**Online Processing of Relative vs. Absolute Adjectives: A Visual World Study**

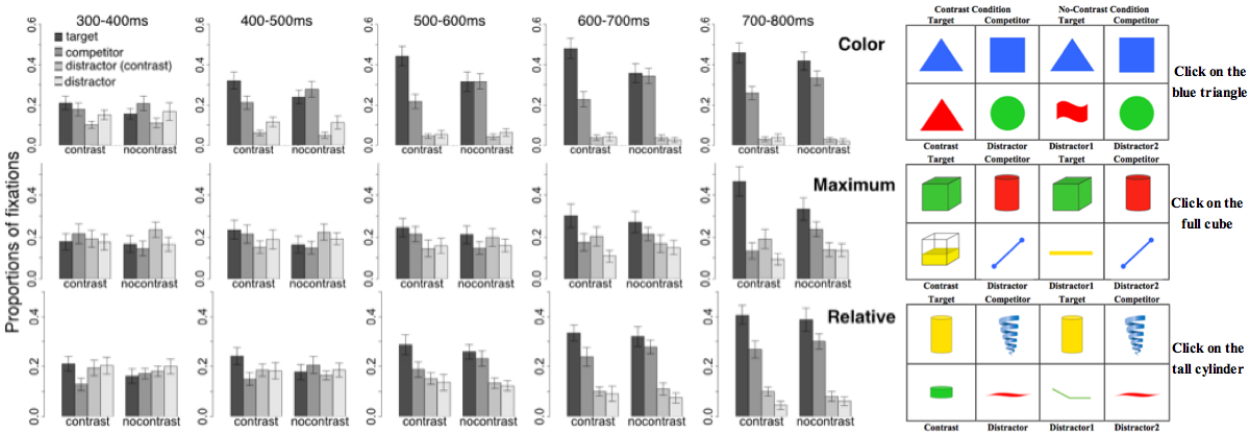
**Introduction:** Both relative adjectives (RAs) like '*big*' and absolute adjectives (AAs) like '*straight*' are sensitive to the context: in the former case, the context determines how much size is required to count as big; in the latter case, the context determines how much deviation from a maximum is allowed to still count as straight. An open question is whether the factors driving context-dependence are the same. Some researchers have argued that both cases are fundamentally semantic in nature, and involve resolving an appropriate comparison class (Klein 1980, Sassoon and Toledo 2011); others have claimed that AAs have a more fixed (endpoint-oriented) semantics and that their variability reflects pragmatic reasoning of some sort, such as resolution of tolerance for imprecision (Kennedy 2007, Syrett et al. 2010, Burnett 2014) or a revision of a probabilistic default (Lassiter & Goodman 2013). We employ the Visual World Paradigm (VWP) to investigate the processing of RAs and AAs used as restrictive modifiers, a use that triggers pragmatic reasoning about referential contrast (Sedivy et al. 1999; Altmann and Steedman 1988; Tanenhaus et al. 1995). Our results suggest that the processing of both RAs and AAs is costly, but only RAs involve fixing a comparison class.

**Design and Procedure:** (total experimental items n=50; fillers n=60) Participants saw a visual display with four objects. Their eye movements were tracked while they listened to instructions such as "*click on the tall cylinder*". Following Sedivy et al. (1999), there are two critical kinds of visual displays. In the **Contrast condition** (Figure 1), the visual display contains: 1) a TARGET (e.g. a tall cylinder); 2) a COMPETITOR that shares the target property but not shape (e.g. a tall spiral); 3) a CONTRAST object that belongs to the same noun class as the target but could not be described by the adjective in the instruction (e.g. a short cylinder); and 4) a DISTRACTOR object that could not be described by the adjective in the instruction, nor does it belong to the same noun class (e.g. a wavy line). The **No-contrast condition** was created by substituting the contrasting object with a second distractor. Three types of adjectives were tested in one experiment: RAs, AAs, and the control color adjectives. AA target pictures were only compatible with precise interpretations. All the stimuli were normed in a series of MTurk studies.

**Predictions:** Color adjectives served as a baseline control since their interpretation is not context dependent. Given that restrictive modifiers generally trigger rapid pragmatic inference about a contrastive set of referents, we predict that the Contrast condition, but not the No-contrast condition, will facilitate the disambiguation between the target and the competitor during (and after) the color adjective time window. For RAs and AAs, if an additional lexical semantic process of fixing a comparison class is evoked, we should observe an additional disambiguation effect in the Contrast condition, above and beyond the pragmatic effect.

**Results:** (subject n=18, data collection ongoing) Adjectives mean duration is 459ms, with no significant differences across the three adjective classes. Given that it takes about 200ms to plan for an eye movement, we offset the adjective time window to 200ms after the onset of the noun (i.e. eye gazes between 200ms and 659ms from the onset of the adjective are triggered by the processing of the adjective). For each adjective type, analyses were done on the aggregated proportions of looks over five consecutive time windows (100ms each), starting from 300ms after the onset of the adjective. We first analyzed the No-contrast condition alone to establish a baseline on how quickly participants can narrow down to only those objects that satisfy the property of the adjective, which approximated the time taken to comprehend the lexical meaning of the adjectives. A one-way ANOVA in each time window for each adjective type showed that the looks to the target and the competitor started to diverge significantly from the looks to the two distractors in the 400-500ms window for the color adjectives, 500-600ms for the relative adjectives, 600-700ms for absolute

adjectives (all ps<.01), suggesting different time course to process the three types of adjectives when there is no contrasting object present. We then compared the Contrast and the No-contrast conditions. For all three types of adjectives, the presence of a contrasting object facilitated the disambiguation between the target and the competitor, but the effect of contrast started in different time windows (Figure 1). For color adjectives, the first robust difference between the contrast and No-contrast conditions appeared in the 500-600ms time window (Contrast: target vs. competitor p<.001; No-contrast: target vs. competitor p>.9); for relative adjectives, this difference arose early at the 300-400ms time window (Contrast: target vs. competitor p<.05; No-contrast: target vs. competitor p>.8); finally, for absolute adjectives the earliest difference took place during the 700-800ms time window (Contrast: target vs. competitor p<.001; No-contrast: target vs. competitor p>.1).




**Discussion and Conclusion:** Our main interest lies in the timing of the contrast effect, for the three types of adjectives, relative to the timing at which participants could identify the adjectival property when no contrast was present. With respect to the latter, the visual search of the relevant adjective property (satisfied by both target and competitor) is faster for color adjectives than for relative and absolute adjectives. This could reflect either the visual saliency of color or the fact that the interpretations of both RAs and AAs are more context-dependent and hence more complex (as we noted earlier), or both. More crucial for our purposes, for both color and absolute adjectives in the Contrast condition, the disambiguation between the target and the competitor emerged during 500-600ms and 700-800ms respectively, lagging behind the visual identification of the relevant adjective property (as assessed by the No-contrast condition). For relative adjectives, however, the effect of contrast was observed at an earlier time window (300-400ms) than that at which the adjective property was identified in the No-contrast condition (500-600ms). We suggest there exist two distinct underlying sources contributing to the observed contrast effect. For color adjectives and AAs, the contrast effect is driven by a more general pragmatic reasoning that restrictive modifiers signal contrast; furthermore, such pragmatic reasoning does not precede the lexical processing of the adjective meaning itself. On the other hand, for RAs, the contrast effect in a very early time window (300-400ms) would result from the lexical semantic processing itself —i.e., the visually present contrasting object facilitated the construction of a semantic comparison class for relative adjectives. Taken together, our results show that i) the lexical processing of context-dependent adjectives involves cost; ii) only RAs, not AAs, trigger the semantic processing of constructing a comparison class.

**Selected References:** Altmann&Steedman (1988), *Cognition* 30; Burnett (2014), *L&P* 37(1); Kennedy (2007), *L&P* 30(1); Lassiter&Goodman (2013) in *SALT 23*; Sedivy et al. (1999), *Cognition* 71; Sasson&Toledo (2001) ms in prep.; Syrett et al. (2010), *JofS* 27; Tanenhaus et al. (1995), *Science* 268.