Would a *blue kite* by any other name be just as blue? Effects of descriptive choices on subsequent referential behavior

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ABSTRACT

Using objects that contrast along multiple dimensions, we examined how the earlier description of an object using one dimension (size/color) influences reference to as-yet unmentioned objects, and how this depends on whether the two objects contrast with each other (i.e., whether they belong to the same nominal category). The dimensions of size and color were used because of their different sensitivity, with size adjectives being more closely tied to the presence of a contrasting object from the same category in the situational context. Experiment 1 elicited speakers' descriptions for an object following an earlier description of another object, and Experiment 2 investigated the real-time comprehension of the second description in a two-utterance sequence. Although the priming of linguistic forms may play a role in explaining some of the observed referential patterns, the full set of data suggests that precedence effects in referential descriptions are best explained in terms of a representation that maps those forms onto a mental representation of entities, namely, a discourse model that encodes relationships between entities. The results also highlight how color and size adjectives are processed differently from the earliest moments in comprehension.

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Introduction

In natural language, entities, properties and events can all be labeled in a number of different ways. Even concrete objects, which arguably might invite more consistency in their labeling, reflect considerable diversity in the linguistic forms available for use. This arises from various factors including the existence of synonyms or near-synonyms (e.g., *pail* vs. *bucket*), alternatives along the superordinate–subordinate dimension (e.g., *reptile* vs. *dinosaur* vs. *Stegosaurus*), and descriptions that reflect different perspectives or knowledge states (e.g., *Rockefeller Center* vs. *that square with the flags*). In addition, when the situational context contains more than one entity from the same category, such as two buckets, the label will normally require a modifier, presenting yet another descriptive choice. For

example, although in many cases there will be a number of dimensions along which entities contrast, a single dimension is sufficient for successful reference.

What are the consequences of these descriptive choices for referential behavior? In terms of the *amount* of information that speakers provide, numerous studies have shown that listeners expect "just enough" information to ensure referential success, and that over- or underspecification has measurable impacts on various aspects of linguistic processing (e.g., Altmann & Steedman, 1988; Davies & Katsos, 2013; Sedivy, 2003; Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995; but see Engelhardt, Bailey, & Ferreira, 2006). The current study focuses instead on the *kinds* of information encoded, and how past choices influence the production and interpretation of subsequent referring expressions. Our goal is to examine the mechanisms that underlie these influences, asking whether they can be explained solely in terms of the transient activation of forms and concepts (i.e., priming effects), or whether

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these effects reflect a representation that links linguistic forms with a mental representation of referents (i.e., a discourse model).

As a starting point, one relevant observation is that, when speakers repeatedly refer to the same object, they tend to use the same or similar labels over the course of a conversation (Brennan & Clark, 1996; Clark & Wilkes-Gibbs, 1986)—a phenomenon known as lexical entrainment (Garrod & Anderson, 1987). Listeners, in turn, are sensitive to lexical entrainment, finding a referent more quickly if the speaker maintains the linguistic precedent (Brown-Schmidt, 2009a) and more slowly if the speaker breaks the precedent and uses different descriptive content in the new referring expression (Metzing & Brennan, 2003; Shintel & Keysar, 2007). Interestingly, expectations about consistency in reference can sometimes trump expectations based on the amount of information. For example, speakers will sometimes continue to use an established referring expression even when changes in the context would guarantee referential success using a less-specific referring expression (Brennan & Clark, 1996; van der Wege, 2009). However, the consistent labeling of a previously mentioned (discourse-given) object provides only a limited means for understanding the underlying mechanisms. For example, in this situation it is difficult to determine whether the observed patterns stem from the instantiation of an object and its properties in an evolving discourse representation, or simply from the priming of specific linguistic forms.

A more promising approach is to examine how a referential precedent influences subsequent reference to *as-yet unmentioned* objects. In this situation, persistence in the use of abstract linguistic/conceptual information or syntactic structures can be separated from the reuse of specific linguistic tokens. As one example, Cleland and Pickering (2003) found that the tendency to produce a syntactically marked description (e.g., *the sheep that's red*) increased following an earlier description with the same structure and modifier (e.g., *the goat that's red*). Importantly, this tendency decreased when the second object to be described was not a semantic associate of the first (e.g., *the knife that's red*). This study illustrates syntactic priming within a noun phrase and further demonstrates an interdependence between conceptual activation and the activation of syntactic frames. The authors hypothesize that this "semantic boost" occurs because a lemma node can be partially activated via spreading activation among conceptual representations, thereby allowing *sheep* to become coactive with the combinatorial node corresponding to the relative clause construction.

In another study, Goudbeek and Krahmer (2012) found that hearing descriptions that are stylistically marked (e.g., *the front-facing chair*), or have disfavored syntactic orderings (e.g., *the red big chair*) increases the tendency to subsequently produce similar kinds of expressions when describing as-yet unmentioned objects with different properties, as do descriptions that contain redundant information (e.g., *the red chair seen from the front* when *the red chair* would suffice). This outcome demonstrates a more abstract effect whereby the form and the *type* of content used for an earlier modifier can encourage reference to new entities using the same kind of linguistic format. Note,

however, that the effects of form and abstract content cannot be separated in this case.

Other findings cannot easily be captured in terms of the transient patterns of activation that characterize priming effects. For example, Carbary and Tanenhaus (2011) examined speakers' choices of referential form in situations where modification could either be prenominal or postnominal (e.g., *the striped cat* vs. *the cat with the stripes*). When a contrasting object was referred to earlier in the conversation (e.g., *the spotted cat* or *the cat with spots*), speakers' choice of the modifier format (prenominal/postnominal) for a new description was more affected by the structure used earlier for the contrasting object than by the structure of the most recently heard referring expression (which was used to refer to an unrelated object). This finding suggests that the choice of structure for a modifier is not exclusively governed by the activation of the latest syntactic frame, and instead requires a record of the conversation that links linguistic forms with a mental representation of referents, namely a discourse model.

The current study focuses specifically on the influence of the *semantic content* of noun phrases by examining how past descriptions influence reference to as-yet unmentioned objects that contrast along two salient dimensions: size and color. We use situations where either dimension would be sufficient to refer successfully. For example, in a context that contains two kites—one blue and small and the other large and yellow—the descriptions *the blue kite* and *the small kite* are both felicitous and would lead to successful reference. Importantly, color and size are both normally encoded using prenominal adjectives, allowing us to isolate effects of content from issues related to the reuse of syntactic structure (and syntactic markedness) across descriptions. However, color and size adjectives have important semantic and pragmatic differences that provide a critical tool for investigating the extent to which precedence effects can be accounted for in terms of the priming of concepts, or whether a discourse model-based explanation is required. Specifically, size adjectives such as *tall*, *large*, or *small* are understood to involve the notion of a comparison class. That is, their use is tied to the availability of another object from the same nominal category that contrasts in size (e.g., Kennedy, 1999). Indeed, empirical studies have shown that speakers rarely produce size adjectives in situations where the context does not include a contrasting object (Brown-Schmidt & Konopka, 2011; see also Wardlow-Lane, Groisman, & Ferreira, 2006). Listeners, in turn, are sensitive to this pattern when interpreting a size adjective: Upon hearing an unfolding utterance like *Pick up the tall...*, they anticipate a referent that has a contrasting object in the current context (Sedivy, Tanenhaus, Chambers, & Carlson, 1999).

Color adjectives are not as sensitive to the availability of a contrasting object in the context. This is probably because the properties they denote are less relative in nature and do not typically require a comparison class to establish their semantic value. Combined with the perceptual salience of color, this naturally creates different linguistic patterns compared to size modifiers. For instance, speakers produce color adjectives even in the absence of a contrasting object (Brown-Schmidt & Konopka, 2011; Olson, 1970; Pechmann,