

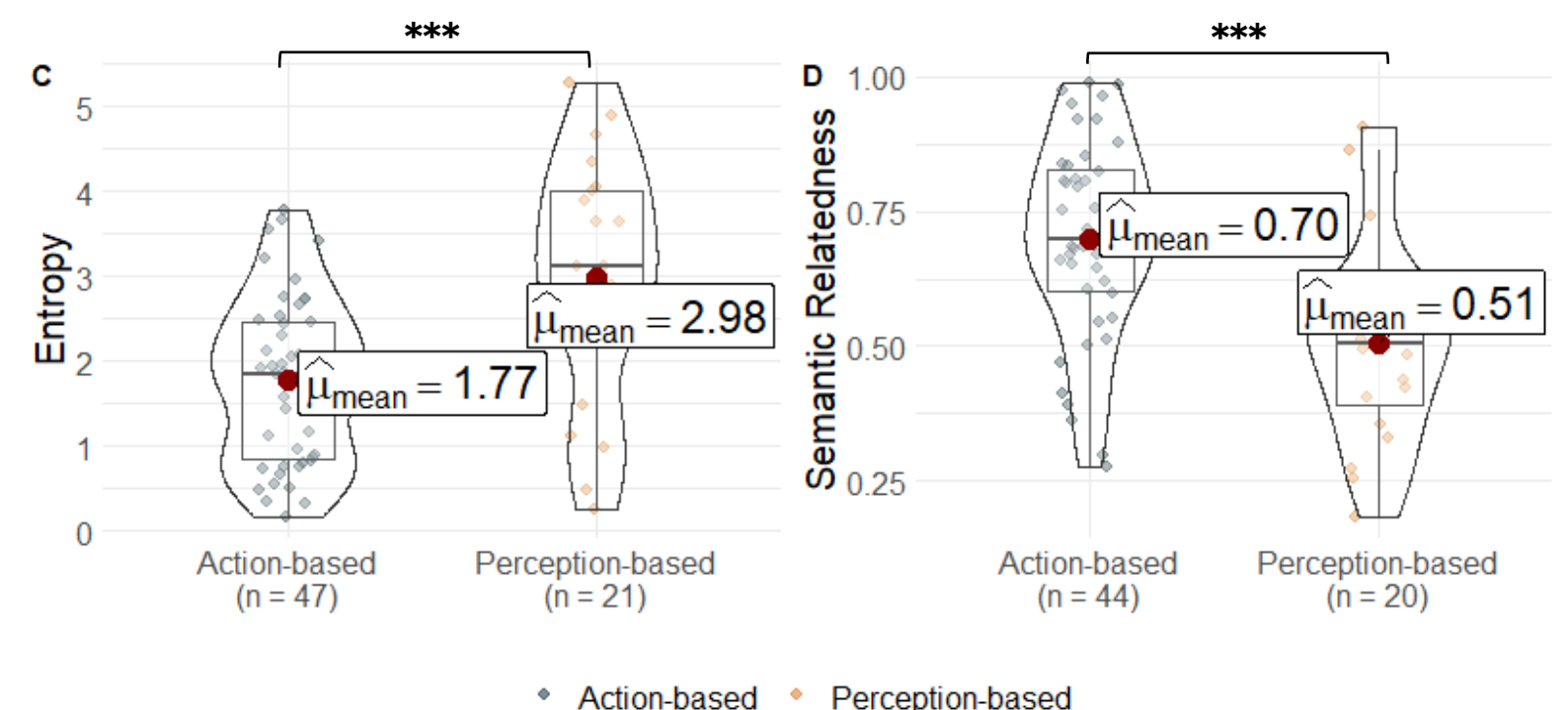
Gesturing to be understood: hearing speakers produce silent gesture that benefit comprehension

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Introduction

- Silent gesture is gesture-based communication system created by hearing speakers when communicating exclusively in manual modality. Silent gesture can tell us what kind of bias hearing speakers bring with them when creating a new communication system.
- Gesturer usually faces multiple choices as to how to produce gestures to refer to a concept: for the concept apple, a gesturer can produce an **action-based gesture** or a **perception-based gesture**.
- Although multiple choices are available, previous cross-linguistic studies have demonstrated **systematicity in silent gesture production** [1][2].
 - Systematic gesture form:** To express a given concept, hearing speakers reliably employ a specific gesture with a subtype of iconicity (e.g., pantomimes eating an apple rather than any other gesture form when depicting an apple).
 - Action bias:** Hearing speakers are more likely to produce action-based gestures than perception-based gestures.
- What general principles govern a gesturer's choice when multiple gestures are available to express the same concept?
- We posit a functionalist view of silent gesture - silent gesture is fundamentally usage-based and is designed to achieve efficient comprehension. People produce gestures with high communicative values, which maximize the probability of a potential interpreter recovering the intended meaning.

2. Action-based gestures are generally better understood compared to perception-based gestures

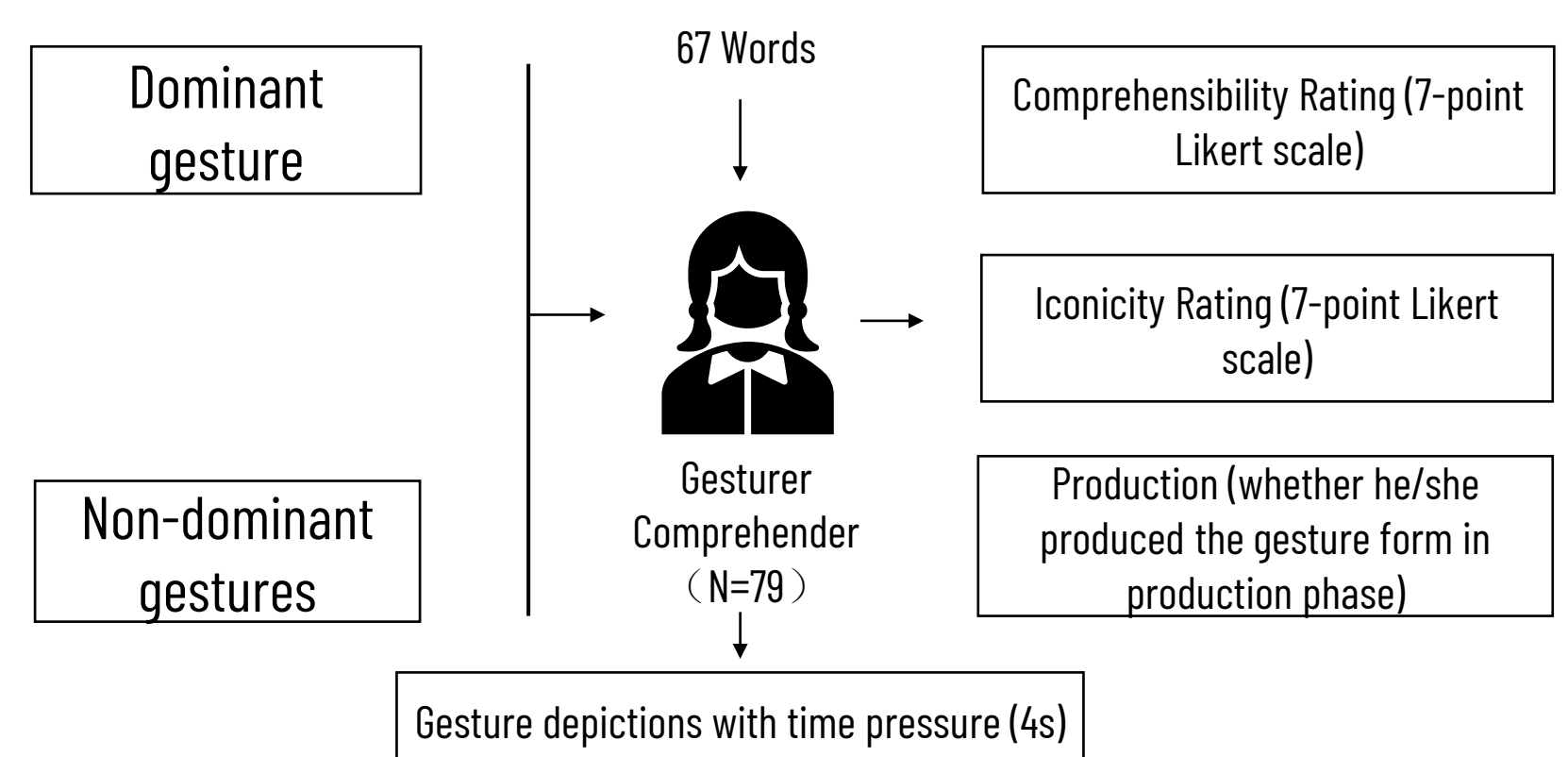


Experiment 2

- People are intelligent communicators – they tend to produce gestures that are efficient for the comprehenders.
- However, they do not always make the correct choice - around 41% of the gesture depictions include a non-dominant gesture

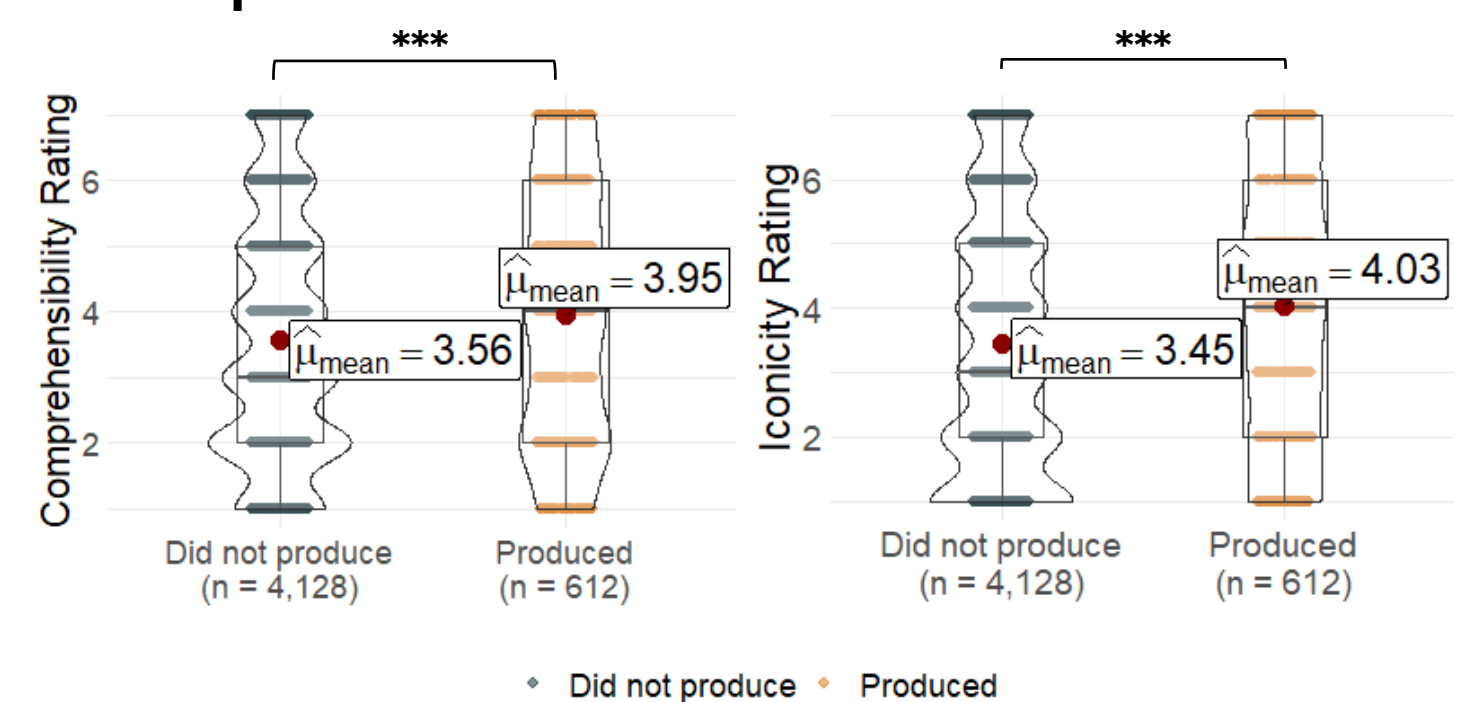
Do hearing speakers who produced the specific non-dominant gesture overestimate the communicative value of that non-dominant gesture?

Method – Experiment 2



Result – Experiment 2

3. Hearing speakers provide higher communicative value ratings for the non-dominant gesture form if they produced the gesture form before compared to those who didn't

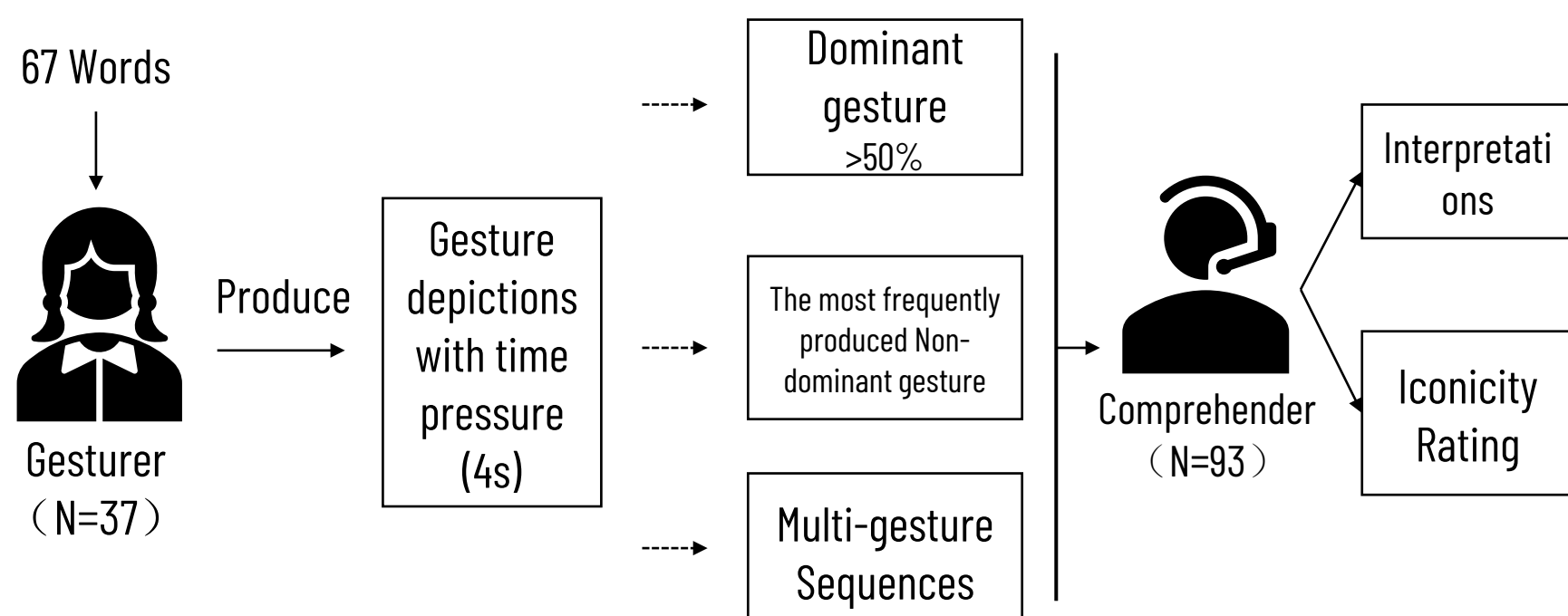


4. Differences in communicative value ratings between dominant gesture and non-dominant gesture for the same target word are significantly lower provided by hearing speakers who produced the non-dominant gesture compared to those who didn't.



Is silent gesture production structured by the comprehender-oriented pressure: gesturer's choice is governed by the communicative value of the gesture?

Method – Experiment 1

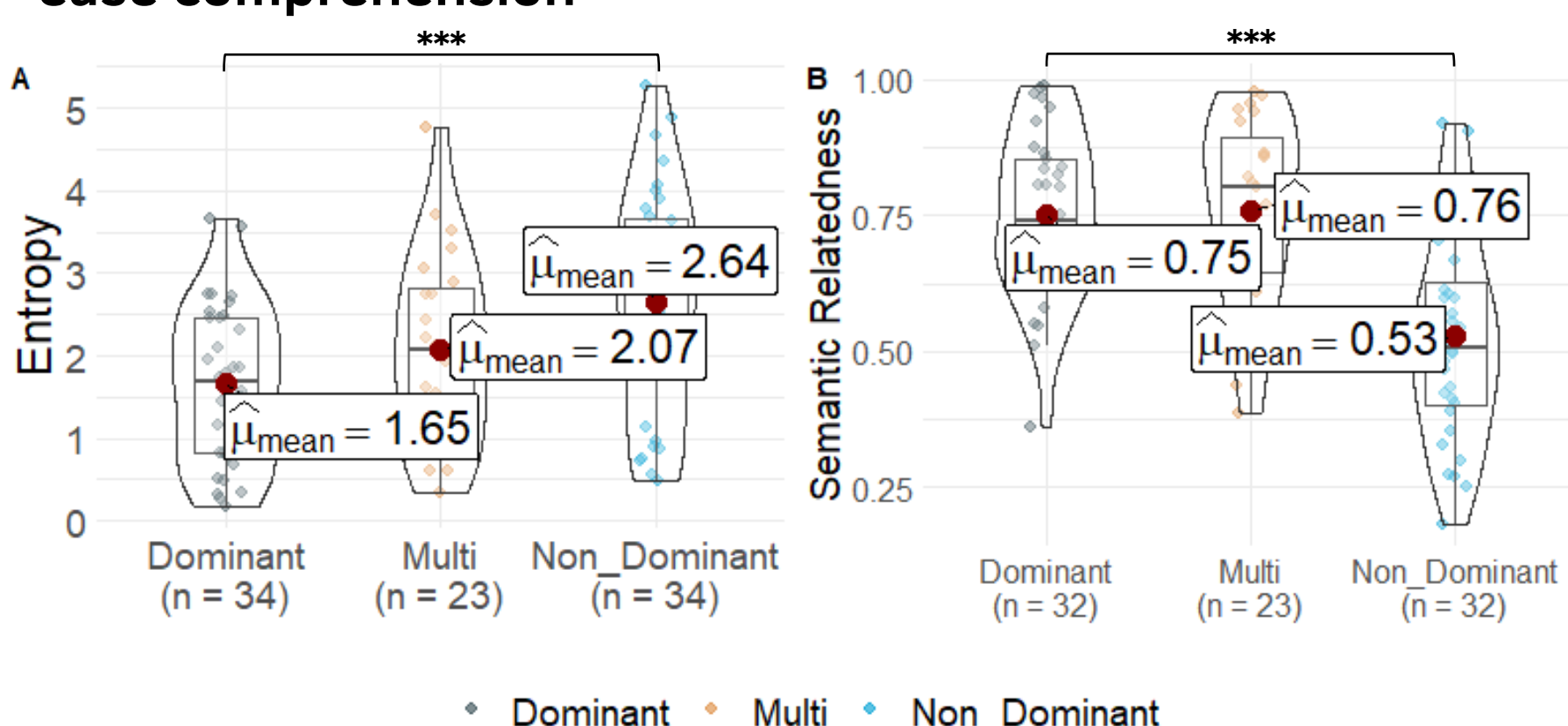


We measure the communicative value of a gesture form by

- Shannon entropy:** the average level of surprisal or uncertainty of interpretations of a gesture form. Lower entropy means lower uncertainty. [3]
- Semantic relatedness:** the average semantic distance between the interpretations and the target word for the gesture form. The semantic relatedness gets closer to 1 when the interpretations and target words are closer semantically.

Result – Experiment 1

1. The most frequently produced gestures are those that can ease comprehension



Take home message

People are intelligent communicators – even when communicating in a novel modality, they can structure their communication in a way that is efficient for the comprehenders.

References

- [1] Ortega, G., & Özyürek, A. (2020). Systematic mappings between semantic categories and types of iconic representations in the manual modality: A normed database of silent gesture. *Behavior Research Methods*, 52(1), 51-67.
- [2] Ortega, G., Schiefner, A., & Özyürek, A. (2019). Hearing non-signers use their gestures to predict iconic form-meaning mappings at first exposure to signs. *Cognition*, 191, 103996.
- [3] MacKay, D. J., & Mac Kay, D. J. (2003). *Information theory, inference and learning algorithms*. Cambridge university press.

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