

Toward an Integrated Model of Structure and Frequency

Markus Bader, Jana Häussler & Josef Bayer
University of Konstanz

Previous work on case ambiguities in German has considered possible influences of frequency only with respect to complete syntactic constructions. In this paper, we will present a more fine-grained analysis by looking at a particular interaction of lexical and syntactic ambiguity. A relevant example is given in (1).

- (1) a. Ich glaube, dass ein Professor [den Studenten]-DAT/PLURAL geholfen hat.
I believe that a professor the students helped has
"I believe that a professor helped the students."
b. Ich glaube, dass ein Professor [den Studenten]-ACC/SINGULAR unterstützt hat.
I believe that a professor the student supported has
"I believe that a professor supported the student."
- (2) a. Ich glaube, dass [den Studenten]-DAT/PLURAL ein Professor geholfen hat.
I believe that the students a professor helped has
"I believe that a professor helped the students."
b. Ich glaube, dass [den Studenten]-ACC/SINGULAR ein Professor unterstützt hat.
I believe that the student a professor supported has
"I believe that a professor supported the student."

The determiner "den" is ambiguous between Dative/Plural and Accusative/Singular. With nouns like "Studenten" which are ambiguous themselves, the ambiguity of "den" is inherited by the complete DP. This ambiguity allows to combine a lexical number/case ambiguity with different syntactic constructions.

In a first corpus study, we counted the singular respective plural occurrences of 48 ambiguous nouns like "Studenten", finding 80% plural instances. Secondly, we counted the use of NPs with the article "den" in two syntactic environments: (a) Subject-object sentences and (b) object-subject sentences. With respect to (a) and (b), the corpus counts showed a strong interaction: for the SO-order, "den"-NPs were mainly used as accusative-NPs, whereas for the OS-order, dative "den"-NPs prevailed.

Following the corpus analysis, three experiments using the method of speeded grammaticality judgments were run. These experiments tested ambiguous sentences as in (1) and (2) together with unambiguous control sentences. Furthermore, the sentences either contained two animate NPs and an action-verb (cf. (1) and (2)), or an animate NP (always the "den"-phrase) together with an inanimate NP and a psych-verb. For action-verbs, the SO word-order is unmarked whereas the OS word-order is marked. For psych-verbs, both word-orders are unmarked.

The main results were as follows: (i) For sentences with action-verbs, the experimental results mainly matched the corpus counts. For SO-sentences (corpus: accusative more frequent than dative), dative but not accusative disambiguation led to a garden-path effect. For OS-sentences (corpus: dative more frequent than accusative), unambiguous accusative sentences were judged substantially worse than unambiguous dative sentences, and ambiguous accusative sentences were judged even worse than unambiguous one, showing a clear garden-path effect. Not mirroring corpus frequencies, a significant garden-path effect occurred for dative OS-sentences. (ii) For sentences with psych-verbs, ambiguous sentences caused garden-path effects throughout, with accusative sentences causing stronger effects in both word-orders.

We will show how a model of the HSPM that combines structural parsing-principles with lexical frequencies (pertaining to the number-ambiguous nouns used in our experiments) can account for the experimental results described above. Finally, we will show how our results resolve the recent debate between Bornkessel et al. (2002) and Kempen/Harbusch (2003).

References

- Bornkessel, Ina, Schlesewsky, Matthias, and Friederici, Angela D. 2002. Grammar overrides frequency: evidence from the online processing of flexible word order. *Cognition* 85:B21-B30.
- Kempen, Gerard, and Harbusch, Karin. 2002. An artificial opposition between grammaticality and frequency: comment on Bornkessel, Schlesewsky and Friederici (2002). *Cognition* 90:205-210.