

When Words Don't Come Easy – How Speakers Cope With Communicatively Challenging Situations Using Verbal Creativity and Co-speech Gesture

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Verbal creativity and co-speech gestures can both be powerful tools for communication, particularly when speakers lack conventional forms for expressing their intended meanings. Verbal creativity may be used to fill lexical or grammatical gaps, e.g., by inventing novel linguistic forms or repurposing existing forms to novel functions [5, 6]. Gestures may convey information that is difficult to encode in speech, e.g., by iconically depicting spatial relations and motor events [3]. However, the interplay between verbal creativity and co-speech gestures remains unexplored. On one hand, gestures have self-oriented cognitive functions which may support verbal creativity, such as facilitating lexical access and conceptualizing spatio-motoric information [4]. On the other hand, it has been hypothesized that there may be a “tradeoff” between speech and gestures, such that speakers would rely more on gestures when speech production is difficult, and vice versa [2].

This study explores the role of, and interplay between, verbal creativity and co-speech gestures in communicatively challenging situations. We present two experiments investigating German speakers' speech and gesture production when referring to stimuli that systematically vary in their codability, ranging from shapes with conventional labels (e.g., circle) to ones that are harder to describe (e.g., five-point star overlaid on upside-down trapeze). Experiment 1 (80 participants) is a picture-naming task used to generate quantitative codability norms for a set of visual stimuli. Experiment 2 (40 participant pairs) is an interactive multimodal reference game in which two participants collaborate to identify a target stimulus. In addition to manipulating the codability of targets, we also restrict participants' use of the verbal channel – (dis)allowing descriptions of more than a single word; and/or the gestural channel – (dis)allowing the use of manual gestures; in a 2×2 factorial design.

We find that participants proactively use both verbal creativity and co-speech gestures when communicating about low codability stimuli. The results of Exp. 1 show a correlation between stimulus codability, measured as (negative) entropy, and novel word use, i.e., the proportion of responses not listed in a dictionary ($r = -0.83$, $p < .001$). Mixed effects regressions conducted on the results of Experiment 2 show an effect of codability on the length of verbal descriptions ($b = -8.27$, $p < .0001$), on the use of novel words when speech is restricted to a single word ($b = -0.72$, $p < .0001$), and on the rate of gestures produced per spoken word, whether or not speech is restricted to a single word (Unrestricted: $b = -4.13$, $p = .001$; One word: $b = -39.51$, $p < .0001$); see Figure 1.

Regarding the interplay between verbal creativity and gestures, the results show no effect of the experimental condition restricting gestures on the length of verbal descriptions ($b = 1.39$, $p = .770$), nor on the use of novel words ($b = 0.76$, $p = .272$). It seems that the (un)availability of verbal labels, i.e., codability, has an effect on gesture production, whereas the (un)availability of gestures has no discernible effect on speech production. This asymmetry suggests that, rather than compensating for difficulties in speech production, gestures either provide redundancy to information conveyed via speech, as proposed in [1], or are used primarily for the speaker's own benefit, as discussed in [4].

References

- [1] Jan P De Ruiter. The asymmetric redundancy of gesture and speech. In R Breckenridge Church, Martha W Alibali, and Spencer D Kelly, editors, *Why Gesture? How the hands function in speaking, thinking and communicating*. John Benjamins Publishing Company, 2017. doi: 10.1075/gs.7.04der.
- [2] Jan P De Ruiter, Adrian Bangerter, and Paula Dings. The interplay between gesture and speech in the production of referring expressions: Investigating the tradeoff hypothesis. *Topics in Cognitive Science*, 4(2):232–248, 2012. doi: 10.1111/j.1756-8765.2012.01183.x.
- [3] Autumn B Hostetter. When do gestures communicate? A meta-analysis. *Psychological Bulletin*, 137:297–315, 2011. doi: 10.1037/a0022128.
- [4] Sotaro Kita, Martha W Alibali, and Mingyuan Chu. How do gestures influence thinking and speaking? The gesture-for-conceptualization hypothesis. *Psychological review*, 124(3):245, 2017. doi: 10.1037/rev0000059.
- [5] Judith Munat. Lexical creativity. In Rodney H. Jones, editor, *The Routledge Handbook of Language and Creativity*, pages 92–106. Routledge, 2015. doi: 10.4324/9781315694566.
- [6] Ralf Vogel. Grammatical gaps, grammatical invention and grammatical theory. In Thomas Strobel and Helmut Weiß, editors, *Grammatical gaps: definition, typology and theory*, pages 15–49. Helmut Buske Verlag, 2023. doi: 10.46771/978-3-96769-291-4.

Figures and Tables

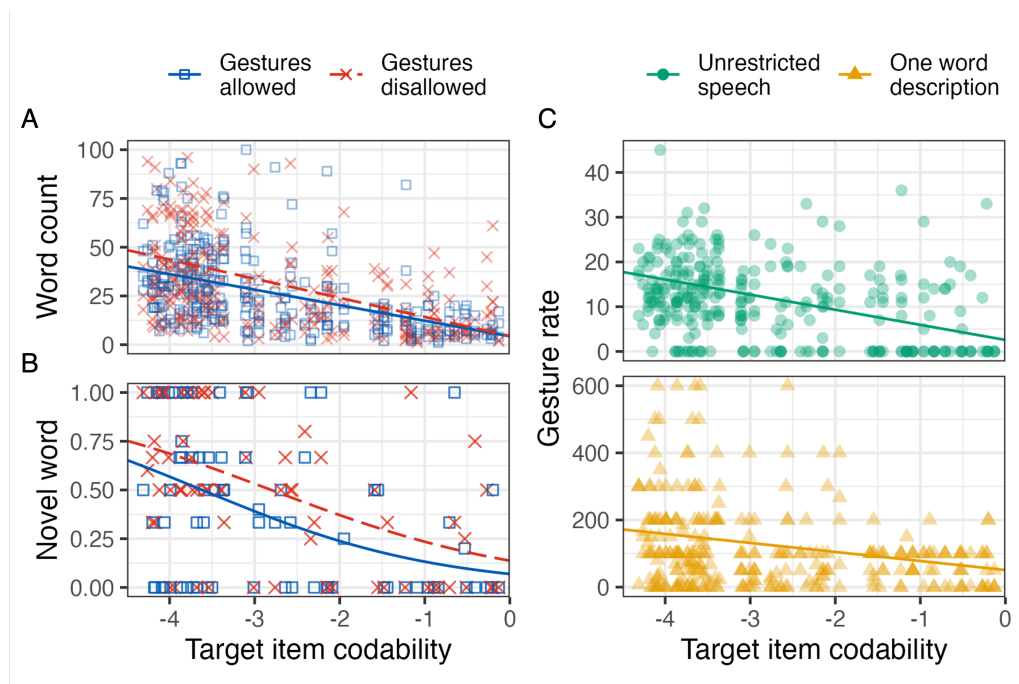


Figure 1: A. Number of words per trial. B. Proportion of novel words used per item. C. Number of gestures per 100 spoken words per trial.