



# A broad assessment of theory of mind in adolescence: The complexity of mindreading

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## ABSTRACT

The aim of this research was to provide an articulated assessment of several different ToM components, namely first- vs. third-person, egocentric vs. allocentric, and first- vs. second-order ToM, in preadolescence and adolescence. Our expectations for the sample of 80 juveniles that participated in the research were that: (1) ToM abilities would improve with age; (2) participants would perform better at first-person than at third-person tasks; (3) participants would perform better at first-order than at second-order tasks; (4) girls will perform systematically better than boys. We also explored possible differences in performance (5) in the allocentric vs. the egocentric perspectives as well as (6) in the comprehension of different types of mental states, namely desires, beliefs and positive and negative emotions. Overall our expectations were confirmed. Our data confirmed that all ToM aspects we investigated keep maturing during preadolescence and adolescence.

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## 1. Introduction

The phrase Theory of Mind (henceforth, ToM) was first introduced by Premack and Woodruff (1978) to refer to the capacity of ascribing mental states to oneself and the others and using this knowledge to predict and explain the relevant actions and behaviors. For various theoretical reasons, other labels were created in the following years to refer to this faculty, like mindreading (Baron-Cohen, 1995) or social cognition (Adolphs, 1999).

Initially ToM was implicitly considered a unitary, all-or-nothing faculty. With time, however, it has become clear that it has a more complex, articulated nature, opening the way to the possibility of decomposing it into different aspects or components. In particular, neuroscientific studies have identified a network of brain regions subserving social cognition, which is now commonly called the “social brain” (Brothers, 1990; Frith, 2007; Frith & Frith, 2010).

The goal of this research is to contribute to understanding how the different aspects of theory of mind develop through preadolescence and adolescence.

As a first thing, it is necessary to distinguish between *first-person* and *third-person ToM* (Nichols & Stich, 2003). To understand oneself and to understand another person appear to be different activities, mediated by different processes and recruiting different kinds of knowledge. This distinction is also supported by evidence that different brain circuitry is recruited when participants are asked to take a first- or a third-person perspective (Abu-Akel, 2003; Vogeley & Fink, 2003; Vogeley et al., 2001).

As regards third-person ToM, a difference is commonly drawn between *first-order* and *second-order ToM*. The former is the ability to grasp someone’s mental states (“John thinks that. . .”), while the latter requires to deal with nested representations,

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that is to infer what someone thinks about a third person (“John thinks that Mary thinks that...”). Expectably, there is evidence that first-order tasks are easier than second-order ones to normally developing children (Wellman & Liu, 2004). On the average, children begin to solve the former at three or four years of age, at least according to the most pessimistic studies (Wimmer & Perner, 1983), and the latter at about seven (Perner & Wimmer, 1985).

A further distinction, proposed by Frith and de Vignemont (2005), is that between an *egocentric* and an *allocentric* perspective. In the former the mental states of other persons are represented in relation to the self, while in the latter they are represented independently from the self.

ToM-like reasoning appears to emerge in human beings during the second year of life (Bosco, Friedman, & Lesile, 2006; Onishi & Baillargeon, 2005), possibly founding on more primitive capabilities for shared intersubjectivity (Tirassa, Bosco, & Colle, 2006a, 2006b), and continues to develop at least through adolescence (Bosacki, 2000, 2003; Choudhury, Blakemore, & Charman, 2006; Goldstein & Winner, 2012; for a review see Sebastian, Viding, Williams, & Blakemore, 2010). A thorough understanding of the functioning of ToM during preadolescence and adolescence is particularly interesting since these phases of life are characterized by marked behavioral, hormonal and physical changes (Coleman & Hendry, 1999) as well as by the further maturation of aspects of cognitive functioning, like the so-called executive functions, that appear to be related to ToM (Dumontheil, Apperly, & Blakemore, 2010; Taylor, Barker, Heavey, & McHale, 2012; for a review see Apperly, Samson, & Humphreys, 2009).

During adolescence readiness toward the social environment outside the family gains a wholly new degree of independence, showing individual, emotional, social and cultural dynamics which are profoundly different to those of infancy. It is reasonable to think that ToM abilities and strategies would change correspondingly, adapting to the new social needs that the individual faces.

First- and third-person ToM reasoning appears to improve with age (Hatcher, Hatcher, Berlin, Okla, & Richards, 1990). Dumontheil et al. (2010) showed that the ability to adopt another agent's point of view grows from infancy through adolescence and further improves in adulthood. In general terms, it is not clear precisely when ToM reaches a final degree of maturation: Maylor, Moulson, Muncer, and Taylor (2002) studied the performance of young participants aged between 16 and 29 years old (mean age: 19 years old) at advanced first-person ToM tasks, including a subset of Strange stories (Happé, 1994; Happé, Brownell, & Winner, 1999) as well as new stories devised along similar lines: the participants to their study obtained a mean score of 4 against a maximum available of 7, thus showing no sign of a ceiling effect.

Neuroscience offers further evidence that the social brain is still developing during adolescence (Blakemore, den Ouden, Choudhury, & Frith, 2007; Shaw, Grosbras, Leonard, Pike, & Paus, 2012; for a review see Blakemore, 2008; Burnett, Sebastian, Coehen Kadosh, & Blakemore, 2011). Data collected with functional magnetic resonance imaging (fMRI) show that in this phase of life the social brain undergoes an increase in connectivity, synaptic reorganization, and a general structural development (Sowell et al., 2003). This appears to be related with various cognitive and emotional aspects of mental functioning, as well as with ToM abilities (Moriguchi, Ohnishi, Mori, Matsuda, & Komaki, 2007).

The aim of the research we present here was to conduct a behavioral assessment as broad as possible of theory of mind abilities in adolescence. We used a recently developed tool, the Theory of Mind Assessment Scale (Th.o.m.a.s.: Bosco, Colle, De Fazio, et al., 2009; see also Bosco, Capozzi, Colle, Marostica, & Tirassa, 2014; Castellino, Bosco, Marshall, Marshall, & Veglia, 2011; Chiavarino et al., 2014; Laghi et al., 2014). This is a semi-structured interview which provides a detailed profile of different facets of ToM abilities, namely first- vs. second-order, first- vs. third-person, egocentric vs. allocentric. It also explores different types of mental states involved in ToM (beliefs, desires, positive emotions, and negative emotions) and of causal relations between them, both in terms of the possess of knowledge about them and of the ability to govern their dynamics, that is to put such knowledge at use.

We also administered the Strange Stories, which is another advanced ToM task (Happé, 1994; Italian version by Mazzola & Camaioni, 2002).

Based upon the available literature, thus, our expectations for the sample of preadolescent and adolescents that participated in the research were that:

1. There will be an improvement of ToM abilities with age.
2. Participants will perform better at first-person than at third-person tasks.
3. Participants will perform better at first-order than at second-order tasks.
4. Girls will perform better than boys in all ToM tasks: this expectation is rooted in one of the few certainties that can be gathered from the scarce empirical literature on ToM in adolescence (Bosacki & Astington, 1999).

For explorative purpose we also wanted to investigate:

5. Whether the participants will perform differently when taking an allocentric than an egocentric perspective.
6. Whether the participants will differently deal with different types of mental states, namely beliefs, desires, positive emotions, and negative emotions.

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