

# **How Uniqueness Guides Definite Description Processing**

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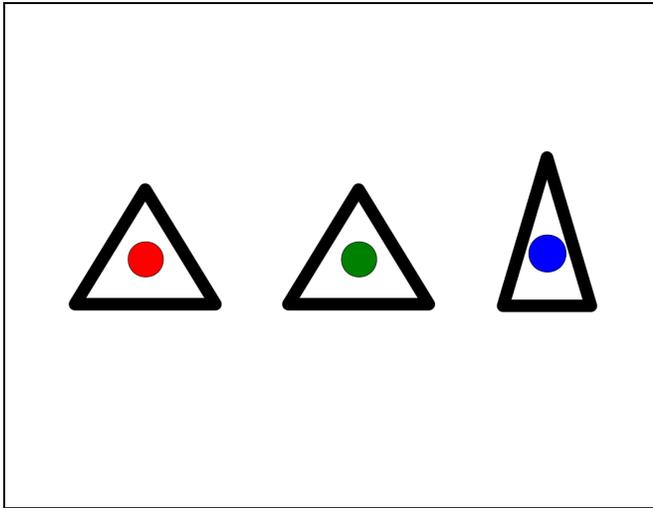
**SUMMARY** Recent theories of definiteness are largely based on the notions of uniqueness (Kadmon, 1990; Roberts, 2003) and familiarity (Heim, 1982; Prince, 1992). Uniqueness-based theories hold that the use of definite noun phrases presupposes uniqueness under a description within a given discourse context. For example, “the” in “the triangle” contributes the presupposition that there is a unique referent in the discourse context that matches the description “triangle”. If uniqueness is part of the meaning of definiteness, then we expect hearers to predict referents for definite descriptions which maximize the probability of a uniqueness presupposition being satisfied. Eye-tracking using the visual world paradigm (Cooper, 1974) provides a means to assess whether this expectation holds. We find that when presented with temporarily ambiguous definite descriptions, subjects appear to predict referents which are unique under the greatest number of available descriptions, thus maximizing the probability of a uniqueness presupposition being satisfied. No such effect is found with indefinites. These results suggest that uniqueness offers not only a robust notion for describing the meaning of definites, but is also a crucial factor in guiding hearers in the online processing of definite descriptions.

**UNIQUENESS** Consider the temporarily ambiguous definite description “the triangle...” in the context of Figure 1. This description could be disambiguated in various ways. Namely, the completed phrase could be “the triangle with the red/green/blue dot” or the “the triangle with only two equal sides.” Suppose that shape and color are the only available disambiguating attributes. If color is used as the disambiguating attribute, there are three possible descriptions under which there is a unique triangle (“with a red/green/blue dot”). Each one of these continuations is equally as likely under a color description. If shape is used, there is only one description that picks out a unique triangle (“with only two equal sides”). Once a listener has heard “the triangle”, regardless of whether shape or color will be used to disambiguate, the blue triangle is the most probable referent. This is because the blue triangle is not only unique under a color description, but is the only referent that is unique under a shape description. We might say that the blue triangle is *maximally unique* in being the felicitous referent of the largest number of definite descriptions. With an indefinite noun phrase (“a triangle”), the maximally unique candidate is no more likely a referent than any other because uniqueness is not part of the meaning of the indefinite. That is, the indefinite does not carry with it any expectations of uniqueness under any description. If uniqueness is a factor in online processing, we would expect subjects to attend to maximally unique referents during temporarily ambiguous definite descriptions, whereas no such behavior would be expected for indefinites.

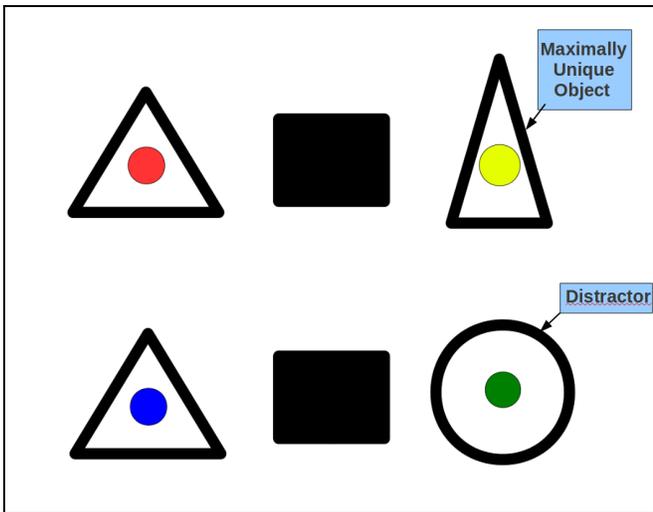
**METHODS** We presented subjects (n=28) with a series of visual arrangements and instructions to click on particular objects in the arrangements. Figure 2 shows an example stimulus and instructions. The design was cross-factorial. The two factors were article type (definite or indefinite) and whether the referent was maximally unique or not. Stimuli were balanced for location, color, and shape. Fillers were constructed so that color and shape were used in equal proportion to disambiguate the referent. This prevented subjects from forming strong expectations regarding what aspects of the stimuli to attend to. To ensure that indefinite utterances were as felicitous as definites, we embedded the target noun phrases in a phrasal modifier. Thus we had, “Click on the box that's next to a triangle with a yellow dot inside” and not “??Click on a triangle with a yellow dot inside.” No visual arrangements were presented in more than one condition for any subject. For each target item there was a period of temporary ambiguity between the end of the determiner and a disambiguating post-nominal modifier (“...the triangle with a yellow...”), during which we tracked the location of subjects' gaze. The instructions required subjects to select one of the boxes, so we examined the effect of article on the proportion of looks to the row containing the maximally unique referent.

**RESULTS** We fit a mixed effects model, with subject and item as random effects, to a binary variable of whether the subject was looking to the row containing the maximally unique object or not during the period of temporary ambiguity. The definiteness of the determiner, time, and an interaction between the two were used as predictors. The interaction between time and determiner on looks to the row containing the maximally unique object is significant ( $p=1.35e-05$ ). This suggests that the online interpretation of the matrix definite descriptions is influenced by the definiteness of the embedded determiner. Namely, during the period of ambiguity, the row with the maximally unique object is highly favored in the definite condition, but not in the indefinite condition (Figure 3). Given that there is no increase in the looks to the row containing the maximally unique object in the indefinite condition, we can also rule out any sort “pop-out” effect due to visual saliency. That is, if eye movement revealed an *a priori* expectation for the maximally unique referent given its visual characteristics, then this effect would be seen in both conditions. There is no such effect.

**CONCLUSION** Evidence from eye movements suggests that the online interpretation of definites is guided by uniqueness. When processing definite descriptions, but not indefinites, subjects look reliably more toward the candidate referent that is unique under the greatest number of descriptions. These results show the importance of uniqueness not only in theoretical models, but also in processing behaviors.



**Figure 1.** All of the triangles are unique under a description, but the blue triangle is unique under the most descriptions.



**Figure 2.** Stimulus and Instructions.

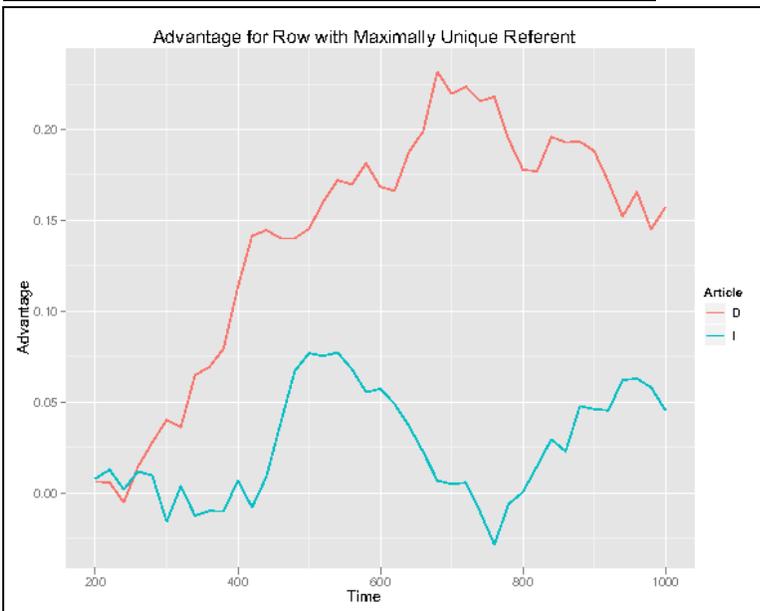
Click on the box that's next to...

...the triangle with a yellow dot inside.

...the triangle with a red dot inside.

...a triangle with a yellow dot inside.

...a triangle with a red dot inside.



**Figure 3.** Advantage for row containing maximally-unique referent over time. The red line is the advantage of the row containing the maximally unique object after a definite, and the blue line is after an indefinite. Time begins at 200ms after determiner to give time for saccade planning.

**References**

Cooper, Robin. 1974. Control of eye fixation by meaning of spoken language. Heim, Irene. 1983. File change semantics and the familiarity theory of definiteness. Kadmon, Nirit. 1990. Uniqueness. Prince, Ellen. 1992. The ZPG letter: subjects, definiteness, and information-status. Roberts, Craig. 2003. Uniqueness in Definite Noun Phrases.