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Gesture plays a role in thinking for speaking

**Martha W. Alibali, Sotaro Kita,
Lisa J. Bigelow, Chai M. Wolfman and Susan M. Klein**

M. W. Alibali : Department of Psychology, University of Wisconsin
Madison, 1202 W. Johnson St., Madison, WI 53706, USA,
mwalibali@facstaff.wisc.edu

Sotaro Kita : Max Planck Institute for Psycholinguistics,
P.O. Box 310, 6500 AH Nijmegen, The Netherlands
kita@mpi.nl

Abstract

There is wide agreement that gesture is involved in speaking; however, it is not clear exactly how or at what point in the process that gesture plays a role. We hypothesize that gesture highlights perceptual-motor information in the conceptual planning of speaking. One implication of this view is that when gesture is prohibited, people should be less likely to use perceptual-motor thinking. Two experiments were conducted to test this claim. In Experiment 1, children solved and explained Piagetian conservation tasks with gesture allowed and with gesture prohibited. Children who were prohibited from gesturing focused on non-perceptual information in their task explanations more frequently than children who were allowed to gesture. Experiment 2 examined whether this effect derived from the fact that gestures could not be used to communicate in the gesture-prohibited condition. The procedure used in Experiment 1 was replicated with visibility between speaker and listener blocked by a curtain. Again, children who were prohibited from gesturing focused on non-perceptual information in their task explanations more frequently than children who were allowed to gesture. Taken together, the experiments suggest that spontaneous gestures promote a focus on perceptual-motor information. Thus, producing gestures may help speakers decide what to say.

Why do speakers produce gestures? There is wide agreement that gesture is involved in speaking (e.g., McNeill, 1992); however, it is not clear exactly how or at what point in the process gesture plays a role. Various hypotheses have been put

forth as to the exact locus of the link between speech and gesture production processes. At present, the dominant viewpoint in the field is that gestures are involved in generating the surface forms of utterances, specifically, accessing items from the mental lexicon (e.g., Butterworth & Hadar, 1989; Krauss, Chen, & Chawla, 1996; Rauscher, Krauss, & Chen, 1996).

In this paper, we present an alternative conceptualization. We argue that gesture plays a role in the conceptual planning of speaking (see Alibali, Kita, & Young, 2000; Kita, 2000). Specifically, we claim that gesture serves to highlight perceptual-motor information for speaking. We hypothesize that gestures can highlight or lend salience to information about the physical properties of objects, about how bodies interact with objects, and about how objects interact with one another. For example, when describing a cup, gestures may indicate or represent physical aspects of the cup (such as its size, shape, or height) or information about how the speaker's body could interact with the cup (such as by picking it up or holding it). We hypothesize that gesture production promotes a focus on such perceptual-motor information. In this way, gesture plays a role in the conceptual planning of speaking.

One implication of this view is that when gesture is prohibited, people should be less likely to use perceptual-motor thinking. The present experiments test this hypothesis using a task in which speakers can choose to focus on either perceptual-motor or non-perceptual-motor information: Piagetian conservation.

Experiment 1

Method

Fifty 1st- and 2nd- grade students participated. Each was asked to solve six Piagetian conservation tasks, administered in two sets of three. Each set included one continuous quantity task, one number task, and one length task. In each task, children were first asked to verify that two objects (e.g., two glasses of water) had the same quantity. One object was then transformed (e.g., water poured into a short, wide dish), and children were asked to judge whether the quantities were the same or different, and to explain that judgement.

For the first set of three tasks, all children were allowed to gesture as they explained their judgments. For the second set of three tasks, children were randomly assigned to a gesture-allowed or a gesture-prohibited group. Children were prohibited from gesturing by placing their hands inside a furry cloth muff.

Children's verbal explanations were classified as either perceptual-motor explanations, which focus on perceptual dimensions of the task objects (e.g., "This cup is tall and this one is short"), or non-perceptual-motor explanations, which focus on non-perceptual aspects of the tasks (e.g., "They were the same amount before").

Results and discussion

At set 2, children who were prohibited from gesturing produced more non-perceptual-motor explanations than children who were allowed to gesture, $F(1, 48) =$

17.28, $p < .0001$. Thus, when gesture was prohibited, children were less likely to focus on perceptual-motor information. This finding suggests that gesture production does indeed promote a focus on perceptual-motor information.

However, this finding is not conclusive, because it is possible that the observed effect of gesture prohibition derives from the fact that gesture could not be used to *communicate* in the gesture-prohibited condition. When gesture is prohibited, any potential function of gesture in the conceptual planning of speaking is blocked; however, any potential communicative functions of gesture are blocked as well. It is possible that the results of this experiment are due to gesture prohibition preventing the communicative function of gesture, rather than the preventing the speaker-internal function. To address this issue, we conducted a second experiment in which visibility between speaker and listener was blocked. In this situation, gestures cannot be communicative even when they are allowed.

Experiment 2

Method

Twelve kindergarten students participated. The method was like that of Experiment 1, with two exceptions. First, a mass task was substituted for the length task. Second, visibility between child and experimenter was blocked with a curtain during the child's task explanations, so that even when gestures were allowed, those gestures could not be communicative.

Results and discussion

As in Experiment 1, at set 2, children who were prohibited from gesturing produced more non-perceptual-motor explanations than children who were allowed to gesture, $F(1, 10) = 6.3$, $p < .03$. Since gestures could not be communicative in either group, this finding suggests that gesture production promotes a focus on perceptual-motor information.

General discussion

In both experiments, children expressed perceptual-motor information less often when gesture was prohibited than when it was allowed. Further, Experiment 2 showed that this finding is not due to gesture prohibition preventing any communicative function of gesture. Taken together, the experiments suggest that spontaneous gestures promote a focus on perceptual-motor information in conceptual planning for speaking.

The present findings are compatible with those of Rimé, Shiaratura, Hupet, and Ghysseleinckx (1984), who also showed that gesture prohibition can alter the content of speech. They asked speakers to converse freely on a set of given themes, and assessed the imagery content of speech using a "computer program of content analysis conceived to quantify the degree of speech imagery" (p. 317). When gestures were prohibited, speakers' imagery scores were lower. In our view, this finding pro-

vides additional support for the idea that gesture is involved in perceptual-motor thinking, because perceptual-motor information is likely to be high in imagery. When gesture was prohibited, speakers in Rimé et al.'s experiment presumably shifted their focus from high-imagery, perceptual-motor information to low-imagery, non-perceptual-motor information.

In sum, our findings support the view that gesture production is involved in the conceptual planning of speech. We have argued that gestures serve to highlight or lend salience to perceptual-motor information, such that speakers are more likely to talk about perceptual-motor information when they are free to gesture. In this way, producing gestures may help speakers decide what to say.

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