Incremental Processing Difficulty in Cross-serial and Nested Verb Clusters

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Certain Germanic languages like Swiss-German, Dutch and Flemish exhibit cross-serial verb clusters in embedded sentences. The cross-serial order is the opposite of the nested order attested in English and German. The co-presence of both orders in the world's languages plays a key role in motivating mildly context-sensitive (MCS) grammar formalisms (Morawietz, 2003, chapter 9). This work reports results from two eye-tracking studies, in Flemish ($n = 49$) and German ($n = 45$) respectively, that examine the incremental processing of embedded verb clusters on bilingual stimuli. A sharp dip in comprehension question-answering accuracy between embedding levels 2 and 3 suggests a kind of perceptual limit common to both languages. However, in eye-tracking measures such as First Fixation Duration the contrast between these levels is only significant in German ($t = 4.56$), not Flemish. This asymmetry is consistent with offline ratings suggesting that the cross-serial order is easier to understand (Bach et al., 1986). Indeed, in the longest verb clusters our participants read, the profile of early fixation durations across the two languages is qualitatively different: German readers slow down along the verb cluster, while Flemish readers do not.

To interpret these findings, we express a verb-raising analysis for both constructions in an MCS formalism (Stabler, 1997). Under this analysis, German and Flemish clusters receive isomorphic syntactic derivations. But during incremental processing, a top-down parser would traverse these derivations in different orders. These two traversals give rise to different memory requirements. In particular, the nested order requires that expectations for predicted verbs be stored across longer sequences of parser operations (cf. Rambow and Joshi, 1994). Such a memory effect could account for the slowdown that we observe in German but not Flemish.

References

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