

## Parsing Quantifiers in Object Position

### Introduction

The problem of quantifiers in object position is a well-known case of syntax semantics mismatch (Montague 1973) that can be summarized as follows: Even though quantifiers cannot be analyzed as referring expressions and internal argument positions of predicates are reserved for such expressions, quantifiers seem to occur freely in those positions (e.g. *John likes every girl.*). Various solutions to this problem exist (e.g. type-shifting, quantifier raising, continuations). All maintain that semantic composition is more complex for quantifiers in object positions than for quantifiers in subject position. Whether this increased complexity affects real time processing of sentence structure has not been investigated as far as we know. Positive evidence to this effect would therefore be an important contribution to the parsing literature. More specifically, it would show that purely formal semantic complexity affects sentence processing even though – and unlike the cases of semantic coercion investigated in e.g. McElree et. al. ( '01, '02, '05) – there is no concurrent change in meaning.

### NP/S Attachment Ambiguity Resolution with Quantifiers

To study whether the parser “knows” about the semantic complexity incurred by quantifiers in object position we ask whether semantic properties of DPs (quantificational/referring) are a factor in the resolution of temporary attachment ambiguities. We employ sentences that are locally ambiguous between construing a DP as the object of the preceding verb or the subject of an embedded clause (NP/S ambiguity; cf. Trueswell, et.al. 1993, etc.). I.e. as exemplified in (1), we created a situation in which the parser cannot know if the DP/QNP is the object of ‘remembered’ or the subject of the sentential complement until disambiguation occurs on ‘who’ or ‘was’. If the semantic complexity incurred by a quantifier in object position affects the parser object disambiguation (‘who’) should be dispreferred over subject disambiguation (‘was’) in the case of *every NP*. Assuming that definite descriptions can be interpreted as referring expressions (in the default case), no such effect is expected. I.e. if the parser “knows” about quantifiers in object position we expect an interaction between determiner type (quantifier/definite determiner) and attachment type (NP/S) in the post disambiguation area.

To control for possible interference of the matrix verb which could create a spurious interaction we chose only S-biased matrix verbs (Trueswell et.al.'93, etc.). Averaging residual reading times over 20 subjects, we obtained two effects: 1. Reading times on the noun immediately following ‘the’ or ‘every’ show a main effect of determiner ( $p = .036$ ) such that ‘every NP’ takes longer than ‘the NP’. This shows that the semantic difference between ‘the’ and ‘every’ is reflected in real time processing. 2. There is a significant interaction on the first ( $p = .045$ ) word after disambiguation as well as in the region of the word of disambiguation to the third word after that ( $p = .01$ ) between determiner type and attachment type indicating that quantifiers in object position are more difficult for the parser than quantifiers in subject position or definite descriptions in object or subject position.

- (1) The nun remembered **the/every** child (who) was abused and malnourished.