

Gesturing to be understood: Hearing speaker create manual symbol that benefits comprehension

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There has been accumulating evidence showing that human communication is optimized for communication (Gibson et al., 2019; Goldberg & Ferreira, 2022). This evidence indicated that human language evolves into a way so as to facilitate easy, rapid and robust communication (Conway et al., 2020; Hahn & Xu, 2022; Piantadosi et al., 2011), and language user actively adapt language use to maximize the rate of communicative success while minimizing the effort (Mahowald et al., 2013; Rubio-Fernandez et al., n.d.). However, it remains unclear whether communicative efficiency play a role in the process of language creation. Does communicative efficiency influence individuals' choices when they creating a novel communication system?

To answer this question, we focus on the rudimentary communication system created in manual modality – silent gesture. Silent gesture is gesture-based communication system created by hearing speakers when communicating exclusively in manual modality. Building upon iconicity, gesturers manage to communicate via silent gesture without pre-established form-meaning mapping by employing iconic signs in various ways. Previous cross-linguistic studies have demonstrated systematic iconicity in silent gesture (Hwang et al., 2017; Marentette et al., 2016; Ortega & Özyürek, 2020; van Nispen et al., 2017). To express a given concept, gesturers reliably employed the specific gesture with a subtype of iconicity (e.g., gesturers prefer to use a gesture which pantomiming eating an apple than any other gesture form when depicting an apple). The mechanism that underlies the observed systematic iconicity remains unclear. The presents study focuses on communicative efficiency as a factor that determines which subtype of iconicity is employed. We propose that individuals select the subtype that can maximize the probability of being understood.

In experiment 1, we ask whether hearing speakers are more likely to produce silent gesture that maximize meaning recoverability. 39 adult English native speakers were asked to produce gestures for a total of 67 concepts about manipulable objects. For the gestures depicting each concept, we identified the dominant gesture (i.e., the most frequently used gesture which produced by more than 50% of participants) and the non-dominant gesture (i.e., the second frequently used gesture). The dominant and non-dominant gesture forms for each concept that elicited dominant gesture were then shown to 97 comprehenders. Comprehenders were asked to provide their best guess for the meaning of each gesture. To measure the communicative efficiency of a gesture form, we used the Shannon entropy, which measured the informativeness of the gesture form (i.e., how consistent interpretations are across comprehenders), and the semantic relatedness, which represented the average semantic distance between the interpretations and the target word for the gesture. The results showed that comprehenders were more likely to provide consistent interpretations and semantically related interpretations to the target word when interpreting a dominant gesture than a non-dominant gesture.

In experiment 2, we ask whether hearing speakers who produce non-dominant gesture overestimate the communicative value of non-dominant gesture. 70 adult English native speakers were asked to produce gestures for the same set of concepts in experiment 1. After the production phase, they were asked to estimate the communicative value of the gesture forms produced for the target concepts in experiment 1. Result of experiment 2 indicate hearing speakers tend to rate the communicative value of a gesture form they have produced in the production phase higher compared to the hearing speakers who didn't produce the gesture form. Taken together, our result indicates communicative efficiency play a role in governing individuals' choice when they are creating novel communication system.

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