



Understanding the Advantage of Retrieval for Long-Term Retention Using Modeling



Philip I Pavlik Jr, Carnegie Mellon University, Pittsburgh Science of Learning Center

Introduction

- We know that retrieval practice is superior to study only practice, but how can we describe this benefit for long-term learning in more detail.

Goal

- Quantitatively describe using a model (Pavlik Jr., 2007) how the temporal course of learning and forgetting differs depending on whether practice occurs as passive study or active testing.

Data

- Thompson, Wenger and Bartling (1978) provide excellent data since their work includes 2 retention intervals and 3 conditions of practice.

All conditions began with a recording of 40 words at a 3 second rate. This was followed by 3 tests without review (STTT), 3 tests with review (SRRR) or 3 studies (SSSS). Retention was at either 20 minutes or 48 hours in this 3x2 within-subjects design.

Result

- The best model implies that the main difference between studies and tests is not the amount of learning, but rather the durability of that learning.

Implications

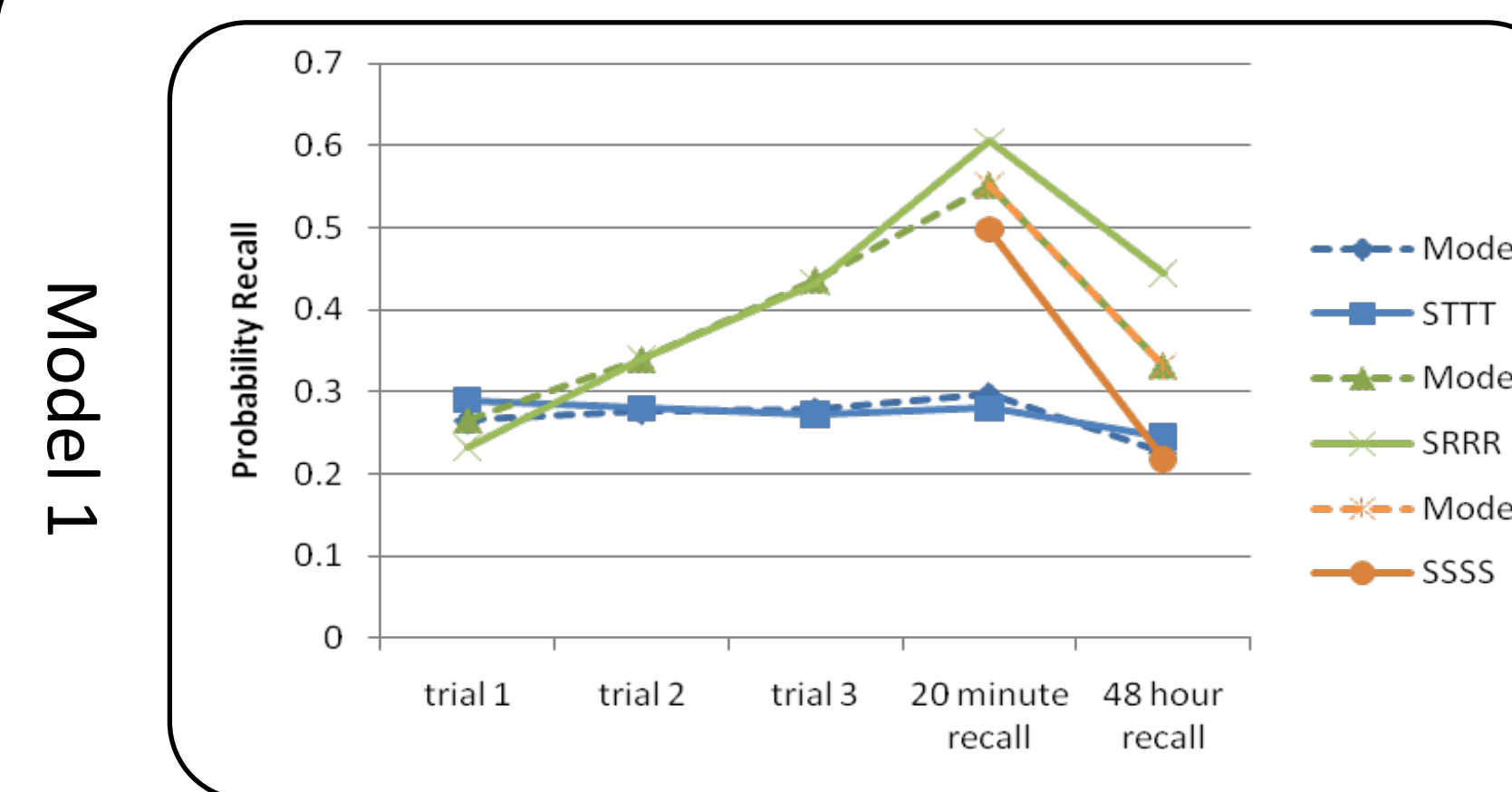
- Further supports testing use as an excellent way to promote durable learning in educational settings. Suggests that test practice may be more important than spacing practice (not conclusively).

Models based on ACT-R (Anderson) strength model of declarative memory used to capture study and testing results previously (Pavlik 2007).

5 Alternative Models of the Data

Increasing decay – A model that says forgetting increases when learning takes place when recall is already good. Captures spacing effects.

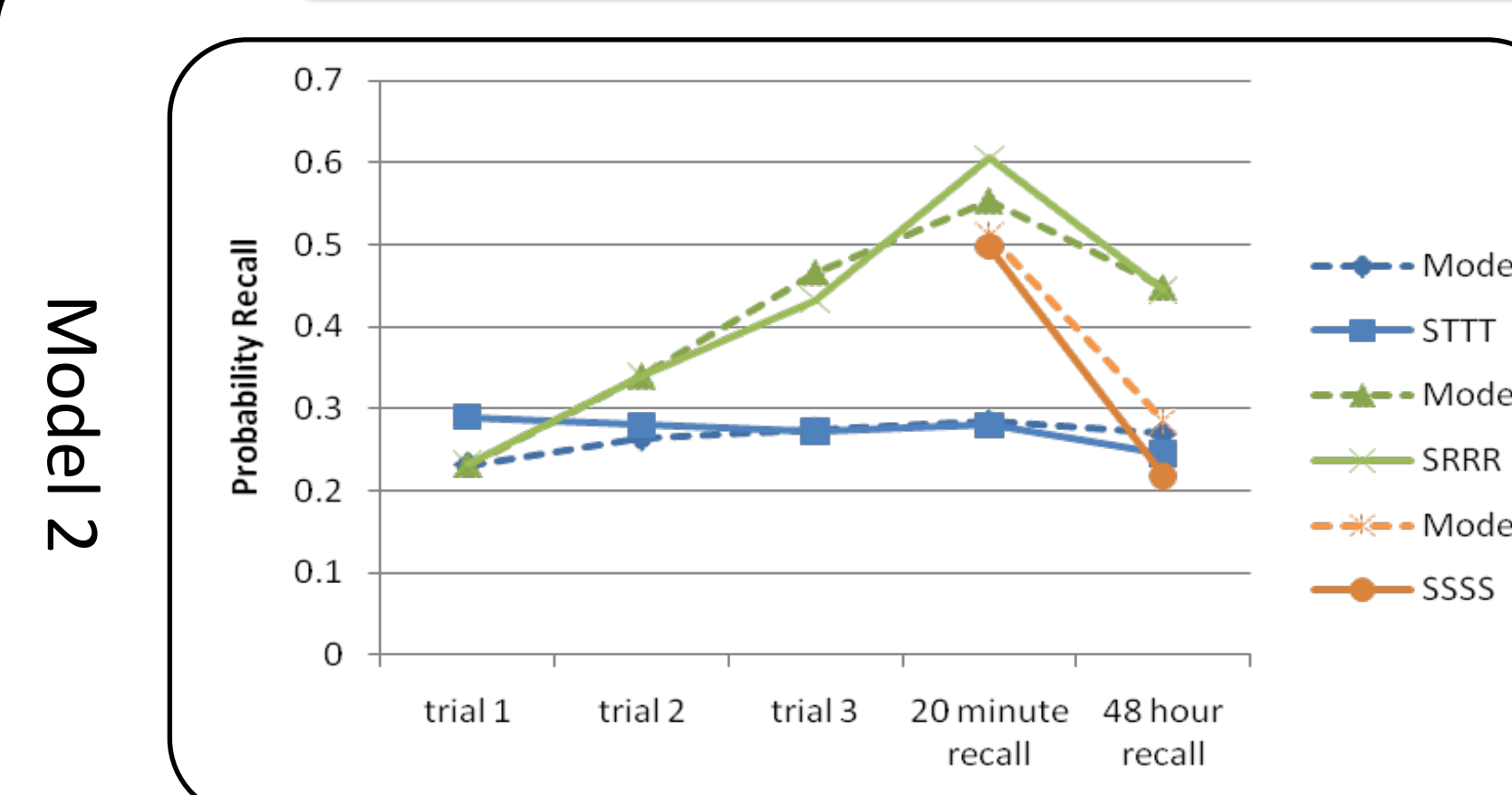
A model with no mechanism to capture the study/test difference and equal increasing decay for study/test



- This model demonstrates increasing decay mechanism is not enough and that some mechanism is necessary to distinguish the different effects of study vs. test practice
- Notice poor long-term model fit

- 6 parameters fit
- Mean Absolute Deviation (probability) = 0.0367

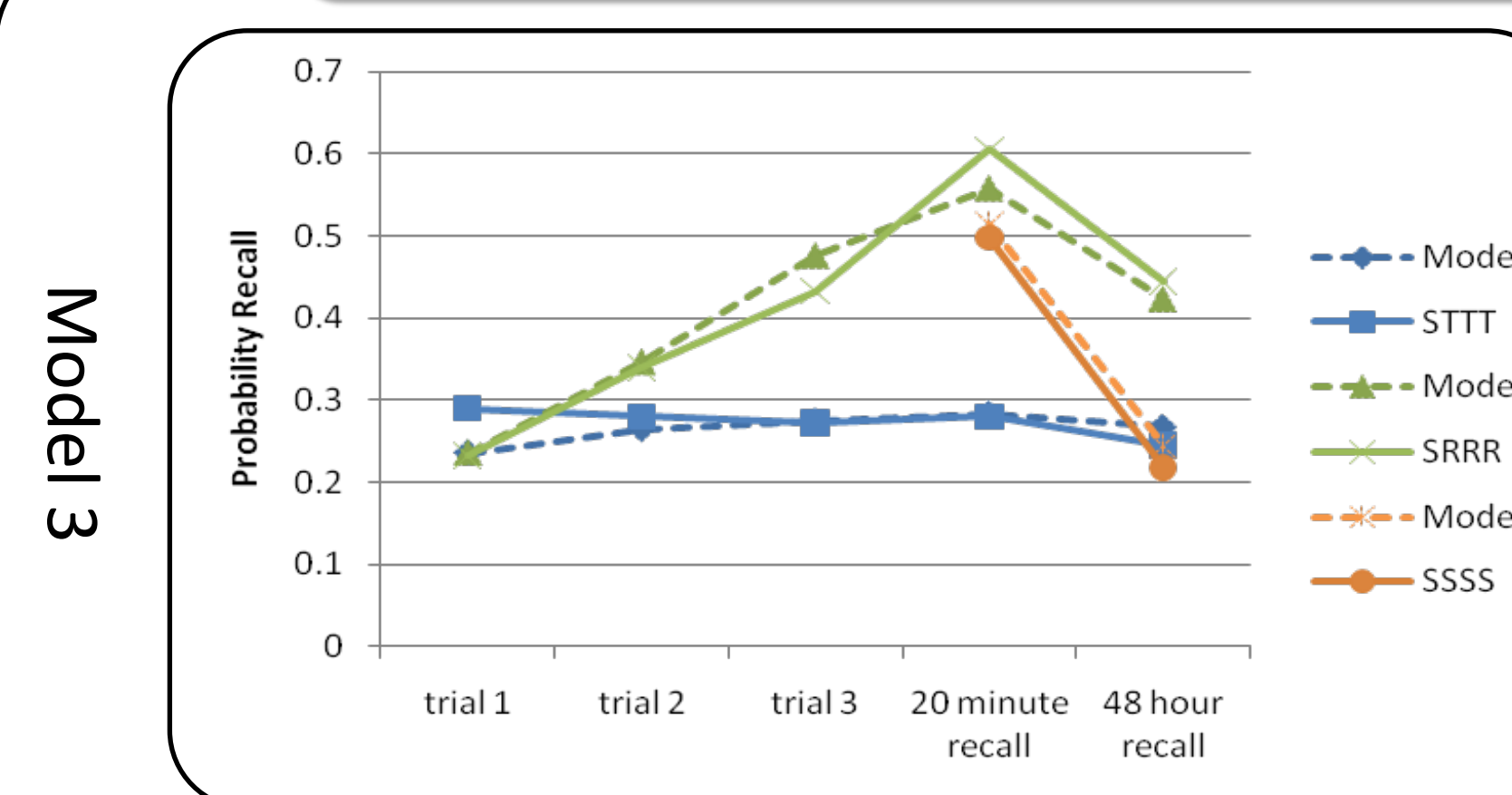
A model with different encoding strengths to capture the study/test difference and equal fixed decay rates same for study/test



- This model shows how the assumption of different encoding strength for study vs. test improves the fit
- Notice better long-term fit

- 6 parameters fit
- Mean Absolute Deviation (probability) = 0.0231
- However, parameters unrealistic
- Testing 5 times better than study

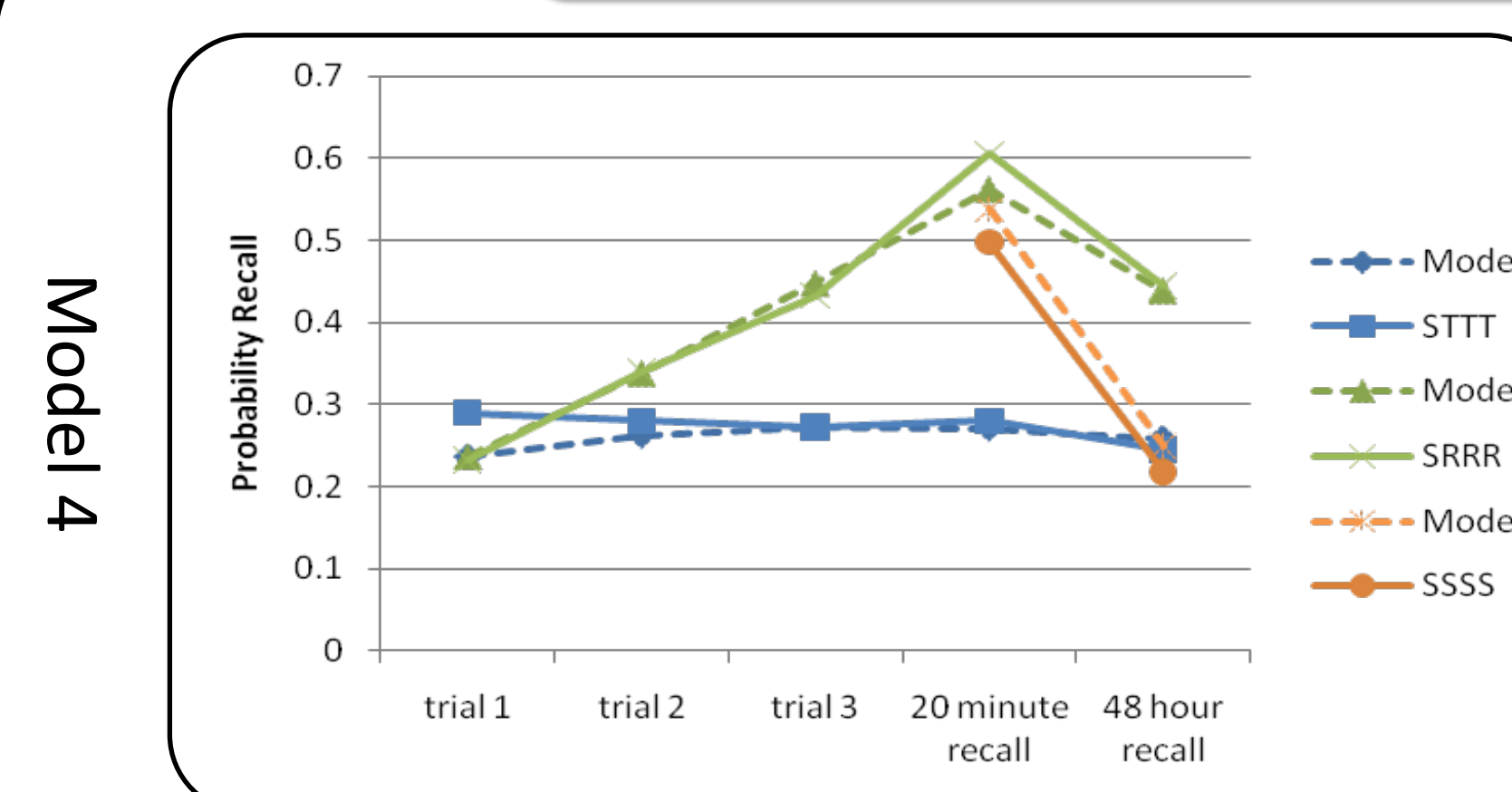
A model with different encoding strengths to capture the study/test difference and equal increasing decay rates for study/test



- To see whether increasing decay improves model 2, this mechanism was added with encoding strength difference

- 6 parameters
- Mean Absolute Deviation (probability) = 0.0218
- However, parameters still unrealistic
- Testing 4 times better than study

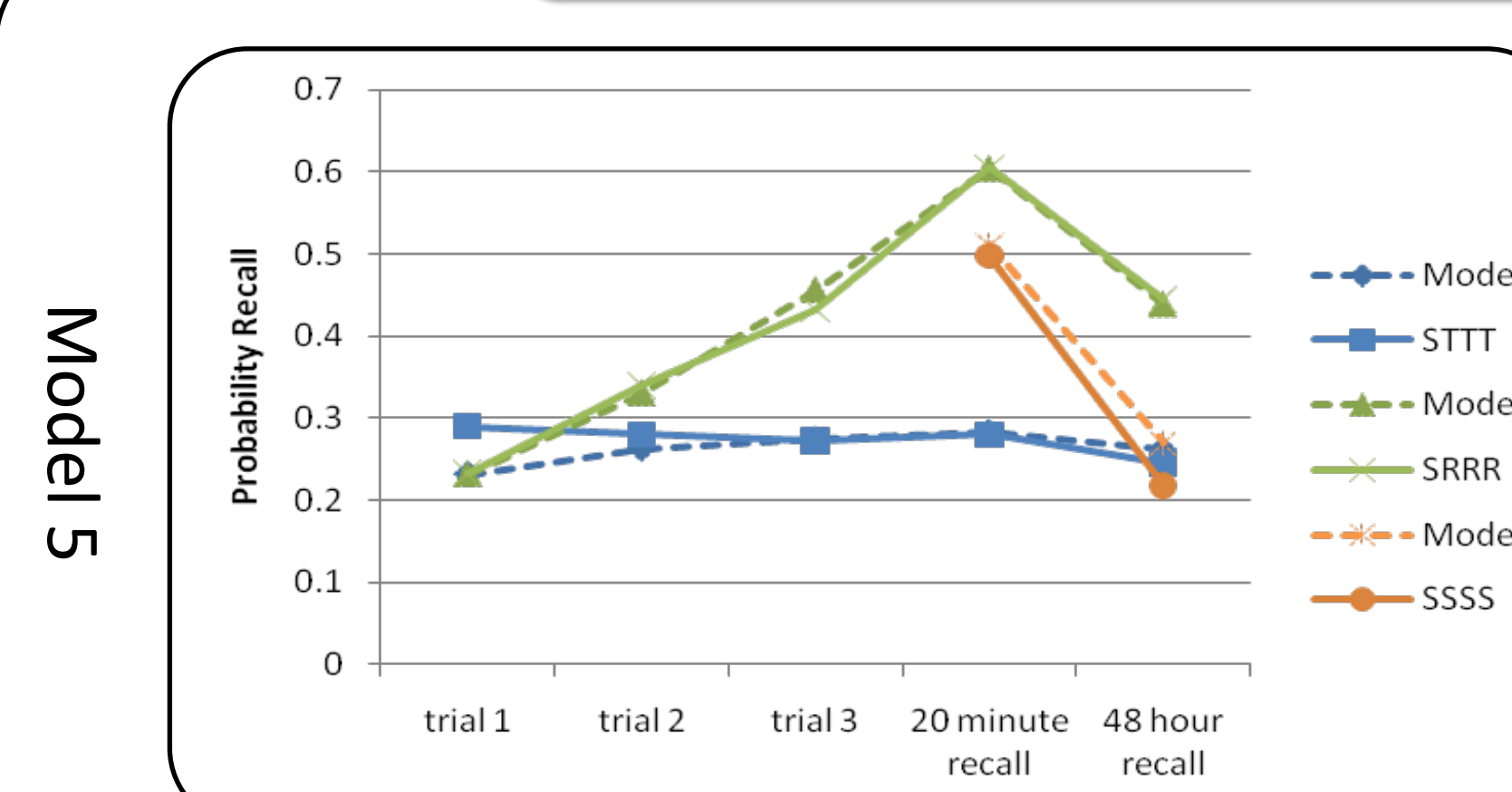
A model with different fixed decay rates to capture the study/test difference and equal study encoding strength



- To see whether different fixed decay values would distinguish tests from studies and improve the fit without encoding differences

- 7 parameters fit
- Mean Absolute Deviation (probability) = 0.0197
- Parameters are again unrealistic
- Almost no decay for test practices

A model with fixed decay rate for tests and increasing decay rate for study and equal study encoding strength



- To see whether increasing decay might be a property of study practice only, while testing practice might be stable, no encoding differences

- 6 parameters fit
- Mean Absolute Deviation (probability) = 0.0171

References

- Thompson, C. P., Wenger, S. K., & Bartling, C. A. (1978). How recall facilitates subsequent recall: A reappraisal. *Journal of Experimental Psychology: Human Learning & Memory*, 4, 210-221.
- Pavlik Jr., P. I. (2007). Understanding and applying the dynamics of test practice and study practice. *Instructional Science*, 35, 407-441.

Acknowledgements

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