

Experiment I: Overnight consolidation after a single study session

Background

In everyday life adults learn new meanings for words they already know due to (Rodd et al., 2012):

- Evolution of language:



- Learning a new hobby/subject:



How are new meanings integrated with existing word knowledge?

CLS model (Davis & Gaskell, 2009):

New word → Episodic Memory → Offline Consolidation → Semantic Memory
(Hippocampus) (e.g., sleep) (Neocortex)

Q: Is overnight consolidation beneficial for learning new meanings for familiar words (as previously shown for learning new word forms)?

Method

Participants: $N = 84$ (age: $M = 31.4$ years, range = 18-49; 39 females).

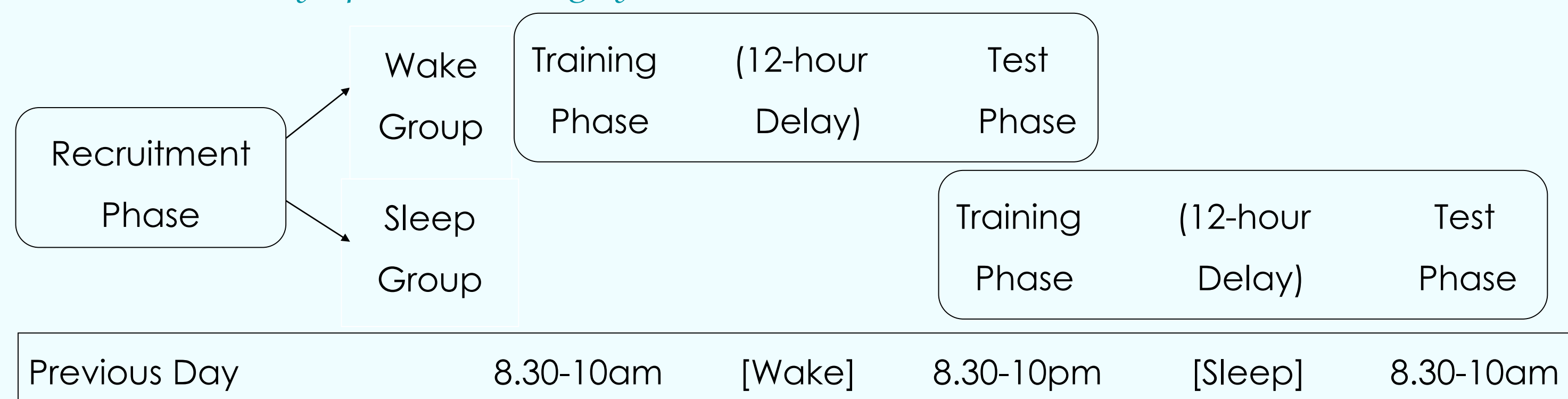
Web-based; between-subjects; participants learned 8 new word meanings.

Stimuli: 16 English words given novel unrelated noun meanings:

"A foam is a safe that is incorporated into a piece of furniture with a wooden panel concealing the key lock, and each is individually handcrafted so that no intruders are able to recognise the chief use of the furniture."

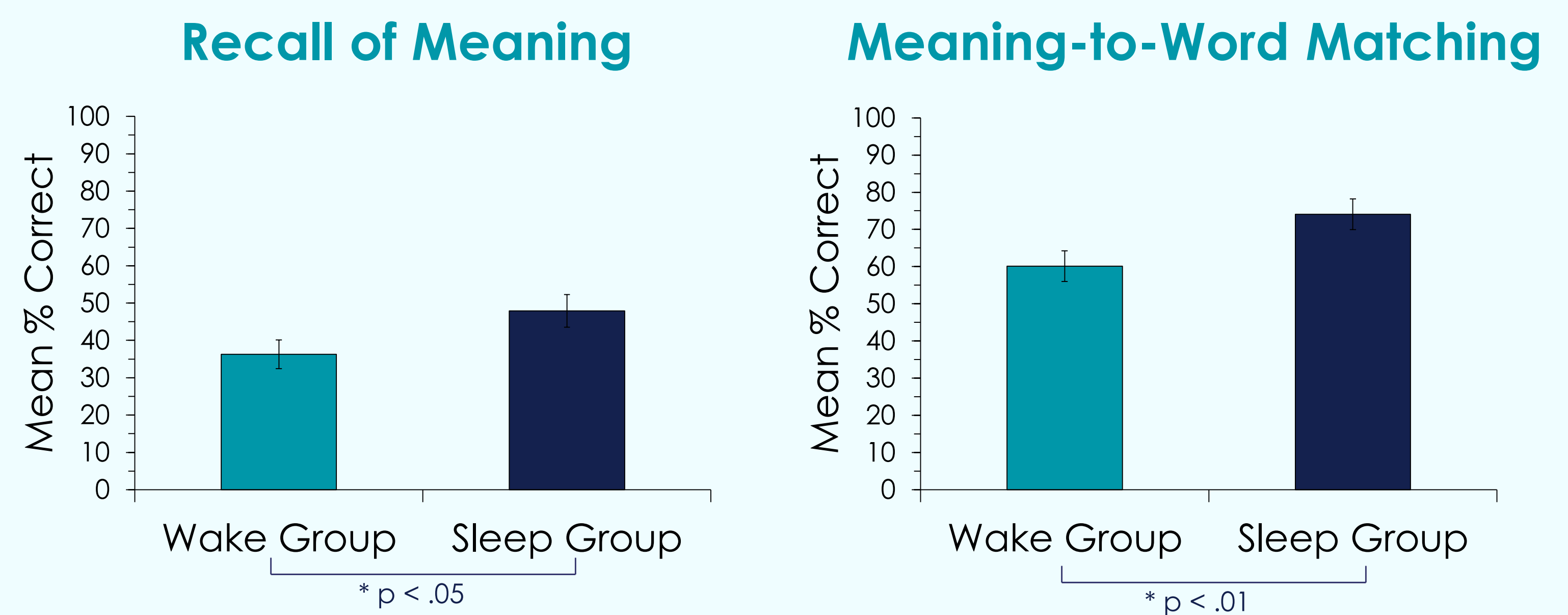
Incidental learning: Stimuli incorporated into four separate short stories to convey meanings (with 8 exposures to each of the 4 words in a story):

"... 'Yes,' I murmured, breathing again. 'I knew it! It's a foam.' The ornate chaise longue was no ordinary piece of furniture, but concealed a built-in safe with an intricate key-operated locking system..."

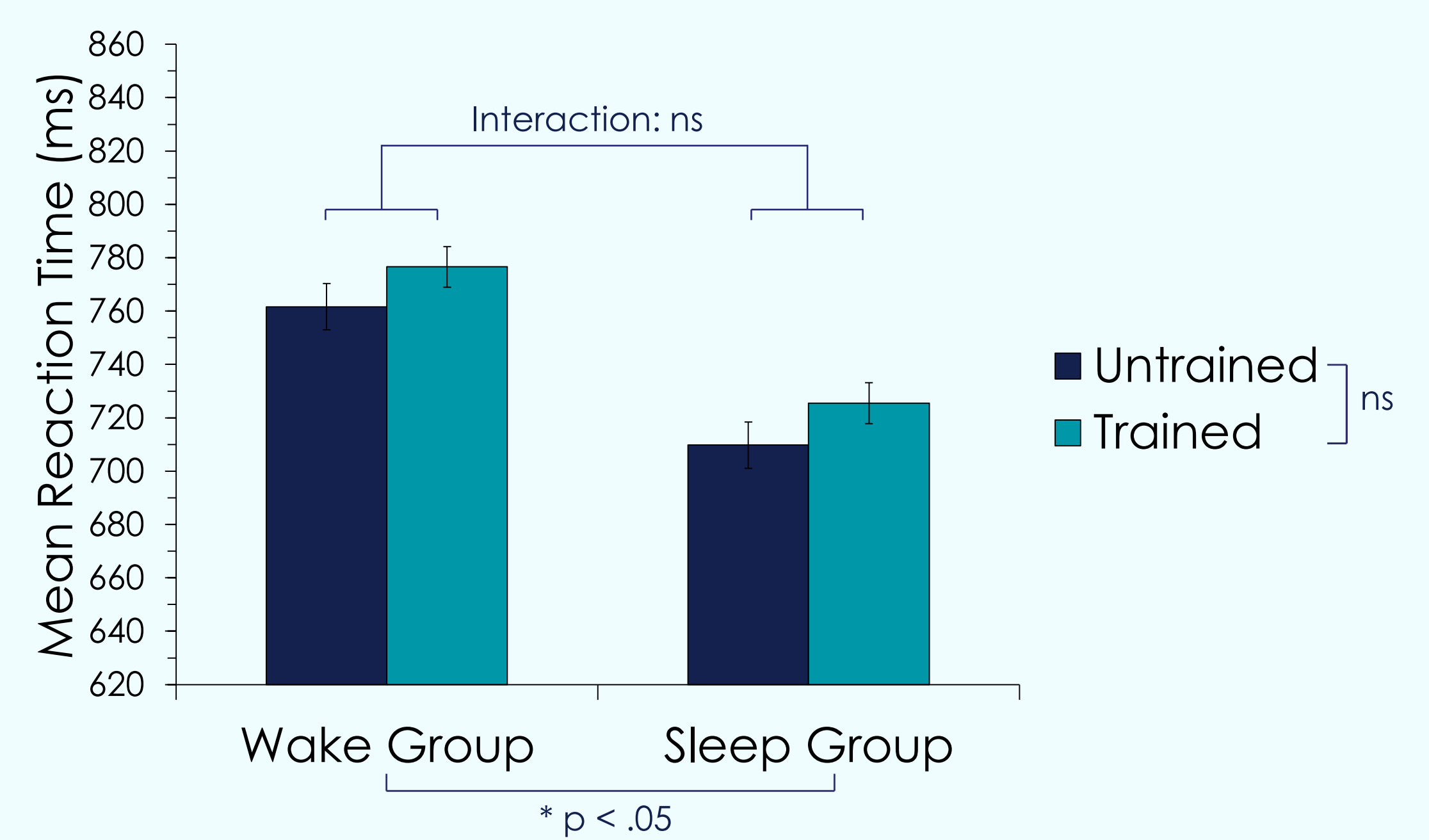


Results & Conclusions

Data were analysed using linear mixed effects modelling (Barr et al., 2013).



Semantic Relatedness Judgement



- The sleep group had significantly better explicit memory of new word meanings than the wake group (recall: 12% higher; recognition: 14% higher).
- No significant group x training interaction for the implicit measure, so no evidence of competition between new and existing word meanings.
 - Possibly due to insufficient consolidation of new word meanings.
 - Possibly due to lack of sensitivity in semantic relatedness judgement test.

Experiment II: Overnight consolidation after two study sessions

Background

Preregistered on Open Science Framework: <https://osf.io/uvgp4>

Used a 12:12 design to tease apart effects of sleep and time of day at training, and improved sensitivity of implicit measure.

Active consolidation: better memory for items trained before sleep, competition between new and existing meanings.

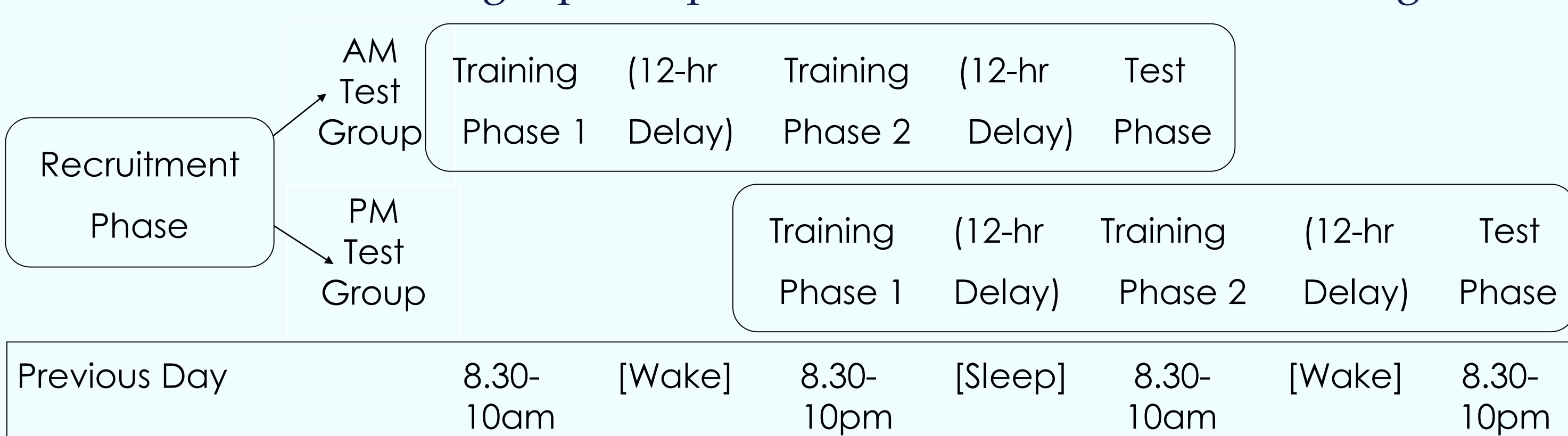
Passive protection: better memory only for items trained directly prior to sleep.

Q: Is sleep important for active consolidation of new word meanings, or does it provide passive protection against interference?

Method

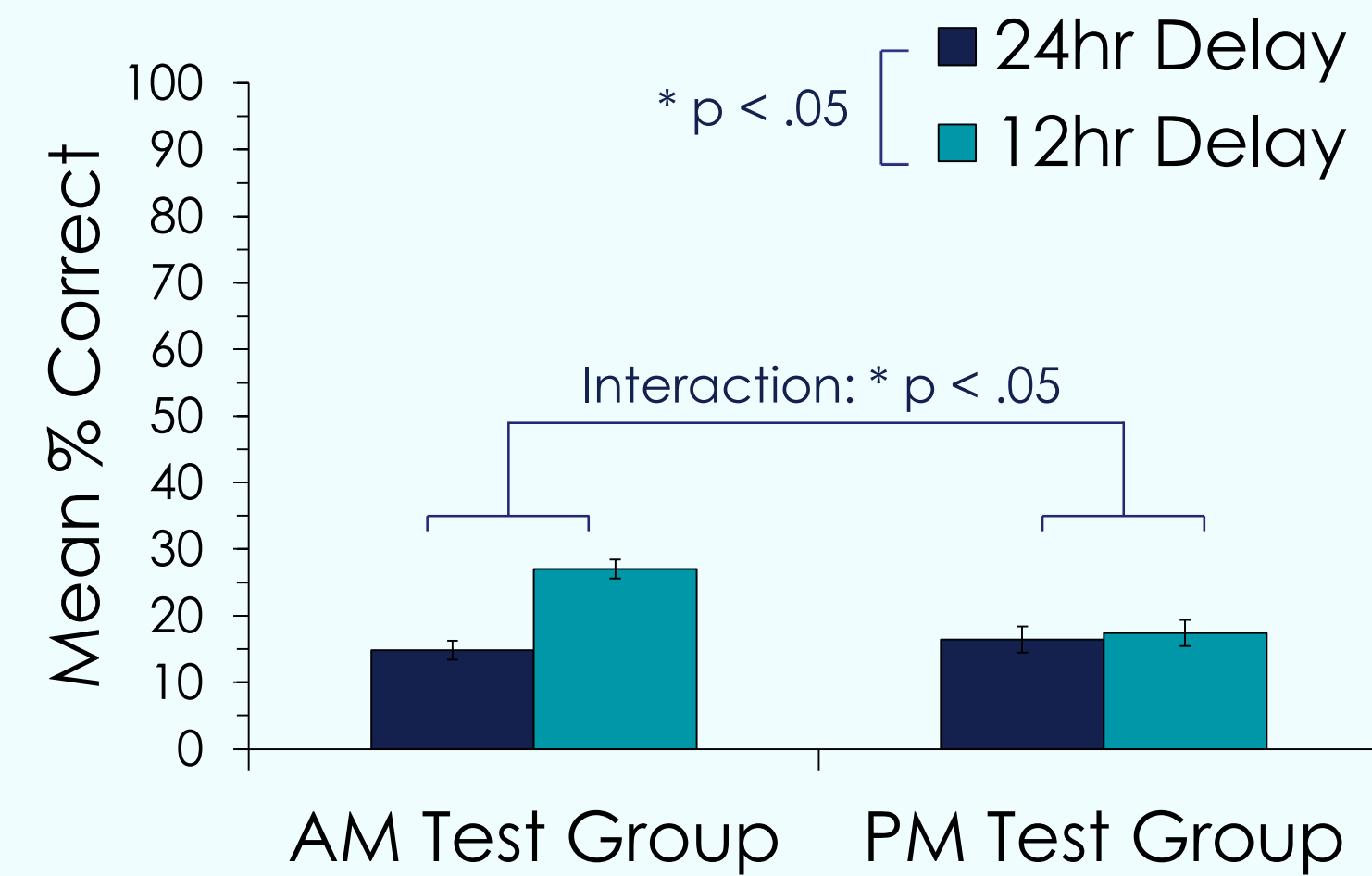
Participants: $N = 84$ (age: $M = 34.0$ years, range = 20-48, 69 females).

Web-based; mixed design; participants learned 16 new word meanings.

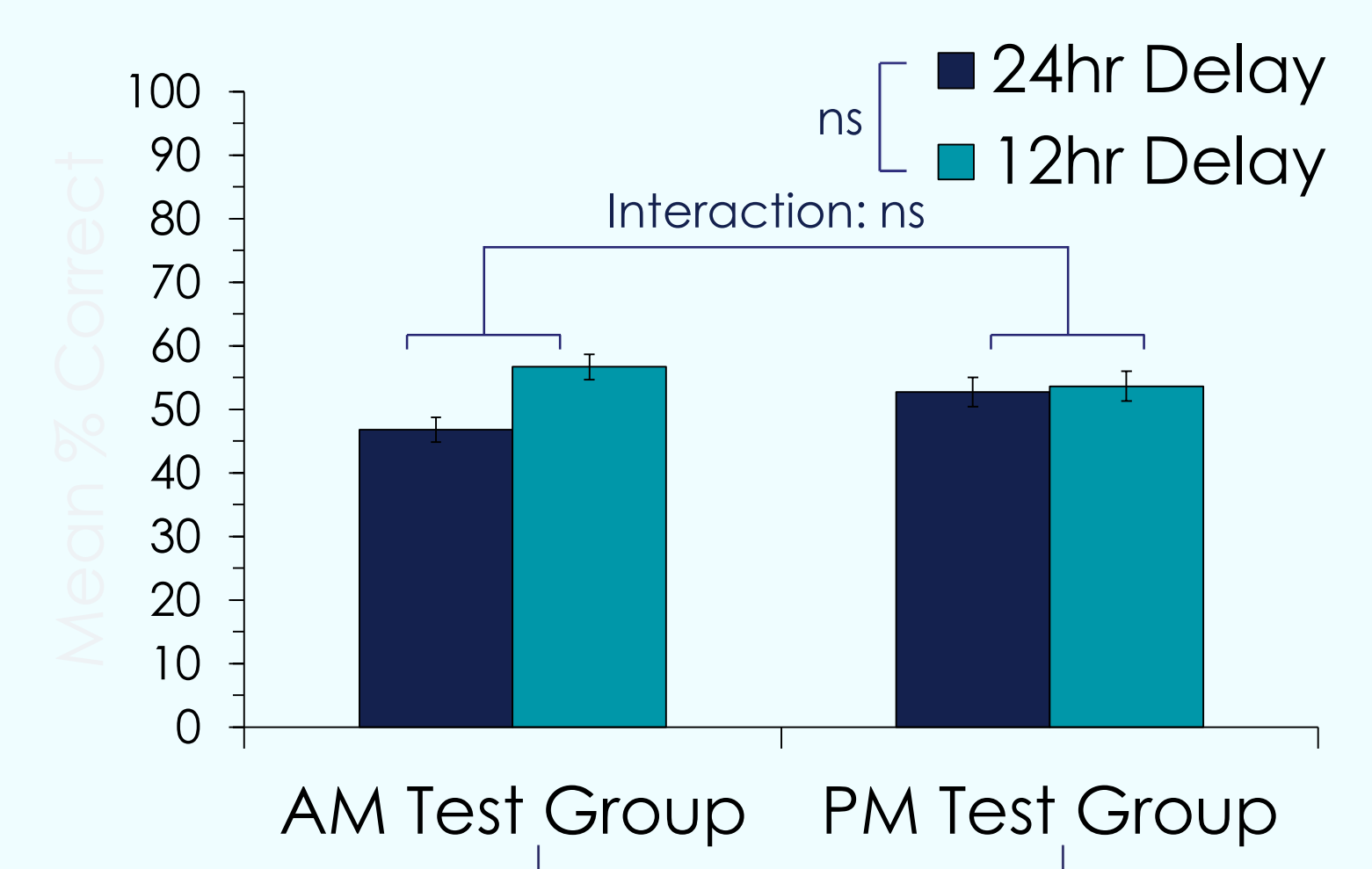


Results & Conclusions

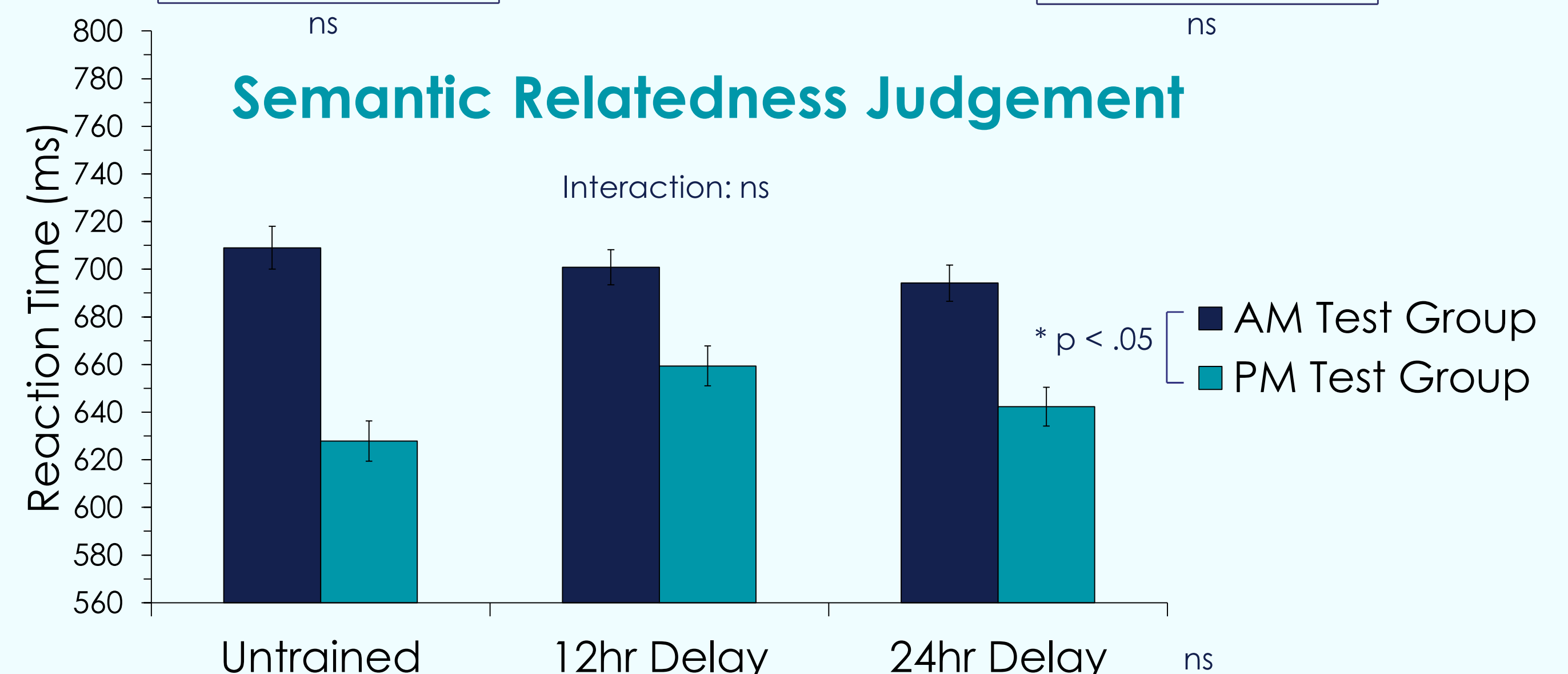
Recall of Meaning



Meaning-to-Word Matching



Semantic Relatedness Judgement



- Participants had better explicit memory for word meanings only when sleep occurred in the immediate interval between training and test.
- No significant group x training interaction for the implicit measure, so no evidence of competition between new and existing word meanings.
- Sleep may provide passive protection against interference.

References

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, 68(3), 255-278.

Davis, M. H., & Gaskell, M. G. (2009). A complementary systems account of word learning: Neural and behavioural evidence. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 364, 3773-3800.

Rodd, J. M., Berriman, R., Landau, M., Lee, T., Ho, C., Gaskell, M. G., & Davis, M. H. (2012). Learning new meanings for old words: effects of semantic relatedness. *Memory & Cognition*, 40(7), 1095-1108.