Journal of Experimental Child Psychology 172 (2018) 168–188

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

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

Beat gestures help preschoolers recall and comprehend discourse information

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ARTICLE INFO

Article history:
Received 30 January 2017
Revised 12 February 2018

Keywords:
Beat gestures
Prosodic prominence
Word recall
Narrative comprehension
Saliency effect
Child development

ABSTRACT

Although the positive effects of iconic gestures on word recall and comprehension by children have been clearly established, less is known about the benefits of beat gestures (rhythmic hand/arm movements produced together with prominent prosody). This study investigated (a) whether beat gestures combined with prosodic information help children *recall* contrastively focused words as well as information related to those words in a child-directed discourse (Experiment 1) and (b) whether the presence of beat gestures helps children *comprehend* a narrative discourse (Experiment 2). In Experiment 1, 51 4-year-olds were exposed to a total of three short stories with contrastive words presented in three conditions, namely with prominence in both speech and gesture, prominence in speech only, and nonprominent speech. Results of a recall task showed that (a) children remembered more words when exposed to prominence in both speech and gesture than in either of the other two conditions and that (b) children were more likely to remember information related to those words when the words were associated with beat gestures. In Experiment 2, 55 5- and 6-year-olds were presented with six narratives with target items either produced with prosodic prominence but no beat gestures or produced with both prosodic prominence and beat gestures. Results of a comprehension task demonstrated that stories told with beat gestures were comprehended better by children. Together, these results constitute evidence that beat gestures help

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https://doi.org/10.1016/j.jecp.2018.02.004

preschoolers not only to recall discourse information but also to comprehend it.

Introduction

Speakers express their thoughts in two dimensions: speech and gesture. Research over the past decades has shown that these two dimensions constitute a single communicative system that is tightly integrated semantically, pragmatically, and temporally (e.g., Kendon, 1980; Levinson & Holler, 2014; McNeill, 1992). In general, across studies, there is strong evidence that iconic and metaphorical gestures (i.e., gestures that either express specific semantic information in their own right or express more abstract ideas) have a positive effect on the recall of information by adults (Riseborough, 1981; So, Chen-Hui, & Wei-Shan, 2012; Thompson, 1995) and children (Cook, Mitchell, & Goldin-Meadow, 2008; Goldin-Meadow, Kim, & Singer, 1999; So et al., 2012; Tellier, 2008) as well as on comprehension processes by adult listeners (Cocks, Morgan, & Kita, 2011; Hostetter, 2011; Kelly, Barr, Church, & Lynch, 1999). In the area of child development, many studies have shown that iconic, metaphoric, and deictic gestures guide children toward the semantic content of a message; that is, they help children comprehend the discourse to which they are listening (Clark, Hutcheson, & Van Buren, 1974; Goldin-Meadow & Wagner, 2005; McNeil, Alibali, & Evans, 2000). Moreover, McNeil et al. (2000) pointed out that reinforcing gestures are an effective scaffold for children's comprehension of complex spoken messages because they guide comprehension toward the meaning of the spoken language.

Whereas previous work has focused on the facilitation effects of gestures that convey meaning through their form and movement trajectory (iconic and metaphoric gestures) or signal reference (pointing gestures), less is known about the potential effects of beat gestures. Of the different kinds of gestures (see McNeill, 1992), beat gestures are unique in that they are nonreferential, typically co-occur with prosodically prominent positions in speech, and can have a set of discourse pragmatic functions (see Prieto, Cravotta, Kushch, Rohrer, & Vilà-Giménez, 2018, for a review of the properties of beat gestures). Beat gestures are often produced simultaneously with prominent positions in speech and are typically associated with pitch-accented syllables (Yasinnik, Renwick, & Shattuck-Hufnagel, 2004). In a quantitative meta-analysis of 63 studies on the overall communicative role of co-speech gestures involving adults and/or children, Hostetter (2011) found strong evidence that gestures foster comprehension in listeners. However, all the gestures analyzed in those studies were iconic, metaphoric, or deictic gestures; none of them included beat gestures.

The current study investigated whether gestures must necessarily carry referential meaning to improve recall and comprehension in preschool children or may fully perform this function even when such referential meaning is absent, as in beat gestures. Thus, this work had the goal of broadening our understanding of the ways in which gesture can facilitate communication during early developmental stages.

With respect to the role of beat gestures in information recall, conflicting results have been found in studies dealing with both adults (Austin & Sweller, 2014; Feyereisen, 2006; Kushch & Prieto, 2016; McNeill, 1985; So et al., 2012) and children (Austin & Sweller, 2014; Igualada, Esteve-Gibert, & Prieto, 2017; Macoun & Sweller, 2016; So et al., 2012). For instance, under similar conditions, some studies of adults have found that beat gestures support memory (So et al., 2012), but other studies have not (Feyereisen, 2006). With children, whereas iconic gestures facilitate young children's word recall (So et al., 2012), beat gestures seem to provide benefits to preschool children only when presented in pragmatically relevant contexts (Igualada et al., 2017). Nor do beat gestures seem to intensify word recall when presented with isolated target sentences/words not linked to any previous discourse context (So et al., 2012). To explore the effect of context, Austin and Sweller (2014) tested whether beat gestures would help 3- and 4-year-old children and adults to recall spatial directions. In a between-