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## Development of constructivist theory of mind from middle childhood to early adulthood and its relation to social cognition and behavior



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#### ABSTRACT

Two studies examined the development of constructivist theory of mind (ToM) during late childhood and early adolescence. In Study 1, a new measure was developed to assess participants' understanding of the interpretive and constructive processes embedded in memory, comprehension, attention, comparison, planning, and inference. Using this measure, Study 2 tested a mediational model in which prosocial reasoning about conflict mediated the relation between constructivist ToM and behavior problems in high school. Results showed that the onset of constructivist ToM occurs between late childhood and early adolescence and that adolescents who have more advanced constructivist ToM have more prosocial reasoning about conflict, which in turn mediated the relation with fewer serious behavior problems in high school, after controlling for academic performance and sex. In both studies, girls showed more advanced constructivist ToM than boys in high school.

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#### Introduction

Theory of mind (ToM) is the ability to view people as psychological beings. Children develop a ToM when they can consider mental states (such as desires, thoughts, and beliefs) and the links between mental states and behavior (Wellman, Cross, & Watson, 2001). Because most research on ToM development has focused on early childhood, less is known about how children understand the mind during middle childhood and beyond (Astington & Hughes, 2013; Hughes & Leekam, 2004).

Researchers have used several different methods to investigate later developments in ToM. These include tasks requiring reasoning about others' communicative intentions (Filippova & Astington, 2008), considering a speaker's perspective that guides behavior (Dumontheil, Apperly, & Blakemore, 2010), and thinking about another person's thoughts regarding how another person thinks or feels (termed second-order reasoning; Miller, 2009, 2012; Perner & Wimmer, 1985). Several tasks have been constructed to assess sensitivity to different emotional reactions, including the "Reading the Mind in the Eyes Test" (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), which involves presenting photos of the eyes and asking participants to identify the emotional state. Other tasks assess understanding that emotional reactions depend on how statements are "taken" or interpreted. These include the "Strange Stories" task (Happé, 1994; White, Hill, Happé, & Frith, 2009) and the "Silent Films" task (Devine & Hughes, 2013), which involve presenting a series of short vignettes about social scenarios (e.g., joke, pretense, sarcasm, white lie) and asking participants to explain the protagonist's behavior based on mental states. The "Stories from Everyday Life" task (Kaland et al., 2002) is similar but includes more complex vignettes. In the "Faux Pas" task (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999) and the "Awkward Moments" task (Heavey, Baron-Cohen, & Rutter, 2000), the protagonist inadvertently says something awkward or embarrassing and participants are asked to identify the awkward statement or the other's emotional reaction. Bosacki and colleagues developed a task that involves reasoning about ambiguous social interactions and querying participants about several forms of social understanding (e.g., empathy; Bosacki, 2000; Bosacki & Astington, 1999).

In contrast, Fabricius and Schwanenflugel (1994; Fabricius, Schwanenflugel, Kyllonen, Barclay, & Denton, 1989) studied the development from middle childhood to adulthood of understanding interpretive diversity, namely, that "knowledge can be more or less certain, that feelings of uncertainty are important in evaluating information, that things can have multiple meanings, and that these meanings can arise solely from differences in interpretive mental processes" (Schwanenflugel, Fabricius, & Noyes, 1996, p. 288). Their work and others' work (Chandler, Boyes, & Ball, 1990) has shown that pre-adolescents are only beginning to understand the constructivist nature of active mental processes. Constructivist ToM accounts are in line with views about the development of naive epistemology, that is, conceptions of knowledge and how knowledge is constructed (Kitchener, 2002). Constructivist notions have pervaded nearly all discussions of adult ToM (Hofer & Pintrich, 1997), and research has charted developing awareness and acceptance of uncertainty and multiplicity of interpretation in late high school (Chandler et al., 1990) and early adulthood (King & Kitchener, 1994).

Fabricius, Schwanenflugel, and colleagues used various methods to investigate the conceptual organization and underlying structure of mental processes. In some studies, they asked participants to judge the similarity in the way that pairs of scenarios engaged mental activities (e.g., How similar are "telling your friend everything you had to eat today in the school cafeteria" and "listening to the announcements in a noisy cafeteria" in terms of the way that you would use your mind?; Fabricius et al., 1989; Parault & Schwanenflugel, 2000; Schwanenflugel, Fabricius, & Alexander, 1994). In other studies, they asked participants to make similarity judgments between pairs of mental verbs (e.g., How similar are "memorizing and seeing" in terms of the way that you use your mind?; Alexander, Noyes, MacBrayer, Schwanenflugel, & Fabricius, 1998; Schwanenflugel, Fabricius, Noyes, Bigler, & Alexander, 1994; Schwanenflugel et al., 1996). In still others, they asked participants to select the specific set of mental verbs that might be extended to mental activity scenarios (e.g., Is "telling your mom about how much longer it'll take to finish your homework" an example of estimating, guessing, comparing, and/or remembering, etc?; Schwanenflugel, Fabricius, Noyes, et al., 1994; Schwanenflugel, Henderson, & Fabricius, 1998). The conceptual underpinning of these methods is the theory-based view of concepts (Murphy, 2002; Murphy & Medin, 1985), in which conceptual structure and organi-

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