Discourse effects on the acquisition of subordinate nouns

Word learning is characterized by a bias for mapping meanings to the "basic" ('dog') over the subordinate ('terrier') level [1]. The acquisition of subordinate nouns benefits from mentioning a basic-level category prior to introducing a subordinate ("This is a dog. It's a terrier.") [2, 3]. This "anchoring effect", however, conflates two distinct cues to meaning: i) the contrast between the target label and the (basic-level) anchor, and ii) the order of the subordinate's introduction. Here we propose that part of the challenge in the acquisition of subordinate nouns comes from the fact that, for general-purpose conversations (and from the perspective of a 'generic' addressee; [4]), subordinates are more informative (and even over-informative) compared to basic-level terms. Thus, the anchoring effect builds the conditions under which a subordinate item is felicitous: if the target follows the anchor in the discourse, the order aligns with the natural discourse flow where a basic-level category is refined with a new subordinate-level distinction. However, the opposite order violates this informativeness expectation, diminishing the role of the anchor to simply offering a competing candidate for the basic-level meaning, forcing a revision of the initial basic-level conjecture for the target label to some narrower meaning [5]. We predicted that this failure to integrate expectations about the perceived discourse flow in the latter case would impede reasoning about the intended subordinate-level meaning of the target label [6]. We manipulated the order of target and anchor to test this account.

In a web experiment with English-speaking adults (N=47), participants learned novel words from Sally, a foreign language speaker. There were 10 trials for different categories, each divided into two phases. During the *training phase* (**Fig. 1A-B**), Sally introduced and labelled the One-exemplar target (a dalmatian) and the Three-exemplar anchor (a set of other dogs), varying the Order of presentation in two conditions. In the Three-One condition, the order aligns with the perceived flow of informativity from the anchor, facilitating an interpretation of the target at a the more specific subordinate-level. In contrast, the flipped One-Three condition thwarts that discourse cue to subordination; the ordering is infelicitous assuming an intent to be more informative by saying the target word. Then, in the *testing phase*, participants were shown a sequence of images and asked whether each image matched the target word in a speeded judgment paradigm (**Fig. 1C**). The test set consisted of 2 subordinate matches (dalmatians), 3 basic matches (other dogs), and 7 non-matches (e.g., a computer) (**Fig. 2**). To probe whether learners posited the target as specifically meaning 'dalmatian' and not 'dog', we analyzed responses to the basic matches. Here, we expected all "NO" responses, as the target is unlikely to mean the basic-level given the contrast between labels (Principle of Contrast, [7]), but we predicted greater difficulty in doing so after learning the word in the One-Three order, which deprives the learner of the discourse cue to subordination at the moment of labelling. Lastly, we counterbalanced the position of basic matches in the sequence to account for adaptation effects.

As predicted, learners assigned the subordinate meaning to the target (74%; 4% basic, 22% other), with no significant differences between conditions. Critically, teaching the target word in the One-Three order led to a sustained slowdown across basic-match items in the test phase, compared to in the Three-One order (**Fig. 3; Table 1**). Thus, we find a lingering, on-line effect of disrupting a critical discourse-based cue to informativity that highlights the intended subordinate-level meaning of a word. Results support a pragmatic account of the anchoring effect for subordinates and confirm the role of informativity in acquiring word meanings [8].
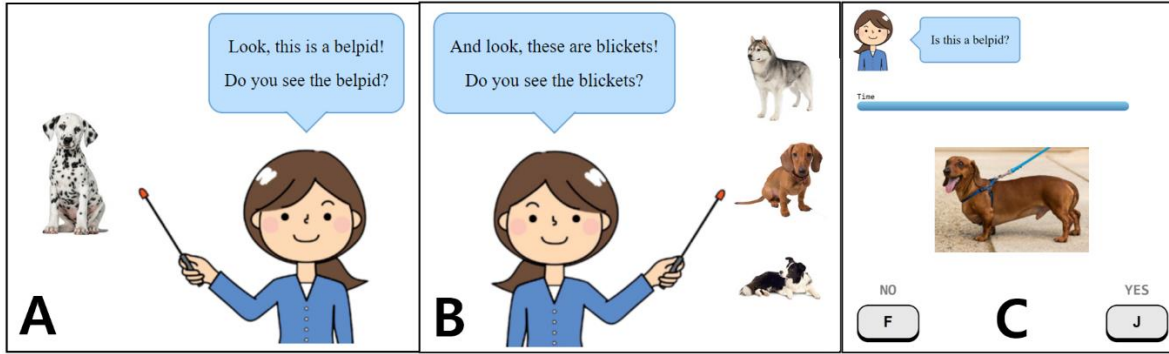
Figure 1 – Labelling of the One-item **(A)** and the Three-item **(B)** in One-Three order in the learning phase of a "dog"-trial. In the test phase, Sally showed a sequence of images and asked whether each item matched the target word; a basic-match item is shown in **(C)**. Participants navigated the test sequence using keypresses under a 5s timeout.
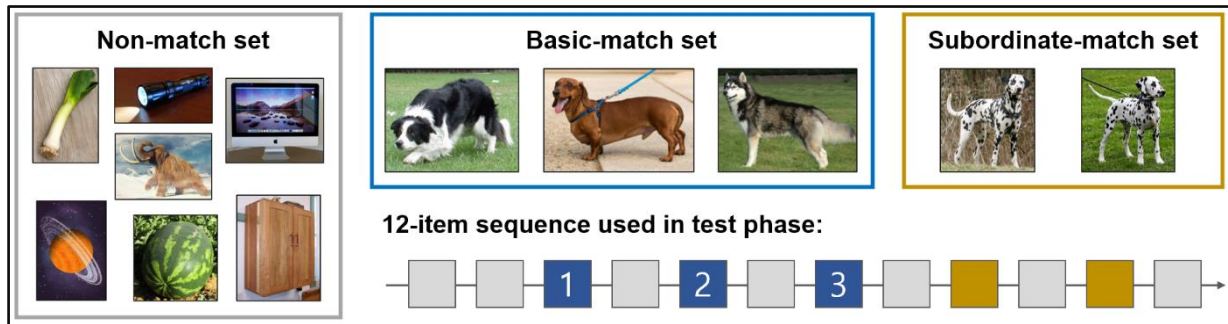

Figure 2 – Images used in a "dog"-trial test phase, consisting of 3 basic-match (blue), 2 subordinate-match (yellow), and 7 non-match (grey) items. The basic and subordinate items were grouped together, with non-matches intervening. The position of the basic items was counterbalanced to alternate between occurring earlier or later in the sequence.
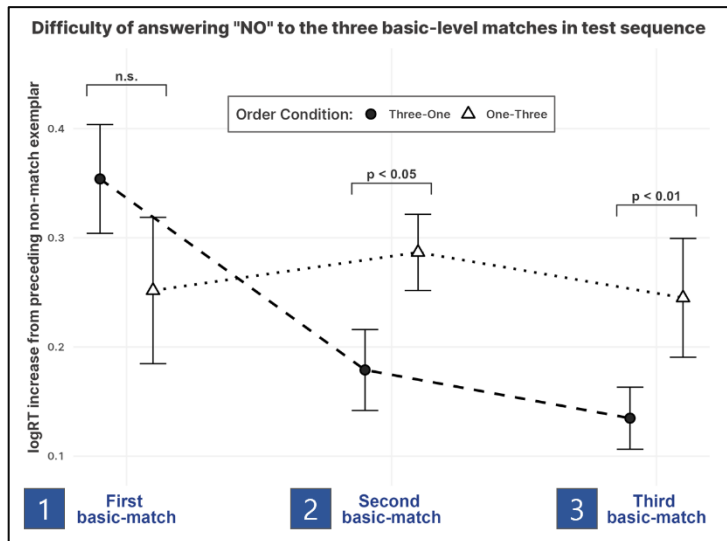

Table 1 – A linear mixed-effects model predicting difficulty at the basic-match items. The model was fitted via the R package *lme4*, using the reported terms in the table as fixed effects and random intercepts and slopes of Order by subject and item. The Order predictor is treatment coded with Three-One condition as the reference level.

Term	β	t	p
(Intercept)	.358	5.2	.0008
nth_basic_match	-.134	-6.6	<.0001
Order	-.074	-2.0	.0471
trial_number	.002	-0.1	.893
nth_basic_match * Order	.081	2.8	.0055

Figure 3 – Difficulty of responding "NO" to each basic-match item (1-2-3) encountered in the test sequence. Difficulty is quantified as the difference in log response time between the basic-match item (*Mean*=684ms) and the preceding non-match item (*Mean*=580ms; also always a "NO" response). Plotted p-values are from a post-hoc test of pairwise comparisons between the Order conditions via the R package *emmeans*, using the model reported in Table 1.

References: [1] Markman, 1990. *Cog. Sci*. [2] Callanan, 1989. *Gene. Epist.* [3] Waxman et al., 1991. *Child Dev.* [4] Brown & Dell, 1987. *Cog. Psy.* [5] Wang & Trueswell, 2019. *Cog. Psy.* [6] Ross & Murphy, 1996. *JEP: LMC.* [7] Clark, 1987, *Mech. Lang. Acq.* [8] Choe & Papafragou, 2022. *Proc. Cog. Sci.*