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Measuring theory of mind across middle childhood: Reliability and validity of the Silent Films and Strange Stories tasks

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ABSTRACT

Recent years have seen a growth of research on the development of children's ability to reason about others' mental states (or "theory of mind") beyond the narrow confines of the preschool period. The overall aim of this study was to investigate the psychometric properties of a task battery composed of items from Happé's Strange Stories task and Devine and Hughes' Silent Film task. A sample of 460 ethnically and socially diverse children (211 boys) between 7 and 13 years of age completed the task battery at two time points separated by 1 month. The Strange Stories and Silent Film tasks were strongly correlated even when verbal ability and narrative comprehension were taken into account, and all items loaded onto a single theory-of-mind latent factor. The theory-of-mind latent factor provided reliable estimates of performance across a wide range of theory-of-mind ability and showed no evidence of differential item functioning across gender, ethnicity, or socioeconomic status. The theory-of-mind latent factor also exhibited strong 1-month test–retest reliability, and this stability did not vary as a function of child characteristics. Taken together, these findings provide evidence for the validity and reliability of the Strange Stories and Silent Film task battery as a measure of individual differences in theory of mind suitable for use across middle childhood. We consider the methodological and conceptual implications of these findings for research on theory of mind beyond the preschool years.

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Introduction

How children learn to use mental states, such as desires, knowledge, and beliefs, to predict and explain others' behavior (commonly referred to as the acquisition of a "theory of mind") is a topic that has attracted extensive theorizing and empirical research for nearly four decades (for recent reviews, see Hughes & Devine, 2015; Wellman, 2014). Most of this research has centered on a single task, the false belief task (Wimmer & Perner, 1983), in which an object is moved in an agent's absence, such that children need to recognize that the agent has a mistaken belief in order to predict or explain his or her behavior. More complex tasks measure children's ability to attribute beliefs to an agent about another agent's beliefs (i.e., "second-order" false beliefs) (Perner & Wimmer, 1985) or to attribute emotional states to others on the basis of false beliefs (e.g., Harris, Johnson, Hutton, Andrews, & Cooke, 1989). These tasks have been used to study both individual differences and age-related changes in theory of mind (ToM) during the preschool and early school years (e.g., Wellman, Cross, & Watson, 2001).

Over the past decade, the developmental scope of ToM research has been greatly increased by the design of new tasks for use with infants (e.g., Luo & Baillargeon, 2010) and with adults (e.g., Apperly, Samson, & Humphreys, 2009). With some notable exceptions, including early research on the development of children's understanding of the interpretive nature of knowledge during early middle childhood (e.g., Carpendale & Chandler, 1996) and evidence for meaningful individual differences in preadolescents' ability to reason about characters' mental states (e.g., Bosacki & Astington, 1999), the developmental period of middle childhood has been largely overlooked. However, over recent years this developmental period has begun to attract research attention (e.g., Apperly, Warren, Andrews, Grant, & Todd, 2011; Banerjee, Watling, & Caputi, 2011; Devine & Hughes, 2013; Dumontheil, Apperly, & Blakemore, 2010).

Middle childhood (the developmental period between 6 and 12 years of age) is a developmentally interesting period during which to study ToM. From a sociocultural perspective, it is worth noting that in primary school children are exposed to increasingly sophisticated forms of knowledge (e.g., fictional literature) and also spend increasing amounts of time outside the home interacting with their peers in a greater variety of contexts (e.g., Del Giudice, 2014; Eccles, 1999). Understanding how these new experiences shape and are shaped by individual differences in ToM presents a novel opportunity for researchers. Indeed, recent work in the field has demonstrated that individual differences in ToM during this period are related to important social and academic outcomes (e.g., Banerjee et al., 2011; Lecce, Caputi, & Hughes, 2011). From a neuropsychological perspective, there is evidence of continued structural changes in the frontal and parietal lobes (specifically, gray matter volume increases in these regions across middle childhood; e.g., Giedd et al., 1999) and related gains in cognitive performance in domains such as executive function (EF) across middle childhood (e.g., Davidson, Amso, Anderson, & Diamond, 2006). Research on ToM across middle childhood could shed light on the correlates and consequences of these neuropsychological changes. Indeed, researchers have now begun to examine the developmental links between ToM and EF across middle childhood in order to understand the factors underpinning the continued development of ToM during this period (e.g., Bock, Gallaway, & Hund, 2015; Lagattuta, Sayfan, & Blattman, 2010; Lagattuta, Sayfan, & Harvey, 2014). In an effort to contribute to this budding new field of research, the focus of the current study was to examine the validity and reliability of two tasks that appear promising as developmentally appropriate and useful indicators of ToM across middle childhood: the Strange Stories task (Happé, 1994) and a more recent analogue task using brief clips from a classic silent film (Devine & Hughes, 2013).

Validity and reliability of false belief task

Validity refers to whether or not a test is measuring the construct that it purports to measure (e.g., Rust & Golombok, 2009). Test validity is established through the accumulation of evidence about whether the test conforms to expectations and hypotheses about the construct being measured (Carmines & Zeller, 1979; Rust & Golombok, 2009). Tasks that purport to measure a particular construct (e.g., false belief understanding) should be related to tasks that measure the same or similar constructs (convergent validity) and unrelated to tasks that do not (discriminant validity). Ideally,

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