

Cumulative semantic interference persists even in highly constraining sentences

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When speakers engage in conversation, they often talk about multiple members of the same semantic category (e.g., “Lions, and tigers, and bears – oh my!”; Baum, 1900). Given this, it seems inefficient that subjects name pictures (e.g., *cow*) slower when they have previously named other (and more) members of the same semantic category (*horse*, *pig*; Howard et al., 2006). Of course, in normal speech, words are typically produced in rich semantic contexts. The present study investigated whether the *cumulative semantic interference effect* (CSIE) persists even when pictures are presented in such a context; i.e., after high-cloze sentences.

In Experiment 1, 80 subjects named 94 pictures (60 critical) in each of two blocks. The critical pictures constituted 12 semantic categories of five pictures each. Half of the pictures in each block were presented in isolation; the other half were preceded by high-cloze sentences presented via RSVP with the last word omitted (e.g., “On the class field trip, the students got to milk a ____”). Results showed that although pictures were named 194 ms faster in the sentence condition relative to the bare condition, CSIEs of equivalent size were observed within both conditions. Furthermore, this interference fully transferred between conditions: Naming *cow* slowed the subsequent naming of *horse* equally regardless of whether *cow* or *horse* were named in isolation or after a sentence.

This finding cannot be explained straightforwardly by Howard et al.’s (2006) model of CSIE since it incorrectly predicts that trials with faster naming latencies will show less interference. However, it could potentially be explained by Oppenheim et al. (2010), whose error-based learning account claims that higher target activation and lower non-target activation constitute less error and thus reweight semantic-lexical connections to a smaller degree. These lead to decreased repetition priming and decreased interference on subsequent trials, respectively. Thus, to explain why bare and sentence conditions elicit same-sized CSIEs, Oppenheim et al.’s model must claim that a high-cloze sentence increases the target’s activation level while leaving its competitors’ activation levels unchanged. If so, we should observe less repetition priming for pictures previously named in sentence conditions than bare conditions.

Experiment 2 tested this hypothesis. As before, 80 subjects named 94 pictures (60 critical) in each of two blocks. In Block 1, half of the pictures were presented in isolation and half were presented after high-cloze sentences. However, in Block 2, every picture was presented in isolation. As in Experiment 1, CSIEs of equivalent size were observed in Block 1 for the bare and sentence conditions. Critically, Block 2 pictures were named 16 ms slower when they were previously named after a sentence than when they were previously named in isolation, confirming the prediction of Oppenheim et al. (2010).

In sum, our results confirm that cumulative semantic interference is undiminished even in richer semantic contexts and provide evidence for Oppenheim et al.’s (2010) error-based learning account of the CSIE. Furthermore, they shed light on how high-cloze sentences facilitate production, suggesting such sentences increase activation levels of targets while leaving the activation levels of their competitors unchanged.

References

- Baum, F. (1900). *The Wonderful Wizard of Oz*. Chicago: George M. Hill Company.
- Howard, D., Nickels, L., Coltheart, M., & Cole-Virtue, J. (2006). Cumulative semantic inhibition in picture naming: experimental and computational studies. *Cognition*, 100, 464-482.
- Oppenheim, G. M., Dell, G. S., & Schwartz, M. F. (2010). The dark side of incremental learning: A model of cumulative semantic interference during lexical access in speech production. *Cognition*, 114, 227-252.