









The role of the social scene narrative task in differentiating autism, intellectual disability, and typical development

O papel de tarefa de narrativa de cenas sociais na diferenciação entre autismo, deficiência intelectual e desenvolvimento típico

El papel de la tarea de narración de escenas sociales en la diferenciación entre autismo, discapacidad intelectual y desarrollo típico

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ABSTRACT

Neurodevelopmental disorders often impact cognitive and social functioning. This study compared performance on Theory of Mind (ToM) tasks among children with Autism Spectrum Disorder (ASD), Intellectual Developmental Disorder (IDD), and Typical Development (TD). A total of 121 children and adolescents (69% male; mean age = 9 years; SD = 2.37) participated and were divided into three groups: ASD (n = 46), IDD (n = 29), and TD (n = 44). Results revealed significant differences between groups on all ToM tasks ($p < .001$). The TD group outperformed both clinical groups, scoring higher in simple organization (**mean difference** = 0.13; $p < .01$), complex organization (MD = 0.18; $p < .001$), and verbalizations (MD = 0.16; $p < .001$). The ASD group performed better on visual organization tasks compared to verbalization tasks ($p < .001$), while the IDD group showed consistently reduced performance with no significant differences between task types. These findings underscore the importance of specific ToM assessments in identifying distinct cognitive and social profiles, informing targeted interventions.

Keywords: Autism Spectrum Disorder, Intellectual Disability, Theory of Mind

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RESUMO

Os transtornos do neurodesenvolvimento frequentemente impactam o funcionamento cognitivo e social. Este estudo comparou o desempenho em tarefas de Teoria da Mente (ToM) entre crianças com Transtorno do Espectro Autista (TEA), Transtorno do Desenvolvimento Intelectual (TDI) e Desenvolvimento Típico (DT). Participaram 121 crianças e adolescentes (69% do sexo masculino; idade média = 9 anos; DP = 2,37), distribuídos em três grupos: TEA (n = 46), TDI (n = 29) e DT (n = 44). Os resultados revelaram diferenças significativas entre os grupos em todas as tarefas de ToM ($p < 0,001$). O grupo DT superou os grupos clínicos em todas as tarefas, com pontuações mais altas em organização simples (DM = 0,13; $p < 0,01$), organização complexa (DM = 0,18; $p < 0,001$) e verbalizações (DM = 0,16; $p < 0,001$). O grupo com TEA apresentou melhor desempenho nas tarefas de organização visual em comparação com as de verbalização ($p < 0,001$), enquanto o grupo com TDI demonstrou desempenho uniformemente reduzido, sem variações significativas entre as tarefas. Esses achados ressaltam a importância de avaliações específicas de ToM para identificar perfis cognitivos e sociais distintos, visando intervenções direcionadas.

Palavras-chave: Transtorno do Espectro Autista, Deficiência Intelectual, Teoria da Mente

RESUMEN

Los trastornos del neurodesarrollo impactan frecuentemente el funcionamiento cognitivo y social. Este estudio comparó el desempeño en tareas de Teoría de la Mente (ToM) entre niños con Trastorno del Espectro Autista (TEA), Trastorno del Desarrollo Intelectual (TDI) y Desarrollo Típico (DT). Participaron 121 niños y adolescentes (69% varones; edad promedio = 9 años; DE = 2,37), distribuidos en tres grupos: TEA (n = 46), TDI (n = 29) y DT (n = 44). Los resultados revelaron diferencias significativas entre los grupos en todas las tareas de ToM ($p < .001$). El grupo con DT superó a los grupos clínicos en todas las tareas, con puntuaciones más altas en organización simple (DM= 0,13; $p < .01$), organización compleja (DM = 0,18; $p < .001$) y verbalizaciones (DM= 0,16; $p < .001$). El grupo con TEA mostró mejor desempeño en tareas de organización visual que en tareas de verbalización ($p < .001$), mientras que el grupo con TDI presentó un rendimiento uniformemente bajo, sin diferencias significativas entre los tipos de tarea. Estos hallazgos destacan la importancia de evaluaciones específicas de ToM para identificar perfiles cognitivos y sociales distintos, con el fin de orientar intervenciones dirigidas

Palabras clave: Trastorno del Espectro Autista, Discapacidad Intelectual, Teoría de la Mente

Highlights of Clinical Impact

- Children with mild Autism Spectrum Disorder (ASD) perform better in visual than verbal tasks, indicating specific intervention targets.
- The ToM-B effectively differentiates cognitive profiles among ASD, Intellectual Developmental Disorder (IDD), and typical development groups.
- The IDD group showed uniform performance across task types, reflecting generalized cognitive deficits.
- Visual supports benefit ASD intervention by leveraging organizational strengths while addressing verbal challenges.

Early Theory of Mind (ToM) deficit identification enables targeted social communication interventions for neurodevelopmental disorders. Neurodevelopmental disorders are characterized by early-life functional and behavioral impairments, particularly affecting cognitive and emotional development. According to the DSM-5-TR, these disorders involve significant disruptions in neurological, cognitive, emotional, or behavioral development (American Psychiatric Association [APA], 2022). Two key neurodevelopmental disorders are Intellectual Developmental Disorder (IDD) and Autism Spectrum Disorder (ASD). IDD is marked by deficits in intellectual abilities, including reasoning, learning, and problem-solving, which impair communication, self-care, and social skills (APA, 2022). Alternatively, ASD is defined by persistent deficits

in social communication and interaction as well as restricted and repetitive behaviors, with symptoms present from early childhood that affect daily functioning (APA 2022).

The prevalence of ASD has risen in recent years, particularly in children aged 6 to 12, compared to adolescents and adults (Talentseva *et al.*, 2023). Globally, approximately 1 in 100 children is diagnosed with ASD (World Health Organization, 2023), and in Brazil, estimates suggest that 1.5 to 2 million children are affected (Brentani *et al.*, 2021). The global prevalence of intellectual disability is estimated between 1% and 3% (Duvall *et al.*, 2022; Schalock & Tassé, 2021). Studies indicate that 30% to 50% of individuals with intellectual disabilities also meet the criteria for ASD, depending on the diagnostic tools used (Bougeard *et al.*, 2021). Understanding

the specific cognitive and behavioral deficits associated with these conditions is essential for accurate diagnosis and effective intervention.

Theory of Mind (ToM); the ability to infer and understand the mental states, beliefs, desires, and intentions of others, is a core cognitive skill central to social interactions (Rosello *et al.*, 2020). Deficits in ToM are hallmark features of ASD and are also observed in individuals with IDD. These deficits hinder their ability to navigate social interactions and relationships (Baron-Cohen, 2000). Children with ASD show marked difficulties in tasks that require them to attribute mental states to others, often leading to social misunderstandings (Rosello *et al.*, 2020). Similarly, individuals with IDD exhibit ToM impairments, though these deficits are often linked to broader cognitive challenges, including limitations in verbal and executive functioning (Baurain & Nader-Grosbois, 2013).

Instruments to assess ToM range from basic tasks, such as the False-Belief Task, to advanced measures like the Strange Stories Task, which evaluate non-literal language and complex social reasoning (Fu *et al.*, 2023; Murray *et al.*, 2017; Rakoczy, 2022). These tools are critical for finding specific cognitive deficits and tailoring interventions to meet the needs of individuals with ASD and IDD. However, in the Brazilian context, validated tools are limited, particularly those designed to measure implicit ToM. The development of comprehensive assessments that incorporate both implicit and explicit ToM measures is crucial for advancing clinical understanding and intervention strategies in this population. Evaluating both implicit and explicit ToM is important because some individuals, particularly those with ASD, may show deficits in explicit reasoning about others' thoughts while maintaining implicit social understanding (Schuwerk *et al.*, 2015). Instruments such as the Reading the Mind in the Eyes Test (Baron-Cohen *et al.*, 2001) assess explicit ToM by asking individuals to infer emotions based on facial expressions, while implicit tasks, like those using eye-tracking technology, measure automatic responses to social cues (Kulke & Hinrichs, 2021). These varied instruments allow clinicians and researchers to gain a more nuanced understanding of ToM deficits, informing more tailored interventions to support social cognition in these populations.

In the Brazilian context, instruments designed to assess both implicit and explicit ToM are still limited, particularly in studies involving clinical populations such as individuals with ASD and IDD. While some adaptations of international tools, like the Faux Pas (Watanabe *et al.*, 2021), Strange stories (Velloso, 2011) and Reading the Mind in the eyes (Miguel *et al.*, 2017) have been validated and utilized, there is still a notable scarcity of instruments specifically tailored and validated for Brazilian populations. This gap is particularly evident in tasks that assess implicit ToM, which remains underrepresented in local research. As a result, there is a need for more comprehensive assessments that incorporate both implicit and explicit measures

to better understand social cognitive deficits in Brazilian clinical populations and to develop targeted interventions that address these nuanced impairments.

In this light, Fernandes (2019) developed The Theory of Mind Battery (ToM-B) to assess a wide range of ToM abilities while controlling for cognitive variables that could influence task performance. ToM-B includes tasks that measure both implicit ToM, such as emotion recognition, and explicit ToM, like false belief identification and verbalizations of emotional states, with varying levels of complexity. It includes five ToM-specific tasks and three control tasks from other cognitive domains, following a modular theoretical approach. Psychometric testing confirmed the content validity of the ToM-B, with expert judges evaluating its alignment with ToM concepts. Reliability analysis, particularly for the verbalization task, showed significant intraclass correlation between raters ($p < .001$). Construct validity was proved through significant correlations with the classic Sally-Anne task, with stronger correlations found for tasks assessing mental states and emotional gradation ($p < .001$). These results highlight the ToM-B's effectiveness in capturing both basic and complex ToM abilities, supporting its use in evaluating social cognition across various levels of complexity in clinical and non-clinical populations. The studies by Fernandes (2019) present robust findings with children with ASD, showing that ToM-B can be used as a screening tool for theory of mind impairments in children with mild symptoms.

The performance on ToM tasks can vary significantly between individuals with ASD and those with IDD. Research suggests that children with ASD often perform better on tasks involving non-verbal or visual-spatial reasoning but struggle with verbal aspects of ToM, such as interpreting emotions or understanding sarcasm (Rosello *et al.*, 2020). Conversely, children with IDD tend to exhibit more generalized impairments across both verbal and non-verbal ToM tasks, reflecting their broader cognitive deficits (Spaniol & Danielsson, 2022). This distinction is crucial for developing effective interventions, as it highlights the need for tailored approaches that address the specific cognitive profiles of each group.

This study aims to compare performance on ToM and control tasks among children with ASD, IDD, and typical development; to investigate intra-group differences regarding tasks with varying cognitive demands, such as visual and verbal tasks; and to analyze the impact of cognitive variables, such as IQ and verbal abilities, on task performance. The hypotheses suggest that the TD group will outperform the clinical groups (ASD and IDD) across all tasks. Furthermore, the ASD group is expected to outperform the IDD group in visual organization tasks but show lower performance in verbalization tasks. Finally, the IDD group is predicted to show more consistent performance across visual and verbal tasks due to their more generalized cognitive deficits.

METHOD

PARTICIPANTS

The study sample consisted of 121 children and adolescents living in the state of Rio de Janeiro. Most participants identified themselves as male ($n = 69, 57\%$), 9 years old (Mean = $9.79 = SD = 2.37$) and were mostly in either their 2nd or 5th year of elementary school. However, the demographic data shows varying gender distributions across groups, with males being predominant in the ASD group (76.7%) and IDD group (61.8%), while females were predominant in the control group (65.9%). Participants were divided into three groups: two clinical groups — one diagnosed with ASD ($n = 43, 35.5\%$) and the other with IDD ($n = 34, 28.1\%$) — and one typical development (TD) group from a public school in Rio de Janeiro ($n = 44, 36.4\%$). All the clinical groups were reached throughout child and adolescent psychiatry outpatient clinical services.

The sample was categorized into these three groups based on specific characteristics of previous diagnoses. Participants with ASD had a prior diagnosis confirmed through neuropsychological and psychiatric evaluations and were categorized as Level 1 support according to the DSM-5 criteria. The IDD group included children with an IQ below 70 and global cognitive and functional impairments, assessed via clinical interviews and evaluations. Participants with IDD did not have comorbid ASD, and most exhibited mild symptoms (IQ range 50–70, 88.2%), with only four

presenting moderate symptoms (11.8%). The TD group included children without cognitive or behavioral alterations of clinical significance and IQ scores above 70. Individuals with IQs below 50 were excluded from all analyses.

The typical development (TD) group consisted of children and adolescents who did not exhibit noticeable cognitive or behavioral alterations of clinical significance. Recruitment took place in Rio de Janeiro, targeting participants from public schools. The identical evaluation protocol employed for the clinical groups was used. Individuals in the TD group with IQ scores below 70 were not included in the analyses. The three groups were filtered by IQ and the results of the participants with IQ above 50 were not used in the analyses (see Figure 1).

INSTRUMENTS

Two instruments were used for analysis implemented: (1) Theory of Mind Battery (ToM-B) (Fernandes, 2019) and (2) Wechsler Abbreviated Scale of Intelligence (WASI) (Wechsler, 2014). The theory of mind battery (ToM-B) is a recent developed instrument, that aims to verify inference-making skills; understand simple and complex beliefs about others; organization of social scenes and has control tasks that involve visuo-perceptual and inhibitory control skills. The ToM-B is composed of seven tasks (see Figure 2). In the current study, the results of three tasks were used, two used as control – simple logical organization and complex logical organization, and one evaluate ToM – verbalizations.

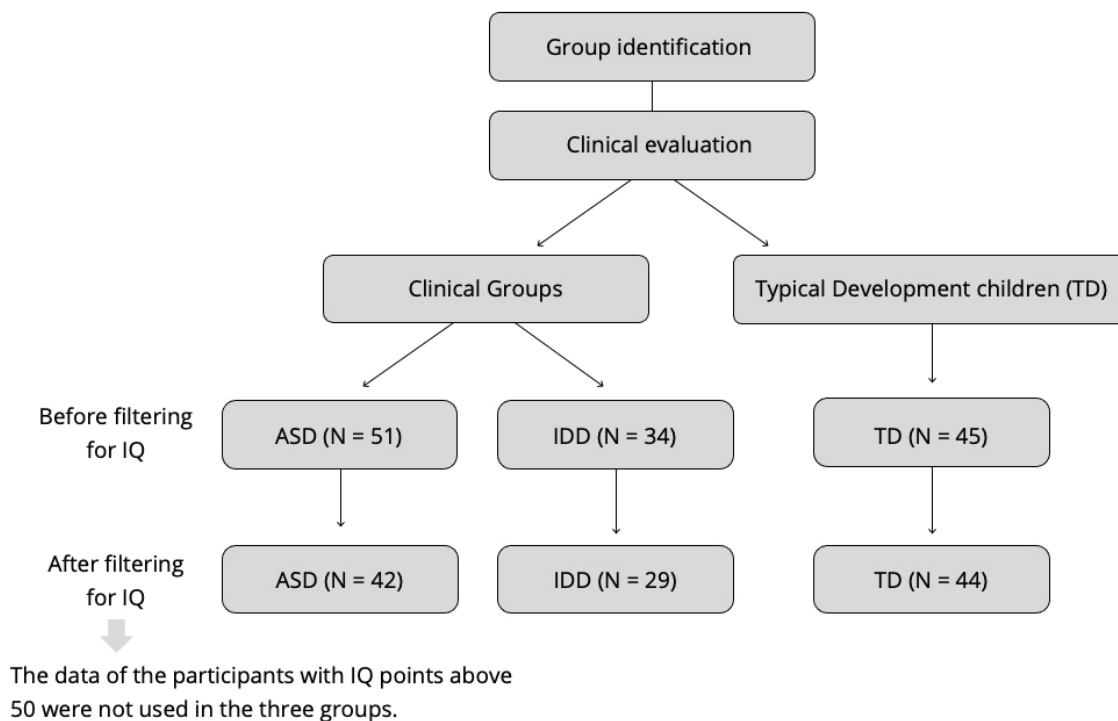


Figure 1. Groups distribution before and after IQ filtering

CONTROL-TASKS

In the simple logical organization task, the participant is asked to organize the order of events when presented with cards with social scenes. The task presents five stories and starts with three cards to organize, but the last two of them presents four cards. The cards are handed to the participant out of order, following a pre-established delivery sequence. As the participant organizes them, the evaluator notes the organized sequence on the back of the cards, where letters are marked. The correction is based on the participant's organization, with two acceptable forms of organization. The first option is entirely correct and worth two points, while the second is an alternative option worth one point (see Figure 3).

In the complex logical organization task, the participant is initially presented with three cards that represent parts of a social scene and is asked to organize them according to the order of events. In total there are five stories to be organized, in which the number of cards, stimuli and the level of inference required gradually increases (see Figure 4).

ToM-Task

The verbalization task takes place after the organization of each story in the complex organization task, in which the participant is freely asked to tell a story based on what he observed with the organization and content of the cards. In this subtest, the participant's organization is not corrected if they previously performed it incorrectly. The correction of the task is

made based on the details presented in each story, then if they identify the details expected by each story, they gain 1 point by detail. The participants are expected to identify, for example, the characters' primary and secondary beliefs, facial expressions and emotions and the central idea of the social scene. Gradually, the level of complexity increases, in which in the last stage identification of verbal expressions, intention and point of view of more than four characters is requested (see Figure 5).

COGNITIVE EVALUATION

The characteristics of the participants' cognitive functioning were determined by the application of the Wechsler Abbreviated Scale of Intelligence (WASI). The Abbreviated Scale of Intelligence is a concise tool designed to assess intelligence across a wide age range, encompassing individuals aged 6 to 89. This assessment provides insights into various cognitive aspects, including verbal knowledge, visual information processing, spatial and non-verbal reasoning, as well as fluid and crystallized intelligence. It is based on four subtests and yields information on Total IQ, Performance IQ, Verbal IQ, as well as subtests such as Vocabulary and Similarities, Block Design and Matrix Reasoning. The verbal index evaluates verbal comprehension, verbal reasoning, and linguistic abilities. The performance index assesses non-verbal reasoning and problem-solving abilities, including spatial processing and visual-motor integration and executive functions as cognitive flexibility and planning skills. The total IQ is a comprehensive measure of overall intelligence based on performance across all four subtests.

ToM-B - Tasks

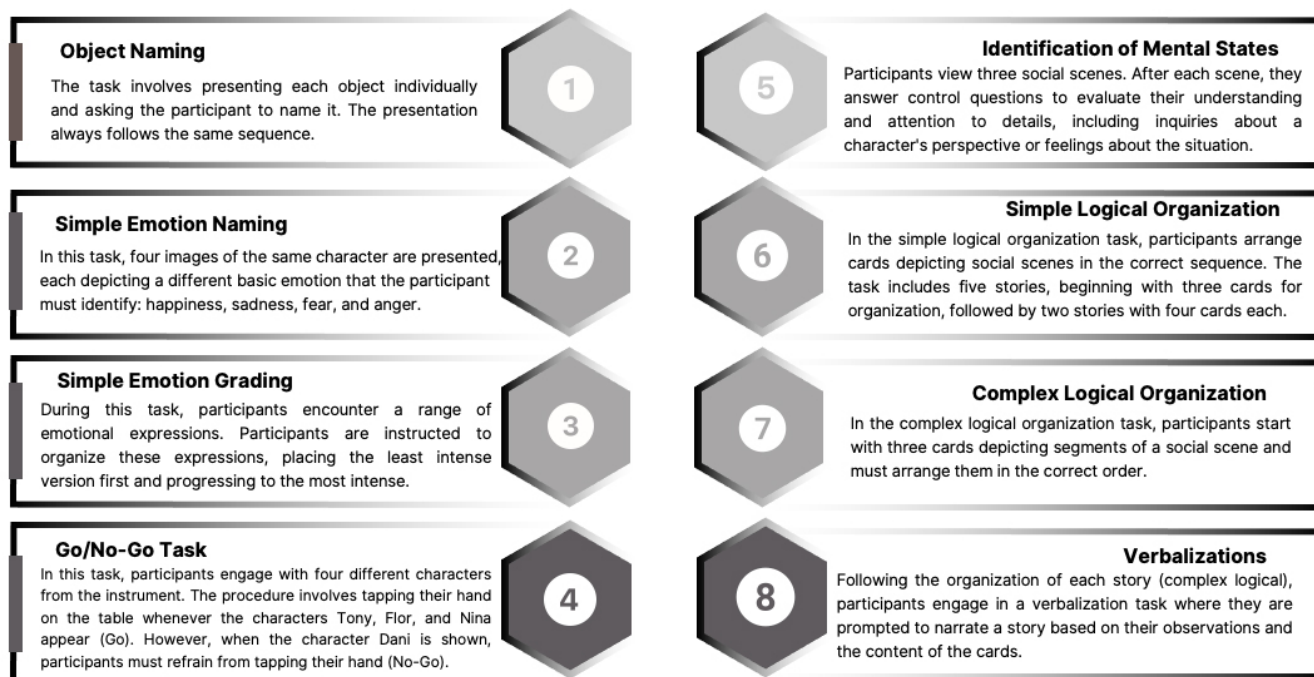


Figure 2. Descriptions of ToM-B tasks

PROCEDURES

Data collection adhered to ethical guidelines approved by the Brazilian Ethics Committee (Protocol number/CAEE: 41590720.4.0000.5257). Written informed consent was obtained from participants and their guardians. Assessments were conducted over four sessions, with clinical groups evaluated at a psychiatric outpatient clinic and the TD group evaluated in schools. Both environments were quiet, well-lit, and suitable for standardized testing. For the ToM-B tasks, all participants followed the same administration protocol. In the outpatient clinic, the battery was used for differential diagnosis and screening for ToM impairments, while in schools, it was used to map socio-emotional profiles for research purposes.

DATA ANALYSIS

The data were pre-processed before analysis to check for possible data inconsistencies, such as outliers and missing

data. After processing, sample distribution characteristics were checked for adequate analysis implementation. During this process, filters were applied to the database, with the aim of correctly identifying the groups that would be analyzed, for example, children under 6 years old.

Descriptive analyses were conducted to examine sociodemographic aspects using means and frequencies. Inferential analyses included a one-way Analysis of Variance (ANOVA) to identify differences between groups, a repeated measures to measure intragroup differences. Tukey's test was used for pairwise comparisons among groups. The analyses were carried out using R software in the Rstudio environment (RStudio Team, 2023) with the packages, tidyverse, readxl, effsize, janitor, irr, dplyr, tidyr, ggplot2, openxlsx, RColorBrewer, car, semPlot, reshape2 and mediation and RColorBrewer and the software Jamovi. All codes and analyses are available at: <https://osf.io/5bkcv/>.



Figure 3. ToM-B - Simple organization example

Source: Fernandes, C. (2019). *Desenvolvimento e evidências de validade de uma bateria infantojuvenil de avaliação de teoria da mente* [Dissertação de mestrado, Pontifícia Universidade Católica do Rio de Janeiro]. http://ppg.psi.puc-rio.br/uploads/uploads/1969-12-31/2019_4da3e360340ee8bfaf09473e927fbf26.pdf

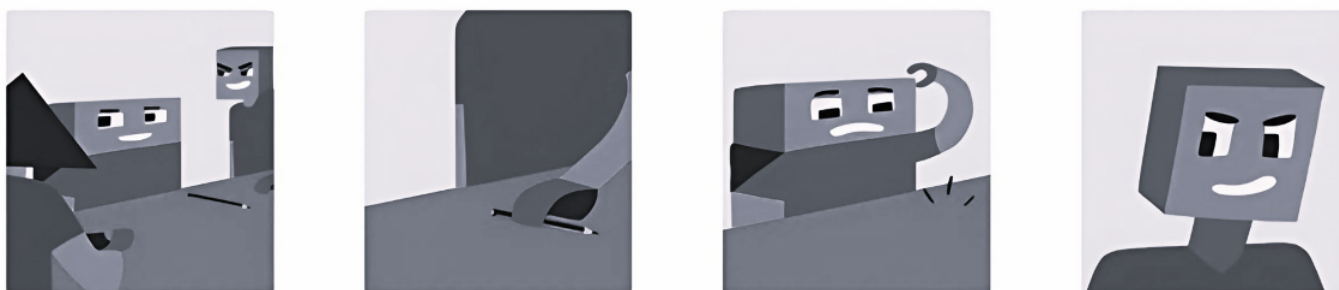


Figure 4. ToM-B - Complex organization example

Source: Fernandes, C. (2019). *Desenvolvimento e evidências de validade de uma bateria infantojuvenil de avaliação de teoria da mente* [Dissertação de mestrado, Pontifícia Universidade Católica do Rio de Janeiro]. http://ppg.psi.puc-rio.br/uploads/uploads/1969-12-31/2019_4da3e360340ee8bfaf09473e927fbf26.pdf

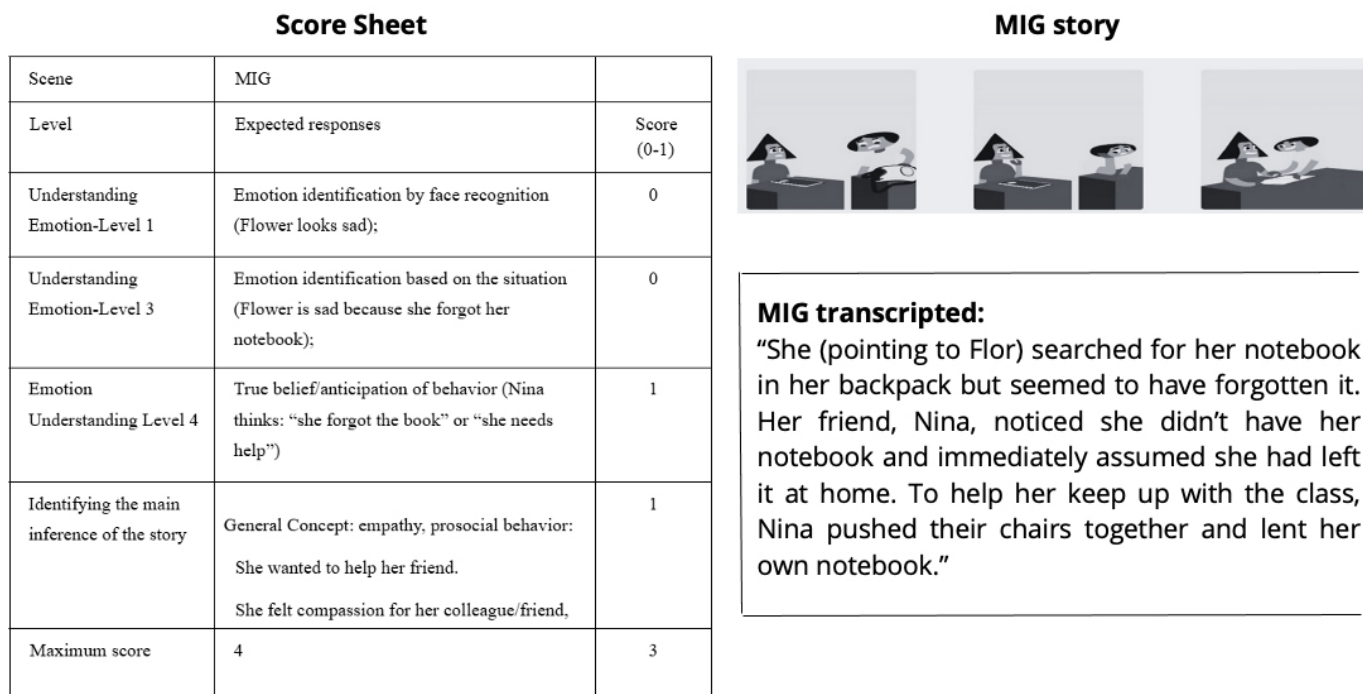


Figure 5. Example of a Verbalizations Task Correction Sheet

RESULTS

DEMOGRAPHIC RESULTS

The sample included 46 individuals with ASD, 29 with IDD, and 44 in the control group. The mean age of participants in the ASD group was 9.48 years (SD = 2.61), while the IDD group had a mean age of 10.69 years (SD = 2.59). The typical development group had a mean age of 9.20 years (SD = 1.56). Regarding gender distribution, 36 (78.3%) of the ASD participants were male, and 10 (21.7%) were female; in the IDD group, 18 (62.1%) were male, and 11 (37.9%) were female; the TD group included 69 (34.1%) males and 29 (65.9%) females.

In terms of comorbidities, 6 (25.0%) of the ASD participants reported comorbid conditions and other neurodevelopmental disorders, 2 (6.9%) in the IDD group and none in the TD group. The Wechsler Abbreviated Scale of Intelligence (WASI) results revealed that the ASD group had a mean IQ of 89.33 (SD = 17.86), significantly lower in the IDD group with a mean of 65.21 (SD = 8.48), and a mean of 94.39 (SD = 12.54) in the TD group. For Verbal IQ, the ASD group had a mean of 88.07 (SD = 17.86), the IDD group had a mean of 65.07 (SD = 10.18), and the TD group had a mean of 96.67 (SD = 15.86). Performance IQ scores were similar, with the ASD group scoring a mean of 93.24 (SD = 15.41), the IDD group at 72.45 (SD = 13.20), and the control group at 93.69 (SD = 12.81).

Are there differences between the groups in terms of the control and ToM tasks?

Initially, the participants' performances in the ToM-B tasks were compared (see Figure 6). Overall, the TD group outperformed the other groups across all three tasks. However, a different pattern emerged when analyzing the simple and complex organization (control tasks) and the verbalizations (ToM-task). In these tasks, the ASD group performed better in the simple and complex organization but scored lower on verbalizations compared to the IDD group.

Differences between the group with autism and other groups across the three tasks

The ANOVA comparing the ASD and TD groups, as well as the ASD and IDD groups, revealed significant findings. In the comparison between the ASD and TD group, all tasks showed notable differences. Specifically, for the simple organization task, the TD group outperformed the ASD group, with a mean difference of 0.13 (F(1, df) = 11.13, p < 0.01). In the complex organization task, the mean difference was 0.18 (F(1, df) = 18.26, p < 0.001), and for verbalizations, the mean difference was 0.16 (F(1, df) = 26.69, p < 0.001).

In contrast, when comparing the ASD and IDD groups, significant differences were observed in simple organization, with a mean difference of -0.14 (F(1, df) = 7.69, p < 0.01), and in complex organization, with a mean difference of -0.12

($F(1, df) = 6.47, p < 0.05$). However, no significant difference was found in verbalizations between these two groups (mean difference = 0.08, $F(1, df) = 3.96, p = 0.05$). These findings underscore performance disparities between the ASD and TD groups across all tasks, while highlighting mixed outcomes when comparing the ASD and IDD groups (see Table 1).

Are there intra-group differences across different levels of tasks?

A repeated measures ANOVA was conducted to evaluate the performance of the ASD group across three ToM-B tasks. The analysis revealed a significant effect of the task type on performance, $F(2, 84) = 30.6, p < .001$, indicating that the ASD group's performance varied across the tasks. Post-hoc comparisons using the Tukey test indicated that there was no significant difference in performance between simple organization and complex organization ($M = -0.004, p = 0.99$). However, significant differences were observed between simple organization and verbalizations ($M = 0.22, p < .001$) and

between complex organization and verbalizations ($M = 0.22, p < .001$). These results suggest that the ASD group's performance was significantly better in the simple and complex organization tasks compared to the verbalization task.

Similar analyses were conducted for the TD group across the same three ToM-B tasks. Post hoc comparisons using the Tukey test indicated no significant difference between simple organization and complex organization ($M = -0.03, p = 0.61$). In contrast, performance in verbalizations was significantly lower than both simple organization ($M = 0.21, p < .001$) and complex organization ($M = 0.24, p < .001$).

In the analysis of the intra-subject effects within the IDD group, the results indicate no significant differences across the three levels of tasks: simple organization, complex organization, and verbalizations. The sum of squares for the repeated measures factor was 0.03, with 2 degrees of freedom, yielding a mean square of 0.01. The F statistic was 0.65, and the associated p -value was 0.52, suggesting that variations in performance across these task levels did not reach statistical significance.

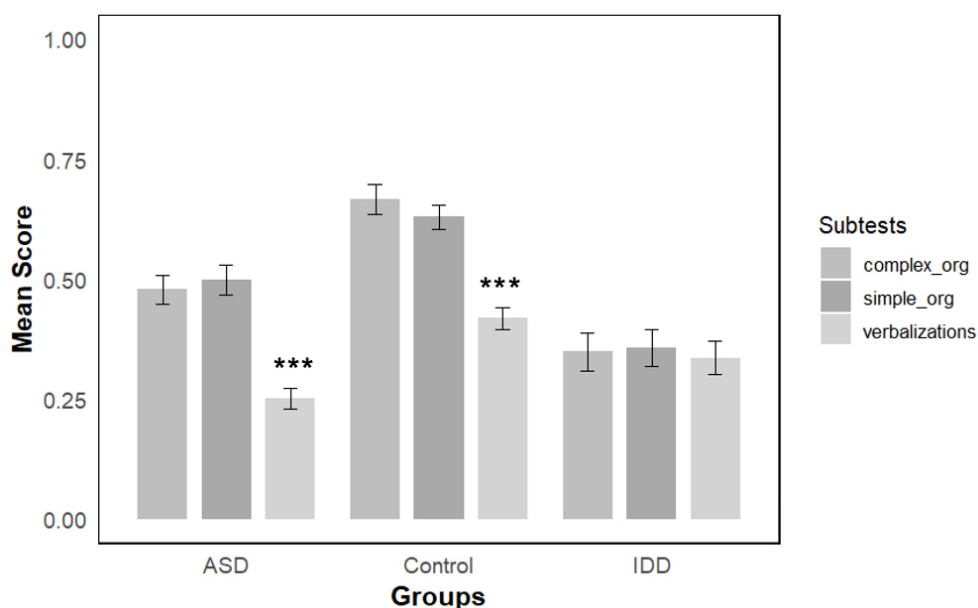


Figure 6. ToM-B tasks compared by groups

Table 1. ANOVA and post-hoc results

Groups	Tasks	Df	SS	f	p	Mean Diff	Post-Hoc p-value	CI (Lower, Upper)
ASD vs. TD	Simple organization	1	0.37	11.13	**	0.13	***	0.05 - 0.21
	Complex organization	1	0.75	18.26	***	0.18	***	0.10 - 0.27
	Verbalizations	1	0.58	26.69	***	0.16	***	0.10 - 0.23
ASD vs. IDD	Simple organization	1	0.34	7.69	**	-0.14	**	-0.24 - -0.03
	Complex organization	1	0.29	6.47	*	-0.12	*	-0.02 - 0.01
	Verbalizations	1	0.11	3.96	ns	0.08	ns	-0.00 - 0.17

Note. Asterisks denote statistical significance levels: $p < 0.05$ (*), $p < 0.01$ (**), $p < 0.001$ (***); ns = non-significant result; df = degrees of freedom; SS: Sum of squares; Mean Diff = Mean difference; CI (Lower, Upper) = Confidence interval for the mean difference.

DISCUSSION

This study aimed to identify ToM profiles among clinical groups (ASD and IDD) and a non-clinical group (TD), compare their performance on different ToM tasks, and analyze the influence of cognitive variables on task outcomes. The findings reveal that (a) the TD group consistently outperformed both clinical groups across all tasks, (b) individuals with ASD performed better on tasks involving simple and complex visual organization compared to verbal tasks, and (c) the IDD group exhibited uniformly reduced performance, with no significant variation across tasks.

The findings revealed that the TD group outperformed both clinical groups (ASD and IDD) across all ToM tasks, underscoring the cognitive deficits often associated with neurodevelopmental disorders. This performance gap emphasizes the urgent need for early and targeted interventions for children with ASD and IDD. Research suggests that early ToM intervention can significantly enhance developmental outcomes, particularly in social and cognitive domains (Fletcher-Watson *et al.*, 2014). Given that individuals with ASD often experience difficulties in understanding social cues and engaging in appropriate social interactions, tailored interventions focusing on ToM skills may facilitate improvements in their social cognition and overall functioning (Rogers, 2009).

The role of ToM in distinguishing neurodevelopmental profiles is well-documented, highlighting its utility as a diagnostic and intervention tool. ToM deficits are particularly pronounced in ASD, where challenges in inferring others' mental states often lead to difficulties in social communication and interaction (Baron-Cohen, 2000). These deficits are contrasted by individuals with Intellectual Developmental Disorder (IDD), whose ToM impairments are generally attributed to broader cognitive limitations rather than specific social cognitive deficits (Baurain & Nader-Grosbois, 2013). The present study supports this distinction, as evidenced by the ASD group's stronger performance on visual organization tasks compared to verbal tasks, reflecting their relative strengths in non-verbal reasoning. Meanwhile, the IDD group demonstrated consistent but reduced performance across all tasks, underscoring their generalized cognitive impairments. These results align with findings that link verbal IQ and executive functioning to ToM capabilities, particularly in differentiating ASD and IDD profiles (Isaksson *et al.*, 2021; Spaniol & Danielsson, 2022). By leveraging ToM assessments, clinicians can better identify cognitive and social challenges specific to each disorder, facilitating tailored interventions and improving developmental outcomes.

Notably, the ASD group proved better performance in tasks requiring the logical organization of social scenes compared to their verbalization skills. This indicates a potential opportunity for targeted intervention, where tailored programs focusing on visual and organizational skills could be developed to strengthen their ability to create and articulate narratives.

Such interventions could facilitate improvements in social cognition and overall functioning (Cohen *et al.*, 2022). The observed performance gap highlights the need for interventions that leverage these visual strengths while directly targeting the verbal and social-emotional challenges prevalent in ASD. For example, visual supports, such as video modeling and social stories, have been shown to improve social understanding and interaction in children with ASD (Reichow & Volkmar, 2010). However, to address the deficits in verbalization and narrative construction, interventions could incorporate narrative-based therapies, guided role-play, and structured verbal exercises aimed at enhancing both expressive and receptive language skills (Nejati *et al.*, 2024; Upshaw, 2009). This approach is crucial as studies indicate that the inability to verbalize emotions and social cues often exacerbates difficulties in social integration, even in individuals with mild ASD symptoms (Fletcher-Watson *et al.*, 2014). By addressing these specific deficits early on, it may be possible to mitigate the long-term impacts on social integration and emotional well-being, which are critical for successful development (Mecca, 2024).

It is important to consider that most of our sample was composed of children with ASD with symptoms that are considered mild. Our findings highlight the persistent challenges that children with ASD, even those with milder symptoms, face in cognitive and social tasks. Research indicates that children with ASD often display strengths in visual processing and non-verbal reasoning, which can contribute to better performance in visual tasks (Fletcher-Watson *et al.*, 2014). However, their difficulties in verbal tasks and overall social communication remain significant, as shown by their lower performance compared to non-clinical peers. Literature suggests that even children with high-functioning autism or those classified as having Level 1 support needs may struggle with ToM capabilities, particularly in understanding and articulating emotional states.

The cognitive demands of verbal tasks, which often require a higher level of social cognition and the ability to interpret and communicate complex emotions, can pose challenges for these individuals, leading to performance discrepancies. Moreover, these findings resonate with the concept of "masking" in ASD, where individuals learn to compensate for their difficulties in social situations, often at the expense of genuine understanding and expression (Hull *et al.*, 2017). While their visual strengths may enable them to navigate certain social contexts, the underlying challenges in verbal communication can hinder their overall social interactions and emotional relationships. The literature emphasizes the need for tailored interventions that not only build on these visual strengths but also specifically target verbal communication and social understanding skills (Rogers, 2009). This approach is critical for promoting a holistic development of ToM in children with ASD, allowing them to strengthen their cognitive strengths while addressing the areas that present challenges. In conclusion, while children with ASD exhibiting mild symptoms

may show better performance in visual tasks, their lower scores compared to non-clinical peers underscore the necessity for targeted interventions that support their development in verbal communication and social cognition, ultimately enhancing their overall functioning in everyday social interactions.

The results of this study carry significant implications for the differential diagnosis and treatment of children with ASD and IDD. Clinicians should use a comprehensive approach when evaluating children with suspected neurodevelopmental disorders, considering not only their cognitive abilities but also their social communication skills. The findings suggest that traditional diagnostic criteria may overlook the nuanced differences in ToM performance among children with varying support needs. In terms of treatment, interventions should be tailored to the specific needs of each group. For children with ASD, particularly those with mild symptoms, interventions that leverage their visual strengths—such as using visual aids, social stories, and video modeling—can be effective in enhancing their social cognition and verbal communication skills (Dyrda *et al.*, 2020).

On the other hand, children with IDD may benefit from more holistic approaches that focus on building both verbal and non-verbal communication strategies to support their social interactions (Danniels & Pyle, 2023). Strategies may include the use of structured teaching methods, which emphasize clear instructions and routine, along with the incorporation of visual supports to enhance understanding and engagement. Programs that utilize play-based learning can also be beneficial, as they promote social interaction and communication in a naturalistic setting (Danniels & Pyle, 2023). Ultimately, both groups require individualized intervention plans that recognize their unique strengths and difficulties. By employing strategies tailored to the cognitive profiles of children with ASD and IDD, practitioners can foster meaningful improvements in social functioning and communication, leading to better overall developmental outcomes.

Despite its contributions, this study has limitations. The predominance of participants with mild ASD symptoms may limit the generalizability of the findings to individuals with more severe presentations. Additionally, the cross-sectional design precludes causal inferences about the relationship between cognitive variables and ToM performance. Future longitudinal studies should explore how ToM abilities evolve over time and assess the long-term impacts of interventions. Expanding the range of tasks and incorporating culturally adapted tools could also provide a more comprehensive understanding of ToM in diverse populations.

CONCLUSION

This study highlighted significant differences in Theory of Mind task performance among children with ASD, IDD, and TD. While the ASD group exhibited strengths in visual tasks, challenges in verbalizations were evident, reflecting their difficulties in social communication. The IDD group demonstrated

generalized deficits, underscoring the need for comprehensive interventions. The findings emphasize the importance of individualized approaches to assess and address specific ToM deficits, utilizing tasks tailored to the unique cognitive profiles of each group. Future studies should include more diverse samples to better explore the impact of symptom severity and cognitive functioning on social skills.

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