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Donald Duck's garden: The effects of observing iconic reinforcing and contradictory gestures on narrative comprehension

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ABSTRACT

Both speech and gesture play a vital role in human communication. Gesture itself provides an external support to a spoken message. As a consequence, when presented together with speech, gesture has the ability to benefit learning across a variety of tasks, including narrative comprehension. However, the exact mechanisms underlying how the observation of gestures benefits learning are yet to be well understood and cannot be understood without further investigation into the types of gesture that benefit learning. Specifically, gestures themselves are not a homogeneous set, with different kinds of gestures having varying effects on learning. In the current study, we examined the effects of observing iconic gestures that either reinforce (i.e., *reinforcing gestures*) or contradict (i.e., *contradictory gestures*) the content of accompanying speech on narrative comprehension in preschool-aged children. Children were presented with a short video narrative that contained either reinforcing gestures, contradictory gestures, or no gestures accompanying the verbal narrative. Results indicated that observing reinforcing gestures significantly benefited narrative comprehension beyond when no gestures were observed. However, observing contradictory gestures was neither significantly beneficial nor significantly detrimental to narrative comprehension beyond observing reinforcing or no gestures. The results from the current study provide valuable insight into the benefits of observing different kinds of iconic gestures on narrative comprehension in preschool-aged children.

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Introduction

Our day-to-day interactions rely on our ability to communicate (Littlejohn & Foss, 2010). Although we typically associate "communication" with speech, gestures (i.e., movements made by one's hands or arms) play a similarly important role through providing an external support to spoken messages (McNeil, Alibali, & Evans, 2000). Although speech alone allows for the verbal communication of ideas and descriptions of objects, actions, and events, gestures accentuate such spoken messages through providing a visual representation (Kelly, Barr, Church, & Lynch, 1999). Through this visual representation, therefore, gestures may enhance the comprehension of a spoken message and, in turn, aid learning. Although gestures have been shown to serve a communicative function for individuals both producing and observing gestures (Kimbara, 2006), the current study focused on the beneficial effect of observing gestures on learning. The observation of gestures has previously been shown to benefit learning in problem solving (Alibali & DiRusso, 1999; Chu & Kita, 2011), speech comprehension (Driskell & Radtke, 2003), comprehension of route information (Austin & Sweller, 2014), and (more recently) narrative comprehension (Macoun & Sweller, 2016), which was the focus of the current study.

A variety of theories have been put forward to explain how gestures benefit learning in an observer. One theory suggests that for gestures that are semantically related to the content of speech and offer semantically meaningful visual features for encoding, the information presented should be processed at a deeper level, improving encoding and, therefore, improving recall (Woodall & Folger, 1981, 1985). More information should be recalled when semantically related gestures are observed than when either no gestures or semantically unrelated gestures are observed. Semantically related gestures provide a more elaborate memory trace, thereby resulting in enhanced recall (Woodall & Folger, 1981, 1985).

This idea relates to depth of processing research by Craik and Lockhart (1972) and Craik and Tulving (1975). Such research suggests that semantically meaningful contextual cues are processed, and thus are encoded, at a deeper level than contextual cues that are not semantically meaningful, resulting in a more established memory trace that allows for greater recall of encoded content (Craik & Lockhart, 1972; Craik & Tulving, 1975). Indeed, the observation of gestures that are semantically related to the content of speech has been shown to benefit learning and recall to a greater extent than the observation of gestures that are not semantically related to the content of speech, that is, beat gestures that are simply rhythmic movements accentuating parts of a spoken message (Woodall & Folger, 1981, 1985). Alternatively, it may be that gestures benefit learning through capturing an individual's attention.

Given the dynamic visual representation that gestures provide, it is likely that the observation of gestures may effectively capture an individual's attention, potentially leading to an improvement in learning (Cook, Duffy, & Fenn, 2013). Previous research by Valenzeno, Alibali, and Klatzky (2003) supports this idea through showing that children were significantly more likely to turn their heads away from a video when presented with speech only (i.e., no gestures) compared with children who were shown videos that included both speech and gestures. Subsequently, in the same study, children learned significantly more about symmetry when presented with both speech and gestures in the video compared with speech only. Such results suggest that attention may play a role in how the observation of gestures benefits learning. Given that attention plays a vital role in memory encoding, consolidation, and subsequently recall (Chun & Turk-Browne, 2007), perhaps the observation of gestures benefits learning through drawing in an individual's attention. Consequently, it is possible that the observation of gestures can improve comprehension through highlighting, and thereby focusing attention on, specific elements of a spoken message (McNeill, 1992). However, gestures are categorized in a variety of ways, and due to differences in form, different kinds of gesture have different effects on learning.

Although gestures are typically categorized broadly as deictic, metaphoric, beat, or iconic in nature, the current study solely focused on iconic gestures. Iconic gestures refer to gestures that are semantically related to the content of accompanying speech, typically exhibiting a concrete meaning such as