

IMPLICIT SEQUENCE LEARNING WITH RESPONSE REMAPPING IN YOUNG AND ELDERLY ADULTS



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Goal

To assess age differences in implicit learning of a repeating first-order non-spatial auditory sequence in the absence of spatio-motor response sequencing.

Abstract

Previous research has used the Serial Reaction Time (SRT) task to investigate implicit learning of visual and auditory sequences in both young and elderly adults when the stimuli have a one-to-one mapping to responses. Theories of sequence learning suggest that people may learn contingencies among perceptual stimuli, responses, or a combination thereof. The present study examines implicit sequence learning and aging when the stimulus-to-response mapping changes on every trial to remove the ordered motor sequence from the responses. This technique was introduced by Goschke (2001) to investigate sequence learning in the absence of spatio-motor sequencing. Results indicate that for simple first-order deterministic sequences (e.g., RCRPOCOP), both young and elderly adults demonstrate significant implicit learning. Therefore motor sequencing is not necessary for sequence learning and no age differences in learning occur for first-order deterministic sequences.

Participants

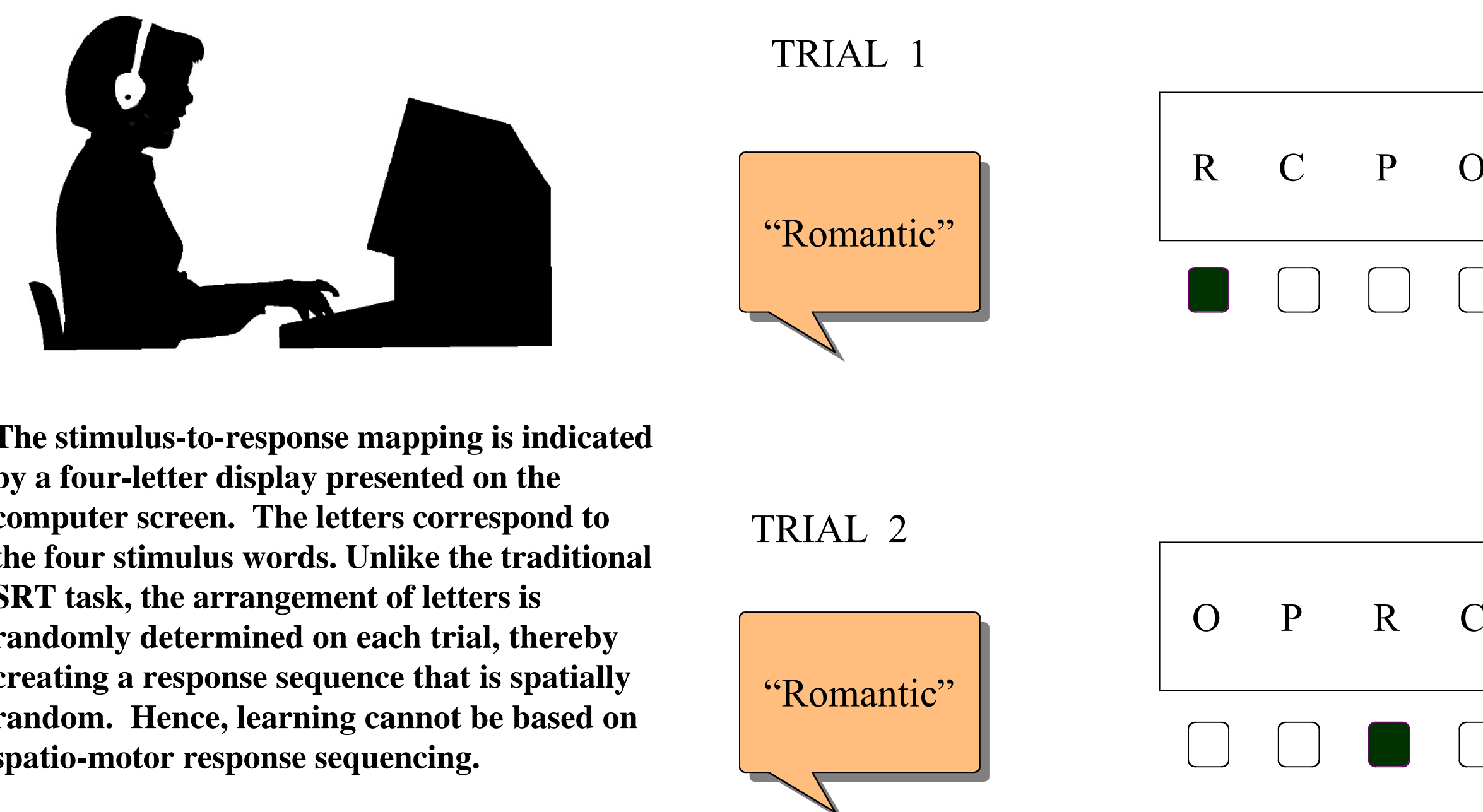
	Young	Elderly
Gender	7F / 5M	8F / 4M
Age	20.17 (1.64)	71.75 (4.33)
Self-rated Health	4.4 (0.51)	4.0 (1.13)
Education	13.42 (1.24)	14.82 (2.75)

Method

- 12* young and 12 elderly
- Each participant received one of two different first-order sequences:
 - Sequence 1: RCRPOCOP (Ss 1-6)
 - Sequence 2: CPRPCORO (Ss 7-12)
- Participants received 1 practice block of 80 structured trials
- The task consisted of 6 structured blocks followed by 1 random block (block 7), and the a return to a structured block (block 8)
- Free generation and recognition tasks were given to assess sequence knowledge and explicit learning.
- Participants were interviewed to assess declarative knowledge

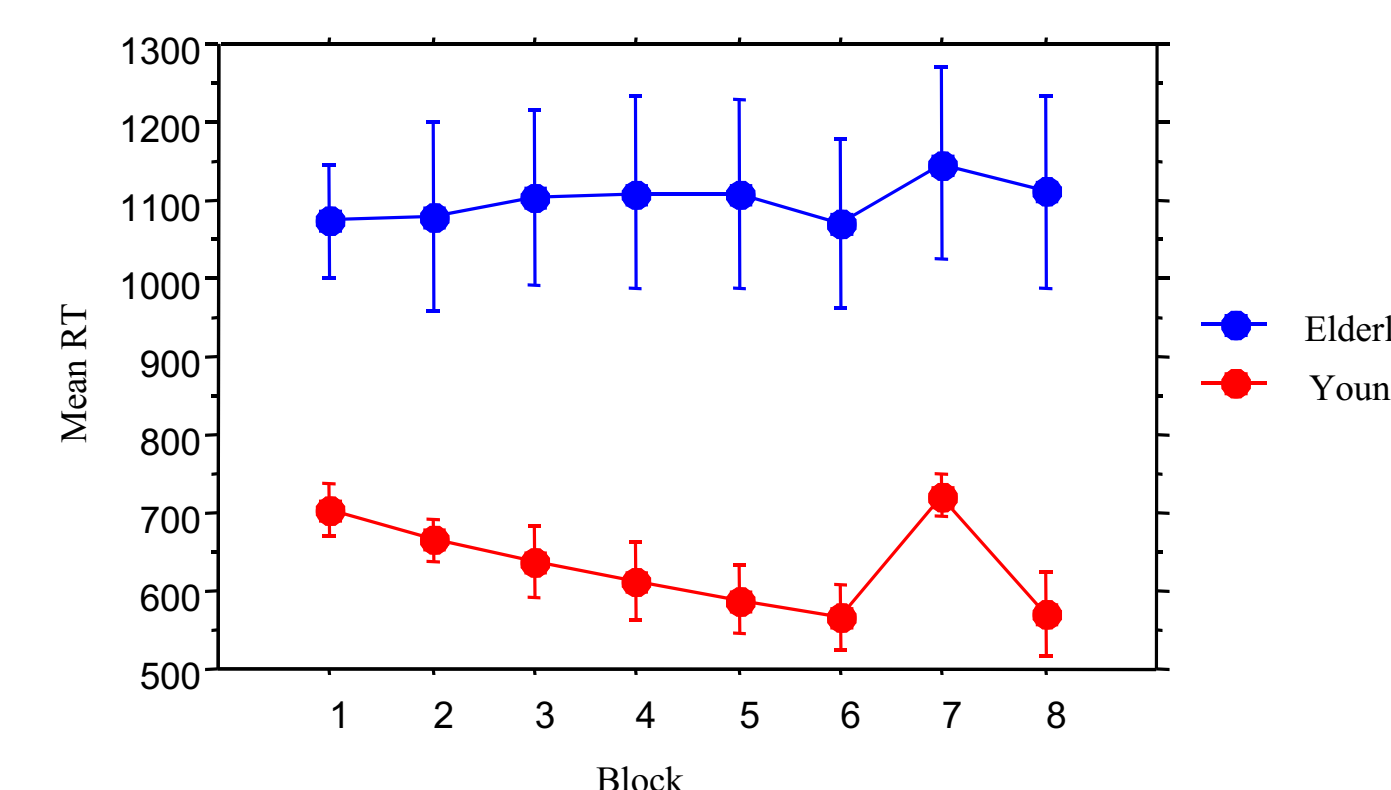
* Two young adults gained full declarative knowledge of the sequential structure. Their data are not included in analyses.

Auditory SRT Task with Response Remapping

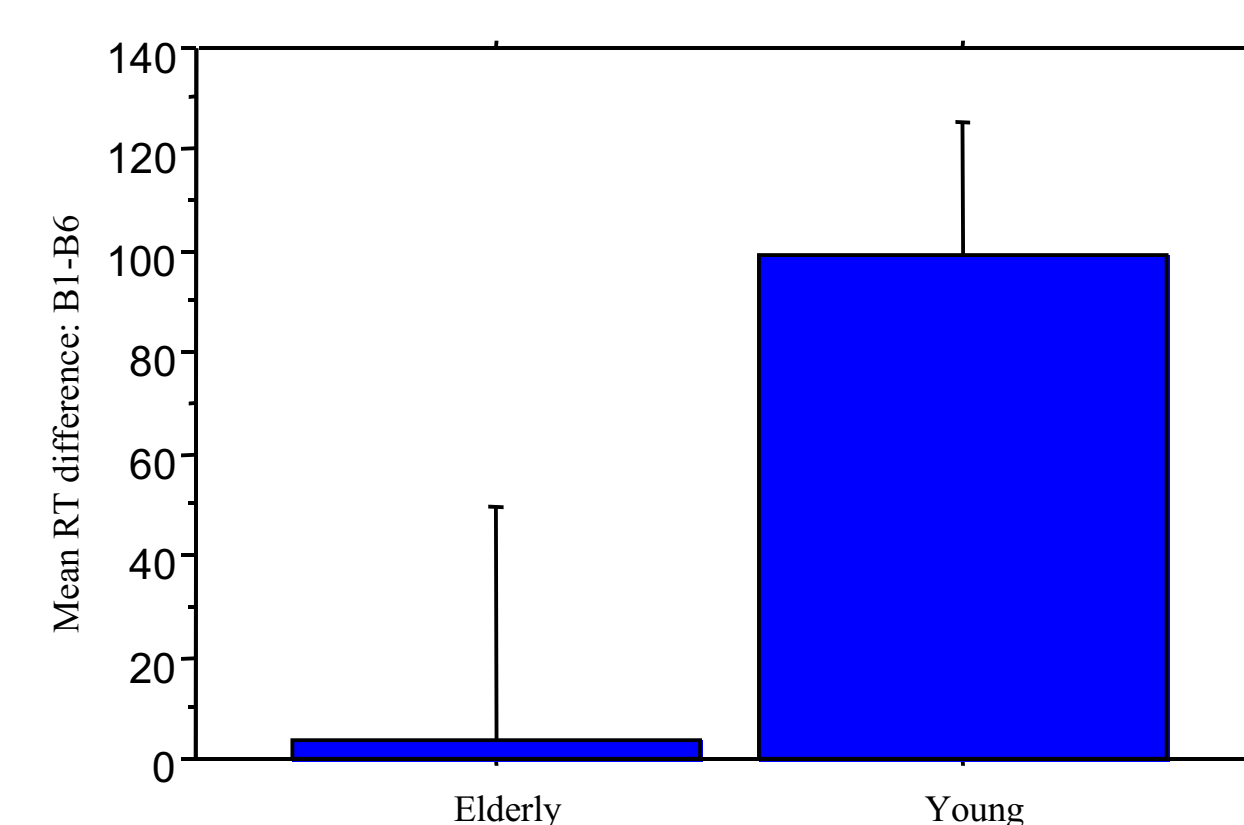


The stimulus-to-response mapping is indicated by a four-letter display presented on the computer screen. The letters correspond to the four stimulus words. Unlike the traditional SRT task, the arrangement of letters is randomly determined on each trial, thereby creating a response sequence that is spatially random. Hence, learning cannot be based on spatio-motor response sequencing.

Are there age differences?



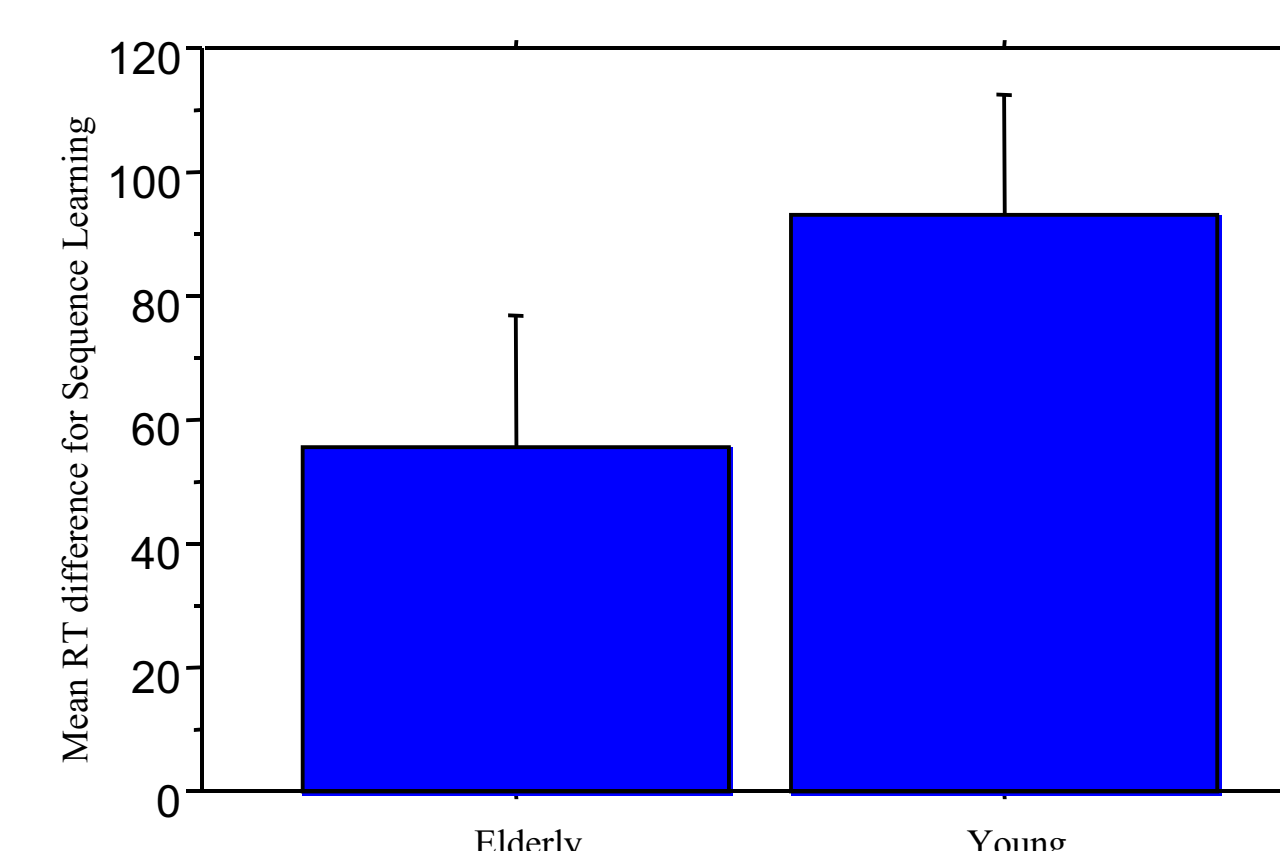
In non-specific skill learning?



•Young demonstrate significant improvement in RT over the first six sessions

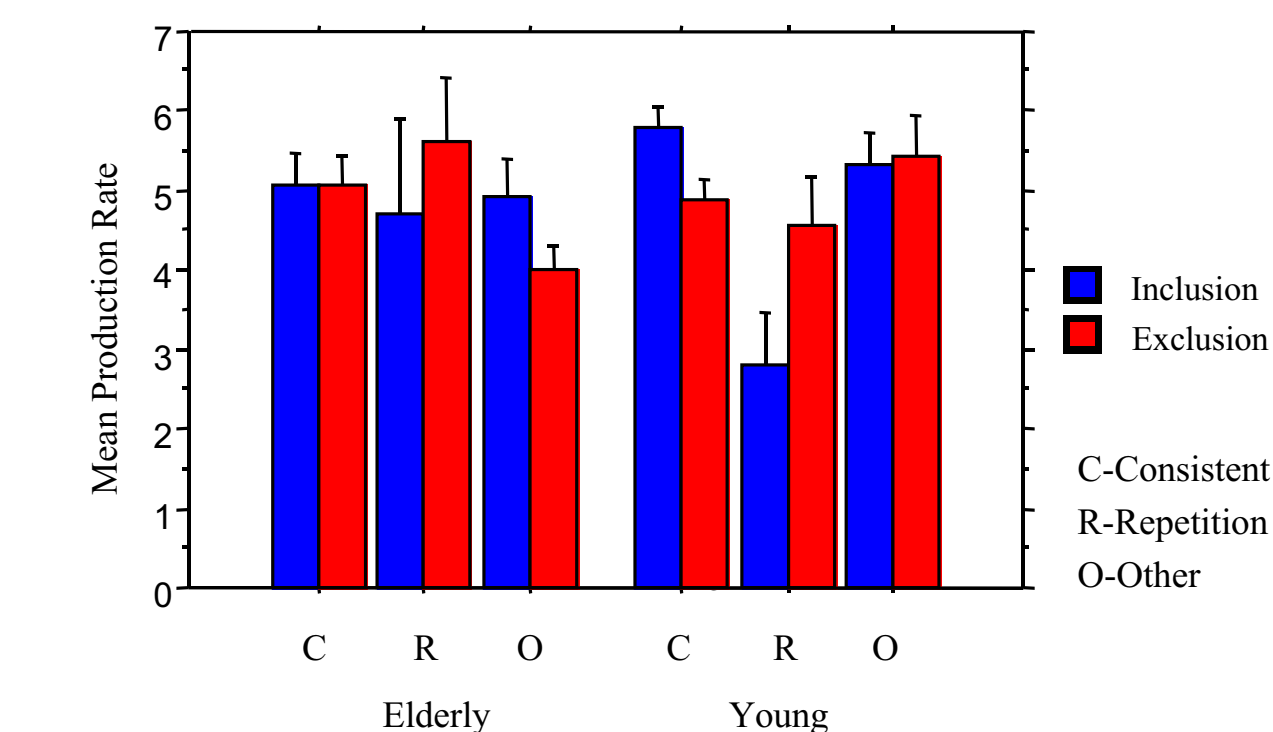
•Elderly do not

In sequence learning?



•Both young and elderly demonstrate significant sequence learning

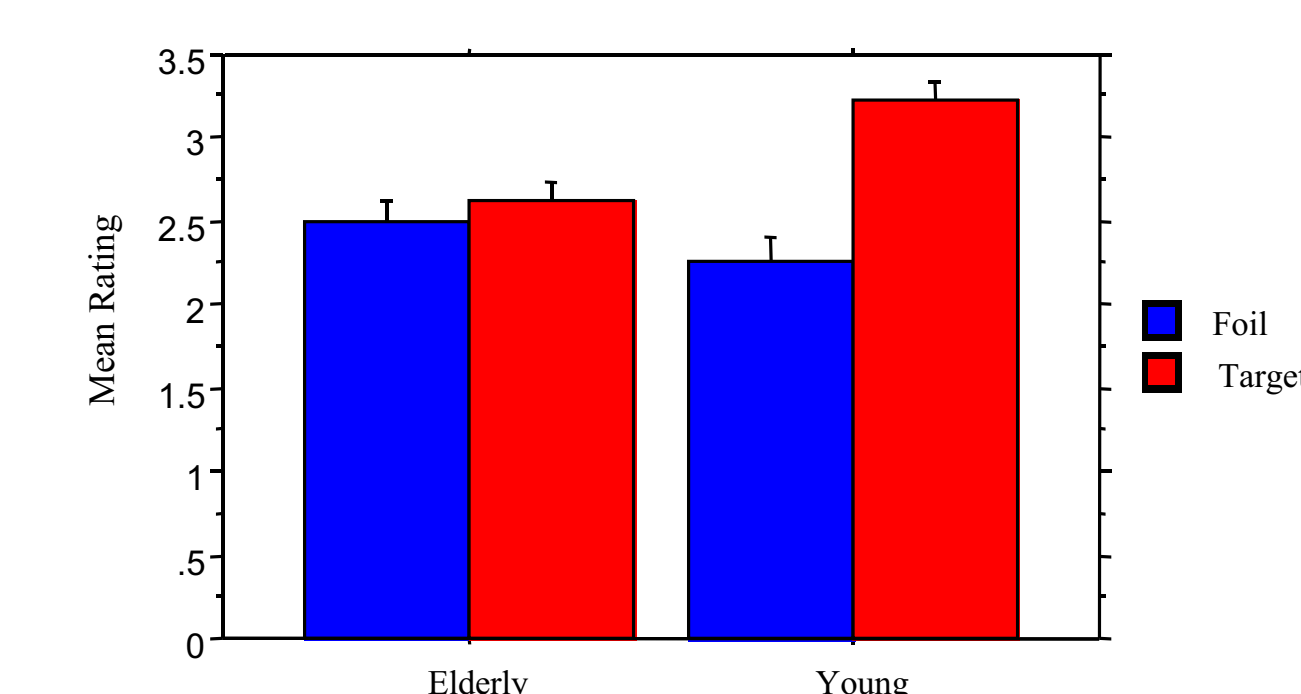
Age differences in generation?



•Young adults exhibit control over their sequence knowledge under exclusion instructions

•Old adults do not

Age differences in recognition?



•Young adults exhibit significant recognition

•Old adults do not

Conclusions

•Healthy elderly exhibit significant age deficits in general practice effects in implicit sequence learning with response remapping.

•Both young and elderly are able to learn a first order sequence in the absence of sequential motor responding.

•Young show evidence of explicit knowledge in generation and recognition whereas elderly do not.

References

Goschke, T., A. D. Friederici, et al. (2001). "Procedural learning in Broca's aphasia: dissociation between the implicit acquisition of spatio-motor and phoneme sequences." *Journal of Cognitive Neuroscience* 13(3): 370-88.

Society For Neuroscience Conference, Orlando, FL,
 November 1-6, 2002
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Supported by NIA Grant R37 AG15450