The effects of spatial manipulation and mental imagery skills on gesture production

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Why do some people gesture more than others? Prior work (Hostetter & Alibali, 2007) shows that spatial reasoning skills are one predictor of gesture rate. The Gesture as Simulated Action (GSA) framework (Hostetter & Alibali, 2008) posits that iconic gestures arise from mentally simulated action and perception, and further predicts that speakers will gesture more when simulating mental action or perception. We extend this prediction to consider the effects of individual variation on gesture rate. We consider two types of spatial reasoning skills: *spatial manipulation* (the ability to rotate and manipulate imagined objects) and *mental imagery* (the ability to keep detailed visuals in the mind's eye). Given that an individual with greater skill should have a stronger degree of mental activation, we predict a positive correlation between each spatial reasoning ability and gesture rate during tasks that rely on that skill. Individuals with high spatial manipulation skills will gesture more during spatial manipulation description tasks, and individuals with high mental imagery skills will gesture more during imagery description tasks.

One hundred native English-speaking undergraduate students participated in the study. Here we report the results of the first 12 participants as a pilot. Participants completed two spatial cognition assessments and two tasks intended to elicit gestures. The cognition assessment tasks were a paper folding task (i.e., spatial manipulation) (Ekstrom et al., 1976), and a visual template task (i.e., mental imagery) (Reed, 1974). Each production task mainly required one of the two types of spatial cognition. They were an origami explanation task (i.e., spatial manipulation) and a picture (BrainPOP, 2013) description task (i.e., mental imagery). Speech and gesture were coded separately. Gestures were coded in ELAN and categorized as representational or non-representational.

We found a moderate correlation between gesture rate and spatial skills for the spatial manipulation tasks (Fig. 1). There was only a weak correlation between gesture rate and spatial reasoning for the mental imagery tasks (Fig. 2). There was also a moderate correlation between the paper folding score and picture description gesture rate (Pearson's $r = 0.58$). There is a weak correlation between gesture production rates ($r = 0.34$); hence it is not simply the case that participants gestured at consistent rates between tasks. Results suggest that some aspects of spatial reasoning skill, such as spatial manipulation, may be stronger predictors of gesture production rates than others. They also support the claim of the GSA that heightened simulated action leads to increased gesture production.

References

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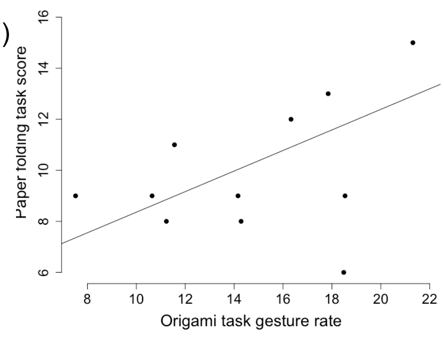
Fig 1. $r = 0.57$, p (df=10) = 0.055



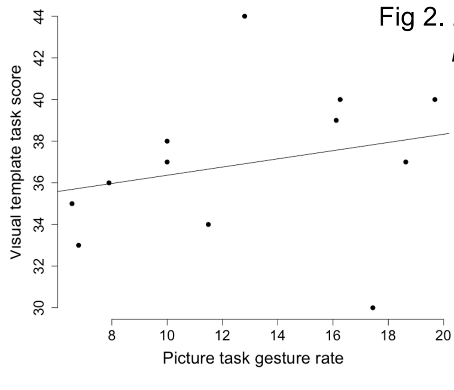


Fig 2. $r = 0.25$, p(df=10) = 0.433