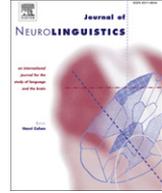




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# The relationship between syntactic development and Theory of Mind: Evidence from a small-population study of a developmental language disorder

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## ABSTRACT

We investigated whether performance on false belief understanding tasks is related to language ability by looking at Russian-speaking children enrolled in a study of a developmental language disorder in a geographically isolated small population characterized by a high prevalence of developmental language disorders. All consenting children between the ages of 6 and 12 ( $n = 54$ ) were given the Assessment of the Development of Russian Language (ORRIA), non-verbal IQ, short-term memory measures, a narrative task, and the Unexpected Transfer task of false belief. We found that language development scores were related to success on the false belief task even when controlled for IQ and short-term memory. Also, the group who succeeded on the false belief task had significantly higher syntactic complexity scores for narratives than those who failed it. References to mental states, manifested by the children's use of mental, psychological and perception verbs, were not related to performance on the false belief task. These findings support the hypothesis that developed representations of false belief are tied to

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syntactic development, not general cognitive functioning or the acquisition of mental-state verbs.

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The relationship between the development of language and Theory of Mind in children of preschool age has been the subject of much debate. Theory of Mind (henceforth, ToM) is conceptualized as a capacity to perceive others in terms of their mental states (i.e., desires, emotions, intentions and beliefs), and to understand that the actions of others are not merely automatic responses to outside stimuli, but are motivated by their mental states (Premack & Woodruff, 1978). The main challenge is to explain why children under 4–5 years of age find it difficult to deal with certain ToM-related tasks but not with others, and whether the reason for the late acquisition of some ToM-related skills is that they require a certain, relatively advanced, stage of language development. The issue that is subject to a particularly vigorous debate involves the question of what makes a task of predicting the behavior of another person based on that person's false belief difficult for young children and the role of syntactic development in children's mastery of this skill.

In the current study, we investigated the relationship between language development and false belief reasoning and sought evidence of this relationship from a small Russian-speaking population characterized by a high rate of the developmental language disorder (henceforth, DLD). The main goal of the study was, first, to understand the respective roles of general cognitive functioning and general language development in children's performance on a standard task of false belief and, second, to see which aspects of language development contribute uniquely to the likelihood of success on such a task. In the remainder of the article, we will 1) talk about the role of false belief reasoning in probing an individual's ToM capacity, 2) discuss the semantic and syntactic properties of belief ascriptions contributing to the complexity of false belief tasks and explain why acquiring linguistic knowledge of these properties may be necessary for being able to cope with the demands of such tasks, 3) review the existing theories of ToM development and studies of false belief acquisition in typically developing children and clinical populations, and 4) present the results of our study, the goals of which were described above.

## 1. The role of false belief in identifying representational Theory of Mind

Recent advances in infant cognition, as well as evidence from brain lesion and neuroimaging studies, indicate that ToM is a complex capacity with multiple basic components, supported by a widely distributed neural system, some of which are present in humans as early as infancy (for a review of behavior studies see Apperly & Butterfill, 2009; Yamaguchi, Kuhlmeier, Wynn, & vanMarle, 2009; for a review of the brain literature see Carrington & Bailey, 2009; Segal & Varley, 2002). The capacity to represent a third person's false belief (henceforth, FB), generally considered to be indicative of the successful acquisition of representational ToM (e.g., Dennett, 1978; Wellman, 2002; but see Bloom & German, 2000 for a counterargument), is not typically expected in children until they reach the age of 4 or 5 (e.g., Flavell, Green, & Flavell, 1986; Gopnik & Astington, 1988; Perner, Leekam, & Wimmer, 1987; Wellman, Cross, & Watson, 2001; Wimmer & Perner, 1983). However, there has been some evidence that FB understanding can be facilitated in children as young as under 3 years of age by lowering the experimental demands suggesting that even younger children possess certain ToM-related capabilities (e.g., Chandler, Fritz, & Hala, 1989; Onishi & Baillargeon, 2005; Surian, Caldi, & Sperber, 2007). Such conflicting findings have led to a considerable debate on the significance of FB understanding in the human capacity to reason about minds, componential skills involved in full-fledged FB reasoning, and the role of language in its development.

The importance of FB reasoning in establishing a developed ToM was first addressed in the discussion generated by the seminal paper by Premack and Woodruff (1978), which investigated the ToM capacity of chimpanzees. In a response to their article, Dennett (1978), and others since then, pointed out that in order to demonstrate that individual A possesses the ability to represent the content of others' minds, it is not enough to show that A can predict the actions of individual B. In many cases, correct behavior predictions can be made without understanding mental states, but by simply

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