inappropriately uninformative. It may thus be the case that group differences do exist for some of the sub-variables but not for others. Collapsing the data on all the sub-variables may lead to a lack of group differences overall.

³ The LACA network brings together researchers across the world investigating all aspects of language in autism. One of its objectives is to identify appropriate assessment methods for autistic individuals across the spectrum.

Members of the LACA network are currently in the process of developing a pragmatic test including the social and linguistic pragmatic markers discussed in Sect. "Markers of pragmatic impairment": irony comprehension, identification of implicitly communicated meaning based on linguistic knowledge (i.e. scalar implicatures, such as the enrichment of *some* with 'not all') and on contextual considerations (i.e. ad hoc implicatures, such as understanding that if there is a man with a hat, and a man with a hat and glasses, *the man with the hat* should be taken to refer to the man with the hat and no glasses), and sensitivity to the violation of conversational maxims (e.g., realizing that *it has sleeves and a hole for the head* is not an adequate description for a red t-shirt).

However, testing pragmatics in a structured lab setting has its limitations. Pragmatics is a language domain that is reflected best in language chunks larger than words or sentences, e.g. in social conversation or in (oral or written) texts. Thus, a structured lab test may not reflect participants' true pragmatic skills, as also suggested by Jary and colleagues (2025) for the derivation of conversational implicatures (see Sect. Markers of pragmatic impairment).

To address these issues, researchers at the University of Tours and Saint Joseph University of Beirut have started developing a more naturalistic, conversation-based method that isolates specific pragmatic aspects to highlight behaviour characteristic of autism. For example, implicit requests for clarification (e.g. *I don't know this* or *I don't understand this*) or implicit openings (e.g. *I don't practice this sport, but I practice another one*) typically elicit responses such as providing further explanations or asking follow-up questions, responses that autistic people may not produce. Asking questions during a conversation could also be useful to monitor the quantity and the relevance of the information provided by the interlocutor in the response.

Prévost (2024) piloted such a semi-guided conversation protocol with 16 autistic and 16 neurotypical French-speaking adults. Based on a protocol used informally by speech-language pathologists at the Tours Autism Center, it includes questions on the participant's work and/or studies, their hobbies and interests, and elicitation of a story (about a movie or a book). The results of 14 out of 16 autistic participants were below the threshold based on the neurotypicals' behaviour (see also Poulain 2022). Atypical pragmatics included providing too much information in their responses to questions and misunderstanding implicit openings. While larger-scale replications are needed, including studies with autistic children and children and adults with other NDCs, these findings suggest that conversation-based assessments can target pragmatic abilities in real time, distinguishing between clinical and nonclinical populations.

Screening grammatical/structural language impairment

Morphosyntax

Production of morphosyntax: Sentence Repetition Assessment of morphosyntax is more developed. For example, Sentence Repetition (SR) tasks have been shown to effectively assess morphosyntactic abilities in individuals with NDCs, including autism and DLD (Riches et al. 2010; Ward et al. 2024). They test production, but also comprehension of morphosyntax: in order to repeat a sentence correctly, proper understanding of the morphosyntactic structures featuring in the sentence is a prerequisite. A good illustration of an SR task adhering to the criteria outlined in Sect. "Preliminary remarks" is the LITMUS-SR task, freely available in many languages (Marinis and Armon-Lotem 2015).⁴ Participants listen to a stimulus and are asked to repeat it verbatim, with minimal instructions: *Repeat exactly what you hear*. It is short and takes only a few minutes to administer. Most versions of the test contain 30 items (English: Marinis and Armon-Lotem 2015; Dutch: de Jong et al. 2021; French: Fleckstein et al. 2018; Hebrew: Armon-Lotem and Meir 2016; Russian: Armon-Lotem and Meir 2016), though shorter 16-item versions are being validated, e.g. French (Prévost et al. 2019), Dutch (van Barneveld et al. 2023) and German (Abed Ibrahim et al. 2026).

Unlike other SR tasks, the LITMUS-SR includes sentence structures that are rarely produced in spontaneous speech, but are known to be challenging for children with different NDCs, across different languages. Crucially, it includes the markers of morphosyntactic impairment discussed in Sect. "Markers of impairment in morphosyntax", e.g. finiteness, different types of long passives, object relative clauses. It also minimizes interaction with the examiner, as well as the potential effects of other (linguistic and nonlinguistic) cognitive domains. For example, performance on the SR task is not affected by pragmatics as each sentence is decontextualized: it is presented in isolation, without conversational or situational context, which prevents the need for the participant to infer its meaning based on preceding discourse, shared knowledge, or social cues. The individual sentences are not differentially affected by memory either, as all sentences have comparable numbers of syllables. Finally, a strong effort was made to use age-appropriate words, so that lexicon would not be an influencing factor in this test that is meant to measure morphosyntactic skills.

⁴ The LITMUS (Language Impairment Testing in Multilingual Settings) sentence repetition task was developed during COST Action IS0804 (2009–2013), along with the non-word repetition task and the narrative task discussed here (see <https://www.litmus-srep.info/>).

The LITMUS-SR task has been shown to be appropriate to use for both autistic toddlers, children, and adults, with task completion rates over 80%, in studies including participants with the full range of required support (e.g. Silleresi et al. 2020: $n=51$ with varying language and intellectual abilities, age range 6–12, French; Manenti et al. 2023: $n=39$ with varying language and intellectual abilities, age range 18–57, French; Michel et al. 2026: $n=9$ with varying language and intellectual abilities, age range 3;6–5;11, French). This is substantially higher than the 50% or below completion rates with standardised tools such as the CELF (e.g. Kjelgaard and Tager-Flusberg 2001). Interestingly, even though some autistic individuals may be prone to echolalia, i.e. repeating sentence fragments out of context, this does not appear to enhance their performance on SR tasks (Silleresi 2023).

Studies that have compared ASD-LN and ASD-LI children using LITMUS-SR have reported significantly higher performance in the ASD-LN group (Bataillon et al. 2025; conference presentation: $n=7$ ASD-LN, $n=8$ ASD-LI, age range 7–12; Silleresi 2018: $n=23$ ASD-LN, $n=14$ ASD-LI, age range 6–12).

The task has also been successfully used with bilingual/multilingual autistic children. Meir and Novogrodsky (2020) used the Hebrew and Russian LITMUS-SR tasks with 28 autistic children without intellectual disability (14 monolingual Hebrew-speaking, 14 bilingual Hebrew–Russian-speaking, age range 4;6–9;2), finding that the task correctly identified 12 of the 14 monolingual children as at risk for language impairment, and also distinguished between the bilingual children with ASD-LI and ASD-LN. These findings are in line with a number of studies arriving at this conclusion for bilingual children with DLD (Armon-Lotem and Meir 2016; Taha et al. 2021; Tuller et al. 2018).

The LITMUS-SR has also been used to compare children with ASD to children with other NDCs. Silleresi (2018) included 26 French-speaking children with DLD matched in age to her autistic participants. Children with ASD-LI ($n=14$) scored significantly lower than the DLD group, and both groups performed below the ASD-LN group ($n=23$). Bataillon et al. (2025; conference presentation) compared their autistic participants with 21 children with DLD and 15 with IDD, 12 of whom had language impairment. Examining whether children preserved target sentence structures in their repetitions, the authors found that all three language-impaired groups performed equally poorly, while the ASD-LN group scored as high as age-matched neurotypical children ($n=54$), significantly above all language-impaired groups. The adult version of the French LITMUS-SR has also been used to compare ASD to DLD. Prévost et al. (2026; conference presentation) tested 176 adults aged 19–65: 104 non-autistic adults without NDCs, 13 adults with a childhood diagnosis for DLD, and 59 autistic adults (without

DLD, and nearly all with adulthood ASD diagnosis). Comparing z-scores based on the performance of the non-autistic adults revealed that 85% of the adults with DLD had low SR scores (Z-score < 1.5 with respect to non-autistic adults), reflecting prevalent long-term effects of DLD. Only 7% of the non-autistic adults had such low performance (possibly effects of undiagnosed childhood difficulties), while twice as many autistic adults (14%) had low scores (suggesting long-term effects of language impairment). These results support the utility of LITMUS-SR in detecting long-term effects of morphosyntactic impairment.

Note, however, that determining morphosyntactic skills in minimally speaking (autistic) individuals solely with production tasks such as LITMUS-SR is clearly insufficient. Furthermore, due to weak phonological (short-term verbal) memory, some children with NDCs such as Down syndrome, may experience significant difficulty with SR (Perovic et al. 2025). In these cases, morphosyntactic skills could be tested by comprehension tasks, as discussed in the following sections. Of course, using morphosyntax comprehension tasks alongside morphosyntax production tasks can also shed light on potential differences between expressive and receptive language skills in any NDC.

Comprehension of morphosyntax: Truth Value Judgment, Coloring Book, and eye-tracking – work in progress Linguistic-experimental research frequently employs picture selection tasks (PST) to assess comprehension of morphosyntax (Gerken and Shady 1998; Bastiaanse et al. 2003; Bishop 2003). In a PST, participants are typically required to point to the picture that corresponds to an orally presented sentence. In some cases, act-out paradigms involving object manipulation are used to evaluate morphosyntactic comprehension (Goodluck 1998; Winskel 2004).

However, both PSTs and act-out tasks may present specific challenges for individuals with NDCs, which could potentially obscure underlying morphosyntactic knowledge. PSTs, for example, require not only sentence comprehension but also visuospatial processing and comparison across multiple competing visual alternatives. This may be particularly demanding for autistic individuals, who often show relatively stronger local than global processing abilities, as described by the Weak Central Coherence account (Frith 1989). In addition, PST performance places demands on executive functions such as inhibition, selective attention, and working memory, which have been shown to be frequently affected in autism (Demetriou et al. 2019; Dehnavi and Iyer 2026).

Similarly, act-out tasks impose additional motoric demands, including fine motor coordination and object manipulation. Given that reduced fine motor skills are also

reported in many autistic individuals (da Silva et al. 2025), such requirements may further complicate task performance independently of linguistic competence.

Attempting to minimize the cognitive and motor skill load of such comprehension tasks, linguists at the University of Tours developed an oral Truth Value Judgment Task (TVJT-FR[ench]), targeting complex syntactic structures, some of which are also tested by the LITMUS-SR production task (Prévost and Tuller 2022b). TVJT contains 24 sentences, including simple SVO sentences, SVO sentences with a complex subject, sentences with a long passive, sentences with an object clitic, and sentences with a relative clause (subject or object). The participant first sees a picture and then hears a sentence pre-recorded by a female voice. He/she must decide whether the sentence they hear is true or not with respect to the action displayed in the picture. The participant is asked to answer by pressing either a green button (for TRUE) or a red button (for FALSE) on a response pad. Figure 1 shows two examples of pictures associated with a sentence containing a subject relative clause. In Fig. 1a, the target answer is TRUE, whereas in Fig. 1b, the target answer is FALSE.

This new task is suitable for use with both autistic children and adults. Preliminary results from children with ASD ($n=15$, mean age 10;11, eight with LI), children with DLD ($n=21$, mean age 8;10), and 15 children with DID ($n=15$,

mean age 10;4, 12 with LI) show that children with ASD-LI, children with DLD, and children with DID-LI display similar accuracy rates, lower than those of neurotypical children ($n=54$, mean age 9;10) (Bataillon et al. 2025; conference presentation). Cognitively able autistic adults ($n=59$, age range 18–64) had accuracy scores similar to those of non-autistic adults in the same age range ($n=104$), but their reaction times were significantly slower (Prévost et al. 2026).

In a similar vein, researchers at the University of Utrecht, The Netherlands, have developed the Coloring Book (CB) method, aiming for a more ecologically valid way to test language comprehension (Pinto and Zuckerman 2019). Instead of choosing among different pictures (as in a PST), the test-taker colors the correct character or object on a touch screen. For example, to test comprehension of a passive sentence such as *The yellow monkey is scratched by the green monkey*, the test-taker is asked to colour the correct monkeys in yellow and green (see Fig. 2).

The CB task has proven to be an ecologically valid, reliable and fun method to test several specific morphosyntactic and lexical abilities in typically developing children (Pinto and Zuckerman 2019). It has also successfully been used with 19 autistic children (age 7;10–14;11) in a study investigating pronoun reference in Dutch (preliminary data in Van Veen 2016; unpublished MA thesis).

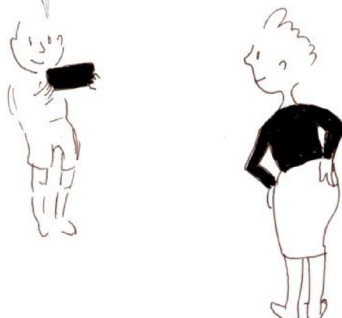
	
a <i>Il y a le papy qui embrasse le petit garçon</i> ‘There’s the grandpa who is kissing the little boy’ (TRUE)	b <i>Il y a la dame qui photographie le garçon</i> ‘There’s the woman who is photographing the boy’ (FALSE)

Fig. 1 Examples from TVJT-FR testing subject relative clauses. Reproduced with permission from Prévost and Tuller (2022b; unpublished manuscript)

Fig. 2 Reproduced from Pinto and Zuckerman (2019), licensed under CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)



Researchers at the University of Amsterdam are currently developing a short Morphosyntax Coloring Book test (MCB-NL, In 't Veld et al. 2026; conference presentation) with 16 pre-recorded sentences targeting the cross-linguistic markers of morphosyntactic impairment identified in Sect. "Markers of impairment in morphosyntax". One of the objectives is to create a comprehension counterpart of the LITMUS-SR-NL-16 (van Barneveld et al. 2023) described in Sect. "Production of morphosyntax: sentence repetition", covering similar morphosyntactic structures, as is also the aim of the TVJT-FR developed in Tours. The task requires very little verbal instruction, as it is introduced through a few practice items that demonstrate what the participant is expected to do. In 't Veld et al. (2026) obtained ceiling results from 26 neurotypical Dutch-speaking adults (age range 22–38), indicating task validity. Preliminary results from 13 typically developing Dutch-acquiring children (age range 4;5–6;11) suggest that the test is suitable and attractive even to young pre-school children, and that it reliably distinguishes simpler (e.g. finite modal+infinitive, short passives) from more complex morphosyntactic structures (e.g. object relative clauses, long passives, conditionals). The next steps include testing larger samples with older typically developing children, aged between 4 and 10, digitizing the task, and piloting it with autistic individuals, including those with motor challenges or minimal speech, as the task requires little fine motor control and simple instructions. The task can further be adapted for adolescents and adults by adjusting the pictures and vocabulary.

The expected advantages for autistic individuals of the CB method over a PST or an act-out task include the following. The CB method requires less processing of visual information than the PST. Furthermore, the CB does not provide separate, alternative pictures to choose from, to compare or to match to the orally presented sentence, requiring additional executive function skills (inhibition, attention, working memory). Rather, it presents one picture with one integrated scene. Finally, regarding motor skills, the CB task requires only putting a scratch/cross/line with

a marker or pencil in the (relatively large) target character or object, or, if the task is presented digitally, touching the target character or object on a touch screen. This taxes fine motor skills to a much lesser degree than an act-out task, and also than a PST.

Although CB tasks involve minimal and simple verbal instructions and place low demands on participants, they still require test-takers to perform an action, just like in TVJ tasks. To gain insight into the receptive language abilities of autistic individuals whose language potential would remain otherwise unexplored, researchers have developed passive tasks (i.e. not requiring any active response from the participants). Various testing techniques can and have been used for this purpose, including eye-tracking (Brady et al. 2014; Naigles and Fein 2017; Plesa Skwerer et al. 2019), often employed to assess language development using the Inter-modal Preferential Looking (IPL) paradigm (Golinkoff et al. 1987). In this paradigm, participants are presented with an auditory linguistic stimulus alongside two visual stimuli displayed side by side, only one of which matches the auditory input. Findings from studies using the IPL paradigm to assess receptive morphosyntax in autism provide evidence that young autistic children (ages 2–5) who produce little to no language can understand subject-verb-object word order (Su and Naigles 2019; Swensen et al. 2007). Recently, researchers at the University of Tours (France) developed a task called MOSYCAT (MORphoSYntactic Comprehension in Autistic and Typically developing children), which employs the IPL paradigm with videos to test the comprehension of both simple and complex morphosyntactic structures in French-acquiring autistic ($n=21$) and non-autistic ($n=79$) children aged 2–5 (Michel et al. 2026). Results indicate that the task can be administered to a broad range of autistic children, including those with severe symptoms and/or limited linguistic/non-linguistic cognitive abilities. These results align with previous findings showing that some minimally speaking autistic children may nonetheless demonstrate relatively preserved receptive language abilities (Naigles and Fein 2017).

Phonology

To address issues related to the influence of memory or lexical skills on testing phonology, dos Santos and Ferré (2018) developed a new nonword repetition (NWR) task with nonwords that vary little in length (between one and three syllables only), do not resemble real words, and whose phonological complexity is balanced across items. The task, called LITMUS-QU(quasi-universal)-NWR, contains a language-universal part that can be used across all languages and a language-specific part addressing the target language's specific syllabic complexity properties. It consists of 31 nonwords and takes about three minutes to complete. LITMUS-QU-NWR currently exists in several languages, including English, Dutch, German, Italian, Lebanese, and Portuguese.

Silleresi (2018) tested 37 French-speaking autistic children aged 6 to 12 with the French version (LITMUS-QU-NWR-FR). Nine of these children scored below the cut-off point (based on scores from children with DLD compared to children without an NDC), indicating phonological impairment. Silleresi also administered a standardised phonology test based on repetition of real words (*Evaluation de Langage Oral*, ELO, Khomsi et al. 2007) to the same children. The results showed that eight children performed below the cutoff point on the standardised test but above the cut-off point on LITMUS-QU-NWR-FR, whereas the reverse pattern was extremely rare (one child only). Comparatively low performance on the standardised test (real words up to six syllables long) but not on the LITMUS-QU-NWR-FR task (one- to three-syllable nonwords with phonologically complex syllables) may reflect weak lexical knowledge and/or memory skills, rather than impaired phonological abilities. The author contends that the LITMUS-QU-NWR-FR captured structural phonological abilities that standardised phonology tests did not because of confounds with lexical knowledge and memory skills.

An adult version of LITMUS-QU-NWR-FR has also been developed (Ferré et al. 2022) and was used to identify phonological difficulties in French-speaking autistic adults (Manenti et al. 2025: $n=48$ ASD with intellectual and language variability, age range 18–56). In this study, 34.8% of the autistic adults showed weak performance on the NWR task, as compared to 8.2% of the adult controls, suggesting phonological impairment in the autistic individuals. Phonological complexity clearly impacted the performance of the autistic adults: the more complex the phonological structures in the nonwords, the less often they were repeated correctly.

Prosody

Few studies have proposed comprehensive measures of prosody that test both production and perception across a variety of variables while also taking into account factors external to prosody, such as co-occurring language disorders, perceptual or attentional deficits, or the cognitive demands of the tasks being used. The most commonly used tool, the PEPS-C (Peppé and McCann 2003), does not allow for a fine-grained characterisation of prosody in individuals with autism. It assesses prosody at a broad level, indicating the potential presence of a prosodic disorder without pinpointing specific deficits (Paul et al. 2021). In addition, it requires skills such as reading and understanding sometimes long or complex instructions, making it less suitable for young children or individuals with severe autism or co-occurring intellectual disability.

There is currently no (short) test addressing the markers of prosodic impairment mentioned in Sect. "Markers of impairment in phonology and prosody". Designing such a test would require separating the various prosodic variables, including pitch, duration and intensity, which determine intonation, stress patterns and rhythm. It would also require minimal effects of other cognitive abilities such as executive functions, including memory and attention. Such a test could effectively reveal the specific nature of prosodic challenges in autistic individuals. Developing such a tool is a goal of the LACA network for the future.

Interface phenomena

As narration integrates knowledge of various linguistic domains and includes interface phenomena such as the ones discussed in Sect. "Markers of pragmatic impairment", we draw attention to a recently developed instrument that assesses both production and comprehension of narratives, namely, the LITMUS Multilingual Assessment Instrument for Narratives (MAIN, Gagarina et al. 2019). This test has been designed to elicit culturally appropriate narrative samples and has been used worldwide in over 80 languages, with typically developing children and adults, as well as autistic children (Gittens and Perovic 2026: $n=4$, age range 7;7–11;10, multilingual, with English as a societal language; and Wolfer et al. 2026: $n=90$, age range 5–12, multilingual, acquiring a range of societal languages), and individuals with other NDCs such as Down syndrome (Mattiauda et al. 2022: $n=13$, age range 15–33, English; Martzoukou et al. 2020: $n=20$, age range 19–46, Greek), Williams syndrome (Perovic et al. 2024; conference presentation: $n=4$, age range 9–11, Croatian) and DLD (Fichman et al. 2017: $n=14$, age range 5;6–6;5, Russian-Hebrew bilinguals).

MAIN provides an efficient scoring method of episodic complexity (story characters' goals, attempts to achieve these goals, and eventual outcomes), the use of linguistic expressions that contribute to the story coherence, such as pronouns, articles, and connectives, as well as the comprehension and production of mental state terms and inferences related to these mental state terms. Given this breadth of coverage, MAIN is well-positioned to identify markers of impairment at the interface of the lexicon and pragmatics (e.g. mental state terms) as well as at the interface of syntax and pragmatics (e.g. pronouns) as discussed in Sect. "[Markers of impairment at interfaces](#)".

Summary

Despite their different stages of development, the approaches targeting markers of language impairment in autism described above all share the design principles outlined in Sect. "[Preliminary remarks](#)": linguistic grounding, short duration, minimal cognitive load, cross-linguistic, cross-cultural and cross-age applicability, and suitability for individuals across the full range of the autism spectrum. The proposed tools allow for identification of impairment in various language domains separately, keeping confounds between linguistic abilities to a minimum. The design principles above strengthen the ecological validity of the testing instruments and make them also suitable for many individuals with other NDCs (e.g. Down syndrome, Williams syndrome, ADHD), enabling cross-condition comparisons. As these tools continue to be refined and validated across languages and populations, the longer-term goal remains to translate them into clinical practice, enabling more precise identification of each autistic individual's specific language profile and, ultimately, more targeted support. Table 2 summarises the suggested screening tools discussed in this section.

Factors to consider: multilingualism, sex, and autism support needs

The markers reviewed above are not interpreted in isolation: factors such as multilingualism, sex and support needs associated with autism (referred to in much of the literature as severity of autistic symptoms) may shape how language strengths and weaknesses manifest in autism and must therefore be considered when using these markers to identify language impairment in autism.

Multilingualism

In multilingual populations, there is a risk of both overdiagnosing and underdiagnosing language difficulties (Bedore and Peña 2008). Reduced exposure to the societal language may lead neurotypical multilingual children to appear delayed in certain linguistic domains, such as vocabulary, however, these apparent delays often disappear when lexical abilities are assessed across all the child's languages (Byers-Heinlein et al. 2024).

As in other NDCs, current evidence suggests that multilingual autistic children do not experience compounded language deficits: language outcomes in these children are similar to those seen in monolingual autistic children rather than being aggravated by the sum of being autistic and multilingual (Gilhuber et al. 2023; Meir and Novogrodsky 2025). In other words, multilingualism does not seem to adversely affect language development in autistic individuals, though more research is needed to confirm this, particularly regarding individuals with multiple diagnoses, such as ASD and DID/ADHD/epilepsy (see Prévost and Tuller 2022a for a review). In general, it is best practice to assess children across all their languages (Gilhuber et al. 2023; Meir and Novogrodsky 2020, 2023), although this may not always be feasible (see De Cat et al. 2026).

Sex

Recent research suggests that autistic females may present differently from males in both behavior and language (e.g. Wood-Downie et al. 2021). Notably, these sex differences mirror patterns observed in neurotypical populations: females generally use larger vocabularies, employ more emotions and internal state language, and engage in more turn-taking during conversations (Landau et al. 2026). This adds further complexity to the question of diagnostic tool sensitivity. Research shows that autistic girls outperform autistic boys in certain pragmatic domains, including mental state language and figurative language (see den Hartog et al. 2023 for review). Sturrock et al. (2020) found that autistic girls outperformed boys on comprehension of emotional language and figurative expressions; Porrini et al. (2026) report stronger pragmatic inferencing in adult autistic females than males, and Landau et al. (2026) found fewer atypical gestures and speech intonation violations in autistic females than males during conversation (though see Eilon and Novogrodsky 2025b; who report no sex difference in mental state verb use in younger autistic children, possibly due to the low proportion of girls in their autistic sample). These findings carry important implications. If this line of research is further supported, females' relative pragmatic strengths may mask underlying difficulties, increasing the

Table 2 Overview of proposed tools to screen language impairment in autism

Domain	Task	What?	Key Features
<i>Pragmatics</i>			
	LACA Pragmatics Test <i>LACA Network</i>	Comprehension Linguistic pragmatics: scalar and ad hoc implicatures, conversational maxims Social pragmatics: irony	Adolescents, adults Under development
	Semi-guided conversation protocol Prévost 2024; University of Tours/University of Beirut	Production and Comprehension Linguistic pragmatics, social pragmatics (see above), general pragmatics (incl. turn-taking, topic maintenance, etc.)	Speaking adolescents, adults Under development
<i>Structural language/grammar</i>			
<i>Morphosyntax</i>			
	LITMUS-SR (Sentence Repetition) Marinis and Armon-Lotem 2015	Production Sentences of varying syntactic complexity, equal syllable length, w/o difficult vocab; longer and shorter (16 items) versions	Speaking children, for some languages also adolescents, adults Available in many languages Website: litmus-srep.info
	Truth Value Judgment Task (TVJT) Prévost and Tuller 2022b; University of Tours	Comprehension Truth Value Judgment of sentences of varying syntactic complexity	Suitable for minimally speaking autistic children, adolescents and adults, including those with severe symptoms or limited cognitive abilities Work in progress
	MCB-NL (Morphosyntax Coloring Book) in 't Veld et al. 2026; University of Amsterdam Participant colours target character/object on touchscreen in response to spoken sentence	Comprehension 16 sentences corresponding to LITMUS-SR-NL-16 constructions. Single integrated scene, no competing pictures, reducing visual processing and EF load.	Suitable for minimally speaking autistic children, adolescents and adults, including those with severe symptoms or limited cognitive abilities Work in progress
	MOSYCAT (MORphoSYntactic Comprehension in Autistic and Typically developing children) Michel et al. 2026; University of Tours Intermodal Preferential Looking paradigm	Comprehension	Suitable for minimally speaking autistic children, including those with severe symptoms or limited cognitive abilities Work in progress
<i>Phonology</i>			
	LITMUS-QU-NWR (Quasi-Universal Non-Word Repetition) dos Santos and Ferré 2018; adult version: Ferré et al. 2022	Production	Suitable for minimally speaking autistic children, adolescents and adults, including those with severe symptoms or limited cognitive abilities Available in English, Dutch, French, German, Italian, Lebanese, Portuguese; adult and toddler French versions.
<i>Interfaces</i>			
	LITMUS-MAIN (Multilingual Assessment Instrument for Narratives) Gagarina et al. 2019.	Production and comprehension Syntax-pragmatics interface: discourse cohesion through e.g. reference, connectives Lexicon-pragmatics interface: mental state terms	Speaking children, adolescents, adults. Available in 80+ languages. Website: https://main.leibniz-zas.de/

risk of under-identification of autism. Screening tools must therefore be sensitive enough to detect subtle pragmatic differences that other strengths may compensate for, particularly in females, who may engage in camouflaging behavior (i.e. masking autistic characteristic) (Hull et al. 2020).

It will also be important for future research to consider gender identity alongside sex assigned at birth. Gender identity does not always correspond with assigned sex, and autistic individuals, particularly autistic females, are more likely to identify as gender-diverse than the general population (Landau et al. 2026).

Support needs associated with autism

There is ongoing debate about the extent to which the autism support needs, referred to as severity of autistic symptoms (APA 2013) contribute to variability in language skills among autistic individuals. Some studies have found a negative association between the severity of autism symptoms and both language ability and developmental trajectories (see Ellis Weismer and Kover 2015; Modyanova et al. 2017; Tek et al. 2014; among others), while others have found no such association (e.g. Kjellmer et al. 2012; Loucas

et al. 2008; Müller et al. 2022; Silleresi et al. 2020). Studies examining autism severity in minimally speaking children frequently report no significant differences compared to verbal children, indicating that autistic symptoms are not more pronounced in children with little or no speech (Knaus et al. 2018; Plesa Skwerer et al. 2019; Thurm et al. 2015; but see Hus et al. 2014). The role of autism symptomatology in the developmental trajectories of minimally speaking children remains an important venue for future research.

Contrasting findings may stem, at least in part, from how autism severity is conceptualised and from the methodological challenges involved in measuring it. As Silleresi and Tuller (2025, p.210), point out, it remains unclear whether severity refers to symptom intensity, number of symptoms across each diagnostic dimensions, functional impact, or some combination of these. This conceptual ambiguity is reflected in the variety of assessment tools used, which range from diagnostic to symptom-specific measures, to adaptive behaviour and support measures (Mehling and Tassé 2016). Combining these may guide clinical judgment of autism severity, now defined as the level of support needs, which range from “requiring support” to “requiring very substantial support” (DSM-5-TR, APA 2022). Furthermore, since most studies examining the link between language development and autism symptomatology focus only the first dimension (Silleresi and Tuller 2025), future research should incorporate severity measures for both diagnostic conditions (i.e. the first dimension, impairment in reciprocal social communication and social interaction, and the second dimension, restricted and repetitive behaviors). Overall, whether and how autism severity and autistic symptomatology impact language skills in autistic individuals remains far from resolved. Future assessment research should therefore routinely report severity measures to enable more systematic comparisons across studies.

Cross-syndrome comparisons

Beyond the individual factors considered above, a broader question concerns whether the markers of linguistic impairment reviewed here are unique to autism or whether they are also present in other NDCs. This question has important clinical implications, for both diagnosis and intervention: if the same language phenomena are compromised in different NDCs, then similar intervention programs may be successful (though see Schaeffer et al. 2025b for recommendations that assessments used for autistic participants need to be autism-friendly). This question also has important implications for our theories of the nature of language and language acquisition. If the same difficulties observed in different NDCs are also observed in the process of early

typical language acquisition, this would support a general ‘language delay’ hypothesis for all NDCs (Rice et al. 2005). If, however, individuals with autism or other NDCs show error patterns that do not occur in typical development, this would indicate a crucial difference in the underlying mechanisms of language acquisition. Furthermore, different error patterns in different NDCs may signal different causes and mechanisms underlying the linguistic impairments observed across NDCs.

There is currently insufficient comparative research across NDCs and across linguistic domains to reach definitive conclusions. What we do know is that certain morpho-syntactic markers, such as persistent difficulties with verb inflection, object clitics, reflexive pronouns, object relative clauses and some types of passives have been reported not only in ASD-LI, but also in children with hearing loss, with epilepsy, in DLD, Down syndrome, Williams syndrome and Fragile X syndrome (Friedmann and Novogrodsky 2004; Friedmann and Szterman 2006; Perovic 2006; Delage and Tuller 2007; Monjauze et al. 2007; see Rice et al. 2005 and Perovic and Wexler 2025 for review), although not necessarily with the same phenomena across all the conditions.

However, the patterns may not be consistent. For example, difficulties with interpreting reflexive pronouns have been found in Down syndrome (Perovic 2006; Ring and Clahsen 2005) but not Williams syndrome (Perovic et al. 2013; Ring and Clahsen 2005) or DLD (Perovic and Wexler 2018). Furthermore, they have been reported in children and adults with Down syndrome in different languages (English - Perovic 2006; Ring and Clahsen 2005; Greek - Sanoudaki and Varlokosta 2014; Serbo-Croatian - Perovic 2008), making it a potential cross-linguistic marker for this condition at least. There is currently no evidence on misinterpretation of reflexive pronouns in autistic speakers of languages other than English, calling for more cross-linguistic research in this area.

A similar picture emerges for verb inflection relevant to tense marking: difficulties have been reported in both young and older children with ASD-LI (Modyanova et al. 2017; Roberts et al. 2004), DLD (Laws and Bishop 2003; Rice and Wexler 1996), fragile X (Hilvert et al. 2020) and Down syndrome (Baxter et al. 2022; Laws and Bishop 2003), but they are not characteristic of older children or adults with Williams syndrome (Peregrine et al. 2006), who more generally do not display morphosyntactic difficulties. This indicates that while verb inflection errors are not autism-specific, they may serve as a marker of grammatical vulnerability across several NDCs.

In contrast, if there is one language domain in which impairment appears autism-specific, it is social pragmatics. One strong candidate marker in the domain of social pragmatics is difficulty with irony, which appears reliably

impaired across ASD-LN and ASD-LI. Although systematic cross-syndrome comparisons are rare (cf. Pouscoulous and Perovic 2025), our review suggests that social pragmatic abilities may be where autism diverges most clearly from other NDCs, in contrast to linguistic pragmatics, which could be compromised both in ASD-LI and other NDCs, e.g. DLD.⁵

We recommend that future research incorporate two complementary research strategies: (a) *Cross-syndrome comparisons* of the same linguistic phenomenon across different NDCs, to establish whether a marker is shared or distinct; (b) *Cross-linguistic comparisons* within a single syndrome, to determine whether a phenomenon is universally impaired or language-specific. These approaches have been successful in typical language acquisition research (see Guasti 2017) and could be equally revealing here, especially given the availability of several appropriate cross-syndrome and cross-linguistic assessment tools as described in Sect. "3. Screening for language impairment in autism" (see also Schaeffer et al. 2025b for a recommended battery of assessments).

While the ultimate goal of the domain-specific language tasks presented above is their use in clinical settings, clinical transfer is not ready at this time and will require concerted efforts with clinical partners, currently underway, toward their refinement.

Conclusion

This selective review presents a preliminary framework for identifying markers of language impairment in autism that may prove valuable across languages, learning contexts and other NDCs. While the empirical support for individual markers varies in robustness and consistency, the findings reviewed here provide researchers and clinicians with theoretically and empirically motivated candidates for identifying language impairment in autism, spanning pragmatics, morphosyntax, phonology, as well as interfaces of pragmatics with other language domains. This precision in characterising linguistic profiles will make it easier for researchers to uncover the biological and cognitive factors that contribute to autism and its different subtypes.

Several important limitations of the current review should be acknowledged. First, the literature surveyed is heavily skewed toward English, meaning that the proposed markers

may not generalise straightforwardly to other linguistic contexts. Second, the review is selective rather than systematic, and little replication data is available across studies, making it difficult to assess robustness comprehensively. Third, most studies include relatively narrow participant samples in terms of age, cognitive ability, and autism symptomatology, limiting the generalisability of findings.

Much research therefore remains to be done. Pressing needs include cross-linguistic validation of these markers and development of assessment tools in languages beyond English. We highlighted practical tasks already available or under development, and called attention to the importance of tailoring assessment, both in production and comprehension, to individuals across a wide range of language abilities and autism symptomatology, whether monolingual or multilingual, while also recognising possible sex-related differences in how pragmatics is assessed. Most of these assessment approaches are applicable to individuals with other NDCs, enabling cross-syndrome comparison, though such generalisations should be treated with caution until directly tested.

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⁵ Note that DSM-5 (2013) introduced a related diagnosis, Social Pragmatic Communication Disorder (SPCD), distinguished from ASD primarily by the absence of restricted and repetitive behaviours. Future cross-syndrome comparisons should clarify the similarities and differences in social pragmatics between the two conditions (see Félix et al. 2024).

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