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Theory of mind and executive function during middle childhood across cultures

Zhenlin Wang^{a,*}, Rory T. Devine^b, Keri K. Wong^b, Claire Hughes^b^a Department of Psychological Studies, The Hong Kong Institute of Education, Tai Po, New Territories, Hong Kong^b Centre for Family Research, Department of Psychology, University of Cambridge, Cambridge CB2 3RQ, UK

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ABSTRACT

Previous studies with preschoolers have reported “East–West” contrasts in children’s executive function (East > West) and theory of mind (East < West). This cross-cultural study with two samples of older children from the United Kingdom and Hong Kong aimed to test competing accounts of these contrasts that focus on either global effects of culture or more specific effects of pedagogical experience. Both groups of children in Hong Kong outperformed the British children on executive function tasks. That is, with respect to executive function, general cultural influences appear to be salient. In contrast, compared with their U.K. counterparts, children attending local schools in Hong Kong (but not those attending British-based international schools in Hong Kong) performed poorly on age-appropriate tests of theory of mind. With respect to theory of mind, therefore, pedagogical experiences appear to be more salient than factors related to the broad contrast between individualist and collectivist cultures. Our findings also contribute to the debate surrounding the relationship between theory of mind and executive function; although scores on these two sets of tasks were robustly correlated within each country, the double dissociation between delayed theory of mind but superior executive function for children in local schools in Hong Kong compared with their U.K. peers suggests that variation in executive function may be necessary but is not sufficient to explain variation in theory of mind.

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* Corresponding author.

E-mail address: zlwang@ied.edu.hk (Z. Wang).

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Introduction

Theory of mind is a developmental achievement that emerges early in life and continues to develop during adolescence and adulthood. Developments in cognitive domains such as language and executive function, as well as social factors such as cultural practice, family context, and interactional and pedagogical experience, all support the process of gaining insight into people's mental world (for a comprehensive review, see [Hughes & Devine, 2015](#)). Research in this field has been largely restricted to young children (e.g., [Wellman, Cross, & Watson, 2001](#); [Wellman & Liu, 2004](#)), although recent years have seen growing interest in infants' mental state understanding (e.g., [Onishi & Baillargeon, 2005](#); [Sodian, 2011](#)). Moreover, several studies have reported striking individual differences in adults' perspective taking ([Dodell-Feder, Lincoln, Coulson, & Hooker, 2013](#); [Ferguson & Austin, 2010](#); [Keysar, Lin, & Barr, 2003](#); [Royzman, Cassidy, & Baron, 2003](#)).

What remains scarce, however, is research on theory of mind during middle childhood that bridges the gap between these two fields. A few studies (e.g., [Banerjee, Watling, & Caputi, 2011](#); [Devine & Hughes, 2013](#); [Dumontheil, Apperly, & Blakemore, 2010](#)) have shown age-related gains in theory of mind across middle childhood, but individual differences in theory-of-mind development during this period and their underlying mechanisms remain poorly understood. To address this challenge, the current study examined both internal and external factors that might contribute to individual difference in theory of mind beyond early childhood. With regard to internal factors, we focused on executive function, the higher level cognitive ability that underpins flexible, goal-directed activity using working memory, attention shifting, and inhibitory control ([Blair, Zelazo, & Greenberg, 2005](#); [Diamond, 2013](#)). With regard to external factors, we focused on social and pedagogical experiences at school, which increase in frequency and complexity across middle childhood ([Eccles, 1999](#)).

Theory of mind across cultures

Although most theory-of-mind research has been conducted within Anglo-Saxon countries ([Hughes & Devine, 2015](#)), the past decade has seen a marked increase in cross-cultural research (e.g., [Callaghan et al., 2005](#); [Liu, Wellman, Tardif, & Sabbagh, 2008](#)), including several cross-cultural comparisons ([Ahn & Miller, 2012](#); [Hughes et al., 2014](#); [Lecce & Hughes, 2010](#); [Lewis et al., 2009](#); [Sabbagh, Xu, Carlson, Moses, & Lee, 2006](#)). This cross-cultural perspective is helpful in unraveling the nature versus nurture riddle in theory-of-mind development: Is theory of mind an innate, culturally universal construct that is merely triggered by environmental factors, or is it cultivated in a context of social interaction, displaying culturally specific developmental routes?

Existing findings are mixed. Some cross-cultural studies (e.g., [Callaghan et al., 2005](#); [Oberle, 2009](#)) have highlighted synchrony in the onset of false belief understanding, but others have reported dramatic contrasts. For example, [Mayer and Träuble \(2013\)](#) found that under the age of 8 years Samoan children overwhelmingly failed false belief tasks, with one third of 10- to 13-year-old Samoan children also failing. These results echo earlier reports of delays in non-Western children's understanding of false belief (e.g., [Naito & Koyama, 2006](#); [Vinden, 1996](#)). Moreover, a meta-analysis of data from more than 3000 children from mainland China and Hong Kong showed that although mainland Chinese children were more or less in line with North American children in the onset of false belief understanding, children in Hong Kong lagged behind by up to 2 years ([Liu et al., 2008](#)).

If preschoolers in Hong Kong lag behind their Western peers by up to 2 years in their false belief understanding ([Liu et al., 2008](#)), do they catch up eventually? There is some evidence to suggest that Chinese adults might in fact have better perspective taking than their Western counterparts. [Wu and Keysar \(2007\)](#) found that bilingual Chinese American adults outperformed European Americans in perspective taking. However, a later reanalysis of Wu and Keysar's data using a more time-sensitive approach found that the Chinese participants made the same egocentric mistakes initially in interference as the European American participants but suppressed the interference earlier and more effectively ([Wu, Barr, Gann, & Keysar, 2013](#)). That is, rather than having a more advanced perspective taking ability, the bilingual Chinese participants appeared to capitalize on their relatively advanced executive functions ([Sabbagh et al., 2006](#)). To date, no study has gone beyond the preschool years

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