Chapter 7

Summary

Various clause types in Dutch and German are at least temporarily ambiguous with respect to the order of subject and object. A number of previous studies regarding the processing of such subject-object ambiguities have reported a preference for a subject-object interpretation. This order preference has generally been attributed to a syntactic generalization, that is, a generalization which abstracts away from specific properties of the NPs and the verb in the clause. The results of the present experiments suggest, however, that the syntactic subject-object preference is not as strong as has previously been assumed: the discourse-related properties of the NPs also play a role in determining order preferences. First, the subject-object preference for main clauses is much weaker when the first NP is a \textit{wh}-phrase than when it is a non-deictic definite NP; second, embedded \textit{wh}-questions may even show an object-subject preference when the second NP is a pronoun. However, whether this non-structural information has an effect, and to what extent, depends on other factors, such as the manner of disambiguation (case, number information), and the point of disambiguation.

In Chapter 2 an overview was given of the current literature on subject-object ambiguities in Dutch and German. With only a few exceptions, a preference for the subject-object order has been found, even in cases where plausibility or contextual information favored an object-subject interpretation. Several syntactic accounts of this order preference were discussed. Next, it was argued that information which is not purely structural in nature may also affect the order preference. Several predictions were formulated that were experimentally investigated in Chapters 3 and 4.

In Chapter 3 the processing of subject-object and object-subject main clauses was investigated. Declarative clauses in which the first NP was a non-deictic definite NP were compared with \textit{wh}-questions in which the first NP was a \textit{which}-N (\textit{welke}-N) phrase. Object-subject declaratives impose more restrictions on the discourse context than subject-object declaratives do. Subject- and object-initial \textit{wh}-questions do not differ in this respect. In addition, subject- and object-initial declaratives have been claimed to differ in terms of phrase structure in a way subject- and object-initial \textit{wh}-phrases do not. A weaker subject-object preference was therefore expected for the \textit{wh}-clauses compared to the declaratives. Self-paced reading times (Experiment 1) showed a subject-object preference starting immediately at the disambiguating auxiliary. The difference between \textit{wh}-clauses and declaratives with respect to the order preference became apparent one word later, suggesting that the nature of the first NP affects ambiguity resolution somewhat later than the overall syntactic subject-object bias.
In Chapter 4 the impact of the discourse-related properties of the second NP was investigated using temporarily ambiguous embedded wh-questions. Pronouns differ from non-pronominal definite NPs in the frequency with which they are used in the subject position. This is related to the discourse-status of the elements they refer to. Non-pronominal definite NPs can either refer to given information or introduce new entities into the discourse. In contrast, pronouns are generally used to refer to given entities in the discourse which are salient. Given, salient entities are generally also the topic of discussion. The prototypical position for a topic is the subject position. Pronouns therefore bias towards a subject interpretation. This bias is much weaker for definite NPs, especially if sentences are presented in absence of a discourse context and the definite NP is taken to introduce new entities. A pronoun in second position thus introduces a bias for the object-subject order. This bias is in competition with the syntactic bias for the subject-object order. If the discourse-related properties of the NPs are taken into account during the processing of order ambiguities, a weak subject-object preference, or even a preference for an object-subject order is expected if the second NP is a pronoun.

First, an off-line completion study (Experiment 2) was conducted, showing that the syntactic preference for the subject-object order also holds for embedded wh-clauses. Next, three experiments were carried out on wh-clauses in which the second NP was a case-marked pronoun. An off-line questionnaire study (Experiment 3) showed that people choose the nominative form (object-subject interpretation) more often than the accusative form (subject-object order). The preference for an object-subject order was replicated in two on-line studies. Self-paced grammaticality decision times (Experiment 4) and self-paced reading times (Experiment 5) showed an increase for the subject-object order relative to the object-subject order starting at or immediately after the disambiguating pronoun. No preference for the subject-object order was seen.

The object-subject preference was partially replicated in Experiment 6. In this experiment, the wh-clauses were disambiguated by number information at the finite auxiliary in penultimate position. The pronoun itself was ambiguous. In addition, the length of the ambiguous region was manipulated: either one or six words separated the second NP pronoun from the disambiguating auxiliary. Again, an object-subject preference was found, but only in the conditions with a long ambiguous region. In the short conditions, subject-object clauses were responded to faster than object-subject clauses, but this difference was not significant.

Finally, in Experiment 7, wh-clauses containing a case-ambiguous pronoun were compared with clauses containing a non-pronominal definite NP in second position. This time, four words separated the second NP from the disambiguating auxiliary. The clauses with a definite NP showed a tendency for a subject-object preference. No preference for either order was found for clauses containing the ambiguous pronoun, in contrast to the object-subject preference found in conditions with a case-marked pronoun (Experiments 3-5) or in conditions in which the ambiguous region was six words in length (Experiment
These results suggest that the discourse-related properties of the NPs can indeed have an effect on order preference. However, the time course and strength of this effect depends on other factors such as the manner and point of disambiguation.

In Chapter 5 the frequencies of occurrence of subject and object-initial \(wh\)-clauses were investigated in a sample of written Dutch texts. Collapsing across the various types of predicates, the subject-initial order is the most frequent. However, when counts are restricted to transitive and ditransitive predicates only, the object-subject order is the most frequent. The nature of the second NP appears to be of influence: the object-subject order is significantly more frequent in clauses containing a pronoun than in clauses containing a definite NP or an indefinite NP.

These frequency data are interesting in the light of frequency-based theories of sentence processing. These theories predict a correspondence between processing difficulty and frequency: the most frequent solution to the ambiguity should elicit the least processing difficulties. An important issue in this respect is the grain-size problem: which categories can be distinguished in terms of frequency, and on the basis of which information? The present data suggest that a grain-size according to which transitive \(welke\)-questions are treated as one, separate class cannot be correct for the following reason. For transitive \(welke\)-questions in general, the object-subject order is the most frequent. Transitive \(welke\)-clauses containing a definite NP, however, showed a reading time advantage for the subject-object order (Experiment 6). Tabulating frequencies separately for \(welke\)-questions containing a definite NP will not solve this problem: the object-subject order for such clauses is still more frequent than the subject-object order, in spite of the reversed parsing preference. A possible solution is to assume either that grain-size is yet even finer, or that grain-size is not fixed, but that several levels of abstraction are taken into consideration during processing.

The results of the experiments and the corpus study were summarized in Chapter 6. The data suggest that not only syntactic and discourse-related preferences play a role in determining the order preference, but that also the manner and point of disambiguation are of importance. Which order is ultimately preferred, the strength of this preference and the development of the preference over time are determined by the interplay of these and other factors. It was shown that these factors do not have an equally strong contribution; rather some factors or combinations of factors are stronger than others. Finally, four current theories of sentence processing were discussed. Garden-path theories and constraint-based theories account for the Dutch data most readily. These two approaches differ with respect to the modularity of syntactic processing: according to garden-path theories an initial, informationally encapsulated syntactic stage of processing can be distinguished; non-syntactic information may affect processing only somewhat later. According to constraint-based theories, all kinds of information are made use of immediately when available. Future research should be directed at
constructing quantitative models which capture the relative impact of various sources of information. Only then can precise predictions be made which can be used to decide between garden-path and constraint-based approaches to sentence processing.