

INTRODUCTION

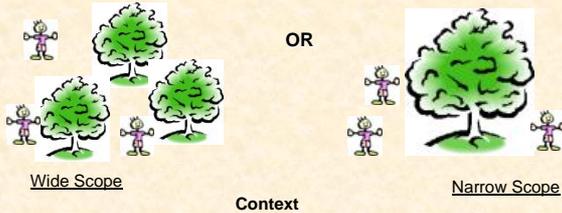
- Linguistic ambiguity is present at every level of the grammar, yet perceivers have little difficulty during on-line language comprehension. While psycholinguistic investigations of lexical and syntactic ambiguity have been studied extensively, the present work aims to explore ambiguity at the level of the syntax-semantics interface. Namely, we will examine the interpretation of sentences that contain more than one quantified Noun Phrase (NP), which allows for **scope ambiguity**. Scope reflects the way in which a quantifier (e.g., *every*) is interpreted. In linguistics, a quantifier (or operator) is said to have “wide” or “narrow” scope over an NP.

Background

- When a sentence contains more than one quantified NP, 2 different interpretations arise due to different scope possibilities.

Every kid climbed a tree.

- (i) $(\forall x)(\exists y)$ (x is a kid & y is a tree & x climbed y)
 [read as: “For every kid x, there is a tree y, such that x climbed y”]
 (ii) $(\exists y)(\forall x)$ (x is a kid & y is a tree & x climbed y)
 [read as: “There is a tree y, such that for every kid, x, x climbed y”]



	Ambiguous	Unambiguous
Continuation	Plural Every kid climbed a tree. The trees were in the park.	Every kid climbed a different tree. The trees were in the park.
	Singular Every kid climbed a tree. The tree was in the park.	Every kid climbed the same tree. The tree was in the park.

- Kurtzman and MacDonald (1993; see also Kemetes & Kemper, 1999, as well as Tunstall, 1998) investigated the interpretation of sentences as above, using on-line acceptability tasks, in which participants indicated whether the continuation sentence “made sense” after the context sentence. Results indicated a preference for the plural interpretation (i.e., “every kid” interpreted with wide scope).
- The goal of the present investigation was to further explore the nature of scope ambiguity using a task that relied less on metalinguistic judgements and that could elucidate the temporal nature of the interpretive process.

HYPOTHESES

- The non-preferred singular continuation (**Amb-Singular**) should elicit an ERP effect after ambiguous contexts, presumably as soon as possible when the noun provides disambiguating information, as compared to its Unambiguous control (**Unamb-Singular**). The form of this component is an open question (i.e., a frontal P600 - indicating structural/syntactic re-analysis; [c.f., Dwivedi et al., 2006] or an N400 - indicating semantic anomaly).

METHOD

Participants

- 25 right-handed native English speakers (16 female, mean age 21.9 years).
- No self-reported neurological impairments.

Materials

- Experimental Stimuli:** 160 2-sentence discourses as displayed in Table 1 (40 trials per condition). Participants were instructed to read the sentences for comprehension.
- Filler Stimuli:** 160 2-sentence discourses, some which included syntactic and semantic violations. After a subset of the filler stimuli, forced-choice questions were asked in order to ensure that participants paid attention.

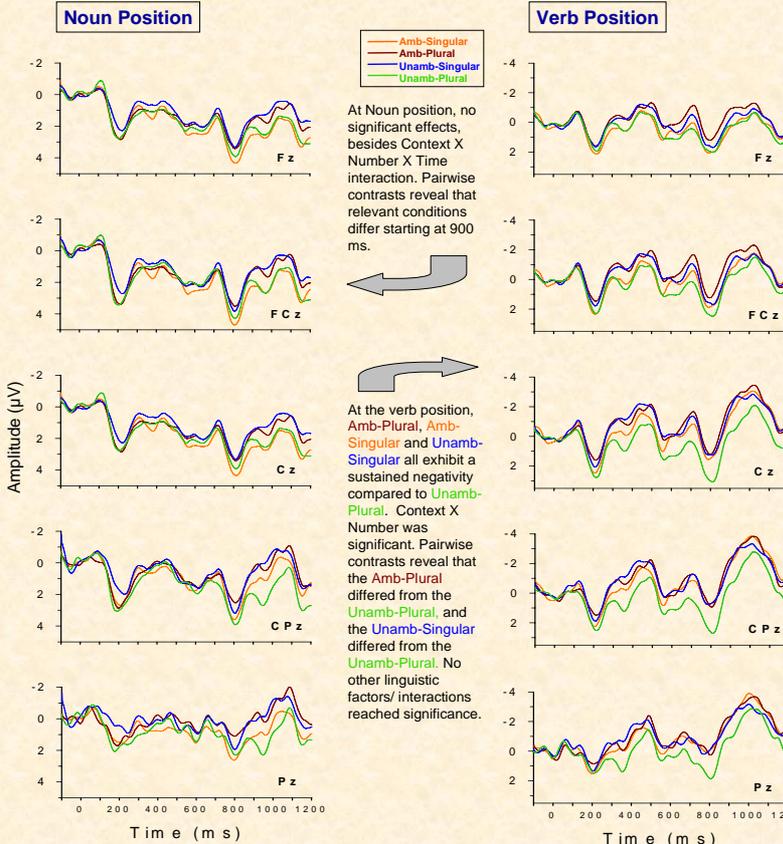
Procedure

- The first (context) sentence was presented in its entirety and participants pressed a button on a keypad to move onto the second (target) sentence. This was presented word-by-word (duration = 300 ms, SOA = 600 ms). ERPs were recorded to the **Noun** and **Verb** positions in the target sentence.

ERP Recording

- EEG was sampled continuously, with EEG epochs time-locked to the onset of each critical stimulus. EEG was recorded from 32 Ag/AgCl electrodes, referenced off-line to linked ears. Data were amplified in a DC-100 Hz bandwidth and sampled at 500 Hz for 1200ms.

RESULTS



DISCUSSION

- No evidence was found of N400 or P600 effects in target continuation sentences (although these effects were obtained in relevant filler stimuli). Instead, **Amb-Plural, Amb-Singular, and Unamb-Singular** conditions exhibited a slow negative shift at the Verb position compared to **Unamb-Plural**. We interpret this negativity following Klueder and Kutas (1993), Kutas and King (1996) and van Berkum et al. (1999; 2003), who proposed that the negativity is a marker of increased cognitive load. Thus, the present negativity can be argued to mark the cost of integrating an NP into an ambiguous context.

- One way to think about this ambiguity would be in terms of integrating an NP into a context where its number is unknown or underspecified, as in the **Amb** contexts.

- To explain the fact that the other supposed unambiguous condition (**Unamb-Singular**) patterned with the ambiguous conditions, we suggest that the answer lies in the interpretation of the referential NP, *the same tree*. Referential NPs are ambiguous between NPs that refer to individuals vs. kinds (Carlson, 1980). Thus, *the same tree* can mean either a particular tree or it can mean *the same (kind of) tree*. On the latter reading, *Every kid climbed the same (kind of) tree*, the number associated with the object NP can be left vague. Thus, once the number is made clear in the continuation sentence, the increased cognitive load from the ambiguity can be integrated.

- What is interesting is that the parser/brain is not choosing an interpretation that might be pragmatically obvious or preferred. Instead, in the absence of any biasing context, the brain simply interprets sentences using the logical-semantic information that is available. At later points in the computation, which might be measured using behavioural tasks, such as self-paced reading or acceptability tasks, pragmatic information seems to play a role as evidenced by the different pattern of results obtained in previous behavioural studies compared to the present results. This suggests that more on-line measures of processing may reveal qualitatively different findings.

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