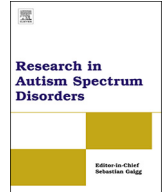




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Social cognition and Reading comprehension in children and adolescents with autism spectrum disorders or typical development



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ABSTRACT

Background: Many individuals with autism spectrum disorders (ASD) exhibit social cognitive impairments in the development of theory of mind (ToM), or the ability to attribute mental states to oneself and others. ToM has been shown to relate to reading comprehension for children and adolescents with typical development (TD) and with ASD. This study examined the relation between reading comprehension, word recognition, oral language, and ToM for higher-functioning children and adolescents with ASD (HFASD) as compared to those with TD.

Method: 70 children with HFASD and 40 children with TD, aged 9–17 years, participated in the study. In order to describe the HFASD as compared to the TD sample, a series of ANOVAs and ANCOVAs were conducted. Multiple regression analyses were conducted with reading comprehension as the outcome variable. Separate regression models (TD & HFASD) were run with IQ, word recognition, oral language, and two ToM measures (Happé's Strange Stories and the Silent Films Task) as predictors.

Results: The TD group performed better than the HFASD group on all standardized and experimental measures. Regression analyses revealed that after controlling for IQ, word recognition, and oral language, both ToM measures predicted unique variance in reading comprehension in the HFASD, but not the TD, sample. Furthermore, the TD and HFASD groups displayed different patterns of significant predictors of reading comprehension.

Conclusions: This study suggests that in addition to oral language and higher-order linguistic comprehension, social cognition is an important factor to consider when designing reading interventions for students with ASD.

1. Introduction

Social and communication difficulties are hallmark characteristics of individuals with autism spectrum disorder (ASD; Christensen, Baio, & Van Naarden Braun, 2016) and have been linked to underlying social cognitive impairments in the development of theory of mind (ToM). ToM is the ability to attribute mental states (e.g., beliefs, desires, intentions) to oneself, and infer others'

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mental states in order to understand and predict their behavior (Baron-Cohen, Leslie, & Frith, 1985; White, Hill, Happé, & Frith, 2009). Impairments in ToM are evident across developmental stages and functioning levels in individuals with ASD, and these deficits remain evident throughout adolescence and into adulthood, even among individuals without comorbid intellectual disabilities (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Kaland, Callesen, Møller-Nielsen, Mortensen, & Smith, 2008; White et al., 2009).

ToM enables one to understand that oral and written language are about the expression of thoughts, emotions, and desires, as well as the interpretation of intended meaning rather than literal meaning (Tomasello, 2010). Relatedly, performance on ToM tasks is associated with oral language skills (Happé, 1995) and communicative competence (Hale & Tager-Flusberg, 2005). ToM and language have been posited to have a bidirectional relation in development (Miller, 2006; Slade & Ruffman, 2005). For instance, evidence from typically developing (TD) children suggests that ToM is a contributing factor to semantic development (Baldwin & Moses, 2001; Birch & Bloom, 2002). On the other hand, research also suggests that exposure to, and engagement in, conversations about mental states influence children's ToM development (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Ruffman, Slade, & Crowe, 2002). Furthermore, a large body of evidence has demonstrated that general language skills (e.g., syntax and semantics) contribute to performance on ToM tasks, including false belief tasks (Astington & Jenkins, 1999; Cutting & Dunn, 1999; Happé, 1995; Slade & Ruffman, 2005), and that mastery of mental state words such as “think” and “know” are related to children's ToM development (Bartsch & Wellman, 1995; Shattz, Wellman, & Silber, 1983).

Challenges with ToM have the potential to impact performance in a variety of contexts, including educational settings. While data indicate that many children with ASD have difficulty understanding the mental states or beliefs of others, there is a dearth of information about how this could specifically impact academic achievement for these children. Reading achievement, which is also related to language development, underpins learning in many academic milieus and serves as a conduit to overall academic achievement. This study investigates the relation between ToM and reading achievement. Understanding the influence of language and ToM on reading in school-aged children with ASD may provide insights into syndrome specific academic challenges.

2. Reading framework and reading achievement in ASD

The Simple View of Reading framework (Gough & Tunmer, 1986) posits that successful reading comprehension is the product of proficient word reading skills and oral language comprehension and that poor reading comprehension may reflect weaknesses in either, or both, domains. Prior research has demonstrated the utility of this framework for understanding reading skill in TD readers or those with reading disorders (e.g., Catts, Adlof, & Weismer, 2006; Joshi & Aaron, 2000; Tunmer & Chapman, 2012), as well as those with ASD (Jones et al., 2009; McIntyre et al., 2017; Norbury & Nation, 2011; Ricketts, 2011). Studies with children with ASD have demonstrated that proficient reading comprehension is a particular challenge that impacts between 33 and 65% of ASD samples (Jones et al., 2009; Lucas & Norbury, 2014; McIntyre et al., 2017; Nation, Clarke, Wright, & Williams, 2006; Ricketts, Jones, Happé, & Charman, 2013). Many children with ASD exhibit impairments in oral language development (Eigsti, de Marchena, Schuh, & Kelley, 2011; Tager-Flusberg, 2006), and while considerable variability in both domains of the Simple View has been demonstrated, a strong relation between structural language components (i.e., phonology, semantics, syntax, morphology) and reading comprehension has been established (Lindgren, Folstein, Tomblin, & Tager-Flusberg, 2009; McIntyre et al., 2017; Norbury & Nation, 2011; Ricketts et al., 2013). In several studies, children with ASD and structural language impairments performed significantly more poorly on measures of word recognition, word decoding, and overall reading comprehension (Lindgren et al., 2009; Lucas & Norbury, 2014; Norbury & Nation, 2011). Data from studies by Ricketts et al. (2013) and Williams, Minshew, and Goldstein, (2015) indicated that for children with ASD and adequate sentence level language skills, reading comprehension impairments may be related to syndrome specific higher order inferential and cognitive processing challenges. Individuals with ASD have demonstrated difficulty with verbal reasoning, inference generation, and answering questions about inferences (Lucas & Norbury, 2015; Norbury & Nation, 2011; Saldaña & Frith, 2007; Tirado & Saldaña, 2016); this is particularly evident when needing to use ToM to make inferences about social information regarding emotional states, mental states, or intentionality (Bodner, Engelhardt, Minshew, & Williams, 2015; Happé, 1994; Kaland et al., 2008; Le Sourn-Bissauoi, Caillies, Gierski, & Motte, 2009).

3. Relation between ToM and reading achievement

Emerging research highlights the impact of individual differences in ToM on TD children's experiences in school and the pathways that might link ToM to academic success. One pathway Hughes and Devine (2015) reviewed posited links between ToM and metacognitive skills such as understanding that texts have an intended meaning and are representational, like mental states, and, therefore, are open to different, sometimes incorrect, interpretations by different people. Lecce, Zocchi, Pagnin, Palladino, and Taumoepeau (2010) reported that, when controlling for verbal abilities, individual differences in TD children's ToM predicted later meta knowledge about reading including understanding the attitudes and differences of people as readers, the various goals a reader might have for a text, knowledge about different types of texts and their characteristics, and possible strategies that can be applied to different types of texts. Kim (2015) provided evidence that ToM indirectly predicted reading comprehension through its significant relation with listening comprehension in TD kindergarteners, supporting the hypothesis that ToM tasks capture inference making and complex social reasoning skills that are important for understanding story characters' and authors' beliefs and intentions. Reading literary fiction has been shown to promote ToM, empathy, and social development in TD children (Doise, Mugny, James, Emler, & Mackie, 2013; Mar, Tackett, & Moore, 2010) and adults (Kidd & Castano, 2013; Mar, Oatley, & Peterson, 2009), suggesting that exposure to fiction may change how individuals think about themselves and others. Taken together, these data indicate that ToM and

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