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Meta-analysis on the relationship between text comprehension and advanced theory of mind during middle childhood

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ADMINISTRATIVE INFORMATION

Support - Universidad Nacional de Colombia.

Review Stage at time of this submission - Piloting of the study selection process.

Conflicts of interest - The authors declare that there are no financial, academic, or personal conflicts of interest that may have influenced the development of this research.The authors declare that there are no financial, academic, or personal conflicts of interest that may have influenced the development of this research.

INPLASY registration number: INPLASY2025100018

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 October 2025 and was last updated on 7 October 2025.

INTRODUCTION

Review question / Objective Review question What is the magnitude and direction of the association between advanced theory of mind (ToM) and reading comprehension in typical children aged 6 to 12 years, and how is the heterogeneity between studies explained by variables such as age, type of ToM measure?

PECO framework

P (Population):
Typically developing schoolchildren aged 6 to 12 years (middle childhood). Studies conducted in any country or linguistic context are included, provided that the sample corresponds to a population without neurodevelopmental diagnoses or specific clinical conditions.

E (Exposure):
Simultaneous measurement of advanced theory of mind and text comprehension
C (Comparator/Context):
Not applicable.

O (Outcome/Result variable):
Quantitative relationship (correlations or effect sizes) between measures of advanced theory of mind tasks and those that assess the construction of meaning from texts, whether oral or written.Quantitative relationship (correlations or effect sizes) between measured of advanced theory of mind and tasks that assess the construction of meaning from texts, whether oral or written.

General objective:

Estimate the magnitude and direction of the association between advanced theory of mind and reading comprehension in a typical population aged 6–12 years, and to explain the heterogeneity of the results using prespecified moderators.

Rationale Comprehending texts requires processes that involve attributing mental states to characters, recognizing intentions, and resolving ambiguities (Dore et al., 2018; Kim, 2020). These operations may involve the use of advanced theory of mind (ToM), which becomes more complex between the ages of 6 and 12 and is related to text comprehension (Osterhaus et al., 2024). Therefore, it is plausible that higher performance in advanced ToM is associated with better text comprehension, especially in materials with multiple perspectives and conflicting emotional states. However, the accumulated empirical evidence shows heterogeneous results depending on designs, measures, and analytical indicators, with some studies reporting robust associations and others attenuating them when controlling for verbal or executive skills (Dore et al., 2018). This variability prevents conclusions from being drawn for educational practice.

Furthermore, no meta-analysis has been identified that specifically focuses on the relationship between advanced ToM and text comprehension in middle childhood. Filling this gap is relevant both theoretically and practically: (a) it allows us to quantify the magnitude and direction of the association at school age, when formal reading instruction is consolidated and the socio-cognitive demands of the curriculum become more complex; and (b) it provides estimates to guide pedagogical interventions in language and social cognition.

An additional conceptual contribution of this meta-analytic review is that it minimizes the underrepresentation of the construct of comprehension and reflects its supramodal nature, while allowing the modality (written vs. oral) to be treated as a prespecified moderator. In this way, the eventual heterogeneity between studies can be explained by substantive and methodological differences, increasing the interpretive usefulness of the findings.

Finally, the protocol defines a typical population of 6–12 years of age and restricts the search to peer-reviewed publications in English or Spanish, with correlational and/or experimental designs that report statistics convertible to correlation, reinforcing the comparability of the estimates. The current stage is declared as “review in progress” with piloting of the study selection process, which ensures the fine-tuning of criteria and coding before formal extraction. This is expected to provide a rigorous and meaningful synthesis of the relationship between advanced ToM and text comprehension in middle childhood, capable of informing future lines of research and evidence-based educational decisions.

Condition being studied This meta-analytic review addresses the relationship between advanced theory of mind (ToM) and text comprehension during middle childhood (ages 6 to 12), a stage of development in which the linguistic, cognitive, and social skills essential for school learning and social interaction continue to consolidate a stage of development in which linguistic, cognitive, and social skills essential for school learning and social interaction are consolidated.

Theory of mind is a capacity that allows us to attribute mental states (such as beliefs, intentions, desires, and emotions) to others and ourselves, facilitating the interpretation and prediction of human behavior (Wellman, 2018; Devine & Lecce, 2021). In the early years, ToM manifests itself in the understanding of first-order false beliefs; however, between the ages of 6 and 12, advanced ToM develops, characterized by complex social reasoning, understanding irony and sarcasm, detecting social transgressions, and resolving ambiguities (Osterhaus et al., 2016). These skills involve more abstract inferential processes related to language (Dore et al., 2018).

For its part, text comprehension is a complex cognitive skill that involves constructing coherent mental representations of textual content, integrating explicit and implicit information, and using prior knowledge, inferences, and global coherence mechanisms (Kintsch, 1988; van Dijk & Kintsch, 1983). In middle childhood, this process is strengthened in both written (reading) and oral (listening comprehension of texts) modalities (Duke & Cartwright, 2021), hence the term text comprehension is used in a broad sense in the proposed review, recognizing its supramodal nature.

METHODS

Participant or population The review will include studies conducted with typically developing children between the ages of 6 and 12, belonging to the middle childhood period, who are enrolled in school and participate in assessments of text comprehension (in written or oral format) and advanced theory of mind. Samples from any cultural or linguistic context will be considered, provided that the participants reported in the articles do not have neurodevelopmental

diagnoses, sensory disabilities, or clinical conditions that could affect cognitive or linguistic performance.

Intervention The exposure or intervention of interest corresponds to the simultaneous assessment of advanced theory of mind (ToM) and text comprehension in typically developing children aged 6 to 12 years.

Comparator No specific comparison group applies, as the review focuses on studies evaluating advanced theory of mind and text comprehension within the same typical population.

Study designs to be included Empirical studies with correlational, quasi-experimental, and experimental designs that report quantitative or mixed data on the relationship between advanced theory of mind and text comprehension in typical children will be included.

Eligibility criteria Empirical studies published in English or Spanish, peer-reviewed, that simultaneously evaluate advanced theory of mind and text comprehension in typical populations aged 6–12 years will be included. Research involving participants with clinical diagnoses, gray literature, theoretical reports, narrative reviews, and studies without quantitative data, or whose data cannot be converted to effect size, will be excluded.

Information sources The main information sources will be international electronic databases: ERIC, Medline (PubMed), Web of Science, Scopus, and ScienceDirect. In addition, manual searches will be conducted in the reference lists of previous studies and reviews, and authors will be contacted when necessary to obtain missing data. Gray literature will not be included for reasons of quality control and reliability.

Main outcome(s) The main result will be the magnitude and direction of the association between advanced theory of mind (ToM) and text comprehension (reading and/or listening comprehension) in typically developing children aged 6 to 12 years. The effect size will be expressed as Pearson's correlation (r), transformed to Fisher's z for analysis and back to r for presentation. When studies report other statistics (t, F, d, or β), they will be converted to r. Simultaneous assessments will be prioritized, and in longitudinal designs, the closest interval between ToM and comprehension measurements will be taken. A single effect per study will be obtained through internal aggregation when there are multiple measures. The results will be presented with their 95% confidence interval, as well as the indicators of heterogeneity (τ^2, I^2, H^2) and the 95% prediction interval.

Quality assessment / Risk of bias analysis Methodological quality assessment and risk of bias analysis will be using the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies (JBI, 2017), adapted to the type of design (correlational, quasi-experimental, or experimental). Two reviewers will independently evaluate each study and record risk judgments in categories: low, moderate, or high. Discrepancies will be resolved by consensus or with a third reviewer. Criteria such as sample representativeness, validity of measures, control of confounding variables, statistical analysis, and clarity in the presentation of results will be considered. The overall score will be used as a moderating variable and for sensitivity analysis.

Strategy of data synthesis Effect sizes will be expressed as Pearson correlations (r) transformed to Fisher's z, obtaining a single effect per study through internal aggregation weighted by sample size. A random effects model (REML) will be applied to estimate the average effect and its 95% confidence interval, together with heterogeneity statistics (Q, τ^2, I^2, H^2) and the 95% prediction interval.

The analyses will be performed in R (metafor, clubSandwich, robumeta, weightr, and dmetar packages). Residual heterogeneity and model consistency will be documented using graphs and complementary statistics.

Subgroup analysis Effect sizes will be expressed as Pearson correlations (r) transformed to Fisher's z, obtaining a single effect per study through internal aggregation weighted by sample size. A random effects model (REML) will be applied to estimate the average effect and its 95% confidence interval, together with heterogeneity statistics (Q, τ^2, I^2, H^2) and the 95% prediction interval.

The analyses will be performed in R (metafor, clubSandwich, robumeta, weightr, and dmetar packages). Residual heterogeneity and model consistency will be documented using graphs and complementary statistics.

Sensitivity analysis Sensitivity analyses will be performed to assess the robustness of the results:
(a) Exclude studies with a high risk of bias or incomplete data.

(b) Repeat the meta-analysis without outliers (according to influence and residuals).
(c) Compare results when including or excluding partial correlations or dependent effects.
(d) Evaluate publication bias using funnel plots, Egger's test, and Trim-and-Fill and PET–PEESE correction methods.
A selection model will be considered if the number of studies allows it.

Country(ies) involved Colombia.

Keywords Theory of Mind; advanced Theory of Mind; mental state reasoning; social reasoning; text comprehension; reading comprehension; oral comprehension; middle childhood.

Contributions of each author

Author 1 - Yeison Guerrero - Coordinated the overall study design, conducted the literature search, selected studies, extracted and analyzed data, and drafted the protocol and meta-analysis manuscript.
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Author 2 - Luisa Fernanda Méndez Ramírez - Oversee methodological development, critically review theoretical and conceptual content, and participate in the editing and final approval of the manuscript.
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