

The influence of visually depicted actions and information structure on ambiguous pronoun processing in German children

Our research investigates how depicted actions interact with event and information structure during the real time comprehension of ambiguous discourse reference in children. We investigate changes in the processing of ambiguous personal pronouns in the presence or absence of visually depicted actions and linguistic focus constructions. The effects of depicted actions on language and of syntactic cues on pronoun interpretation have each been investigated. However, no study has examined how these two cues interact in pronoun resolution.

In previous research, Bittner and Kuehnast (2011) have found that three-year old children mainly use discourse- and context-based cues to process situations and referents, whereas five-year-old children employ syntax and discourse cues to form representations of the latter. Bittner and Kuehnast suggest that the younger children have not yet determined reference on the basis of syntactic cues. The five-year-olds, however, make use of syntax-based cues to form discourse representation and aid the resolution process.

Zhang and Knoeferle (2012) found that another cue (depicted actions) helped German children to process non-canonical (object-verb-subject, OVS) structures. In German the syntactic word order of the main clause is V2 and coincides with subject-verb-object (SVO) whereas the subordinate clause has an object-verb (OV) order. One way of focusing an element in German is to use an *it*-cleft. The main clause of this construction has a verb-final order. Overall both non-linguistic and syntactic cues influence child language comprehension, albeit with some age-related variation.

The present eye-tracking study examined how visually depicted actions and linguistic focus interact in the processing of ambiguous personal pronouns in three- to seven-year-old children and young adults, all native speakers of German.

Based on Bittner and Kuehnast younger children should mainly use the visual, contextual cues, whereas the older children might employ focus *it*-clefts to process ambiguous referential relations (see also Choi & Trueswell, 2010). We expect the verb-final focus construction to be more difficult to process for the younger children, due to processing load reasons since the verb, which is crucial for the interpretation of the sentence, is only encountered in the end. If Zhang and Knoeferle's (2012) results from thematic role assignment generalize, the depictions of the actions should affect 5-year-old children's pronoun resolution. Furthermore, we expect to find a general subject preference in both adults and the older children.

In the experiment, an item consists of three sentences. The first one introduced two entities that had the same gender and number. The second sentence of the stimulus item contained the description of an action performed by one of the discourse entities. This action was either depicted on-screen or absent. Furthermore, in order to test the interaction with information structure each sentence appeared either in canonical or focused (*it*-cleft) syntactic order. Thereafter, participants heard an ambiguous pronoun sentence, and we recorded their looks to the subject or object referent. We also asked participants to identify the pronoun referent.

1. Da sind Herr Bär und Herr Tiger. → Introductory sentence
- 2a. Herr Bär **kitzelt** Herrn Tiger. → Canonical word order (V2)
- 2b. Es ist Herr Bär, der Herrn Tiger **kitzelt**. → Focus structure (verb-final)

3. Er ist müde. → Ambiguous pronoun sentence
4. Wer ist müde? → Question

Therefore, each stimulus item appeared in four different conditions, taking into account all the possible modifications.

Contrary to our hypotheses, 3-to-4-year-old children looked significantly more to the subject than the object immediately after pronoun onset (0-500ms) if they had heard a focus construction and when actions were depicted. An overall focus effect emerged from 1500–2000ms after pronoun onset. 5-year-old children's eye-gaze behavior resembled that of the 3-to-4-year-olds. They further disambiguated the pronoun offline more often as the subject when actions weren't (vs. were) depicted. As hypothesized, the oldest children's gaze and offline responses revealed a clear focus sensitivity independent of visual context. For the adults a subject preference emerged in both on-and offline data, which was not evident in the children. The results suggest that even young children can already use syntactic cues to disambiguate the pronoun although the overall effect appeared only at 1500–2000 ms. Furthermore, the development from implicit (online) to explicit (offline) knowledge can be seen.

Reference

- Bittner, D., Kuehnast, M. (2011). Comprehension of intersentential pronouns in child German and child Bulgarian. *First Language*, 32 (1–2), 176–204.
- Zhang, L., Knoeferle, P. (2012). Visual Context Effects on Thematic Role Assignment in Children versus Adults: Evidence from Eye Tracking in German. *Proceedings of the 34th Annual Conference of the Cognitive Science Society*. Austin TX: Cognitive Science Society, 2593–2598.
- Choi, Y., Trueswell, J. C. (2010). Children's (in)ability to recover from garden paths in a verb-final language: Evidence for developing control in sentence processing. *Journal of Experimental Child Psychology*, 106, 41–61.