Acquisition of subordinate nouns as pragmatic inference: Semantic alternatives modulate subordinate meanings

June Choe[1], Anna Papafragou[1]
[1]University of Pennsylvania

A major aspect of word learning involves identifying the level of specificity encoded by word meanings (Quine, 1960). Evidence suggests that learners show a bias for mapping words to basic-level (*dog*), as opposed to subordinate-level meanings (e.g., *poodle*; Markman, 1990; Waxman & Markow, 1995; Waxman et al., 1991, 1997), but the circumstances that allow learners to generalize word meanings beyond the basic level are still under debate (Xu & Tanenbaum, 2007; Spencer et al., 2011; Lewis & Frank, 2018; Wang & Trueswell, 2019).

Here, we begin with the assumption that learners make pragmatically-driven inferences about the hypothesis space over which possible word meanings are proposed and evaluated. Unlike past accounts that framed the acquisition of subordinate-level nouns as a question of how various sources of perceptual information in the referential world interact and converge on a specific concept (e.g., Xu & Tanenbaum, 2007), we ask under what discourse contexts learners expect to hear a word with a narrower meaning. In the case of basic vs. subordinate meanings, identifying the intended meaning involves selecting the appropriate level of informativeness for a novel word, with subordinate meanings being more informative. In two online experiments, we probed the nature of these pragmatic inferences by testing the role of contrast in adult learners' basic- vs. subordinate-level generalization of novel words from single trials. We hypothesized that the rate of basic-level generalizations for an ostensive target label (e.g., 'mipen' paired with a red apple) would decrease if the target is followed by a semantic alternative at the subordinate level (e.g., a green apple), under the assumption that the presence of the alternative makes it clear that the more informative (subordinate-level) categories are relevant to the task (Barner, Brooks & Bale, 2011; Skordos & Papafragou, 2016). Additionally, we hypothesized that this effect of contrast would be linguistic, as opposed to conceptual, and should thus be stronger when the alternative was labelled rather than simply present and unlabelled. In two experiments, we tested these hypotheses respectively.

In Experiment 1 (n=50), a foreign-language speaker named Sally told participants that they would be learning words from her native language. There were 10 trials (4 with natural kinds, 4 with artifacts, and 2 catch trials), each divided into two parts. In the learning phase (**Fig. 1**), Sally labelled the target with a novel word. In the *contrast* condition, she then introduced an alternative at the same subordinate level with a different label. In the *no-contrast* condition, no such contrast was introduced. In the test phase, participants were asked to select all matches for the target label from an array of images (two subordinate-level matches to each of the target and the contrast, three unseen basic-level exemplars, three superordinate exemplars, and eight unrelated exemplars; **Fig. 2**). Basic-level responses contained all matches to the target and the contrast and any number of other basic-level exemplars. Consistent with our predictions, we found a significant negative effect of contrast (p <.0001) from a logistic regression model fitted to basic-level responses to the target label at test (**Fig. 3A**).

Experiment 2 (n=90) was similar but sought to disentangle the effect of labelling from the mere presence of the alternative referent. We manipulated the labelling of the semantic alternative (*labelled* vs. *un-labelled*) and, to guard against possible presentation effects, we counterbalanced the order in which the target appeared in the learning phase relative to the alternative (first vs. second). A logistic mixed-effects model fitted to basic-level responses revealed a significant main effect of labelling (p <.0001), indicating a strong shift to subordinate-level generalizations for the target label when the alternative was labelled **(Fig. 3B).**

In sum, semantic alternatives facilitate mappings to subordinate-level meanings, and especially so when the alternative is labelled. This suggests that learners can use linguistically marked contrast to reason about the level of specificity for a word's meaning expected from an ostensive labelling event.

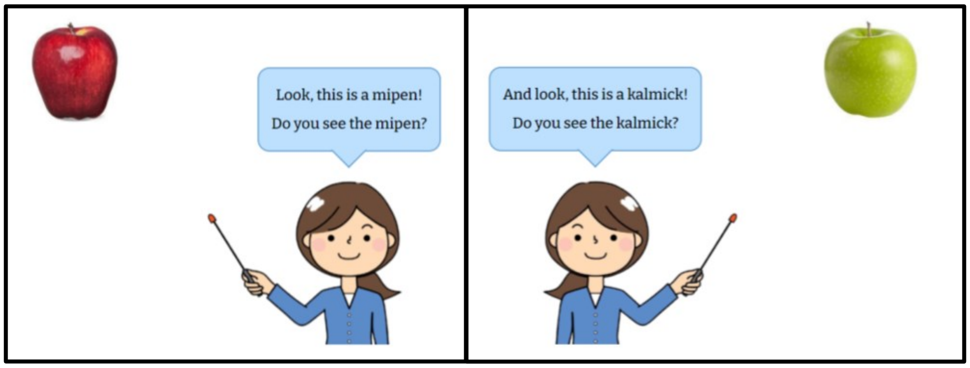

Figure 1. The learning phase. In Experiment 1, the target (A) or the target and the contrast (A and B) appeared to the left then right of Sally, for seven seconds each with one second in between. In Experiment 2, the speech bubble for the *un-labelled* condition read: "(And) look here! Do you see this?"

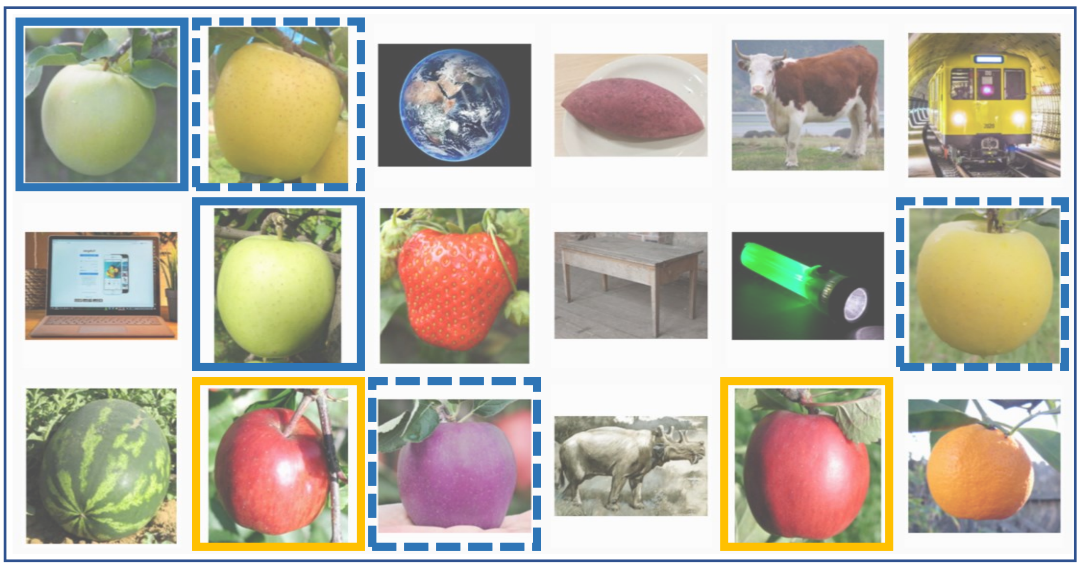

Figure 2. The testing phase. Sally reappeared to give instructions "Do you see any other mipens below? Click on all the mipens you see!" Choices were coded as 'subordinate (orange), 'basic' (orange + blue), and 'other' for all other responses. When the learning phase introduced a contrast label, responses including the alternative subordinate-level images (solid blue) were coded as 'other'.

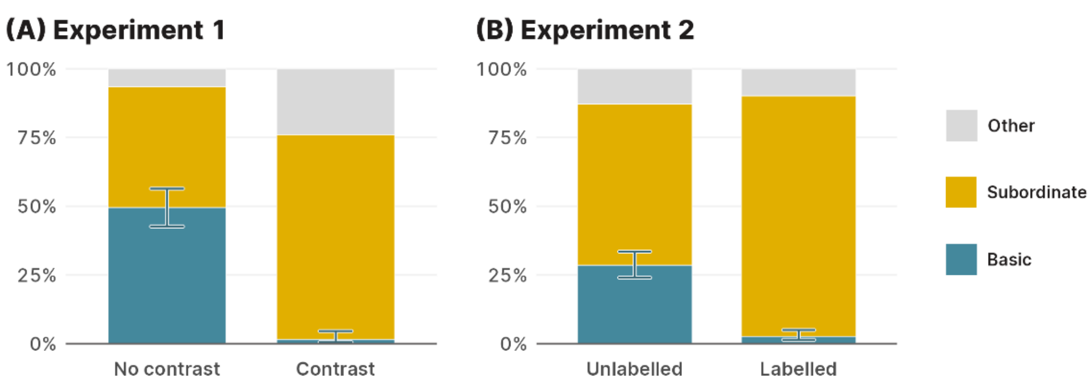

Figure 3. Coded responses to the target label at test in Experiment 1 (A) and Experiment 2 (B)

References: [1] Quine, 1960. MIT Press. [2] Markman, 1990. *Cog. Sci*. [3] Waxman & Markow, 1995. *Cog. Sci.* [4] Waxman, 2003. Oxford UP. [5] Waxman et al., 1991. *Child Dev.* [6] Waxman et al., 1997. *Dev. Psy*. [7] Xu & Tanenbaum, 2007. *Psy. Rev.* [8] Spencer et al., 2011. *Psy. Sci*. [9] Jenkins et al., 2015. *Cog. Sci.* [10] Lewis & Frank, 2018. *Psy. Sci*. [11] Wang & Trueswell, 2019. *Cog. Sci.* [11] Barner, Brooks & Bale, 2011. *Cognition*. [12] Skordos & Papafragou, 2016. *Cognition.*