Listeners use descriptive contrast to disambiguate novel referents and make inferences about novel categories

Suppose a friend asked you to "pass the tall dax." You might look around the room for two similar things that vary in height, and hand the taller one to them. This is how people to respond to adjectives like "tall" with known objects—they preferentially consider only tall objects with short competitors as soon as they hear "tall" (Sedivy, 1999). If there were no objects that varied only on their size, on the other hand, you might infer something different—most daxes must be shorter than the one your friend wants, since people tend to mention atypical features more than typical ones (Mitchell, 2013; Rubio-Fernández, 2016). From the indirect information in your friend's utterance, you could in principle learn either the meaning of a new word, the typical size of a new category, or both. But would you be likely to in practice? In a set of two experiments, we tested first whether people use adjectives like "tall" and "red" contrastively to determine the meaning of the novel word they modified, whether these adjectives lead people to infer the typical color or size of the modified object's category, and whether these two processes interact.

In Experiment 1, we asked whether people can use the contrast implied by adjectives to resolve ambiguous referential events. Participants (n = 80) played a reference game on Amazon Mechanical Turk. On each trial they were asked to find a target, e.g. "toma" or "red toma," from a set of three novel objects. On critical trials, two of the objects were an identical shape but varied on the dimension cued by the adjective, and the third object (the lure) matched the descriptor (e.g., was red), but did not have a contrastive competitor (Fig. 1). If people treat adjectives as contrastive, they should choose the unique lure object when no adjective is specified ("toma"), but should instead choose the matching object with a contrasting competitor when they heard an adjective (e.g. "red toma"). Across participants, we varied whether adjectives referred to size (big or small) or color (red, blue, green, or purple). People responded to color and size differently—making the predicted inference for size ($\beta = 0.85$, $t = 1.97$, $p = .049$), but not color ($\beta = 0.24$, $t = 1.23$, $p = .218$) (Fig. 2). Other work has similarly found a deficit for color adjectives in contrastive processing (Sedivy, 2003). Color adjectives are often used redundantly in English (Pechmann, 1989; Nadig & Sedivy, 2002) and are less relative than size adjectives, which may invite an acontextual, non-contrastive interpretation. Perhaps due to the relative nature of size adjectives or to redundant color adjective use, size seems to carry more contrastive weight in resolving referential ambiguity.
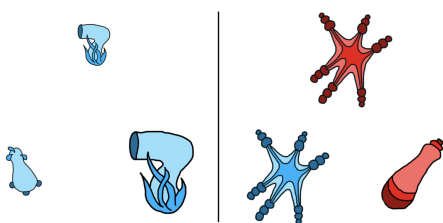

Fig. 1: An example of two displays from Experiment 1. On the left: an example of a critical trial in the size condition. Here, the participant would hear the instruction "Find the small dax." On the right: an example of a critical trial in the color condition. Here, the participant would hear the instruction "Find the red dax." In both of these displays the target is the top object.
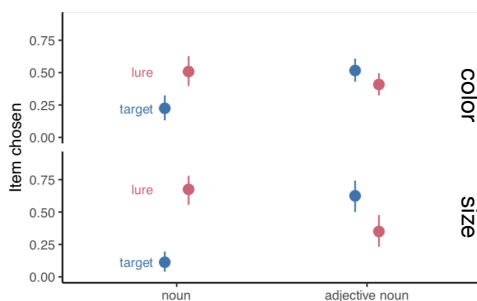

Fig. 2: Experiment 1. Proportion of times that participants chose the target and lure items as a function of adjective condition and whether an adjective was provided in the utterance. Points indicate group means; error bars indicate 95% confidence intervals computed by non parametric bootstrapping. Participants chose the target significantly more often than the lure when an adjective was in the utterance in the size condition (bottom facet), but failed to do so in the color condition (top facet).

In Experiment 2, we asked whether listeners use the contrast implied by adjectives to make inferences about a novel object's category. Participants on Mechanical Turk (n = 240) were presented with two alien interlocutors who exchanged objects using referring expressions, such as "Pass me the purple toma" or "Pass me the toma." After seeing each exchange, participants made a typicality judgment on a 100-point scale: e.g., "What percentage of tomas do you think are purple?" If participants interpret description as contrasting with an object's category, they should infer if an adjective is used ("purple toma"), few tomas are purple in general. We find that participants robustly make this contrastive inference of atypicality across both size and color adjectives compared to their typicality judgments for referents that were not described (β = -10.95, t = -6.89, p < .001). However, context should matter in these judgments: if the descriptor was necessary to identify the referent, an inference of contrast with the category is unwarranted. We manipulated the context of reference to test this hypothesis (see stimuli in Figure 3). In some conditions, the adjective was necessary to establish reference: "the purple toma" referred to a purple object next to another object of the same shape and different color. In others, the description was unnecessary: "the purple toma" referred to a purple object next to an object of a different type and different color. Finally, in others, the description was especially redundant: "the purple toma" referred to a purple object next to an object of a different type that was also purple. If people use referential context to inform their typicality judgments, they should attenuate their inference of atypicality when the adjective is necessary to establish reference and enhance their inference of atypicality when the adjective is especially redundant in context. Participants did not use the referential context to adjust their judgments of atypicality across color and size conditions (β = -2.39, t = -1.62, p = .106; β = 0.04, t = 0.03, p = .977) (Figure 3).
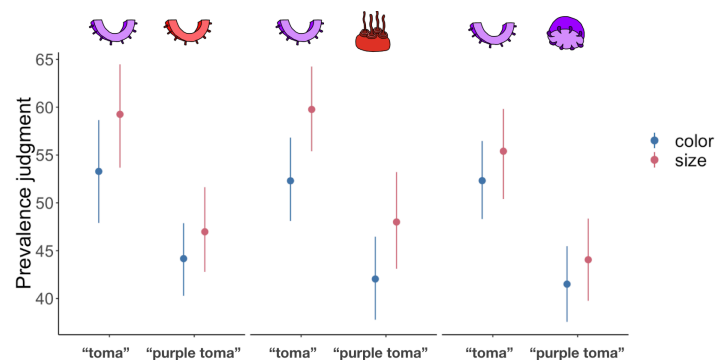
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Fig. 3: Experiment 2. Participants consistently judged the target object as less typical of its category when they the referent was described (e.g., "Pass me the purple toma") than when it was not (e.g., "Pass me the toma"). This effect held across color and size adjectives. However, this contrastive inference of atypicality was not significantly affected by the object context in which the reference occurred.

Overall, we find that people are able to use descriptive contrast to infer the referent of a novel label and to make inferences about a novel referent's category, but they do not seem to trade off between these two inferences. In our first experiment, participants were able to resolve referential ambiguity using a contrastive interpretation of size adjectives, though they fail to do so with color adjectives. In our second experiment, participants inferred that a described referent was atypical of its category on that feature: hearing "big toma" in a referential context led them to think that most tomas were not big. In real life it is often unclear whether description is meant to contrast with present objects or imply atypicality. A rational listener would attribute use of a descriptor to either contrast among present referents or to a referent's broader category. Participants in our task did not: they inferred atypicality of a described feature even when the descriptor was necessary to establish reference. Contrastive inference allows listeners to learn the meanings of new words and the typical features of new categories, but they do not seem to trade off rationally between these two inferences.