Cataphoric pronoun resolution in native and non-native sentence comprehension

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Encountering a cataphoric pronoun is thought to trigger a predictive search for a referent, with the parser trying to link the pronoun to the first available potential referent that it comes across [1]. Evidence from self-paced reading [2,3] indicates that in native language processing, this search is constrained by binding condition C, which prohibits coreference between a cataphoric pronoun and a noun phrase within its c-command domain [4,5]. To obtain a more fine-grained picture of how the search for an antecedent interacts with condition C in real time, we carried out two eye-movement monitoring experiments on cataphoric pronoun resolution in German. Given earlier findings suggesting that structure-sensitive and non-structural constraints on reference resolution may be differently weighted in L2 processing [6], we tested and compared both native German speakers and proficient non-native speakers of German with Russian as their L1.

Experiment 1 examined whether both L1 and L2 comprehenders actively search for an antecedent for a cataphoric pronoun. 34 adult L1 and 34 L2 speakers of German were asked to read sentences such as (1) below for comprehension while their eye movements were monitored using an EyeLink 1000 system with a sampling rate of 1000 Hz. The critical stimulus sentences all contained a cataphoric pronoun (*er* 'he') as the subject of a sentence-initial adjunct clause, and a proper name in matrix subject position that either matched or mismatched the pronoun in gender.

(1)   Als **er** im Krankenhaus war, fragte <u>Joseph/Sandra</u> gleich den Arzt nach Schmerzmitteln...
        'When he was in hospital, Joseph/Sandra asked the doctor for pain killers straight away...'

The analysis of participants' reading times at the matrix subject (*Joseph/Sandra*) revealed significant gender-mismatch effects in first fixation durations, first-pass reading and regression-path times which were not modulated by language group. This replicates and extends earlier findings on English [1] by showing that both L1 and L2 speakers of German do indeed engage in an active, forwards-looking search for a possible referent.

Experiment 2 investigated whether, and at what point in time, the search for a referent would be constrained by binding condition C. Participants included 30 L1 and 29 L2 speakers of German, and both groups demonstrated awareness of condition C in a complementary offline antecedent judgement task. The eye-movement experiment had a 2x2 design, with the sentence-initial pronoun either c-commanding a following proper name (= *constraint* conditions, 2a) or not (= *no constraint* conditions, 2b), and the name either matching or mismatching the pronoun's gender. If condition C constrains the antecedent search, then effects of our gender manipulation should be restricted to the *no constraint* conditions (2b).

(2a)   *Constraint*
        Er fütterte die Tiere, als <u>Daniel/Annika</u> ein lautes Geräusch hörte, und der Zoowärter wusste woher der Lärm kam.

(2b)   *No constraint*
   Sein Freund fütterte die Tiere, als <u>Daniel/Annika</u> ein lautes Geräusch hörte, und der Zoowärter wusste woher der Lärm kam.

   'He/His friend was feeding the animals as Daniel/Annika heard a loud noise, and the zookeeper knew where the noise was coming from.'

The reading-time analysis showed significant gender x group interactions in first fixation duration, first-pass and total reading times at the proper name that were not modulated by the factor constraint. These interactions reflected the fact that the L1 group showed longer reading times for gender-mismatching (*Annika*) than for matching names (*Daniel*), whereas the L2 speakers showed the opposite pattern. No three-way interactions with group were found anywhere. Evidence for the application of condition C was seen only in later processing measures (probability of rereading, and regressions into, the name region) and across both participant groups.

The results from Experiment 2 indicate that in both native and non-native speakers, condition C measurably constrains the referent search only at later processing stages. The early gender-mismatch effects seen in the L1 group indicate that a feature-matching referent was predicted even where coreference should be precluded by condition C (as in 2a). The L2 group's gender-match effects, on the other hand, suggest that disjoint reference was expected even in the *no constraint* conditions, or that prediction was weaker and the attempt to establish coreference only triggered by encountering the proper name, leading to elevated reading times in the 'match' conditions (compare also [3]). This between-group difference apart, both L1 and L2 speakers initially ignored differences between the cataphoric pronouns' syntactic prominence (i.e. c-command), indicating that condition C applies as a relatively late filter on pragmatically inappropriate referential dependencies.

References

[1]   Van Gompel, R.P.G., & Liversedge, S.P. (2003). The influence of morphological information on cataphoric pronoun assignment. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29*, 128–139.

[2]   Kazanina, N., Lau, E.F., Lieberman, M., Yoshida, M., & Phillips, C. (2007). The effect of syntactic constraints on the processing of backwards anaphora. *Journal of Memory and Language, 56*, 384–409.

[3]   Kazanina, N., & Phillips, C. (2010). Differential effects of constraints in the processing of Russian cataphora. *Quarterly Journal of Experimental Psychology, 63*, 371–400.

[4]   Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht: Foris.

[5]   Levinson, S. C. (1991). Pragmatic reduction of the Binding Conditions revisited. *Journal of Linguistics, 27*, 107-161.

[6]   Felser, C., & Cunnings, I. (2012). Processing reflexives in a second language: The timing of structural and discourse-level constraints. *Applied Psycholinguistics, 33*, 571–603.