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Theory of mind (ToM) in children with autism or typical development: Links between eye-reading and false belief understanding

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ABSTRACT

Previous research shows that high-functioning children with autism are slow to pass “litmus” false belief tests of ToM but how this may relate to other aspects of mindreading (e.g., discerning thoughts from facial expressions) is less clear, partly for methodological reasons. Thus the joint methodological and conceptual goals of this study were: (1) to devise and psychometrically validate a new, simplified eye-reading test for preliterate children with or without autism and (2) to use the new test to explore links of false belief understanding with eye-reading in children with autism and matched control groups. A false belief battery and the new eye-reading test were given to 87 Australians: 22 children with autism aged 6–13 and 65 typical developers in three control groups (11 age-matched primary-schoolers; 37 ToM-matched preschoolers and 17 adults). Results supported the new test’s psychometric validity and showed that, for children both with and without autism, false belief and eye-reading were significantly correlated. A hierarchical multiple regression showed this association was independent of age, gender and diagnosis. Although adults earned higher eye-reading scores overall, children equalled them on 44% of items. Implications of the findings for future use of the new test, and for explanations and interventions on behalf of ToM development in autism, were considered.

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The term theory of mind (ToM) describes children's understanding of mental states like thoughts, intentions and beliefs and their influences on human behavior. Typically developing children acquire ToM rapidly during the preschool period, as evidenced by their success on inferential false belief tests requiring predictions about the thoughts, speech or behavior of naïve individuals with ideas that conflict both with reality and with the child's own knowledge (Wellman, Cross, & Watson, 2001). The contrast between 3-year-olds' widespread failure and 5-year-olds' widespread success is so sharp as to suggest that "understanding of belief, and relatedly, understanding of mind, exhibit genuine conceptual change in the preschool period" (Wellman et al., 2001, p. 655). But there are exceptions. Severe delays, specific to ToM, often persist in certain groups of children with disabilities, including those with autism (see Happé, 1995; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998; for reviews).

A wealth of research has addressed questions of causality both for the persistent problems that false belief tests seem to pose for children with autism, and for the individual differences of smaller magnitude that are observed even among typical developers during the crucial preschool acquisition period. In addition to neurobiological hypotheses regarding possible anatomical correlates of ToM growth (e.g., Tager-Flusberg, 2007), a number of important social, conversational, linguistic and family-related correlates of early false belief test success have been identified. For example, children with autism who eventually pass false belief tests are often found to have better language skills than those who fail (Happé, 1995) and are more likely to have mothers who frequently mention mental states in spontaneous narrative conversations (Slaughter, Peterson, & Mackintosh, 2007). Their mastery of the linguistic rules of the embedded complement syntax needed for understanding and discussing people's conversations (e.g., "John said that Mary went to the park") predict later false belief test success, prompting Tager-Flusberg (2007) to suggest that "through listening and speaking about what people say, some children with autism develop the knowledge that people may represent the world in ways that do not match reality" (p. 313). Though at a much earlier chronological age, typically developing preschoolers master ToM most rapidly when their parents converse freely and frequently about beliefs and feelings (e.g., Dunn, 1996; Harris, 2005; Slaughter et al., 2007) and when they have larger numbers of sibling conversational partners (e.g., McAlister & Peterson, 2007; Ruffman, Perner, Naito, Parkin, & Clements, 1998).

While these findings are illuminating, they lead to further questions. For those with autism, one key issue is whether all aspects of social cognition are delayed as severely as false belief understanding, or whether some aspects of ToM that are less reliant on language and conversation might be relatively spared. Conceivably, these might include emotion perception from facial expression (Davies, Bishop, Manstead, & Tantam, 1994; Kahana-Kalman & Goldman, 2008; Peterson, 2003) or awareness of how people deliberately manipulate facial emotional displays nonverbally (Peterson, Wellman, & Liu, 2005). In the case of typical developers, a key question is what happens to social cognition after the age of 5 or 6 when most have mastered false belief. Do those who mastered ToM precociously at age 3 continue to outstrip their peers in surmounting the more sophisticated social-cognitive challenges that punctuate middle childhood and adolescence? Or are these subsequent developments in mindreading largely independent of the individual differences in ToM understanding of false belief that were evident among young preschoolers?

Answers to questions like these will require new methodologies to complement and broaden the developmental purview of the false belief test. In particular, it would be useful to have an alternative test that, while indisputably confined specifically to the ToM domain (rather than assessing broader developmental changes of late childhood in executive functioning, memory, literacy or language) could reliably measure other aspects of folk psychology than the simple awareness of others' false beliefs about objects' locations or contents. Unfortunately, even though a number of such "advanced" test of ToM understanding have been devised for use with adults and typically developing children over age 8, many of these are unsuitable for preschoolers and older children with autism because they take for granted the "non-social" cognitive skills in other domains (e.g., reading ability, sophisticated executive planning or an adult lexicon or memory) that a child with disabilities might never fully acquire, or that might develop out-of-sequence with social cognition in the context of disability (Baron-Cohen, 1989).

For example, a promising alternative to the false belief test for higher functioning adults and adolescents with autism who have good literacy skills is the "reading-the-mind-in-the-eyes" test

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