

raced past the barn. The simple noun phrase *the horse*, on the other hand, merely requires the instantiation of a single entity that has the property of being a horse. Empirical evidence has shown that by manipulating the context of an utterance, and

processing in semantic interpretation carried out on incremental word-by-word basis. One might conclude in all of these cases, that semantic interpretation should be delayed until some point in the phrase, perhaps at the head noun for adjectives, and at the complement noun for prepositions or verbs.

In this, we will pursue an alternative hypothesis, namely, that there are processing bottlenecks at the complement noun for prepositions or verbs, and at the head noun for adjectives.

Subjective

The adjective *good* conveys a very different set of attributes depending upon whether it is modifying *priest* or *lawyer*. It is impossible to pick out a set of entities in the model that correspond to the predicate *good*, independently of the sets of entities corresponding to *priest* and *lawyer*. In fact, it has been argued that adjectives such as *good* can only be evaluated with respect to the set denoted by the head noun such that the set denoted by the phrase *good N* is necessarily a subset of the set denoted by *N*

noun. It can also be set to correspond to a subset of entities denoted by the head noun (as well as a set of entities that is broader than the set denoted by the head noun).

women as 'angry feminists', and subsequently comments on his use of that term by saying:

(8) And I say angry feminists like there's some other kind

ism. The goal of this article was to examine evidence for incrementality and use of contextually-defined constraints for both intersective and non-intersective adjectives. Our contextual manipulations made use of contextually defined contrast, which is described briefly in the next section.

word-by-word basis (and perhaps finer). Experiment 1A represents an attempt to

appeared in a number of different displays, in different arrays with other objects; however, care was taken to ensure that for critical trials, the target object had never been referred to in a previous trial, to ensure that subjects did not develop any expectations about how these objects would be described. There were a total of 44 display changes, with three instructions per display, for a total of 132 instructions. Of the 132 instructions, 68 involved an adjectival modifier, 56 involved a bare

2.1.4. Results

Table 1 shows the mean eye movement latencies for the early disambiguation and late disambiguation conditions. Analysis of variance revealed the difference in eye movement latencies to be statistically reliable both in analyses by subjects ($F_1(1,11) = 11.58, P < 0.01$) and by items (F_2

any object other than the target was not reliably different for the two conditions, there were significantly more looks to the competitor object in the late disambiguation condition than there were to the object in the same location for the early disambiguation condition. This difference was reliable both by subjects ($F_1(1,11) = 8.31, P < 0.05$) and by items ($F_2(1,9) = 11.89, P < 0.01$).

2.2. Discussion

These results replicate the Eberhard et al. (1995) findings of incremental referential interpretation where linguistic expressions are continuously interpreted with

The first instruction always contained reference to one of the objects in the

jects were permitted to watch the display as it was being changed. The data were submitted to 2×2 (referent by stress) repeated measures ANOVAs by subjects (F_1) and by items (F_2). Results of these analyses yielded a robust main effect of referent, such that instructions involving the contrasting object resulted in faster looks to the target object than instructions involving the competitor object. This difference was reliable in the analyses by subjects ($F_1(1,11) = 66.285, P < 0.001$) and by items ($F_2(1,19) = 78.869, P < 0.001$). There was no main effect of stress and no significant interaction of referent and stress.

Table 4 shows the percentage of trials that included a look to an object other than the target, indicating both percentage of trials including a look to any non-target object, and trials including a look to the competitor object (i.e. the object in the display that shared the property indicated by the adjective in the critical instruction). Note that when the target referent was a member of the contrasting pair, the com-

and that this information is used to resolve temporary referential indeterminacies in

3. Experiment 2: contrast, typicality and scalar adjectives

Experiment 1 presented evidence for the incremental processing of adjectival modifiers, and the rapid availability of contextually-bound contrast sets in the interpretation of referential phrases involving adjectival modification. The experiments in this section investigate the use of contrastive knowledge in the process of interpreting adjectives that are vague in their denotation.

Scalar adjectives such as *tall*, *thin*, etc. have no central value, in contrast to adjectives such as *red* or *round*. As a consequence, if scalar adjectives are to be interpreted incrementally, the interpretation must be more complex, and involve the determination of a comparison class.

In this section, we explore the hypothesis that interpretation of adjectives is incremental even for the most problematic cases, the adjective itself fails to have an invariant or stable meaning, but is highly dependent upon either the

3.2. *Subjects*

pitcher.')

The critical instruction was always the first instruction accompanying the

and 1B, with similar procedures. However, in addition to the manipulations involving the display, a third manipulation was introduced to determine the impact of the

Finally, there was a main effect of typicality in the predicted direction as well, with good tokens yielding shorter latencies than poor tokens ($F_1(1,21) = 4.58, P < 0.05$; $F_2(1,19) = 8.46, P < 0.01$). In addition, the interaction of contrast and typicality was marginal by subjects, though not by items ($F_1(1,21) =$

the contrasting object as dependent measures. $2 \times 2 \times$



Fig. 5. Time course of eye movement data for Experiment 2 showing the proportion of trials that contain a look to each object in the display over time. Point 0 ms corresponds to the onset of the adjective in the instruction.

onset of the noun, and subsided relatively quickly. This is consistent with the interpretation that subjects were processing the meanings of adjectives incrementally.

a correlation in corpus data between the definiteness of a noun phrase (where definite noun phrases typically signal old information) and the use of a prepositional phrase as a modifier of the noun, as well as online experiments showing an increased tendency to understand an ambiguous

prepositional phrase as a nominal

when the noun is definite than when it is indefinite (see also Schelstraete, 1996). If contrastive uses of modifiers are indeed related to the status of the head noun as old or new, then several aspects of Experiment 2 are likely to have produced a maximal effect of contrast. First, the modified noun phrases in the target instructions were definite. Second, the entire task was set up in such a way as to presuppose the existence of the target entity in the discourse model. That is, it is only felicitous to instruct someone to pick up a particular object and move it in a context where such an object actually exists, and is perceptually or cognitively accessible to both the speaker and the hearer.

Experiment 3 was designed to test the degree to which the contrastive interpretation of adjectives is dependent upon the presupposition of existence and accessibility of the entity being described. Experiment 3 differed from Experiment 2 in two aspects. First, the target noun phrases were indefinite, rather than definite. Second,

manipulated, with contrast and typicality as within-subjects manipulations, and display time as a between-subjects factor. Thus, half of the experimental items contained a contrasting object, while the other half did not, and half of the target objects were good tokens of the modified expression, while the remaining half were poor tokens. The manipulation of display time was executed in the same way as in

main effect of contrast ($F_1(1,21) = 14.35, P = 0.001$; $F_2(1,19) = 12.35, P = 0.01$),

pretation of adjectival modifiers proceeds in an incremental fashion. As in Experiment 2, there is further evidence that the processing system was able to make use of contrastive information associated with scalar adjectives. Both contrast with respect to a stored representation of the class of objects denoted by the head noun, and contrast with respect to a contextually-available set of objects are relevant for incremental interpretation. The finding that effects of contextually-defined contrast are not dependent upon the presuppositions inherent in instructions such as those in Experiment 2 particularly interesting and somewhat unexpected. Robust effects of contrast are found even with indefinite nouns, and in a situation where the experimental task did not carry any presuppositions of the presence of an object aptly described by the modified expression.

5. General discussion

The experiments in this paper converge upon the finding that interpretation of adjectives is incremental even when the adjective fails to have a table core meaning. This objects in the immediate visual context, or between object its corresponding representation in memory.

implicatures do play a role in initial parsing decisions. We consider this unlikely. Conversational implicatures are...not tied to the form of what is said, but rather, to its semantic content. To make a conversational implicature, a listener must have already parsed the sentence, assigned it its literal inter-

than adjectives, such as relative clauses, and prepositional phrases, primarily in studies focusing on syntactic ambiguity resolution, supporting the claims of Referential Theory. In addition, there is evidence that the definiteness of the noun phrase is implicated, with stronger presuppositional effects occurring with definite noun phrases than indefinite noun phrases (Spivey-Knowlton and Sedivy, 1995; Schelstraete, 1996).

However, Bierwisch's insight that vague scalar adjectives rely heavily on the identification of a comparison class does provide some explanation for the robustness of the effects of contextual contrast found in this study. Particularly striking is the finding that strong contrast effects are not in fact limited to definite noun phrases,

dependent upon the context. In the absence of such contextual specification, the precise identity of the referent of the phrase may not be possible until sufficient information has accrued to result in the specification of the contrast set, either via

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