

Yvonne Portele & Markus Bader

Semantic Bias versus Topicality in the Interpretation of Personal and D-Pronouns

The resolution of pronouns has been investigated from two overarching angles. On the one hand, there are semantic influences including verb semantics, coherence relations, and world knowledge (e.g. Hobbs, 1979). On the other hand, structural factors like grammatical function and topicality affect pronoun resolution (e.g. Fukumura and van Gompel, 2015). Recent work has shown that both semantic and structural biases generate expectations that govern how ambiguous pronouns are interpreted (Kehler and Rohde, 2013; see Bader and Portele, to appear, for supporting evidence from German). Since it is an unsettled question how the two biases are weighted relative to each other, we explore the interplay of semantic bias and information structure when interpreting pronouns in German.

Anaphoric demonstrative pronouns (d-pronouns) as found in languages like Dutch, Finnish, and German have been claimed to refer back to referents not expected to be mentioned again whereas personal pronouns (p-pronouns) are used to refer to expected referents (e.g., Comrie, 1997). Being not expected in these cases is argued to be closely related to topicality – one expects to get further information about the topic. P-pronouns are thus used and expected to establish topic continuity whereas d-pronouns signal an upcoming topic shift in the discourse.

In addition to topicality, semantic bias (e.g. implicit causality and coherence relations) has a strong effect on referential continuity by determining what referents are talked about next (e.g. Stevenson et al., 1994). The question then is whether d-pronouns are taken to refer back to the semantically unexpected referent - analogous to the structurally unexpected non-topic. Initial evidence that this is not the case has been found by Järvikivi et al. (2017), who show that implicit causality affects p- and d-pronouns in the same way. We have shown that the same holds for coherence markers (Poster, AMLaP 2018, Berlin). In the present work, we investigate the question of how potential mismatches between semantic and structural expectations influence the resolution of d-pronouns.

In Experiment 1, 40 participants read 20 three-sentence contexts as shown in Table 1. After each context, they had to complete a sentence fragment starting with either a p- or a d-pronoun and containing the causal coherence marker *nämlich*, which cannot appear sentence initially and therefore followed a short blank line for inserting the finite verb in verb-second position. After a scene-setting sentence, the second context sentence introduced a first human referent. The third context sentences contained an object experiencer psych-verb. One argument of the verb was the referent of the preceding sentence. The second argument was a second human referent newly introduced in the third context sentence. A pretest confirmed a strong expectation for the stimulus argument (the subject) to be mentioned next in such contexts. Participants' continuations were scored as to whether the pronoun referred to the subject/stimulus or the object/experiencer of the third context sentence.

The results are shown in Figure 1. They show a strong preference for the subject (the stimulus) as antecedent of both the p- and the d-pronoun. In addition, there was a significant topic effect for the d-

Table 1: A complete stimulus item for Experiment 1

<i>Context sentences</i>	<i>'Yesterday evening, a talkshow was recorded for TV.'</i>
Topic First:	Im Publikum saß auch ein vorlauter Studiogast. in audience sat also a cheeky studio guest Der Studiogast hat einen angesehenen Experten mehrfach irritiert. the studio guest has a distinguished expert several times irritated. <i>'In the audience, there was a cheeky studio guest. The studio guest irritated a distinguished expert several times.'</i>
Topic Second:	In der Runde saß auch ein angesehener Experte. in the round sat also a distinguished expert Ein vorlauter Studiogast hat den Experten mehrfach irritiert. a cheeky studio guest has the expert several times irritated. <i>'Among the participants, there was a distinguished expert. A cheeky studio guest irritated the expert several times.'</i>
<i>Continuation Prompt:</i>	Experiment 1 Er/Der _____ nämlich (<i>namely</i> ; cause) _____

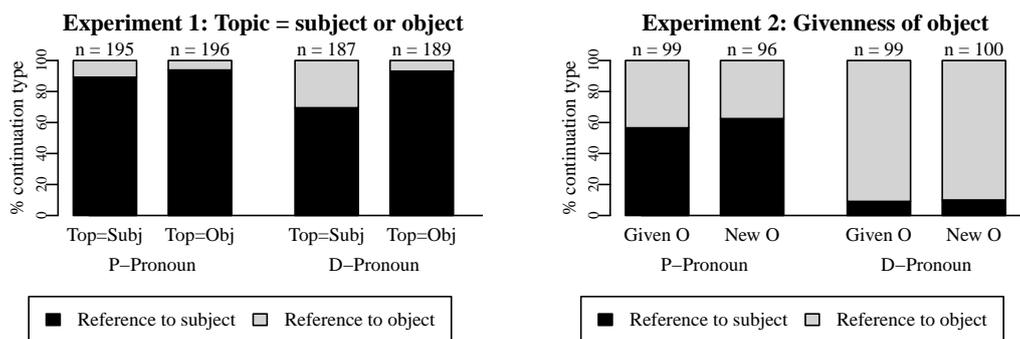


Figure 1: Percentages of references to the subject or the object.

pronoun but not for the p-pronoun. The subject preference for the d-pronoun was less strong when it was the topic than when it was not a topic. Our results show that semantic bias (verb semantics + coherence marker) is a main determinant of the interpretation of d-pronouns. Like p-pronouns, d-pronouns prefer the antecedent that is expected to be mentioned again due to semantic bias, although for the d-pronoun this goes against the often found anti-subject preference. The effect of semantic bias is modulated by topicality, in accordance with the anti-topicality orientation of the d-pronoun. That no topic effect was found for the p-pronoun is probably a ceiling effect.

A possible objection against this conclusion is that topicality and givenness were confounded in Experiment 1: the topic always was a given referent referred to by a definite NP whereas the non-topic was a new referent referred to by an indefinite NP. In order to address this concern, we ran a second experiment varying the givenness of the object NP. This experiment used contexts which have been shown by Bader and Portele (to appear) not to create strong semantic expectations concerning which referent is mentioned in the next sentence. Two types of contexts were tested, as shown in (1).

- (1) a. Ein Koch wartete an der Kasse. Der Koch schubste plötzlich einen Rentner. Er/Der ...
 a cook waited a the cashier the cook pushed suddenly a pensioner He/He-DEM
- b. Ein Koch traf einen Rentner. Der Koch schubste plötzlich den Rentner. Er/Der ...
 a cook met a pensioner the cook pushed suddenly the pensioner He/He-DEM

We manipulated givenness only for the non-topic, which is the object in (1), because in some theories (e.g., Centering Theory), topics must be given. If topicality is decisive for pronoun resolution, we expect a subject preference for the p-pronoun and an object-preference for the d-pronoun in both (1-a) and (1-b) because there is no difference in terms of topicality. If givenness is decisive, the same preferences are expected for (1-a) (subject given, object new) whereas no particular preferences should be found for (1-b) (subject and object both given). 25 students filled out a questionnaire containing 16 short texts as in (1). The results, which are shown in Figure 1, show a weak subject preference for the p-pronoun, a strong object preference for the d-pronoun, and no effect of the givenness of the object.

In sum, our results show that semantic expectations are the main factor in the resolution of both p- and d-pronouns. These expectations can easily override structural preferences, although topicality still has a modulating influence even in the presence of strong semantic biases. Finally, topicality cannot be replaced by givenness as the factor determining pronoun resolution.

Bader, M. and Portele, Y. (to appear). The interpretation of German personal and d-pronouns. *Zeitschrift für Sprachwissenschaft*.

Comrie, B. (1997). Pragmatic binding: Demonstratives as anaphors in Dutch. In *Proceedings of the Annual Meeting of the Berkeley Linguistics Society*, volume 23, pages 50–61.

Fukumura, K. and van Gompel, R. P. G. (2015). Effects of order of mention and grammatical role on anaphor resolution. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 41(2):501.

Hobbs, J. R. (1979). Coherence and coreference. *Cognitive Science*, 3(1):67–90.

Järvikivi, J., van Gompel, P. G., and Hyönä, J. (2017). The interplay of implicit causality, structural heuristics, and anaphor type in ambiguous pronoun resolution. *Journal of psycholinguistic research*, 46(3):525–550.

Kehler, A. and Rohde, H. (2013). A probabilistic reconciliation of coherence-driven and centering-driven theories of pronoun interpretation. *Theoretical Linguistics*, 39(1-2):1–37.

Stevenson, R. J., Crawley, R. A., and Kleinman, D. (1994). Thematic roles, focus and the representation of events. *Language and Cognitive Processes*, 9(4):519–548.