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Theory of mind in middle childhood and early adolescence: Different from before?

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ABSTRACT

Studies with preschool children have shown that language and executive function are important for theory of mind, but few studies have examined these associations in older children and in an integrative theory-guided manner. The theory of constructive operators was used as a framework to test a model of relations among mental attentional capacity, attentional inhibition, language, executive processes (shifting and updating), and higher order theory of mind in two groups of school-aged children: one in middle childhood ($n = 226$; mean age = 8.08 years) and the other in early adolescence ($n = 216$; mean age = 12.09 years). Results revealed a complex model of interrelations between cognitive resources and language in middle childhood that directly and indirectly predicted theory of mind. The model in early adolescence was less complex, however, and highlighted the importance of semantic language and shifting for theory of mind. Our findings suggest not only that contributors to theory of mind change over time but also that they may depend on the maturity level of the theory of mind system being examined.

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Introduction

The majority of research in theory of mind (ToM), or understanding of mental perspective (e.g., beliefs, intents), has focused on the preschool period, although advancements in ToM are believed

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to continue into middle childhood and adolescence (Miller, 2009). In the preschool literature, both language and executive function are related to ToM (Astington & Jenkins, 1999; Carlson & Moses, 2001; Devine & Hughes, 2014; Milligan, Astington, & Dack, 2007). The limited research with older children generally is consistent with these findings (see Miller, 2009, for a review); however, no study to our knowledge has examined an integrative model of the relations among language, executive function, and ToM in middle childhood and early adolescence in a theory-guided manner. In the current study, we test two models of relations among mental attentional (*M*) capacity, attentional inhibition (*I*), language, and executive function within a comprehensive theoretical framework (Pascual-Leone's theory of constructive operators) to examine how these processes contribute to ToM in middle childhood compared with early adolescence.

Theory of mind: Preschool children

Critical developments in children's understanding of mental states occur during a period when children are acquiring more sophisticated structural (semantic and syntactic) language skills. There is now a well-established literature regarding the importance of semantic and syntactic language to ToM in both typical (e.g., Astington & Jenkins, 1999; Milligan et al., 2007) and atypical populations (e.g., autism spectrum disorder: Happé, 1994; Tager-Flusberg & Joseph, 2005; language impairment: Farrant, Fletcher, & Maybery, 2006; Gillott, Furniss, & Walter, 2004). This makes sense when we consider language is the primary means by which we communicate and acquire knowledge about the mental world. Beliefs and intentions are physically unobservable, as is their relation to behavior. Semantics provide a means for representing unobservable mental states (e.g., *think*, *know*, *believe*), and syntax provides a structure for representing and keeping track of false beliefs (e.g., *Mary thinks the doll is in the box*) as well as reflecting on self and other beliefs (e.g., *I thought she knew he was going*).

Although structural language clearly plays a role in ToM, the research regarding the relative importance of semantic versus syntactic language is equivocal. Some studies provide support for the primary role of semantics (Markel, Major, & Pelletier, 2013), and some provide support for the primary role of syntax (Astington & Jenkins, 1999; de Villiers & Pyers, 2002). Others have argued that semantic and syntactic language are too highly correlated and cannot be disentangled from each other (Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003). A meta-analysis by Milligan and colleagues (2007) suggests that although structural language accounts for an impressive amount of variance in false belief task performance (used to measure first-order ToM), the strength of this relation is quite variable (from small negative to large effect sizes). This raises the question of other cognitive factors that might contribute to ToM.

A highly researched correlate of ToM is executive function (EF), an umbrella term used to describe distinct but related abilities that direct, organize, and mediate problem solving. A three-factor model of EF (inhibition, updating of working memory contents, and shifting of mental sets), originally found in adults (Miyake et al., 2000), has been replicated in studies with school-aged children (Lehto, Juujarvi, Kooistra, & Pulkkinen, 2003; Rose, Feldman, & Jankowski, 2011). The structure of EF is less clear in younger children, with empirical evidence for both a unitary model (Brydges, Reid, Fox, & Anderson, 2012) and a two-factor model (Miller, Giesbrecht, Müller, McInerney, & Kearns, 2012; Miyake & Friedman, 2012). Regardless of the structure, EF has been shown to be associated with first-order ToM in preschoolers (Carlson & Moses, 2001; Devine & Hughes, 2014; Perner & Lang, 1999), particularly inhibition (Carlson, Mandell, & Williams, 2004; Carlson, Moses, & Breton, 2002) and shifting or cognitive flexibility (Farrant, Maybery, & Fletcher, 2012; Low, 2010). Theoretically, EF would assist in distinguishing, coordinating, and tracking different mental intentions. A meta-analysis by Devine and Hughes (2014) showed a moderate association between EF and false belief understanding (15% shared variance), which remained significant (8% shared variance) after accounting for verbal ability. It should be highlighted, however, that verbal ability might be measured by a single vocabulary test (e.g., Carlson & Moses, 2001), so these findings do not help to clarify the relations among language, EF, and ToM.

Given the importance of language and EF to ToM, there is a surprising lack of studies integrating these two areas of research in younger children. Studies conducted so far (Benson, Sabbagh,

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