

## Discourse relevance guides modifier choice in reference production

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Reference production is a rapid process that unfolds within seconds. Speakers' choice of adjectives to achieve unambiguous reference is a focus of extensive research, with important implications for debates about communication efficiency in the light of perceptual biases. One incremental-processing model proposes that speakers access absolute attributes, such as color, before relative attributes like size (Pechmann, 1989). In contrast, a probabilistic referential overspecification model initially selects an attribute based on discriminability, then considers any general preferences for other attributes and the speaker's tendency to overspecify, based on the model's specifications (van Gompel et al., 2019). Both models highlight a preference for overspecifying color, particularly for objects that can appear in different colors (e.g., a cup) (Sedivy, 2003). Recent studies have explored the efficiency of "overinformative" references in facilitating object identification. For example, Rubio-Fernandez (2016, 2021) observed more color overspecification when color exhibited high discriminability or contributed to visual search.

A further less-studied consideration is that the choice of referring expression also encapsulates other information that may be relevant to the broader discourse context. "Overinformative" modification may be discourse-efficient, for instance because it calls attention to an attribute which the speaker takes to be relevant. Our study investigates the extent to which speakers take discourse relevance into account when choosing which modifiers to include or omit during reference production, with a focus on color and size. Two web-based experiments were conducted in English, with participants producing referring expressions as part of their contribution to a short dialogue exchange (see Fig. 1).

**Experiment 1** examined situations in which either color or size was sufficient to fully distinguish the target. Participants (native British English speakers,  $n=48$ ) were presented with 18 object pairs with contrasting colors and sizes (e.g., small red mug vs. large blue mug) and corresponding questions prompting object specification. We tested three conditions with discourse goals relevant to color or size or neither (Which mug will you use [to create a Christmas vibe / to serve espresso]?). The results showed a significantly higher frequency of color mentions compared to size across all conditions. Beyond this bias for color overspecification, we also observed a tendency to include an attribute more when it was discourse-relevant (see Fig. 2). The greatest proportion of color-only and size-only responses was noted in the condition where the respective attribute aligned with the discourse goal. **Experiment 2** further tested the use of redundant modifiers, examining scenarios with four objects where only one attribute, either color or size, fully distinguished the target object from the distractors. The materials were modified from Experiment 1 to create color- and size-distinguishing versions. Participants (university students,  $n=60$ ) received an equal number of questions for each combination of version (color- vs. size-distinguishing) and discourse relevance (color- vs. size-goal). When size held relevance to the discourse, we observed significantly fewer mentions of color and more mentions of size (see Fig. 2). Consistent with Experiment 1, color-only and size-only responses reached their highest level when the respective attribute was both fully distinguishing and relevant to the discourse.

Taken together, these experiments build on prior work to enhance our understanding of reference production at the discourse level. Our results provide insights into speakers' sensitivity to the relevance of attributes to the discourse goals when forming referring expressions, suggesting that the inclusion of discourse-relevant attributes may be efficient in conveying both the communicative aim and the speaker's reasoning. We explore the implications of these results for psycholinguistic theories of reference production and discuss accounts of how the different factors governing reference production in this task are integrated by speakers in real time. We sketch a model of speaker reference production which accommodates these data and discuss how to test and refine it further with future experimental work.

### Experiment 1



Which mug will you use  
to create a Christmas vibe? (Color-goal)  
to serve espresso? (Size-goal)

You:

### Experiment 2

(A) Color-distinguishing



(B) Size-distinguishing



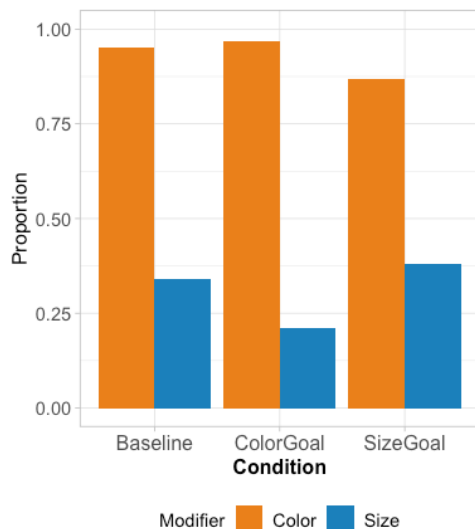
Friend: Which suitcase shall I take?

You: If you want to spot it easily at night, . (Color-goal)

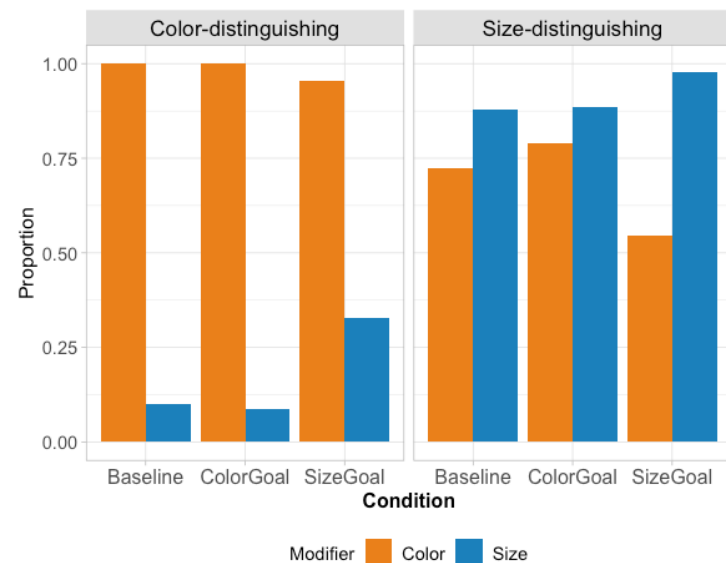
You: If you are going on a two-week trip, . (Size-goal)

**Figure 1.** Sample item displays from Experiment 1 and 2.

### Experiment 1



### Experiment 2



**Figure 2.** Proportion of color and size mentions in Experiment 1 and 2.

Linear mixed-effects models were used to analyze the outcome of Inclusion of modifier (yes = 1, no = 0). Fixed effects were Modifier (color vs. size) and Condition (color-goal vs. size-goal vs. baseline, contrast coded) and their interaction. Using the maximal random effect structure for participants and items as permitted by the data, p-values for the fixed effects of Modifier and its interactions with Condition (size-goal.baseline and color-goal.size-goal) < 0.001.

**References:** • Pechmann, T. (1989). Incremental speech production and referential overspecification. *Linguistics*, 27, 89–110. • Rubio-Fernandez, P. (2016). How redundant are redundant color adjectives? An efficiency-based analysis of color overspecification. *Frontiers in Psychology*, 7, 153. • Rubio-Fernandez, P. (2021). Color discriminability makes over-specification efficient: Theoretical analysis and empirical evidence. *Humanities & Social Sciences Communications*, 8(1), 1–15. • Sedivy, J. C. (2003). Pragmatic versus form-based accounts of referential contrast: Evidence for effects of informativity expectations. *Journal of Psycholinguistic Research*, 32(1), 3–23. • van Gompel, R. P., van Deemter, K., Gatt, A., Snoeren, R., & Krahmer, E. J. (2019). Conceptualization in reference production: Probabilistic modeling and experimental testing. *Psychological Review*, 126(3), 345–373.