Journal of Experimental Child Psychology xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Language complexity modulates 8- and 10-year-olds' success at using their theory of mind abilities in a communication task

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Theory of mind
Perspective-taking
Communication
Middle childhood
Working memory
Language complexity

ABSTRACT

Basic competence in theory of mind is acquired during early childhood. Nonetheless, evidence suggests that the ability to take others' perspectives in communication improves continuously from middle childhood to the late teenage years. This indicates that theory of mind performance undergoes protracted developmental changes after the acquisition of basic competence. Currently, little is known about the factors that constrain children's performance or that contribute to age-related improvement. A sample of 39 8-year-olds and 56 10-year-olds were tested on a communication task in which a speaker's limited perspective needed to be taken into account and the complexity of the speaker's utterance varied. Our findings showed that 10-year-olds were generally less egocentric than 8-year-olds. Children of both ages committed more egocentric errors when a speaker uttered complex sentences compared with simple sentences. Both 8- and 10-year-olds were affected by the demand to integrate complex sentences with the speaker's limited perspective and to a similar degree. These results suggest that long after children's development of simple visual perspective-taking, their use of this ability to assist communication is substantially constrained by the complexity of the language involved.

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http://dx.doi.org/10.1016/j.jecp.2015.09.006
0022-0965/

Introduction

The ability to consider others' perspectives is essential for human social interaction and communication. Under the banner of research on "theory of mind" developmental psychologists have conducted hundreds of investigations of the time course, causes, and consequences of children's developing understanding of mental concepts such as belief, perception, desire, and intention from infancy to early childhood (e.g., Doherty, 2008; Gergely, Nádasdy, Csibra, & Bíró, 1995; Wellman, Cross, & Watson, 2001; Wimmer & Perner, 1983; Woodward, 1998). Recent years have also seen a burgeoning literature investigating the cognitive and neural basis of theory of mind in adult participants (see, e.g., Apperly, 2013, for a recent review). Among the most striking findings in this research is that healthy adults, who have a clear grasp of mental concepts, nonetheless show egocentric effects on many theory of mind tasks observed either as a slowing of responses when judging someone whose perspective differs from their own (e.g., Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010) or as a complete failure to take that perspective into account when responding (e.g., Apperly et al., 2010; Birch & Bloom, 2007; Keysar, Lin, & Barr, 2003). These results from adults show that traditional approaches to the development of theory of mind significantly underestimate the task that they face. A full account of development must not only explain the successful acquisition of theory of mind concepts by young children; they must also account for how older children become able to use these abilities effectively in fast-moving social interactions, and ultimately explain how development arrives at the imperfect abilities observed in adults. The current research builds on one of the few studies that charted the extended development of one theory of mind ability—the use of a speaker's visual perspective to interpret what the speaker says. Our pilot study with healthy adults revealed a clear egocentric tendency in eye movements when their communicative partner uttered complex sentences but not when their partner uttered simple sentences (Wang, Cane, Ferguson, Frisson, & Apperly, 2015). This suggests that the complexity of the speaker's language, which needs to be integrated with information about the speaker's visual perspective, affects adults' ability to fully consider the speaker's perspective. Here we investigated how children aged 8 and 10 years are affected by the complexity of the language and ask whether improvements in coping with such demands account for age-related reduction in egocentrism.

Before going further, a note on our terminology is in order. The primary focus of the literature on children's "theory of mind" has been on children's acquisition of mental concepts. When these concepts are used to understand that another person sees or thinks something different from one self, the difference between self and other is a difference in "perspective" (not a difference in "theory of mind"). When this information is used to guide communication with the other person, we describe this as "perspective use" which is a particular instance of "theory of mind use".

To carry out a successful conversation, both speakers and listeners must refer to information shared between them (Clark, 1992; Clark & Marshall, 1981). For example, if a friend from school asks you to meet her at "the bus stop" it is reasonable for you to assume that she is referring to the bus stop at the school gate and not the bus stop near her house, with which you have no experience. Efficient speakers take into account the information known and unknown to listeners. By the same token, listeners can infer which bus stop the speaker is referring to by drawing on their common experience of using the same bus stop at the school gate. Speakers and listeners must be able to consider each other's perspectives and use this information online so that their conversation does not fall apart.

Despite the intuition that humans are good communicators, studies suggest that even adults frequently struggle to account for their communicative partner's perspective by fixating or selecting objects only available to themselves (e.g., Apperly et al., 2010; Keysar et al., 2003). Clearly, healthy adults do not lack the conceptual understanding that their communicative partner may hold a limited perspective. Nonetheless, the high proportion of egocentric errors—that is, incorrectly selecting the referent that best fits one's own perspective rather than that of the speaker—observed in adults suggests that having a conceptual understanding of others' perspective does not guarantee successful use of perspectival information in online communications (Apperly et al., 2010; Keysar et al., 2003). Moreover, there is evidence that individual differences in neurotypical adults' rates of success at using perspective information online are related to traits associated with both autism and psychosis

Please cite this article in press as: Wang, J. J., et al. Language complexity modulates 8- and 10-year-olds' success at using their theory of mind abilities in a communication task. *Journal of Experimental Child Psychology* (2015), http://dx.doi.org/10.1016/j.jecp.2015.09.006