Lexical Competition Depends on Situation-Dependent Concept Activations: Evidence from a Picture-Word-Sound Interference Experiment

Margit Scheibel (Heinrich Heine University Duesseldorf)
scheibel@uni-duesseldorf.de

Naming an object in neutral contexts is relatively easy and fast, but naming the same object in semantically related contexts can be hampered. This so-called semantic interference effect is often interpreted as reflecting lexical competition: the selection of the target lemma is more difficult when semantically related lexical candidates are also activated and compete for selection (e.g., Levelt et al., 1999). Semantic interference effects are reliably observed in blocked paradigms, when all objects of a block belong to the same category (e.g., Abdel Rahman & Melinger, 2011), in continuous paradigms, when several objects of one category have to be named in close succession (e.g., Belke, 2013), and in picture-word interference (PWI) paradigms with category coordinates as distractors (e.g., Hirschfeld et al., 2008), suggesting that categorical relatedness is critical to make alternative lexical candidates potent competitors. The present study tested whether categorically unrelated lexical candidates can also turn into potent competitors, when their concepts are explicitly boosted. Such a finding would suggest that (i) lexical competition does not necessarily require a semantic relationship between competing candidates and (ii) the situation-dependent activation level of concepts, rather than their category or response relevance, determines which lexical candidates compete for selection.

A PWI experiment (using a 0-SOA) with a picture naming task was conducted. A sound component was added to the paradigm to boost either the activation of the distractor concept (distractor-sound), the target concept (target-sound), or neither concept (no-sound condition). The sounds started 150 ms before the presentation of the picture-word stimuli and overlapped with them for 350 ms. The test items were 42 objects of seven semantic categories. For each item a monochrome line drawing, a typical sound (e.g. “meow” for a cat) and a typical German object name was selected. Items were combined with each other to form categorically related and unrelated picture-word pairs, see examples in Table 1 (all target-distractor pairs included two distinct initial phonemes). A Pretest (n = 27) was conducted to control sound identification; the correspondence of a sound (e.g. “meow”) and an object name (e.g. cat) had to be judged on a Likert scale ranging from 1-*clearly the mentioned object* to 5-*definitely another object*. The results of the Pretest verified that all sounds were clearly identified as sounds of the intended objects only (median = 1 for matching pairs; median = 5 for non-matching target-distractor pairs, related ones, e.g. “meow” – sheep, and unrelated ones, e.g. “meow” – saw). In the experiment proper, both variables Distractor Relatedness (categorically related vs. unrelated) and Sound Matching (distractor-sound vs. target-sound vs. no-sound) were within-subjects and within-items variables. Half of the sounds that a subject heard in a session matched the target and the other half matched the distractor concept; there was no repetition of any target-distractor pair per subject. 36 native German speakers were tested as participants.

The analysis of the data is still ongoing (mixed models will be analyzed using the two independent variables as predictors of RTs and subjects and items as random effects). Preliminary results of 24 subjects, see Figure 1, replicated the standard semantic interference effect in the no-sound condition (about 23 ms longer naming latencies in the related than the unrelated condition). The interference effect increased to about 50 ms when the target concept was boosted by a target-sound because of faster target naming in the unrelated condition and slower target naming in the related condition (compared to no-sound respectively), suggesting that higher target activations imply stronger co-activations of related concepts. Distractor-sounds boosting explicitly the distractor consistently slowed down target naming. Most interestingly, in the distractor-sound condition, categorically related and unrelated distractors had a very similar hampering effect on target naming, suggesting that lexical competition is not semantically restricted. It appears that both related and unrelated candidates can be potent competitors, as long as their conceptual activation level is high at the time of lexical selection. The findings of the study can contribute to a better understanding of the role of concept activations in lexical selection processes. Implications for lexical competition models will be discussed.

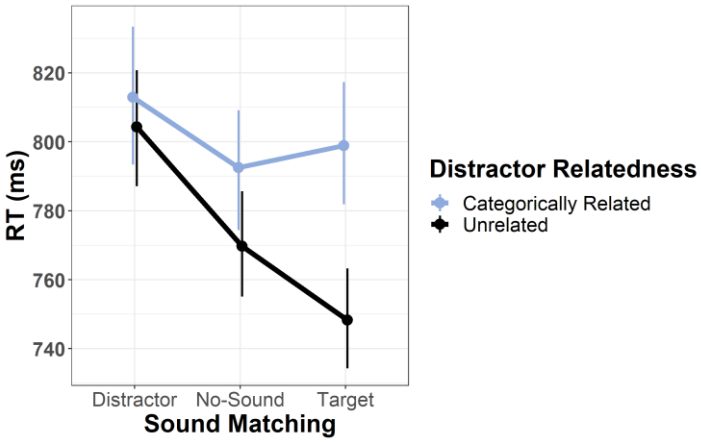
Table 1

Illustration of the Stimuli Presented in the Different Conditions. In all Examples, *Katze* (cat) is the Target; English Translations of the German Distractors are given in Parentheses.

Condition	Example	
Related distractor word (sheep)-**Distractor sound**	"*baa*"	Schaf
Related distractor word (sheep)-**No sound**		Schaf
Related distractor word (sheep)-**Target sound**	"*meow*"	Schaf
Unrelated distractor word (saw)-**Distractor sound**	"*gkr gkr*"	Säge
Unrelated distractor word (saw)-**No sound**		Säge
Unrelated distractor word (saw)-**Target sound**	"*meow*"	Säge

Figure 1

Mean Picture Naming Latencies as a Function of Distractor Relatedness and Sound Matching; Error Bars Indicate 95% *CI*s (Preliminary Results of 24 Subjects)



References

Abdel Rahman, R., & Melinger, A. (2011). The dynamic microstructure of speech production: semantic interference built on the fly. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 37*(1), 149-161.

Belke, E. (2013). Long-lasting inhibitory semantic context effects on object naming are necessarily conceptually mediated: Implications for models of lexical-semantic encoding. *Journal of Memory and Language, 69*(3), 228-256.

Hirschfeld, G., Jansma, B., Bölte, J., & Zwitserlood, P. (2008). Interference and facilitation in overt speech production investigated with event-related potentials. *Neuroreport, 19*(12), 1227-1230.

Levelt, W. J., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioral and brain sciences*, *22*, 1-38.