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Pragmatic Competence and Theory of Mind Deficits in Neurodivergent Children and Adolescents: A Systematic Review

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 8 September 2025 and was last updated on 8 September 2025.

INTRODUCTION

Review question / Objective To systematically map and evaluate the types of pragmatic deficits related to Theory of Mind in neurodivergent children and adolescents, in order to identify their clinical impact and implications for service provision.
PICOS framework:
Population (P): Children and adolescents (3–15 years) with diagnoses of Autism Spectrum Disorder (ASD), Specific Language Impairment, Learning Disorders, or Social (Pragmatic) Communication Disorder, with IQ > 85.
Intervention/Exposure (I): Studies assessing or mapping pragmatic deficits related to Theory of Mind (including shared decision-making tasks).
Comparator (C): Not applicable; studies may include comparisons with typically developing peers or other clinical groups, but a comparator is not mandatory.
Outcomes (O): Clinical outcomes such as the need for specific treatment, treatment duration, use of educational supports, and the application of standardized assessment tools to evaluate pragmatic deficits.
Study design (S): Observational studies, case reports/series, randomized controlled trials, and clinical trials conducted in public, private, or mixed mental health service settings.

Rationale Pragmatic competence, including the ability to use language appropriately in social contexts, is a fundamental aspect of communication and social interaction. Among neurodivergent populations, especially children and adolescents with Autism Spectrum Disorder (ASD), Specific Language Impairment, Learning Disorders, or Social Pragmatic Communication Disorder, deficits in pragmatic skills are frequently observed and are closely related to Theory of Mind (ToM) difficulties. These deficits can significantly impact daily functioning, academic achievement, and peer relationships, thereby influencing long-term outcomes in education and mental health.
Despite the acknowledged importance of pragmatic competence, the literature remains fragmented, with studies varying in their

conceptualization, assessment methods, and outcome measures. A systematic review is needed to map existing evidence on the nature and types of pragmatic deficits associated with ToM in neurodivergent children and adolescents. Clarifying these patterns will contribute to a better understanding of the developmental trajectory of pragmatic impairments and their role in shaping social communication profiles.

Furthermore, identifying which assessment tools and outcome measures are most frequently employed will inform clinical and research practices, guiding the development of standardized protocols and interventions. By synthesizing the evidence across multiple neurodevelopmental conditions, this review aims to highlight both shared and condition-specific pragmatic challenges. This knowledge can support clinicians, educators, and researchers in tailoring evaluation and support strategies, ultimately improving the quality of care and educational planning for neurodivergent children and adolescents.

Condition being studied This review addresses pragmatic deficits associated with Theory of Mind (ToM) in neurodivergent children and adolescents. The conditions of interest include Autism Spectrum Disorder (ASD), Specific Language Impairment, Learning Disorders, and Social (Pragmatic) Communication Disorder, in individuals with intellectual functioning within the normative range (IQ > 85).

From a clinical perspective, pragmatic competence refers to the capacity to use and understand language in context, including skills such as initiating and maintaining conversations, interpreting figurative language, taking turns appropriately, and adapting communication based on social cues. Deficits in this domain are strongly related to difficulties in ToM—the ability to attribute mental states (beliefs, desires, emotions, intentions) to oneself and others. When ToM abilities are compromised, children struggle to anticipate the thoughts and perspectives of others, which often results in communication breakdowns and impaired social reciprocity.

Pragmatic and ToM deficits are particularly prominent in individuals with ASD, where they are considered a core feature of the condition. Children with ASD may demonstrate adequate vocabulary and grammar yet experience significant challenges in understanding irony, humor, or indirect requests. These difficulties can hinder the development of friendships, increase the risk of social isolation, and contribute to comorbid mental health conditions such as anxiety or depression. In Specific Language Impairment and Learning Disorders, pragmatic challenges may present in subtler forms but still exert a significant negative impact on academic performance and peer interactions. In Social (Pragmatic) Communication Disorder, pragmatic deficits are the primary clinical feature, directly affecting the child's ability to engage effectively in social and educational contexts.

The clinical consequences of pragmatic and ToM impairments extend beyond communication. They influence the individual's capacity for shared decision-making, problem-solving, and participation in daily life. In school settings, these difficulties often lead to the use of specialized educational supports, targeted interventions, and individualized learning plans. Within child and adolescent mental health services, pragmatic and ToM deficits are associated with increased service utilization, longer treatment duration, and the need for multidisciplinary care that combines speech-language therapy, psychological support, and educational interventions.

Despite their clinical significance, there is limited consensus regarding how these deficits should be assessed across different neurodevelopmental conditions. Current research is fragmented, with wide variability in assessment tools, outcome measures, and conceptual frameworks. This lack of standardization complicates the identification of children at risk and hinders the design of effective, evidence-based interventions. Moreover, pragmatic and ToM difficulties often remain under-recognized in clinical practice, as they may be overshadowed by more overt behavioral or academic challenges.

By systematically reviewing the evidence on pragmatic and ToM deficits in neurodivergent children and adolescents, this study aims to clarify their prevalence, clinical impact, and relevance for treatment planning. The findings will provide clinicians and educators with a better understanding of how these deficits manifest across different diagnostic groups, highlight shared and distinct patterns, and inform the development of standardized assessment pathways. Ultimately, this knowledge can contribute to earlier identification, improved service delivery, and more tailored interventions, with the goal of enhancing social functioning, mental health outcomes, and overall quality of life.

METHODS

Search strategy A comprehensive search strategy will be applied to identify relevant studies reporting on pragmatic deficits related to Theory of Mind (ToM) in neurodivergent children and adolescents. The strategy has been designed to ensure breadth

and sensitivity, while maintaining focus on the populations and conditions of interest.

Electronic Databases

The following electronic databases will be systematically searched:

PubMed/MEDLINE

EMBASE

Cochrane Central Register of Controlled Trials (CENTRAL)

Scopus

PsycINFO

CINAHL

These databases were selected to cover both biomedical and psychological literature, including clinical trials, observational studies, and case reports/series.

Search Terms

The search strategy combines controlled vocabulary (e.g., MeSH, Emtree terms) and free-text keywords to capture a wide range of relevant articles. The search terms reflect three main conceptual domains: (1) neurodivergent conditions of interest, (2) Theory of Mind, and (3) age group (children and adolescents). Truncations (e.g., neurodiver), Boolean operators (AND, OR), and database-specific syntax will be applied to maximize retrieval.

Example Search Strings

PubMed

(neurodiver*[ti] OR autism spectrum disorder[mesh] OR asd[ti] OR autism spectrum disorder[ti] OR autism[ti] OR specific language disorder[mesh] OR specific language impairment[ti] OR learning disabilities[mesh] OR learning disorders[ti] OR learning disabilities[ti] OR dyslexia[ti] OR dyscalculia[ti] OR dysgraphia[ti] OR social communication disorder[mesh] OR social communication disorder[ti])

AND (theory of mind[mesh] OR theory of mind[ti] OR tom[ti])

AND (child[mesh] OR child[ti] OR adolescent[mesh] OR adolescent[ti])

EMBASE

('neurodiver*':ti OR 'autism'/exp OR 'asd':ti OR 'autism spectrum disorder':ti OR 'autism':ti OR 'language disability'/exp OR 'specific language impairment':ti OR 'learning disorder'/exp OR 'learning disorders':ti OR 'learning disabilities':ti OR 'dyslexia':ti OR 'dyscalculia':ti OR 'dysgraphia':ti OR 'communication disorder'/exp OR 'social communication disorder':ti)

AND ('theory of mind'/exp OR 'theory of mind':ti OR 'tom':ti)

AND ('child'/exp OR 'child':ti OR 'adolescent'/exp OR 'adolescent':ti)

PsycINFO

(neurodiver* OR autism spectrum disorder OR asd OR autism OR specific language disorder OR specific language impairment OR learning disabilities OR learning disorders OR dyslexia OR dyscalculia OR dysgraphia OR social communication disorder)

AND (theory of mind OR tom)

AND (child OR adolescent)

CINAHL

(neurodiver* OR autism spectrum disorder OR asd OR autism OR specific language disorder OR specific language impairment OR learning disabilities OR learning disorders OR dyslexia OR dyscalculia OR dysgraphia OR social communication disorder)

AND (theory of mind OR tom)

AND (child OR adolescent)

Scopus

TITLE-ABS-KEY ((neurodiver* OR autism spectrum disorder OR asd OR autism OR specific language disorder OR specific language impairment OR learning disabilities OR learning disorders OR dyslexia OR dyscalculia OR dysgraphia OR social communication disorder) AND (theory of mind OR tom) AND (child OR adolescent))

Cochrane CENTRAL

(neurodiver* OR autism spectrum disorder OR asd OR autism OR specific language disorder OR specific language impairment OR learning disabilities OR learning disorders OR dyslexia OR dyscalculia OR dysgraphia OR social communication disorder)

AND (theory of mind OR tom)

AND (child OR adolescent)

Language and Time Limits

Only articles published in English or Italian will be included, reflecting the linguistic competence of the review team and the languages most relevant to the clinical context. No time restrictions will initially be applied, in order to capture the full historical development of the field.

Additional Sources

To minimize publication bias and ensure comprehensiveness, supplementary searches will include:

Hand-searching reference lists of included studies.

Searching the websites of relevant scientific societies and repositories in neurodevelopmental research.

Screening grey literature, including conference proceedings, to identify relevant but unpublished studies.

Screening and Data Management

All records retrieved will be exported to a reference management software (e.g., EndNote, Zotero) to facilitate the removal of duplicates. Two independent reviewers will screen titles and abstracts according to pre-specified inclusion and exclusion criteria. Disagreements will be resolved

through discussion or consultation with a third reviewer. Full-texts of potentially eligible studies will then be reviewed in detail.

Summary

This multi-database, multilingual, and multi-step search strategy has been designed to maximize sensitivity and specificity. It ensures inclusion of both clinical and developmental research relevant to pragmatic and Theory of Mind deficits in neurodivergent children and adolescents, thereby providing a solid foundation for the systematic review.

Participant or population Patient, Participant, or Population

The review will focus on children and adolescents aged 3 to 15 years with neurodevelopmental conditions characterized by pragmatic and Theory of Mind (ToM) deficits. Eligible populations include individuals with:

Autism Spectrum Disorder (ASD)

Specific Language Impairment (SLI)

Learning Disorders (including dyslexia, dyscalculia, and dysgraphia)

Social (Pragmatic) Communication Disorder

All genders will be included. To reduce confounding factors, only participants with intellectual functioning within the normative range (IQ > 85) will be considered.

Participants will be excluded if they present with:

Co-occurring intellectual disability

Co-occurring organic conditions (e.g., deafness, blindness)

Diagnoses outside of the specified inclusion criteria

This population was selected to ensure that observed pragmatic and ToM deficits can be meaningfully attributed to the specified neurodevelopmental conditions rather than to broader cognitive or sensory impairments.

Intervention This review will focus on studies that assess or map pragmatic deficits related to Theory of Mind (ToM) in neurodivergent children and adolescents. Interventions of interest include a broad range of evaluation methods, tasks, and procedures designed to measure ToM and pragmatic competence, such as:

Standardized assessment tools and diagnostic instruments

Experimental or clinical tasks targeting ToM (e.g., false-belief tasks, perspective-taking measures, shared decision-making paradigms)

Observational or structured evaluations of pragmatic language use in social contexts

The emphasis is on identification and characterization of deficits, rather than treatment outcomes. Therefore, studies will be excluded if they focus exclusively on interventions or therapies aimed at remediating pragmatic or ToM difficulties, without a clear evaluative or mapping component.

By concentrating on assessment-based approaches, this review aims to clarify how pragmatic and ToM deficits are operationalized, measured, and reported across different neurodevelopmental populations.

Comparator No formal comparator is required for inclusion in this review. However, when available, comparisons with typically developing peers or with other clinical groups (e.g., children with different neurodevelopmental conditions) will be considered. Such comparisons may provide valuable insights into the specificity and severity of pragmatic and Theory of Mind deficits across populations.

Studies without a comparator group will still be eligible if they provide descriptive or observational data mapping the nature of these deficits within the target populations.

Study designs to be included Eligible study designs will include observational studies (cross-sectional, cohort, case–control), case reports and case series, and experimental designs such as randomized controlled trials (RCTs) and clinical trials that evaluate or map pragmatic and Theory of Mind deficits. Studies must be conducted within public, private, or mixed mental health service settings. Qualitative studies, theses/dissertations, and studies outside health service contexts will be excluded.

Eligibility criteria In addition to the PICOS framework, the following criteria will be applied:

Language: Only studies published in English or Italian will be included.

Publication type: Peer-reviewed articles only. Grey literature, theses, dissertations, and conference abstracts will be excluded.

Setting: Studies must be conducted in child and adolescent mental health or related healthcare/educational service settings. Studies carried out exclusively in non-clinical or informal settings will be excluded.

Focus of study: Studies must explicitly evaluate or map pragmatic and Theory of Mind (ToM) deficits. Research focusing exclusively on phonological, articulatory, or structural language aspects without a pragmatic or ToM component will be excluded.

Population restrictions: Studies including participants with intellectual disability or organic sensory conditions (e.g., deafness, blindness) will be excluded to avoid confounding effects.

Information sources Multiple information sources will be used to ensure a comprehensive identification of relevant studies.
Electronic databases
The primary information sources will include six major electronic databases:
PubMed/MEDLINE
EMBASE
Cochrane Central Register of Controlled Trials (CENTRAL)
Scopus
PsycINFO
CINAHL
These databases were chosen to provide broad coverage across biomedical, psychological, and educational research, capturing both clinical and developmental studies relevant to pragmatic competence and Theory of Mind (ToM).
Scientific repositories and societies
In addition to the databases, targeted searches will be conducted on websites and repositories of relevant national and international scientific societies in the fields of autism, neurodevelopmental disorders, and child mental health. These may provide access to specialized datasets and supplementary reports not always indexed in large databases.
Reference list searching
The reference lists of all included studies, as well as of key review articles, will be manually screened to identify additional studies that may not have been captured by the electronic database searches.
Grey literature
Although the primary focus will be on peer-reviewed publications, limited grey literature searches will also be undertaken to reduce publication bias. This will include conference proceedings and professional reports related to neurodevelopmental research. However, theses and dissertations will be excluded, as will non-peer-reviewed sources that do not meet minimum quality standards.
Language and time frame
Only studies published in English or Italian will be considered. No date restrictions will be applied, in order to capture the full range of studies examining pragmatic and ToM deficits in neurodivergent children and adolescents.
Contact with authors
When necessary, corresponding authors of included studies will be contacted to clarify data, request missing information, or verify study eligibility. This approach will help ensure completeness of the dataset and reduce the risk of bias due to selective reporting.
Summary
By combining multiple electronic databases, manual reference checks, targeted society repositories, and selected grey literature sources, this strategy is designed to maximize the sensitivity of the search while ensuring that only relevant and high-quality evidence is included.

Main outcome(s)
The primary outcomes of this review will focus on the identification, characterization, and clinical relevance of pragmatic and Theory of Mind (ToM) deficits in neurodivergent children and adolescents. Specifically, the outcomes of interest include:
Presence and type of pragmatic deficits
Deficits in conversational abilities (e.g., turn-taking, topic maintenance, initiation and response).
Difficulties in understanding nonliteral language (e.g., irony, humor, metaphors).
Limitations in adapting communication to different social contexts or partners.
Theory of Mind performance
Results from standardized or experimental ToM tasks (e.g., false-belief, perspective-taking, shared decision-making).
Relationship between ToM performance and pragmatic language outcomes.
Clinical and functional impact
Need for targeted treatment or individualized educational supports.
Duration and intensity of interventions reported as a consequence of pragmatic or ToM deficits.
Associations with broader outcomes, such as peer relationships, school functioning, or comorbid mental health symptoms (e.g., anxiety, social withdrawal).
Assessment tools used
Identification of standardized scales, observational methods, or clinical measures employed to evaluate pragmatic and ToM abilities.
Frequency of use and reported validity/reliability of these tools.
Timing and effect measures
Outcomes will be recorded as reported in the primary studies, without restriction on follow-up timing. Effect measures may include standardized test scores, behavioral ratings, clinical judgments, or frequency data, depending on study design. Both quantitative and descriptive outcomes will be included to provide a comprehensive overview.

Quality assessment / Risk of bias analysis The methodological quality and risk of bias of the included studies will be systematically assessed using standardized critical appraisal tools appropriate to study design. Two independent reviewers will conduct all assessments, with

disagreements resolved by consensus or consultation with a third reviewer.

For randomized controlled trials (RCTs), the Cochrane Risk of Bias tool (RoB 2) will be applied, evaluating domains such as sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting, and other potential biases.

For non-randomized or observational studies (e.g., cohort, case–control, cross-sectional), the Joanna Briggs Institute (JBI) Critical Appraisal Checklists will be used. These tools are tailored to different designs and assess key elements such as sample selection, exposure measurement, outcome assessment, and confounding.

For case reports and case series, the JBI appraisal tools specific to these study types will be employed, focusing on the clarity of reporting, validity of diagnostic criteria, and appropriateness of outcome measurement.

Each domain will be rated as "low risk," "high risk," or "unclear risk." A narrative summary of the risk of bias assessments will be provided, along with tabular presentations to enhance transparency. Where feasible, sensitivity analyses will be performed to examine whether excluding studies at high risk of bias alters the findings of the review.

In addition, the overall certainty of evidence across outcomes will be evaluated using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach, considering study limitations, consistency, directness, precision, and risk of publication bias. This will enable a structured judgment on the strength of the evidence for each main outcome.

Strategy of data synthesis The synthesis of data will be structured to address the review objectives of identifying, characterizing, and evaluating pragmatic and Theory of Mind (ToM) deficits in neurodivergent children and adolescents. A stepwise approach will be applied, combining narrative and, where possible, quantitative methods.

Data extraction

Two independent reviewers will extract data using a standardized template. Extracted information will include: study design, setting, population characteristics (age, diagnosis, IQ), sample size, assessment tools used, type and description of pragmatic/ToM deficits, and reported clinical or functional outcomes.

Descriptive synthesis

Given the anticipated heterogeneity across diagnostic groups, assessment tools, and study designs, a narrative synthesis will serve as the primary analytic approach. Studies will be grouped and compared by:

Type of neurodevelopmental condition (e.g., ASD, SLI, Learning Disorders, Social Pragmatic Communication Disorder).

Domains of pragmatic deficit (e.g., conversational skills, figurative language, contextual adaptation).

ToM measures employed (e.g., false-belief tasks, perspective-taking, decision-making paradigms).

Clinical and functional outcomes (e.g., treatment needs, academic support, peer relationships).

Patterns of convergence and divergence will be highlighted, with particular attention to whether certain deficits are shared across diagnostic categories or are condition-specific.

Quantitative synthesis

If sufficient homogeneous data are available, a meta-analysis will be conducted. Effect sizes will be calculated for standardized measures (e.g., mean differences, odds ratios, risk ratios) with corresponding 95% confidence intervals. Heterogeneity will be assessed using the I^2 statistic, with thresholds of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. Where appropriate, subgroup analyses will be performed by diagnosis, age group, or type of assessment tool.

Risk of bias integration

Findings from the quality assessment will be incorporated into the synthesis. Sensitivity analyses will explore the robustness of results by excluding studies judged at high risk of bias.

Presentation of results

Results will be presented in both tabular and narrative form. Tables will summarize key study characteristics, types of pragmatic/ToM deficits, and main outcomes. Narrative synthesis will contextualize these findings, highlighting methodological strengths and limitations across studies.

Certainty of evidence

The GRADE approach will be used to evaluate the overall certainty of the evidence for each main outcome, providing structured judgments on confidence in the findings.

By combining rigorous narrative synthesis with the option of quantitative pooling, this strategy will allow for a comprehensive and transparent integration of the evidence, reflecting both the breadth and variability of the available literature.

Subgroup analysis Where data availability allows, subgroup analyses will be conducted to explore potential sources of heterogeneity and to provide a more nuanced understanding of pragmatic and Theory of Mind (ToM) deficits in neurodivergent children and adolescents. Planned subgroup analyses include:

Diagnostic category

Autism Spectrum Disorder (ASD)

Specific Language Impairment (SLI)
Learning Disorders (dyslexia, dyscalculia, dysgraphia)
Social (Pragmatic) Communication Disorder
This analysis will help clarify whether pragmatic and ToM deficits are condition-specific or shared across diagnostic groups.
Age group
Early childhood (3–6 years)
Middle childhood (7–11 years)
Adolescence (12–15 years)
Developmental differences may influence the severity and type of deficits, as ToM and pragmatic competence evolve with age.
Type of assessment tool
Standardized scales (e.g., pragmatic language tests, ToM batteries)
Experimental tasks (e.g., false-belief, irony comprehension, perspective-taking)
Observational or clinician-rated measures
Subgrouping by tool type will highlight differences in how pragmatic and ToM deficits are identified and operationalized.
Clinical outcomes
Studies reporting primarily on communication outcomes
Studies reporting on broader functional outcomes (e.g., academic support, peer relationships, mental health symptoms)
This will provide insight into the real-world implications of pragmatic and ToM deficits.
Comparator presence
Studies including typically developing peers or other clinical groups
Studies without comparators
This analysis will examine how the presence of a control group influences reported deficits and effect sizes.
Where feasible, statistical subgroup analyses will be performed within meta-analysis. Otherwise, subgroup differences will be explored descriptively in the narrative synthesis. These analyses will help to identify key moderators of pragmatic and ToM outcomes, supporting more tailored recommendations for clinical assessment and intervention.

Sensitivity analysis Sensitivity analyses will be undertaken to examine the robustness and stability of the review findings, particularly in light of the anticipated heterogeneity in study designs, populations, and assessment methods. These analyses will allow us to determine whether the overall conclusions are influenced by specific methodological or sample characteristics.
Planned sensitivity analyses include:
Risk of bias
Excluding studies rated as having a high risk of bias in key domains (e.g., selection bias, outcome measurement, confounding). The impact of including versus excluding these studies on effect sizes and narrative conclusions will be examined.
Study design
Comparing results when including only higher-quality designs (e.g., randomized controlled trials, well-designed cohort studies) versus including all eligible designs (including case reports/series). This will help assess whether conclusions are disproportionately influenced by less rigorous study types.
Sample size
Excluding studies with very small samples (e.g., fewer than 10 participants) to evaluate whether small-N studies unduly affect the pattern or strength of results.
Assessment tools
Restricting analyses to studies using validated, standardized assessment instruments for pragmatic and Theory of Mind (ToM) deficits, versus including studies using non-standardized or experimental measures. This will clarify the influence of measurement methods on observed outcomes.
Comparator presence
Assessing differences between analyses including all studies versus only those with comparator groups (e.g., typically developing peers or other clinical populations).
When a quantitative synthesis is feasible, sensitivity analyses will be conducted by systematically excluding the categories above and re-running meta-analyses to examine changes in pooled effect estimates. For narrative synthesis, sensitivity analyses will involve re-examining conclusions after removing studies meeting exclusion conditions (e.g., high risk of bias, small samples).
The results of all sensitivity analyses will be reported transparently, highlighting whether key conclusions are consistent or dependent on specific subsets of studies. This process will strengthen the interpretability of the findings and provide clinicians and researchers with clearer guidance on the reliability of the evidence base.

Country(ies) involved The study is being carried out in Italy, with all authors affiliated with Italian academic and clinical institutions.

Keywords Pragmatic competence, Theory of Mind, Autism Spectrum Disorder, Specific Language Impairment, Learning Disorders, Social (Pragmatic) Communication Disorder, Neurodivergence.

Contributions of each author

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