Persistent semantic interference in picture naming

tests of an incremental learning account

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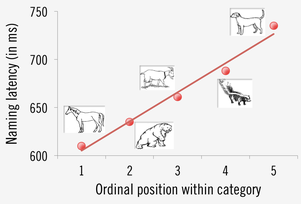
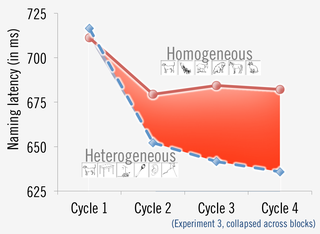
Cumulative semantic interference refers to the fact that retrieving a certain word (*e.g.* DOG) becomes more difficult after retrieving other semantically related words (*e.g.* GOAT).

It manifests as an incremental interference effect when naming several tokens from the same semantic category…



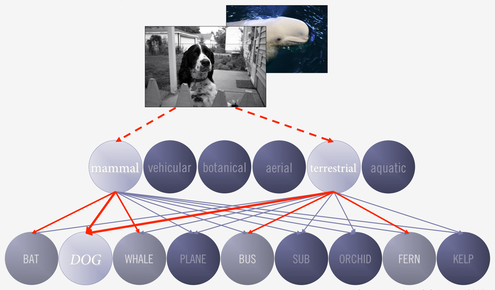
(Howard, Nickels, Coltheart, & Cole-Virtue, 2006)



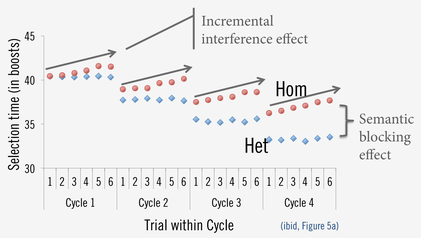
(Experiment 3, collapsed across blocks)

… and a semantic blocking effect when repeatedly naming a small set of related tokens (compared to an unrelated baseline).

Since the interference survives longer than a few seconds, some have suggested that it reflects incremental learning during lexical access.



(Oppenheim, Dell, & Schwartz, 2010)



(ibid, Figure 5a)

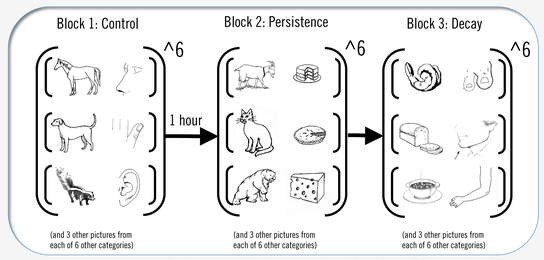
By default, incremental learning accounts assume that interference should last indefinitely, but there is little empirical support for this assumption. In fact, the experimental literature has generally assumed that interference must dissipate in less time than it takes to boil an egg.

How far can we actually get with the strong assumptions that cumulative semantic interference builds with each retrieval and lasts forever?

Experiment 1: Persistence and decay

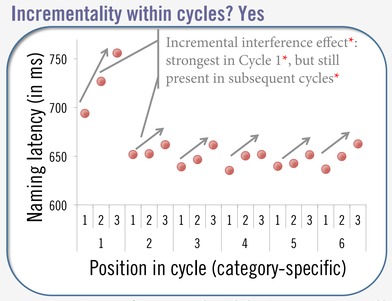
Once interference accumulates, how long does it last?

Long lasting interference should slow target retrieval, even an hour later; but if interference is subject to temporal decay, then recently named competitors should provide more interference than competitors named an hour earlier.



Continuous cyclic picture naming; 48 subjects, 72 items → ~20k trials

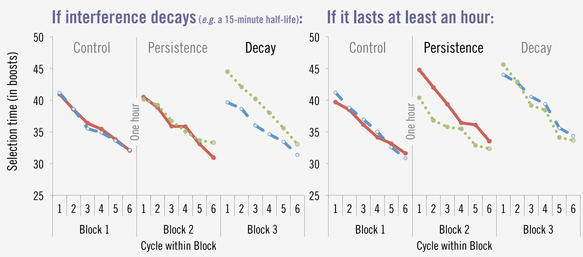
Incrementality within cycles? Yes



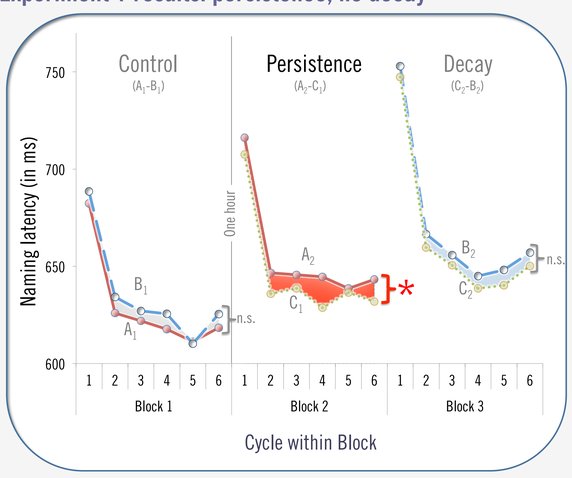
Interference builds incrementally, even after the first cycle, ruling out a token-based effect

Model predictions:

(based on Oppenheim et al., 2010)



Experiment 1 results: persistence, no decay

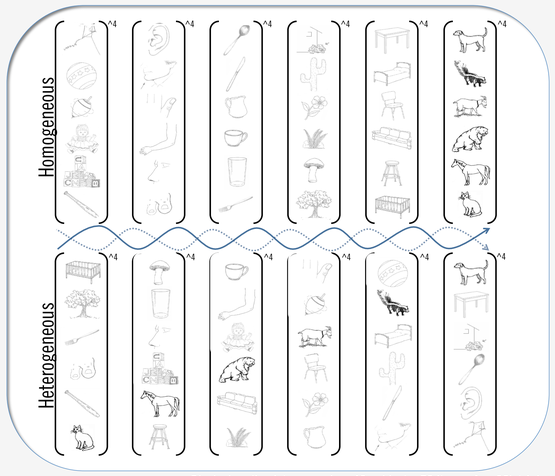


Interference remains detectable much longer than previously thought, and does not seem to decay with time. This firmly establishes it as a learning-based effect.

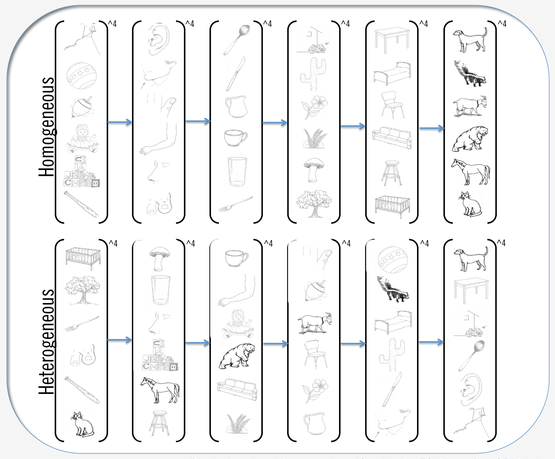
Experiments 2&3: Incrementality

How does incremental learning create semantic interference–*and facilitation*– in blocked cyclic naming?

Interference should accumulate *within* blocks and *within* cycles in the homogeneous condition, and *across* blocks in the heterogeneous condition.



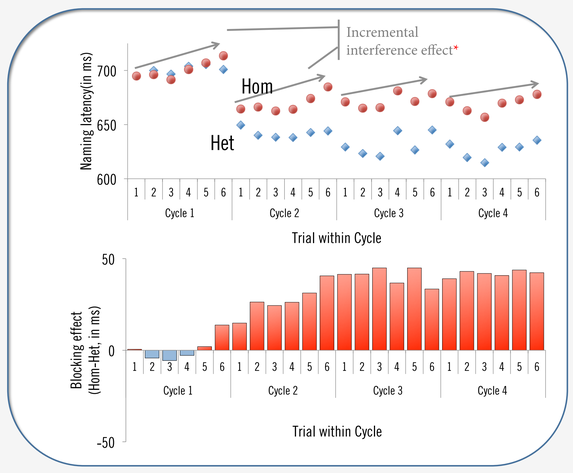
Blocked cyclic picture naming; 48 subjects, 72 items → ~25k trials



Blocked cyclic picture naming; 48 subjects, 72 items → ~25k trials

Incrementality within a block? Yes:

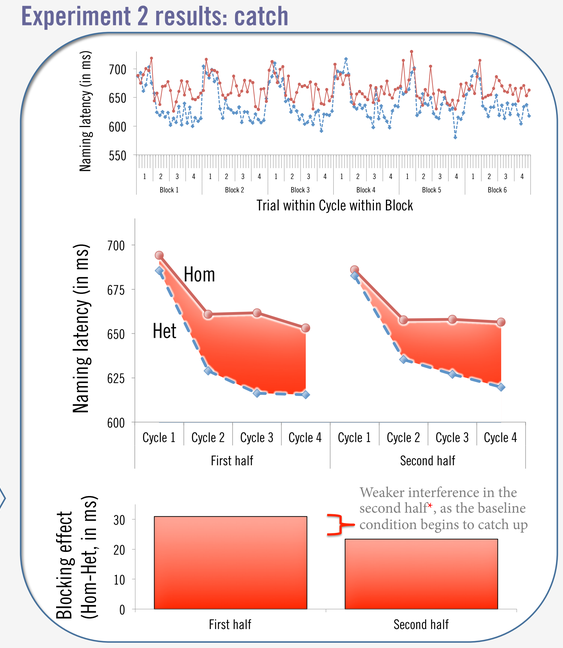
(collapsed across Experiments 2 & 3, for ~50k trials)



Interference builds incrementally, even in blocked cyclic naming: trial-by-trial within a cycle, and cycle-by-cycle within a block

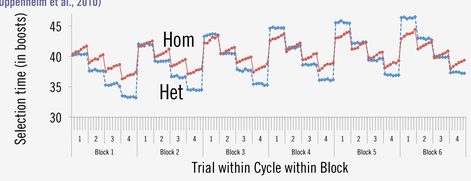
Incrementality across blocks:

Experiment 2 results: catch

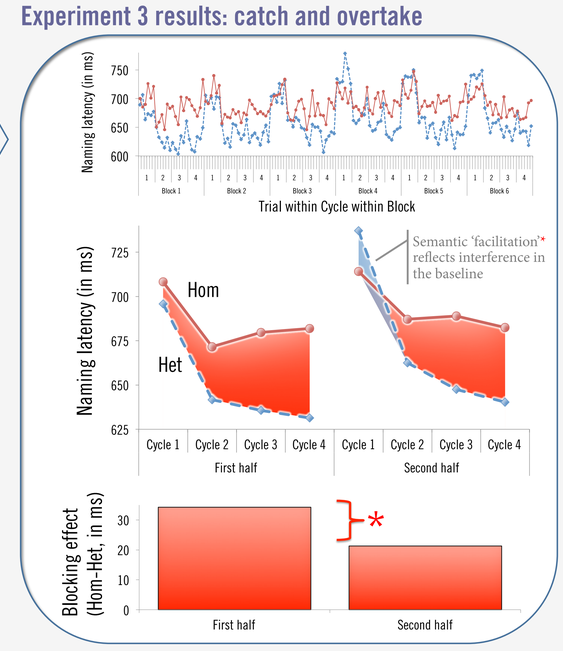


Model predictions:

(based on Oppenheim et al., 2010)



Experiment 3 results: catch and overtake



Over the course of an experiment, interference in heterogeneous blocks can 'catch and overtake' that in the homogeneous, thus masquerading as facilitation.

General conclusions:

- Cumulative semantic interference accumulates with each retrieval and remains detectable for at least one hour. This fits well with its characterization as an effect based in incremental learning.
  - Recognizing the persistence of interference resolves puzzling results from the semantic blocking paradigm.
- When people speak, they learn. In certain experiments, this learning produces what we know as *cumulative semantic interference*.

http://crl.ucsd.edu/~goppenheim/pubs/oppenheim_2012_Psychonomics.pdf