Pragmatic inferences towards prototypical meanings. A visual world study.

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When understanding sentences such as "A bee is looking for food on the *field*", a listener must select a specific instance - a hyponym - of *field* from conceptual knowledge (e.g. flower field, grass field, soccer field etc.). One question is how listeners restrict the conveyed interpretation of a simple or broad concept ('a field') towards its most prototypical denotation ('a grass field'). Neo-Gricean frameworks, e.g., view this type of inference as a default inference (M-implicature [1], but see also [2], [3]). Various studies have investigated the how polysemy is processed differently from lexical ambiguity (cf., e.g., [4]), however no study to date has investigated the processing mechanisms underlying pragmatic narrowing, i.e. going from a broad concept to more narrow, specific, in many cases the prototypical one. In eye-tracking study, [5] showed that listeners incrementally enrich the interpretation of scalar adjectives (e.g. 'a tall glass') and exploit the information in the visual context, such as the presence of a smaller glass, to anticipate the identification of the target. The primary goal of the present study is to investigate whether there is a processing bias (i.e. eye gaze preference) for the prototypical interpretation over the non-prototypical one. If there is a bias, a further question is whether this bias is found in both ambiguous and unambiguous scenarios or whether it only emerges in latter scenarios that include two contrasting competitors. If a bias towards the prototype is due to pragmatic narrowing, we expect to find faster prototypical target identification in the scenarios including a referential competitor. In contrast, if both ambiguous and unambiguous conditions display such an effect, the bias should be attributed to greater conceptual/lexical association between the event described in the sentence and the prototypical picture (e.g. a bee is more likely to look for food on a flower field)., We also included sentences involving lexically ambiguous homonyms (2) to explore whether they display difference in processing with respect to hyponyms. In a visual world experiment based on [5], forty-five participants identified referents for sentences such as (1) and (2) in two kinds of visual scenarios: an ambiguous scenario including two possible referents for the critical word (e.g. a soccer field and a flower field, as in fig.1) vs. an unambiguous scenario (fig.2) with only one possible referent (e.g. a flower field). Each sentence the speech stream was divided into 500 ms time windows, time-locked at the noun (*field*) and disambiguation information (*flower/soccer*).

> (1) A bee is looking for food on the *field*... (a) <u>it's a flower field</u> / (b) <u>it's a soccer field</u>.
> (2) A boy saw the *boxers* in front of the hall... <u>playing with each other/as they finished training</u>.

Prototypes vs. non-prototypes. As predicted, the targets in unambiguous scenarios were identified much earlier than in ambiguous ones (fig.3, 4). Main effects of *ambiguity* were found in five consecutive time windows starting one and a half seconds prior to disambiguation (2.5s: p<.001). *Prototypicality* did not affect the identification of the target. In contrast, targets in ambiguous scenarios were identified 500 ms before the disambiguation point in prototypical hyponyms (fig. 4) but not in the non-prototypical ones (3.5s: p=.03). This resulted in a main effect of *prototypicality* in the disambiguation time window (4s: p=.01) as well as an interaction between *ambiguity* and *prototypicality* in the time regions immediately before (3.5s: p=.02) and after (4s: p<.01) the disambiguation. **Hyponyms vs. Homonyms.** In the overall analysis (fig 4), main effects of *ambiguity* were found starting one second after the onset of the sentence (1s: p<.004, 1.5s: p=.01, 2.s: p<.01, etc.). While with unambiguous scenarios targets were identified more quickly for homonyms than in hyponyms (main effects of *kind* at 1.5s (p=.04) and 2s (p=.07)), hyponyms in ambiguous scenarios where disambiguated more quickly than homonyms, as shown by main effects of *sentence type (hyponym vs. homonym)* after the disambiguation (5s: p<.01; 5.5s: p=.04) but with opposite directionality. **Discussion.** Overall, prototipicality resulted in anticipated target disambiguation in ambiguous visual scenarios (i.e. flower field vs. soccer field). Participants showed a strong bias towards for the prototypical hyponym (flower field*)* vs. the less prototypical one (soccer field). Critically, this effect was selective for ambiguous scenarios, similarly to what reported by studies where referential ambiguity was affected by pragmatic inferencing ([5]). Thus, listeners were able to incrementally assess conceptual knowledge of an event to resolve referential ambiguity and committed to the prototypical interpretation before to actually hearing the disambiguation. The finding that homonyms were disambiguated more quickly with unambiguous scenarios,

whereas, hyponyms were disambiguated more quickly with ambiguous scenarios, also supports this explanation, as well as ruling out alternative explanations such as higher probabilistic association or visual saliency of prototypes.

Figure 1. ambiguous scenarios
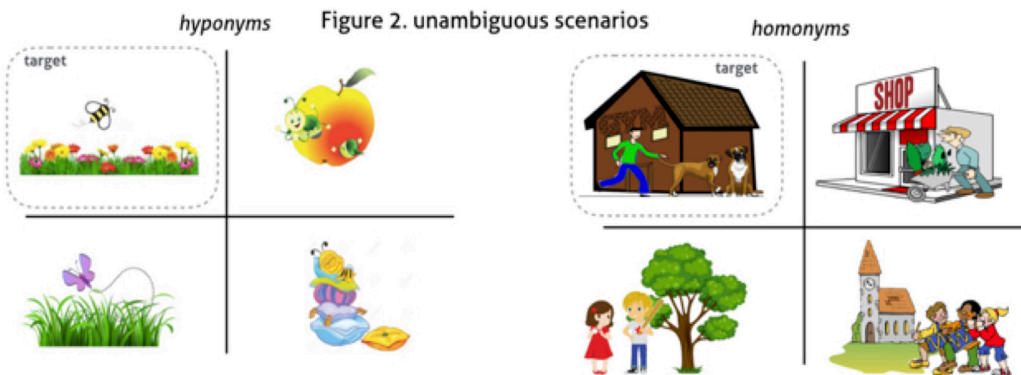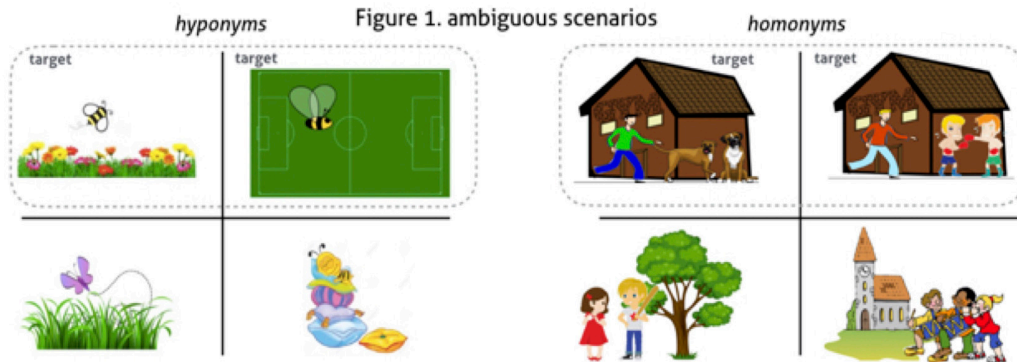

Figure 2. unambiguous scenarios

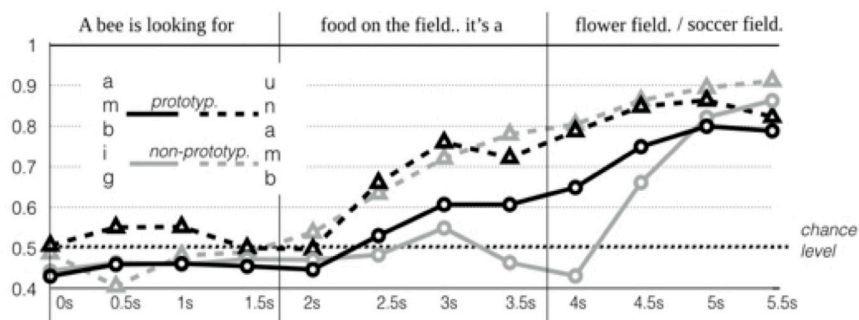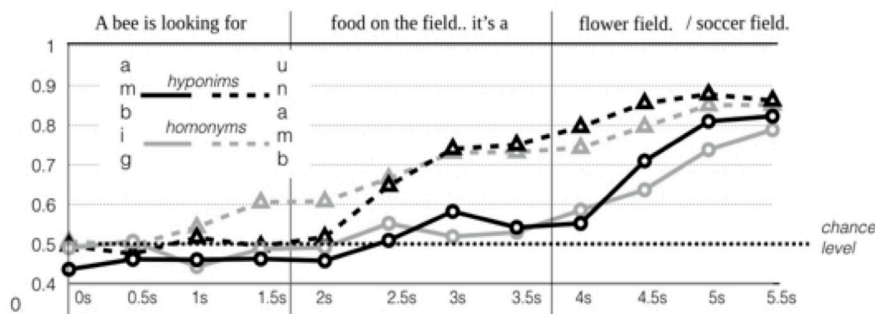Figure 3. Target preference (T/T+D) in hyponym conditions

Figure 4. Target preference (T/T+D) for hyponyms vs. homonyms

References. [1] Horn, L. (1999). Toward a new taxonomy for pragmatic inference. In D. Schiffrin (Ed.), Form and use in context: Linguistic applications. [2] Levinson, S. (2000). Presumptive meanings. [3] Wilson, D. (2003) Relevance and Lexical Pragmatics. Italian J. of Ling. [4] Klepousniotou E. (2002). The processing of lexical ambiguity: homonymy and polysemy in the mental lexicon. Brain Lang. [5] Sedivy, J. C., Tanenhaus, M. K., Chambers, C. G. & Carlson, G. N. (1998). Achieving incremental semantic interpretation through contextual representation. Cognition.