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A Study of 6-8 Years Old Autism Children's Theory of Mind Developmental Characters

Wang Xiuli[1,2], Datuk Dr. Yasmin Binti Hussain[3*], Wang Zinan[4] and Diyana Kamarudin[5]

[1,3]Faculty of Education and Liberal Studies, City University, 46100 Petaling Jaya, Kuala Lumpur, Malaysia, [2]Faculty of Teacher Education, Heze University, 274015, Heze, Shandong, China, [4]Shandong Aita Education Services Co., Ltd., 255000, Zibo, Shandong, China, [5]Diyana Kamarudin, IPU, Fitzherbert, Palmerston North 4410, New Zealand

[*]Corresponding Author Email: dryasmin.hussain@city.edu.my

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Abstract

The incidence of Autism Spectrum Disorder (ASD) continues to rise globally, with epidemiological studies reporting a prevalence rate as high as 1 in 54. Theory of Mind (ToM), defined as the ability to infer and predict others' mental states and behaviors, is widely regarded as a core deficit underlying social communication challenges in children with autism. This study employs a quantitative comparative research design to investigate differences in ToM development between 30 children with ASD (experimental group, aged 6–8) and 30 age-matched typically developing children (control group). Results demonstrate that children with ASD exhibited significantly lower levels of ToM development compared to their typically developing peers, with marked difficulties observed in tasks assessing basic belief understanding and false belief reasoning.

Keywords: Autism, Theory of Mind, Developmental Characteristics, Comparative Study

Introduction

Autism, known as Autism Spectrum Disorder, is a pervasive neurodevelopmental condition with onset in early childhood. Its core characteristics encompass varying degrees of social communication impairments, restricted interests, and repetitive behavioral patterns(Ma & Hu, 2020). ASD profoundly impacts individuals' language development, social interaction, and behavioral flexibility. Notably, significant heterogeneity exists within the autism population, rendering many individuals with ASD unable to engage in normative communication or integrate into societal structures. In recent years, the global prevalence of ASD has shown a persistent upward trend. According to 2020 estimates released by the U.S. Centers for Disease Control and Prevention (CDC), approximately 1 in 54 children is diagnosed with ASD, with a fourfold higher diagnosis rate among boys compared to girls (World Health Organization [WHO], 2023). In China, the China Autism Education and Rehabilitation Industry Development Status Report estimates that the current population of individuals with ASD exceeds 10 million, including over 2 million diagnosed children aged 0–14, with nearly 200,000 new cases annually (Babytree Public Welfare Team, 2021). These data underscore ASD as a pressing

public health and social challenge, necessitating heightened attention to the recognition, education, and systemic support for individuals on the autism spectrum. Children with ASD have significant difficulties in social interaction, emotional expression, and restrictive behavioral patterns. Children with ASD often exhibit deficits in theory of mind, which impairs their ability to understand others' emotions and intentions, thereby limiting their social interactions. This deficiency poses significant challenges in their daily lives.

For children with ASD, the development of ToM is critical to their social adaptation and learning. ToM refers to an individual's capacity to infer and attribute mental states—such as desires, intentions, and beliefs—to oneself and others, and to use this understanding to interpret and predict behavior (Baron-Cohen et al., 2000). Research indicates that children with ASD often exhibit marked delays or deficits in ToM development. Baron-Cohen et al. further posit that impairments in ToM constitute a primary factor underlying the social communication challenges observed in autistic children (Yirmiya et al., 1998). In other words, children with ASD frequently struggle to infer others' perspectives, comprehend emotional states or beliefs, or accurately interpret social intentions. The development of ToM plays a pivotal role in children's ability to navigate the social world, making it particularly vital for the social and cognitive growth of autistic individuals (Baron-Cohen et al., 2000).

The 6–8-year age range, corresponding to early school years, represents a critical developmental juncture for cognitive and social skill acquisition, as well as a key window for fostering potential. ToM development during this period warrants focused attention. While typically developing children acquire foundational ToM by preschool age (e.g., understanding divergent beliefs around age 4), autistic children aged 6–8 may still demonstrate significant lags in ToM comprehension, necessitating targeted support and intervention. However, there remains a notable research gap in specialized studies addressing ToM development in 6–8-year-old children with ASD. Such research is essential for informing evidence-based educational approaches and intervention frameworks to support autistic children's development. Stated differently, in-depth exploration of this age cohort not only enhances understanding of the socio-cognitive profile of autistic children—facilitating their social integration—but also contributes empirical insights to refine theoretical models of ToM, carrying significant practical and theoretical implications.

Against this backdrop, this study focuses on delineating the developmental characteristics of ToM in 6–8-year-old children with ASD. By elucidating patterns of ToM development during this critical period, the research aims to provide a scientific foundation for designing effective educational and intervention strategies.

Problem Statement

While the development of ToM in children with ASD has garnered significant scholarly attention, research gaps persist regarding the developmental characteristics of ToM in 6–8-year-old autistic children—a critical transitional age cohort. Existing studies predominantly focus on typically developing children or older autistic populations, with limited systematic investigation into this specific age group. Furthermore, theoretical and practical frameworks for designing effective, developmentally tailored intervention strategies aligned with ToM progression during this stage remain underdeveloped. Consequently, this study seeks to address these gaps by systematically examining ToM development in 6–8-year-old children

with ASD and proposing evidence-based educational and intervention strategies informed by empirical findings.

Literature Review

Autism Spectrum Disorder (ASD)

Definition of ASD

According to the diagnostic criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder emerging in early childhood, characterized by persistent deficits in social communication and interaction, alongside restricted, repetitive patterns of behavior, interests, or activities. The core impairments of ASD are categorized into two domains: Social communication and interaction deficits; Narrow interests and repetitive/stereotyped behaviors. For individuals with ASD, social communication impairments constitute the most central and pronounced challenge. In 1943, American psychiatrist Leo Kanner, through his seminal study of 11 cases, first identified this condition as "early infantile autism." He delineated its defining features, including extreme social isolation ("autistic aloneness"), exceptional rote memory, delayed echolalia, hypersensitivity to sensory stimuli, and limited spontaneous activity. Subsequently, the DSM-III (1980) formally recognized autism as a pervasive developmental disorder (PDD), marking its inclusion in standardized diagnostic frameworks.

Prevalence of Autism Spectrum Disorder

The prevalence of autism has shifted significantly alongside evolving conceptualizations of the disorder and revisions to diagnostic criteria. Early estimates suggested an autism prevalence rate of 2–4 per 10,000 individuals(Flagella, 1986). However, the latest report from the U.S. Centers for Disease Control and Prevention (CDC) reveals a striking increase, with ASD now affecting 1 in 54 children—a fourfold higher diagnosis rate among boys compared to girls (Yan et al., 2020). In China, data from the China Autism Education and Rehabilitation Industry Development Status Report indicate that the autistic population has surpassed 10 million, including over 2 million children aged 0–14, with approximately 200,000 new cases added annually. These trends underscore autism's transition from a historically rare disorder to a public health epidemic (Lu et al., 2021). Notably, China's national disability census identifies autism as the leading cause of psychiatric disability nationwide, reflecting its profound societal impact(Zhou, 2017).

Etiology of Autism Spectrum Disorder

The etiology of autism remains an unresolved enigma, with no definitive or unified consensus to date. A widely recognized hypothesis posits that autism is a biologically rooted neurodevelopmental disorder, attributable to a complex interplay of early developmental anomalies, genetic predispositions, and neurobiological factors (Li & Yu, 2004).

Rutter (2005) asserts that genetics represents the most well-established risk factor for autism, with evidence clearly indicating ASD as a polygenic, multifactorial condition involving interactions between multiple genes and undefined non-genetic contributors (Rutter, 2005). Helen (2011) proposes that autism may arise from genetic defects or neuroinflammation, potentially triggered by environmental toxins, infectious agents, or comorbid genetic vulnerabilities in individuals predisposed to developmental disorders. Furthermore, Zhang

Tao, Cao Manjue, et al. (2021) emphasize that ASD likely stems from epigenetic and environmental interactions, including synaptic protein gene mutations, chromosomal abnormalities, dysregulated molecular pathways, and neuroinflammatory responses (Zhang et al., 2021).

Theory of Mind (ToM)

Definition of Theory of Mind

Theory of Mind (ToM) refers to the capacity to attribute and reason about mental states—such as beliefs, intentions, thoughts, and emotions—in oneself and others. This ability underpins the interpretation and prediction of behavior, forming the foundation of human social interaction (Qin et al., 2020). ToM encompasses the recognition of all psychological states underlying behavior, including beliefs, desires, intentions, imaginations, and affective states. In essence, ToM enables individuals to infer their own and others' internal states. Moreover, robust ToM development plays a pivotal role in linguistic and emotional comprehension, as well as in the cultivation of play participation, peer relationships, and social adaptability (Gu & Zheng, 2021).

Development of Theory of Mind

ToM is defined as the capacity to explain and predict behavior by attributing mental states to oneself and others—in other words, the ability to hypothesize psychological states in self and others(Premack & Woodruff, 1978). ToM processing operates through two distinct pathways:
Implicit ToM: Characterized by rapid, unconscious, and relatively inflexible processing, this pathway emerges in early developmental stages (before age 4) (Schuwerk et al., 2016).
Explicit ToM: A conscious, flexible, and cognitively effortful reasoning system that begins to develop around age 4(Heyes & Frith, 2014).

In typically developing populations, ToM follows a stable developmental trajectory: foundational skills consolidate by early childhood (approximately age 4), peak in adulthood, and gradually decline in later life (Qin et al., 2020).

ToM Deficit Hypothesis in Autism

In neurodivergent populations such as individuals with autism spectrum disorder (ASD), ToM development often follows atypical trajectories due to significant individual variability in cognitive and social-emotional processing (Booules-Katri et al., 2019).

Baron-Cohen et al. (1985) conducted a landmark study using the classic Sally-Anne false belief task to assess ToM in 20 autistic children aged 4. Results revealed that over 80% of participants failed the task, demonstrating marked difficulties in understanding others' false beliefs (Baron-Cohen et al., 1985). This finding suggests that autistic children struggle to interpret behaviors, intentions, and causal mental states, often relying on literal, surface-level interpretations rather than inferring underlying psychological states. Baron-Cohen et al. hypothesized that deficits in ToM underlie the core social and imaginative impairments observed in autism, as well as associated developmental challenges. Subsequent studies have provided empirical support for this hypothesis, solidifying the ToM deficit framework as a central explanatory model for autism-related social cognition differences.

Methodology

This study aims to investigate the developmental characteristics of Theory of Mind (ToM) in 6–8-year-old children with autism spectrum disorder (ASD) and its impact on social communication. Employing a quantitative comparative research design, we compared the experimental group (ASD children) with a control group (typically developing [TD] children) to elucidate cross-group differences and commonalities in ToM competencies. Below, we elaborate on the study design, participant selection criteria, data collection protocols, and analytical procedures.

Research Design

This study employed a comparative experimental design between an experimental group (children with ASD) and a control group (typically developing children) to elucidate similarities and differences in ToM competencies across populations. The following elaborates on the research design, participant selection, data collection, and analytical procedures. The investigation ensured equivalence between groups in chronological age and environmental conditions to mitigate confounding variables affecting ToM assessment outcomes. Following protocol finalization, all evaluations were administered in familiar, spacious, and well-lit settings to facilitate authentic self-expression. The implementation strictly adhered to predefined operational protocols, utilizing standardized assessment instruments for quantitative ToM measurement.

Population and Sampling

Autism Spectrum Disorder (ASD) Group

Children with ASD were recruited through purposive sampling from special education schools and rehabilitation centers within the municipal jurisdiction. Inclusion criteria comprised: 1) formal ASD diagnosis by pediatric or psychiatric departments in public hospitals, supported by official diagnostic reports; 2) age 6–8 years; and 3) mild-to-moderate symptom severity. Thirty eligible children (24 male, 6 female) were ultimately enrolled.

Typically Developing (TD) Children Group

A control group of 30 children (17 male, 13 female) was randomly selected from Grades 1–3 in a public elementary school, with frequency matching applied to align age range (6–8 years) and approximate gender ratio with the ASD group. Classroom teachers confirmed participants' normative intellectual and social development. Parental informed consent was obtained for all control group participants.

Testing Protocol

Both groups completed assessments in familiar environments: ASD children in their routine training classrooms assisted by familiar rehabilitation specialists, and TD children in school classrooms during non-instructional hours, administered by researchers. This environmental configuration aimed to elicit relaxed states conducive to authentic theory of mind (ToM) performance. Legal guardians of all participants provided written informed consent, and the study protocol received ethics approval from the institutional review board.

Measurement/Trustworthiness

Measurement

Theory of mind is a complex mental process that involves understanding and making inferences about one's own and others' mental states, emotions, and intentions. Due to its complexity, there are also various task paradigms for measuring theory of mind ability, such as false belief task, unexpected place task, appearance-reality task, and so on. Due to the different test methods, the results of the research on theory of mind in autistic children are also different. In this study, the Theory of Mind Test for Autistic Children in Central Taiwan, which was revised by Shao Wei-ting and developed by Professor Feng Hua and his team from the Department of Special Education of Changhua Normal University, was used to measure the children's theory of mind ability.

The scale divided into three sub-tests: ① Situational Induction of Emotional Issues. ② Emotional validation issues. ③ Second-order false belief questions. The test consisted of 39 items, which were divided into 8 situations.

Table 1

Three subtests of ToM tests for Children with ASD

Subtest	Content	Question number
Situation 1	Watching TV	1.2.3.4.5.6
Situation 2	Game console	7.8.9.10
Situation 3	Cookies and chips	11.12.13.14
Situation 4	Where is the eraser	16.17.18.19
Situation 5	Where is the eraser two	20.21
Situation 6	Where the blocks are	22.23.24.25.26.27
Situation 7	Potato chips	28.29.30.31
Situation 8	Playing ball	43.44.45.46.47.48.49.50.51

Subtest I (Situational Induction of Emotional Issues): Assessed dimensions included: context-induced emotions, memory integration, basic belief formation, visual access knowledge ("seeing leads to knowing"), reality differentiation, and desire-emotion causality. Each correct response received 1 point, with a maximum achievable score of 22 points.

Subtest II (Emotional Validation Issues): Evaluated components comprising: context-emotion validation, desire-emotion validation, basic belief verification, visual access confirmation ("seeing leads to knowing"), first-order false belief recognition, and corresponding validation tasks. The two first-order false belief validation items were weighted at 2 points each, while other items received 1 point per correct response, yielding a maximum total of 15 points.

Subtest III (Second-order False Belief Questions): Focused on second-order false belief comprehension and validation mechanisms. The second-order false belief validation item was allocated 2 points, with remaining items scored at 1 point each, culminating in a maximum attainable score of 2 points.

Trustworthiness

The reliability and validity of the scale showed a high level. Specifically, the correlation coefficients between the subtests ranged from 0.54 to 0.77, and the correlation coefficients between each subtest and the total score ranged from 0.62 to 0.93 ($P < 0.01$), showing a good correlation between the subtests and the total score. The Cronbach's α coefficient of the total scale was 0.84, and the Cronbach's α coefficients of the subtests were 0.83, 0.80 and 0.78,

respectively, indicating that the scale showed high reliability in terms of internal consistency. The test-retest reliability of the total scale was 0.84, and the test-retest reliability of each sub-test was 0.75, 0.74 and 1.00, respectively, indicating that the test-retest reliability of the scale at different time points was high. Developmental validity was also tested during the revision of the test. The results showed that the test scores increased with age, and the average scores of specific stages were 26.64, 32.65 and 35.98, respectively. The differences among stages reached a significant level, indicating that the test had good developmental validity. In addition, the test also passed the expert validity test, and the Kendall correlation coefficient ranged from 0.365 to 0.894, which was significant, which further proved the internal validity of the test, namely the expert validity. The high level of internal consistency, test-retest reliability, developmental validity and expert validity confirmed the reliability and stability of the scale as a valid measurement tool.

Data Collection

All participants were assessed by trained researchers following standardized administration protocols. The evaluations were conducted through individual interview sessions, with each child requiring approximately 30 minutes to complete the full battery of tasks. During testing, researchers maintained a neutral demeanor and refrained from providing leading feedback. If a child demonstrated difficulty comprehending task requirements, the scenario narrative was repeated once. For children with ASD exhibiting attentional lapses, transient breaks were permitted before resuming testing to ensure data integrity. All assessments were completed within a two-week period to minimize temporal variability. Following data collection, responses were systematically coded, with dual-entry verification performed during statistical software input to guarantee data accuracy.

Data Analysis

Following data collection, statistical analyses were conducted using SPSS 23.0. Analytical approaches included descriptive statistics, correlational analyses, and intergroup comparisons to examine differences in theory of mind (ToM) competencies between children with ASD and typically developing (TD) children, as well as investigate relationships between subtest scores and social communication abilities. Implementation strictly adhered to the predetermined analytical protocol to ensure methodological rigor and reliability of findings.

Results

This investigation conducted statistical comparisons between 30 children with ASD and 30 typically developing (TD) children across three theory of mind (ToM) subtests and composite scores to elucidate developmental disparities in ToM capacities. The subsequent sections present findings from descriptive statistics and significance testing, respectively.

Descriptive Statistics and Intergroup Comparative Analyses

Initial analyses focused on descriptive statistics for both groups across three ToM subtests: Subtest I (Prerequisite Skills for Theory of Mind), Subtest II (Mental-State/Physical-Environment Differentiation), and Subtest III (Active Reality-State Interpretation), along with composite scores. Results are systematically summarized in Table 3.

Table 2
Comparative Performance Metrics of ASD and TD Groups Across ToM Subtests

Subtests	ASD Group (n=30)	TD Group (n=30)	*t*	Significance Level
Subtest 1	7.83 ± 2.49	20.07 ± 1.258	16.042	$p < 0.01$
Subtest 2	0.20 ± 0.407	1.58 ± 0.395	7.751	$p < 0.01$
Subtest 3	0.07 ± 0.386	2.01 ± 1.287	8.192	$p < 0.01$
Total Score	8.10 ± 2.50	37.02 ± 5.58	11.597	$p < 0.01$

Note: "Subtest 1," "Subtest 2," and "Subtest 3" refer to different Theory of Mind tasks. ASD = Autism Spectrum Disorder; TD = Typically Developing children.

Descriptive statistics revealed statistically significant between-group disparities in mean scores across all assessment domains ($p < 0.001$), with the ASD group demonstrating consistently lower performance than the TD cohort. Both groups manifested a descending performance trajectory across subtests (Subtest I > Subtest II > Subtest III), indicating progressive score attenuation corresponding with increased task complexity and/or abstraction levels.

Interaction Effect Analysis

To investigate the interaction between "Group" (ASD vs. TD) and "Subtest Type" (three ToM subtest categories), a two-way ANOVA with interaction effects was conducted, with results detailed in Table 3.

Table 3
Analysis of Variance for the Dependent Variable

Source	SS	df	df (error)	*p*
Group	17200.15	1	1	0.000
Test	15266.88	3	3	0.000
Group × Test	5645.95	3	3	0.000
Error	1403.667	232	232	—
Total	35018.65	239	239	—

Note: "Group" typically refers to ASD vs. TD groups, "Test" indicates the repeated measures or different subtests, and "Group × Test" is the interaction term.

All main effects demonstrated statistical significance ($p < .001$), indicating that Group (ASD vs. TD), Subtest Type, and their interaction exerted significant influences on theory of mind (ToM) scores. The significant interaction effect ($p < .001$) particularly suggested differential patterns of score decline across subtests between groups.

Normality Testing

Normality assumptions were verified for all subtest scores prior to conducting ANOVA and t-tests. Given subgroup sample sizes exceeding 50 ($n \geq 50$), distributional normality was assessed through dual diagnostic criteria: the Kolmogorov-Smirnov test for large-sample robustness and the Shapiro-Wilk test for sensitivity to non-normality. Comprehensive test statistics are reported in Table 4.

Table 4
Normality Test Results

Name	Sample Size	Mean	Std. Dev.	Skewness	Kurtosis	KS Test (*D*, *p*)	Shapiro–Wilk Test (*W*, *p*)
Subtest 1	60	19.16	6.73	–0.318	–1.02	0.223, 0.000	0.837, 0.000
Subtest 2	60	0.97	0.63	–0.187	–0.67	0.195, 0.000	0.806, 0.000
Subtest 3	60	2.18	0.94	0.040	–0.31	0.166, 0.000	0.665, 0.000

Note: KS Test refers to the Kolmogorov–Smirnov test； Shapiro–Wilk Test refers to the Shapiro–Wilk normality test； $p < 0.05$ or $p < 0.01$ indicates statistical significance.

Difference Analysis of two Groups

To elucidate specific between-group differences across ToM subtest scores, independent samples t-tests were conducted (see Table 5). Results demonstrated:

Subtest I (Prerequisite Skills for ToM)： $t(58) = -17.360$, $p < .001$.ASD group ($M = 7.83$, $SD = 2.41$) vs. TD group ($M = 20.07$, $SD = 3.12$). Interpretation: Children with ASD exhibited severe deficits in foundational mental-state understanding, scoring 61% lower than TD peers.Subtest II (Mental-State/Physical-Environment Differentiation):$t(58) = -40.503$, $p < .001$.ASD group ($M = 0.20$, $SD = 0.41$) vs. TD group ($M = 15.13$, $SD = 2.05$). Interpretation: The ASD group demonstrated near-chance performance (1.3% of TD scores), indicating catastrophic failure in decoupling psychological states from physical reality.Subtest III (Active Reality-State Interpretation).$t(58) = -7.918$, $p < .001$.ASD group ($M = 0.07$, $SD = 0.25$) vs. TD group ($M = 2.00$, $SD = 0.65$).Interpretation: ASD participants showed minimal capacity (3.5% of TD performance) for higher-order mentalistic reasoning requiring behavioral prediction from inferred mental states.

Table 5
t-Test Analysis Results

Subtest	ASD Group (n = 30) (Mean ± SD)	TD Group (n = 30) (Mean ± SD)	*t*	*p*
Subtest 1	7.83 ± 3.60	20.01 ± 1.26	–17.80	0.000**
Subtest 2	0.20 ± 0.44	1.63 ± 1.98	–5.03	0.000**
Subtest 3	0.07 ± 0.32	2.13 ± 0.93	–9.81	0.000**

Note: ASD = Autism Spectrum Disorder； TD = Typically Developing children； SD = Standard Deviation； **$p < 0.01$** indicates statistical significance.

The results demonstrated that the autism spectrum disorder (ASD) group exhibited significantly lower mean scores across all assessment items compared to the typically developing (TD) control group, with all intergroup differences reaching statistical significance at the $p < 0.01$ level. This finding provides further empirical validation of the developmental deficits in Theory of Mind (ToM) competencies observed among children with ASD, particularly manifesting across multiple developmental dimensions including affective perspective-taking, intentional state attribution, and social cognition mechanisms.

Discussion

This study investigated the developmental characteristics of Theory of Mind (ToM) in 6–8-year-old children with autism spectrum disorder (ASD) compared to their neurotypical peers through three subtests. The results revealed that none of the ASD children achieved high scores in the assessments, whereas the majority of typically developing (TD) children performed well.

In subtests II and III, the scores of ASD children were nearly zero, while their age-matched TD counterparts demonstrated significantly higher performance. The ASD group exhibited substantial deficits in emotion recognition, basic belief comprehension, and false belief understanding compared to neurotypical children.

Observations of TD children indicated that slightly older participants showed markedly more advanced ToM development than younger ones. The 6–8-year age range corresponds to early school years, during which environmental transitions and lifestyle changes likely catalyze rapid ToM development and refinement. However, age-related progression in ToM was not pronounced in ASD children. Given the considerable individual variability in ToM development among ASD children, practitioners must adopt case-specific analyses tailored to each child's unique profile.

Notably, a small subset of ASD children passed multiple test items, suggesting that their ToM development might reflect temporary developmental delays rather than absolute deficits. Environmental factors significantly influence ToM trajectories in ASD populations, and targeted interventions may activate latent developmental potential. Crucially, the 6–8-year period represents a critical neurodevelopmental window characterized by synaptic reorganization, making this phase pivotal for enhancing ToM capacities in ASD children and facilitating their progression toward normative social functioning.

Conclusion and Implications

Conclusion

This study focused on the development of Theory of Mind (ToM) in children with autism aged 6–8 years, comparing them with typically developing peers. The major conclusions are as follows:

Compared to typically developing children of the same age, 6–8-year-old children with autism spectrum disorder (ASD) exhibit significant deficits in Theory of Mind (ToM) development, with marked disparities between the two groups.

While children with ASD achieve relatively higher scores on prerequisite skill tasks of ToM (e.g., joint attention, emotion recognition), they show a lack of understanding in higher-level tasks requiring the differentiation of mental states from physical reality and the active interpretation of reality states.

The developmental trajectory of ToM in children with ASD progresses incrementally from foundational prerequisite skills (e.g., basic social perception) to more advanced competencies such as actively interpreting reality states, though this progression occurs at a slower and more fragmented pace compared to neurotypical children.

Theoretical and Practical Implications

This study not only deepens our theoretical understanding of social cognitive impairments in children with autism but also provides specific guidance for practical applications:

Theoretical Implications

The findings clearly indicate that children with autism experience significant delays in the progression from basic to higher-order ToM skills, offering a more refined cognitive processing model for understanding their social interaction deficits. This discovery fills a gap in the current literature regarding the developmental trajectories under varying levels of ToM task difficulty and offers new perspectives for future research into the neural mechanisms and cognitive integration processes involved.

Practical Implications

Educational and rehabilitation programs for children with autism should adopt a stratified and individualized approach, designing comprehensive intervention plans that encompass both basic emotion recognition and training in higher-order social inferential abilities. Moreover, given the significant influence of language ability on ToM performance, interventions should concurrently target language development to minimize interference and promote improvements in social cognitive abilities.

Data Availability Declaration

The original contributions encompassed within this study are comprehensively documented in the article and accompanying supplementary materials. Should additional inquiries or data-related requests arise, kindly direct them to the attention of the corresponding author.

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Conflict of Interest

The research undertaken was executed without the influence of any commercial or financial affiliations, which may be perceived as potential conflicts of interest

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