



Does delay length or sequence exposure affect repeated acquisition performance?

A.R. Johnson, K.A. Reed, B.R. Gomer, M.A. Vanden Avond, E.J. Hendrickson,
T.J. Vossen, D. J. Nemeck, A.T. Schultz, C.A. Todd, and D.C. Jewett
Department of Psychology University of Wisconsin – Eau Claire

Introduction

- Repeated acquisition of response chains is a systematic method used to study learning and memory.
- Subjects complete sequences of responses in order to earn reinforcers.
- Subjects must learn the correct sequence of responses for the session through trial-and-error.
- As the subject completes more correct sequences over session time, the number of errors should be reduced throughout the session.
- This within-session error reduction is defined as learning.
- In order to study learning and memory, we establish baseline error rates for our subjects and response sequences.

Questions

- Does the delay after an error have an effect on overall error rate or within-session performance?
- Are there differences in error rates and learning curves between subjects trained on 6 sequences and those trained on 12 sequences?

Method

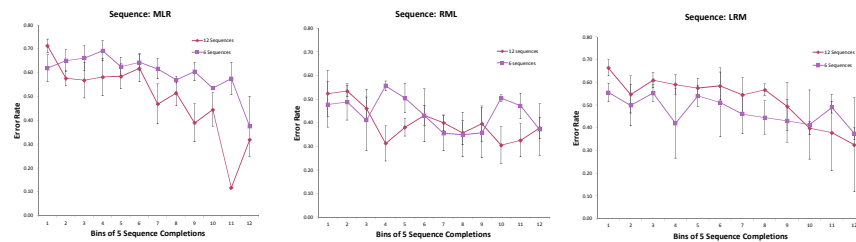
Subjects and apparatus:

- 7 Long-Evans male rats individually caged in a room with a 12:12 light/dark cycle.
- Operant chambers (Med-Associates) with three response options (pigeon keys or rodent nose poke response modules) were used for this study.
- 45-mg food pellets (Bioserve F#0021) were delivered as reinforcers.

Behavioral Training:

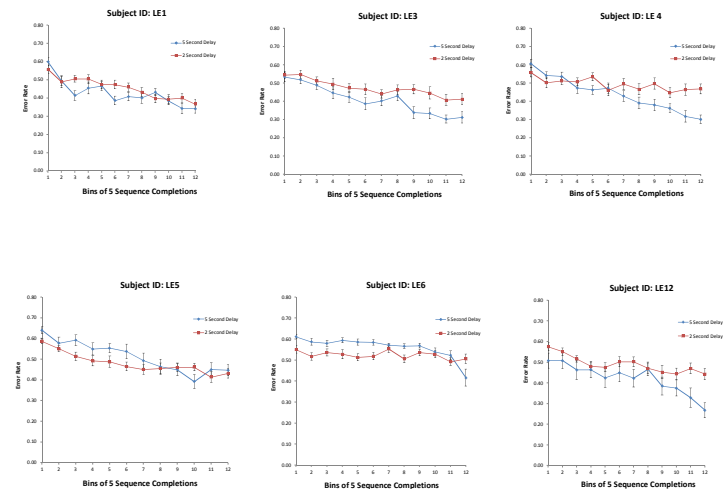
- 12 three-response sequences were used in the course of this study: **Left, middle, right (LMR)**, **LRM**, **LML**, **LRL**, **MLR**, **MRL**, **MLM**, **MRM**, **RML**, **RLM**, **RLR**, **RMR**. *The ones in bold were used in the 6-sequence condition
- The response options were backlit by different colors (yellow, green, or red). The color of the keys represented the different stages of the sequence.
- The order of the color presentation was held constant while the order of the correct responses changed daily.
- Incorrect responses resulted in 2 or 5 seconds of darkness in the chamber and did not reset the sequence.
- Reinforcers were delivered after each sequence completion.
- Sessions lasted for 60 sequence completions or 45 minutes.
- Total errors and error rates were collected for every 5 sequence completions throughout each session.

Sequence Exposure



Each point reflects the mean (+/- SE) of a single session of data; n = 4 in the 12 sequence condition and n = 3 in the 6 sequence condition.

Delay Length



Each point is a mean (+/- SE) of 28 sessions worth of data and includes all sequences the subjects were trained on. A two week adjustment period was allowed after changing the delay to 5 seconds.

Results and Conclusions

- Decreasing the number of sequences does not have a significant effect on performance on the sequences
- Increasing the delay length does decrease error rates in the last few sequence completions of the session
- Certain subjects are more sensitive to these changes than others

The delay after an error does have an effect on within-session learning curves. Longer delays decrease error rates toward the end of the session when compared to sessions with shorter delays. This may reflect an increase in cost associated with making errors. Since the subjects cannot avoid making errors early in the session while they are learning the sequence, the effects are seen later in the sessions after daily learning occurs.

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