Distributional Effects in Iconic Gesture Comprehension

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Introduction

There is disagreement among researchers about the role of gesture in language comprehension; whether it is ignored (Krauss, Dushay, Chen & Rauscher, 1995), processed separately from speech (Goldin-Meadow & Singer, 2003), used only when speakers are having difficulty (Rauscher, Krauss & Chen, 1996), or immediately integrated with the content of the co-occurring speech (McNeill, Cassell & McCullough). In a previous eye-tracking study, Campana, et al (2005) showed that naturally produced iconic gesture speeds comprehension when the gesture is completely redundant with the content of speech. Specifically, trials with co-occurring speech and gesture showed earlier preference for the target item than trials with speech alone.

Method

Eighteen participants wore a light-weight head-mounted eye-tracker as they watched 18 videos which were surrounded by four potential referents: the target (consistent with both speech and gesture), a speech competitor (consistent with the speech early on, but inconsistent with the gesture), a gesture competitor (inconsistent with the speech, but consistent with the gesture), and an unrelated foil (inconsistent with both the speech and gesture). The task was to "click on what the speaker described."

The stimuli were counterbalanced such that across participants each set of visual stimuli occurred once in either the redundant, supplemental or mismatch condition. In redundant trials, the speech and gesture convey the same information (i.e. have the same content and refer to the same object). In supplemental trials, the speech and gesture convey different information, but refer to the same object and integration of the information is necessary in order to choose the target referent. In mismatch trials, the speech and gesture convey conflicting information (i.e. have different content and refer to different objects).

Results

Both reaction times and eye-movement patterns were analyzed. Trials in the redundant condition failed to show early preference for the target as our previous study did. Subanalysis of 4 trials that were identical across the studies (i.e. had the same videos and set of potential referents) revealed a difference in both reaction time and eye-movement pattern. Reaction times in the current study were longer than those in the previous study ($t(61)=2.817$, $p<.01$). The proportion of looks to the speech competitor was not statistically different across the two experiments ($p>.05$); however, the proportion of looks to the foil was significantly higher in the current study compared to our previous study (Mann-Whitney U test=605.0, $p<.05$). Moreover, the proportion of looks to the target was significantly lower in the current study compared to our previous study ($t(78)=2.831$, $p<.01$).

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References

Campana, E., Silverman, L., Tanenhaus, M. K., Bennetto, L., and Packard, S. (2005). Real-time integration of gesture and speech during reference resolution. In *Proceedings of the 27th Annual Meeting of the Cognitive Science Society, Stresa, Italy*. Mahwah, NJ: Lawrence Erlbaum Associates. 378-383.

Goldin-Meadow, S., and Singer, M. A. (2003). From children's hands to adults' ears: Gesture's role in the learning process. *Developmental Psychology*, **39**, 509-520.

Krauss, R. M., Dushay, R. A., Chen, Y., and Rausher, F. (1995). The communication value of conversational hand gestures. Journal of Experimental Social Psychology, 31, 533-553.

McNeill, D., Cassell, J., and McCullough, K. E. (1994). Communicative effects of speech-mismatched gestures. *Research on Language and Social Interaction*, **27**, 223-237.

Rauscher, F. H., Krauss, R. M., and Chen, Y. (1996). Gesture, speech, and lexical access: The role of lexical movements on speech production. *Psychological Science*, **7**, 226-231.