A cross-linguistic investigation of similarity-based interference and depth of processing in English and German

Daniela Mertzen[1], Brian Dillon[2], Anna Laurinavichyute[1], Shravan Vasishth[1]

[1]*University of Potsdam, Germany* [2]*UMass Amherst, MA, USA*

Correspondence: mertzen@uni-potsdam.de

Cue-based retrieval theories [1-3] propose that real-time linguistic dependency formation relies on cue-dependent memory retrieval; sentence-external material is assumed to interfere with the establishment of within-sentence dependencies. [3] showed this interference effect in English. To establish robustness of the effect, we conducted two larger-sample eye-tracking experiments in English (N=65), and two in German (N=120), implementing [3]'s 2 (memory load) x 2 (interference) design. In load conditions (Table 1; a,b), participants memorized three nouns before reading the sentence; in (c) and (d) nothing had to be memorized. The nouns were plausible objects of the relative-clause verb *fixed* (b), but not for *sailed* (a). We expected longer reading times in (b) vs. (a) and no difference between (c) and (d).

Cue-based accounts assume that complete syntactic dependencies are built, and interference arises conditional on complete sentence processing. The model predicts that if shallow processing is induced, interference effects may be reduced or disappear altogether. We tested the prediction that processing depth modulates interference, manipulating question complexity [4]: in two sessions, participants read items with **complex** or **simple** questions.

In English, first-pass reading times showed an interaction of complexity with load and interference (b>a; c≈d), in simple conditions only. For German (simple conditions), total reading times showed an interaction not predicted by theory: no difference in load conditions and a slowdown for interfering compared to non-interfering conditions in no-load conditions. For German, we find no indication that extra-sentential material interferes with within-sentence dependency processing. Contrary to our predictions, only superficial processing yielded effects.

Keywords: sentence processing, similarity-based interference, eye-tracking, Bayesian data analysis

Table 1: German example item (adapted from Van Dyke & McElree, 2006)

Memory load conditions:									
Kühlschrank	Waschmaschine	Computer							
fridge	*washing machine*	*computer*							
a. No interference									
Das Boot,	das	der Mann,	der	am Meer	lebte, gestern	steuerte,	schien	schon alt	zu sein.
The boat ,	that	the man,	who	at sea	lived, yesterday	sailed,	seemed	quite old	to be.
b. Interference									
Das Boot,	das	der Mann,	der	am Meer	lebte, gestern	reparierte,	schien	schon alt	zu sein.
The boat ,	that	the man,	who	at sea	lived, yesterday	fixed,	seemed	quite old	to be.
No memory load conditions:									
—		—			—				
c. No interference									
Das Boot,	das	der Mann,	der	am Meer	lebte, gestern	steuerte,	schien	schon alt	zu sein.
The boat,	that	the man,	who	at sea	lived, yesterday	sailed,	seemed	quite old	to be.
d. Interference									
Das Boot,	das	der Mann,	der	am Meer	lebte, gestern	reparierte,	schien	schon alt	zu sein.
The boat,	that	the man,	who	at sea	lived, yesterday	fixed,	seemed	quite old	to be.

'The boat that the man who lived by the sea sailed/fixed seemed to be quite old.'

[1] Lewis & Vasishth (2005). Cog Sci. **[2]** Van Dyke & Lewis (2003). JML. **[3]** Van Dyke & McElree (2006). JML. **[4]** Swets et al. (2008). Mem Cognition.