Comparing Forgetting Rates Between Item and Relational Memories

Rhiannon N. Soriano Smith & Colleen M. Parks
Department of Psychology, University of Nevada, Las Vegas
Human Memory Lab

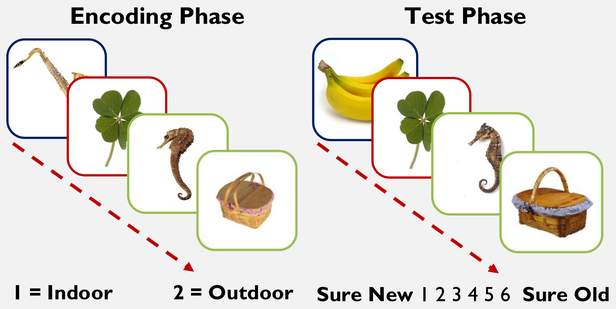
Introduction

- Forgetting is the inability to remember something that you were once able to successfully recall (Tulving, 1974).
- The Representation Theory of Forgetting (Sadeh et al., 2014, 2016; see also Hardt et al., 2013) predicts that the primary cause of forgetting depends on the type of stored representations.
  - Forgetting of single items is thought to be due more to interference than decay.
  - Associative representations are more vulnerable to active decay than interference.
- Wickelgren's (WG) model (1974) is a quantitative forgetting model that has parameters for initial learning, decay, and interference.
- We used WG's model to ask:
  - *Do different measures of memory decline in different ways?*
  - *Do interference and decay parameters support the representation theory?*

Method

Participants: N = 34

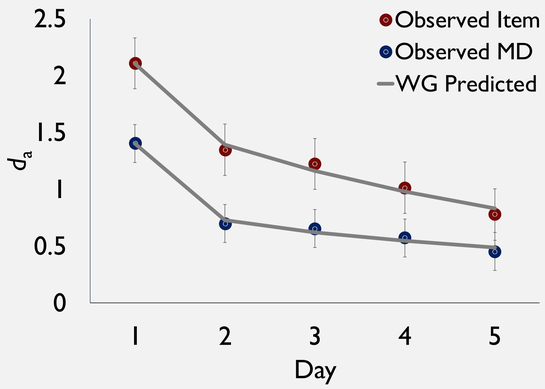
Mnemonic Similarity Task

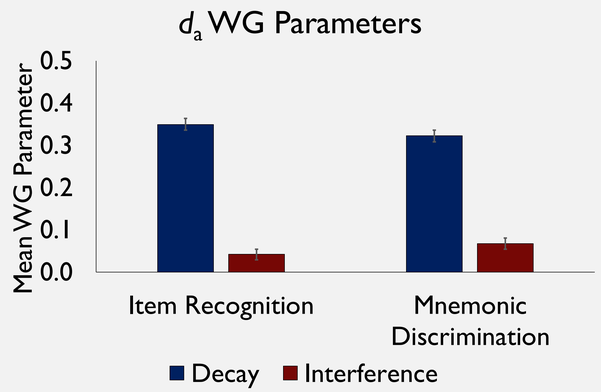


- Encoding consisted of indoor/outdoor judgments paced at 3s with an ISI of 500ms.
- Subjects took five old/new recognition tests with 6-point confidence scales, with instructions to treat similar lures as new.
- The first test was immediate. The others were 24 hours apart. Test items were unique to each test.

Results

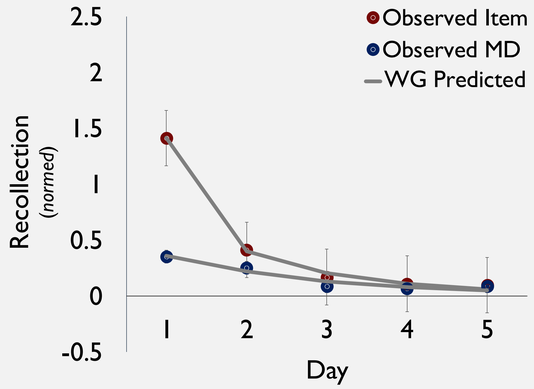
d_a

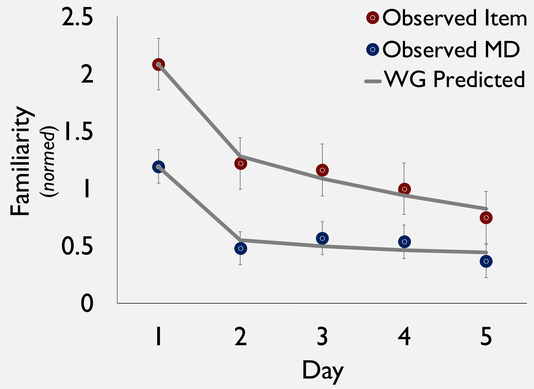


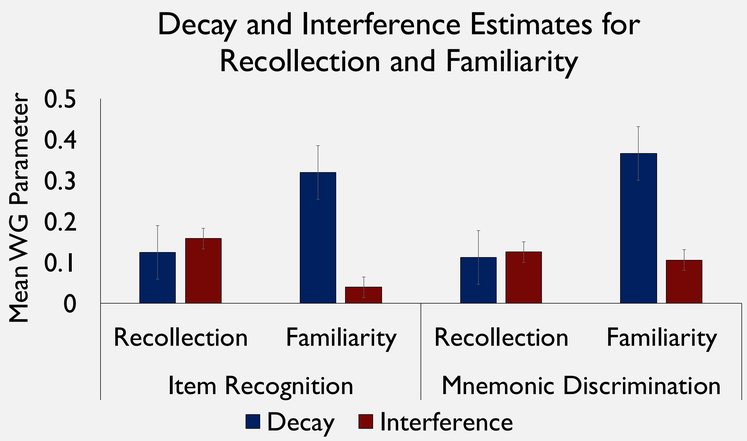


- Significant main effect of forgetting parameter (decay, interference) with decay being greater than interference ($F(1,33) = 27.398$, $p < .001$, $n_p^2 = 0.454$).
- Unexpectedly, decay was significantly greater in both item recognition ($t(33) = 5.003$, $p < .001$, $d = 1.216$) and mnemonic discrimination ($t(33) = 3.956$, $p = .002$, $d = 1.005$).

Recollection & Familiarity







- Significant interaction between forgetting parameter (decay, interference) and memory process (recollection, familiarity):
  - Item recognition ($F(1,33) = 13.340$, $p < .001$, $n_p^2 = 0.288$)
  - Mnemonic discrimination ($F(1,33) = 10.882$, $p = .002$, $n_p^2 = 0.248$)
- Unexpectedly, interference and decay did not differ for recollection, but decay was much higher for familiarity:
  - Item recognition ($t(33) = -4.681$, $p < .001$, $d = -1.107$)
  - Mnemonic discrimination ($t(33) = -3.646$, $p = .005$, $d = -1.056$)

Discussion

- Findings conflict with the Representation Theory of Forgetting, which predicts higher decay for recollection and higher interference for familiarity.
- Our data show:
  - High levels of decay and little interference for familiarity estimates.
  - No difference between decay and interference parameters for recollection estimates.
  - In sum, the dominant forgetting parameter is dependent upon the memory process.
- Potential Explanations
  - The Representation Theory of Forgetting refers specifically to associative memory. Although recollection is associative in nature, it may still differ between the types of judgments made in the MST and in typical old/new and associative recognition.
  - The fit of the model at the group level is excellent, but needs to be evaluated at the individual level.

References

Tulving, E. (1974). Recall and recognition of semantically encoded words. *Journal of Experimental Psychology, 102*(5), 778–787.;
Hardt, O., Nader, K., & Nadel, L. (2013). Decay happens: the role of active forgetting in memory. *Trends in cognitive sciences, 17*(3), 111–120.;
Sadeh, T., Ozubko, J. D., Winocur, G., & Moscovitch, M. (2014). How we forget may depend on how we remember. Trends in cognitive sciences, 18(1), 26–36.;
Sadeh, T., Ozubko, J. D., Winocur, G., & Moscovitch, M. (2016). Forgetting Patterns Differentiate Between Two Forms of Memory Representation. Psychological Science, 27(6), 810–820.;
Stark, S. M., Kirwan, C. B., & Stark, C. (2019). Mnemonic Similarity Task: A Tool for Assessing Hippocampal Integrity. Trends in cognitive sciences, 23(11), 938–951.;
Wickelgren, W. A. (1974). Single-trace fragility theory of memory dynamics. *Memory & Cognition*, *2*(4), 775–780.

SCAN ME