

Restricting and generating hypotheses about focus alternatives

A sentence like (1), which contains the focus-sensitive element *'only'*, is said to convey both that Jane has some candy, and that with respect to the appropriate pragmatically-restricted set of alternatives, Jane has nothing other than candy. The first part of the meaning (2a) was classically treated as a presupposition [1], but much of the subsequent discussion has been about characterizing the exact nature of this inference. We take a different methodological approach that probes comprehenders' changing expectations about the focus value [2] of a sentence like (1) given the preceding discourse context. In three visual world eye-tracking experiments [3], we show that explicit mention in the preceding linguistic context (Experiment 1), the informativity of the preceding context (Experiment 2), and conceptual relatedness with salient context elements (Experiment 3) are all used to restrict the alternatives that (1) is interpreted with respect to (2b). Because the focus value is necessarily included in the alternative set, narrowing down the alternatives strengthens comprehenders' ability to predict the upcoming focus. A final experiment (Experiment 4) compares *only* with *also* (3), which similarly must be interpreted with respect to a contextually-restricted alternative set, but leads to different expectations about the focus of the sentence.

Experiment 1 compared pairs of sentences like (3a) and (1), where the focused item is included in the set of things mentioned in (4a) (*Mention* condition), with pairs like (4b) and (1), where a discourse-new item is focused (*No Mention*). Mention was crossed with presence or absence of *only* in (1). Participants heard sequences of an introductory sentence (4) followed by a target sentence (1), then clicked on the item mentioned in the final sentence (the *target referent*, corresponding to the element that associates with *only*) in a 4-item display (5). First, there was a main effect of Mention, such that the target referent was identified earlier when it had been mentioned. On No Mention trials, *only* disambiguated the intended referent from a phonological cohort competitor after the entire word (600 ms after direct object onset). But in Mention-*only* trials, fixations converge on the target item 200 ms after target word onset—well before the input disambiguates the target and the competitor. At 200-400 ms, there are more looks to the target in Mention-Only than Mention-No Only trials ($p < .001$), while No Mention trials did not differ ($p = .35$). Thus, after hearing only the initial sound of the target word, listeners have a strong expectation that the set of possible referents will be constrained by the set mentioned in the previous sentence.

Experiment 2 embedded the four conditions from Experiment 1 under a Context manipulation (cf. [4], [5] for other context-induced interpretive biases in eye-tracking). Participants heard an initial context sentence that provided them with information about the upcoming narrative that was more (6a) or less (6b) restrictive, followed by a sentence about one of the characters in the narrative, then a target sentence about the other character (7). As in Experiment 1, Mention was crossed with presence or absence of *only*. Underinformative Context conditions replicated Experiment 1: listeners identified the target referent earlier overall (*magazines* in (8)) when it was previously mentioned than when it wasn't ($p < .01$), and even earlier in the context of *only* ($p < .05$, mean disambiguation 186 ms after target word onset). The same pattern of disambiguation occurs even earlier in Informative Contexts: listeners disambiguated in favor of the target earlier for the Mention conditions (352 ms after target onset) compared to No Mention (480 ms, $p < .05$), and earliest in presence of *only* (104 ms after target onset, $p = .06$). These results show that additional contextual information about specific scenarios can strengthen the Mention-Only interaction observed in Experiment 1.

Experiments 1-2 are consistent with listeners using the linguistic context to eliminate unlikely referents from consideration once the referential options are revealed by the visual display. But if listeners instead begin generating expectations about possible target referents as they are interpreting the sentences in the preceding context, we might expect them to show a bias toward target referents that are conceptually similar to previously mentioned items,

relative to conceptually dissimilar items, even when neither has been explicitly mentioned. Experiment 3 gave participants a context sentence (9), and compared how early the target was disambiguated when the continuation contained a mentioned item (10a), an unmentioned item from the same conceptual category as the previously mentioned items (10b), or an unmentioned item in a different category (10c). Consistent with Experiments 1-2, mentioned targets were identified earlier than unmentioned-same-category targets ($p=.01$). In addition, unmentioned same-category targets were disambiguated earlier than different-category targets ($p<.05$), revealing that listeners had a stronger expectation for a conceptually related item to be focused in the target sentence.

How do the findings from Experiments 1-3 generalize to other alternative-sensitive particles? We address this question by comparing *only* with *also*, which associates with focus like *only*, but differs in how the focused element relates to the focus alternatives. While an *only* sentence asserts that every sentence that replaces the focused constituent with another member of the alternatives set is false, the counterpart *also* sentence presupposes that the sentence is also true when the focus is replaced with some other alternative. Thus after hearing a sentence like (9), an *also* sentence like (3) will create an expectation that it is true of a superset of the items just mentioned, contrasting with *only*, where listeners will expect the sentence be true of a subset of the mentioned items. We found that with *also*, looks to the superset (11) exceeded looks to all other quadrants as early as the 200 ms window starting 100 ms before target word onset ($p<.0005$). For *only*, looks converged on the subset quadrant, consistent with Experiments 1-2. Thus while both *only* and *also* are sensitive to recent mention, listeners' expectations about how the focused element will relate to the alternatives will depend on the particular lexical item. On an expectation-based view, comprehenders narrow down the set of likely continuations as they update their expectations on the basis of the preceding discourse, and unfolding information from the current sentence.

Together, the results of Experiments 1 and 2 suggest that lexical items like *only* provide listeners with the strong cue that the alternatives set will be restricted by the set of mentioned items; information about the discourse context can further aid listeners by further restricting this set. In addition, Experiment 3 shows that listeners immediately begin generating hypotheses about upcoming focus alternatives as they are interpreting preceding sentences and integrating them into the discourse context. Future work will build on Experiment 4 to pull apart the meaning contributions of specific lexical items from how alternative-sensitive meanings generally arise from interaction with the linguistic context.

- (1) Jane only has some candy.
- (2) a. Jane has some candy. b. {J has some candy, ...some apples, ...some cupcakes, ...}
- (3) Jane also has some pears.
- (4) Mark has some mugs and... a. *Mention*: some candy. b. *No mention*: some pencils.
- (5) display: *candy* (target); *candles* (competitor); *anchors, shoes* (distractors)
- (6) Jill and Max are at... a. *Informative*: the newsstand. b. *Underinformative*: the mall.
- (7) Max (only) wants to buy some magazines.
- (8) display: *magazines* (target); *magnets* (competitor); *boots, videogames* (distractors)
- (9) Mark has some apples and some oranges.
- (10) Jane only has... a. some apples. b. some pears. c. some sneakers.
- (11) display: apples (singleton-subset of mentioned), pears (singleton-unmentioned), apples+oranges (mentioned set), apples+oranges+pears (superset of mentioned)

References: [1] Horn 1969. *CLS*. [2] Rooth 1992. *NLS*. [3] Tanenhaus, et al. 1995. *Science*. [4] Sedivy, et al. 1999. *Cognition*. [5] Chambers, et al. 2002. *JML*.