

Anti-locality effects without verb-final dependencies

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Anti-locality effects ([2]; [4]) provide strong evidence for expectation-based sentence parsing models [3]. Previous discussion of the anti-locality effect, however, largely focused on the argument-verb dependencies in verb-final constructions, for which a memory retrieval based account has been argued to be equally adequate [7]. In the current study, we found an anti-locality effect in constructions that do not involve argument-verb dependencies. Since the memory based account for anti-locality effects [7] could not be extended to the current case, our findings provide novel support for the expectation-based anti-locality effect. This study compares two different determiners (Dets) in German: the morphologically complex Det *derjenige* ‘the-jenig’ and the bare Det *der* ‘the’. *Derjenige* obligatorily requires a relative clause (RC), whereas the bare Det does not trigger such expectations ([1]; [5]). A search in the newspaper corpus at Treebank.info [6] revealed that DPs with a bare Det mostly occur without a RC, whereas DPs with a complex Det occur most frequently with a RC (see Table 1).

Experiment 1 (subj N=54; item N=24): Experiment 1 was a self-paced reading study using a 2x2 design (e.g. (1)), wherein either a bare or a complex Det (e.g. *den* vs. *derjenigen*) headed the object DP; the RC modifying the object DP was located either right after it or at a distant position. After each trial, participants rated the naturalness of the sentence (1-7 scale). In the Complex-Close condition, local and distant RC attachments are equally likely at the point of the pre-critical region, whereas in the Complex-Distant condition the expectation for the RC at the end of the matrix clause is stronger. All analyses were done with linear mixed effects models. Rating results (Figure 1) found that *der*-DPs with a distant RC were rated less natural than with a local RC ($p < .01$), suggesting a locality preference; in contrast, *derjenige*-DPs with local or distant RCs received the same ratings (Det x Locality interaction $p < .01$). The RT analyses (Figure 2) were performed on residual RTs, which were derived from an initial model with region length as the predictor. There is an anti-locality effect on the critical region (CR) *dessen Mutter* ‘whose mother’ under only the complex Det: the RT was shorter when the RC was more distant ($p < .05$). There was no such effect for the bare Det conditions ($p < .92$).

Experiment 2 (subj N=78; item N=32): Using the same paradigm, Experiment 2 replicated and extended the findings in Experiment 1 through a 2x2x2 design. The sentence structures were modified (e.g. (2)) such that in addition to the *Det* and *Locality* factors, we also manipulated whether the onset of the RC (i.e. the relative pronominal phrase e.g. whose store_{MASC}) matched the gender feature on the object NP (*den Kunden* ‘the customer_{MASC}’, 2a-d) or did not match (*die Kundin* ‘the customer_{FEM}’, 2e-h). Residual RTs (Figure 4) on the CR (‘whose store’) revealed two main findings. First, there was a Det x Gender interaction ($p < .05$), such that only under the bare Det feature-matched RC onsets led to longer RTs than feature-mismatched ones ($p < .05$), indicating a competition cost or an interference effect when both the subject and the object NP were considered as possible attachment sites for the RC. Gender (mis)match had no effect for the complex Det, suggesting that the strong syntactic expectation (i.e. that the subject DP requires a RC) trumped the possibility of attaching the RC to the object NP. Given this independent evidence for syntactic expectation, the second finding replicated the anti-locality effect observed in Experiment 1—on the CR there was also a Det x Locality interaction ($p < .0001$), such that the distant RC onsets had shorter RTs than the closer ones, but only under the complex Det conditions ($p < .05$). The rating results (Figure 3) found a locality preference for both determiners. Distant RCs were rated less natural than local RCs ($p < .0001$), although the effect was more pronounced for the bare Det (Det x Locality interaction $p < .0001$).

Conclusions: The current study provided novel evidence for syntactic expectation. The RC expectation generated by a single determiner could both (i) determine the incremental parsing decisions on RC attachment site and (ii) lead to anti-locality effect in online processing.

1. Experiment 1

- (1) a. *Maria Richter hat den Mitarbeiter, [dessen Mutter] ein großes Haus in Spanien besitzt, in einem Café gesehen.* **Bare-Close**
 (M. R. has the colleague, whose mother a big house in Spain owns, in a café seen)
- b. *Maria Richter hat den Mitarbeiter in einem Café gesehen, [dessen Mutter] ein großes Haus in Spanien besitzt.* **Bare-Distant**
 (M. R. has the colleague in a café seen, whose mother a big house in Spain owns)
- c. *Maria Richter hat denjenigen Mitarbeiter, [dessen Mutter] ein großes Haus in Spanien besitzt, in einem Café gesehen.* **Complex-Close**
 (M. R. has the-jenigen colleague, whose mother a big house in Spain owns, in a café seen)
- d. *Maria Richter hat denjenigen Mitarbeiter in einem Café gesehen, [dessen Mutter] ein großes Haus in Spanien besitzt.* **Complex-Distant**
 (M. R. has the-jenigen colleague in a café seen, whose mother a big house in Spain owns)
 'M. R. has seen the colleague in a café, whose mother owns a big house in Spain.'

Figure 1

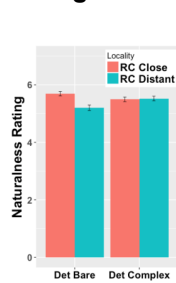


Figure 2

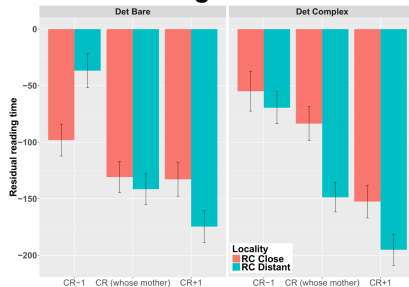


Table 1

	der + NP			d-jenig + NP		
	¬RC	RC Close	RC Distant	¬RC	RC Close	RC Distant
P(x Det)	0.975	0.015	0.009	0.008	0.519	0.474
Count	1,997,306	31,417	19,245	1	69	63

2. Experiment 2

- (2) a. *Gerne berät der Verkäufer, [dessen Laden] echte Delikatessen anbietet, bei Unklarheiten den Kunden.* **Bare-Close-Match**
 (Happily advises the salesman, whose store real delicacies offers, at unclarities the customer_{MASC})
- b. *Gerne berät der Verkäufer bei Unklarheiten den Kunden, [dessen Laden] echte Delikatessen anbietet.* **Bare-Distant-Match**
 (Happily advises the salesman at unclarities the customer_{MASC}, whose store real delicacies offers)
- c. *Gerne berät derjenige Verkäufer, [dessen Laden] echte Delikatessen anbietet, bei Unklarheiten den Kunden.* **Complex-Close-Match**
 (Happily advises the-jenige salesman, whose store real delicacies offers, at unclarities the customer_{MASC})
- d. *Gerne berät derjenige Verkäufer bei Unklarheiten den Kunden, [dessen Laden] echte Delikatessen anbietet.* **Complex-Distant-Match**
 (Happily advises the-jenige salesman at unclarities the customer_{MASC}, whose store real delicacies offers)
- e. *Gerne berät der Verkäufer, [dessen Laden] echte Delikatessen anbietet, bei Unklarheiten die Kundin.* **Bare-Close-Mismatch**
 (Happily advises the salesman, whose store real delicacies offers, at unclarities the customer_{FEM})
- f. *Gerne berät der Verkäufer bei Unklarheiten die Kundin, [dessen Laden] echte Delikatessen anbietet.* **Bare-Distant-Mismatch**
 (Happily advises the salesman at unclarities the customer_{FEM}, whose store real delicacies offers)
- g. *Gerne berät derjenige Verkäufer, [dessen Laden] echte Delikatessen anbietet, bei Unklarheiten die Kundin.* **Complex-Close-Mismatch**
 (Happily advises the-jenige salesman, whose store real delicacies offers, at unclarities the customer_{FEM})
- h. *Gerne berät derjenige Verkäufer bei Unklarheiten die Kundin, [dessen Laden] echte Delikatessen anbietet.* **Complex-Distant-Mismatch**
 (Happily advises the-jenige salesman at unclarities the customer_{FEM}, whose store real delicacies offers)
 'The salesman, whose store offers real delicacies, happily advises the customer in case of any unclarities.'

Figure 3

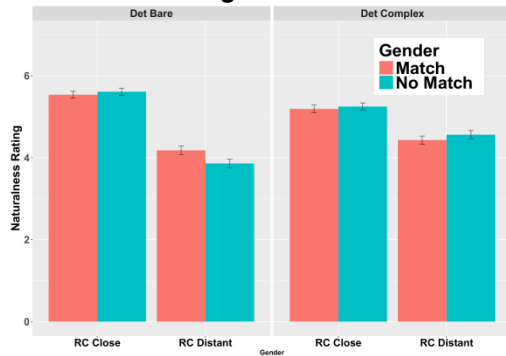
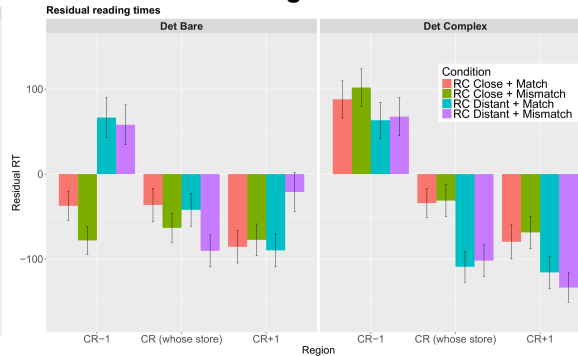


Figure 4



References: [1] Alexiadou et al (2000). *The Syntax of Relative Clauses*; [2] Konieczny (2000). *Journal of Psycholinguistic Research*; [3] Levy (2008). *Cognition*; [4] Levy & Keller (2013). *Journal of Memory and Language*; [5] Roehrs (2006). *The Morpho-Syntax of the Germanic Noun Phrase*; [6] Uhrig & Proisl (2011); [7] Vasisht & Lewis (2006). *Language*.