

Does Degrading Visual Displays Mimic Age-Related Implicit Sequence Learning Deficits?

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Abstract

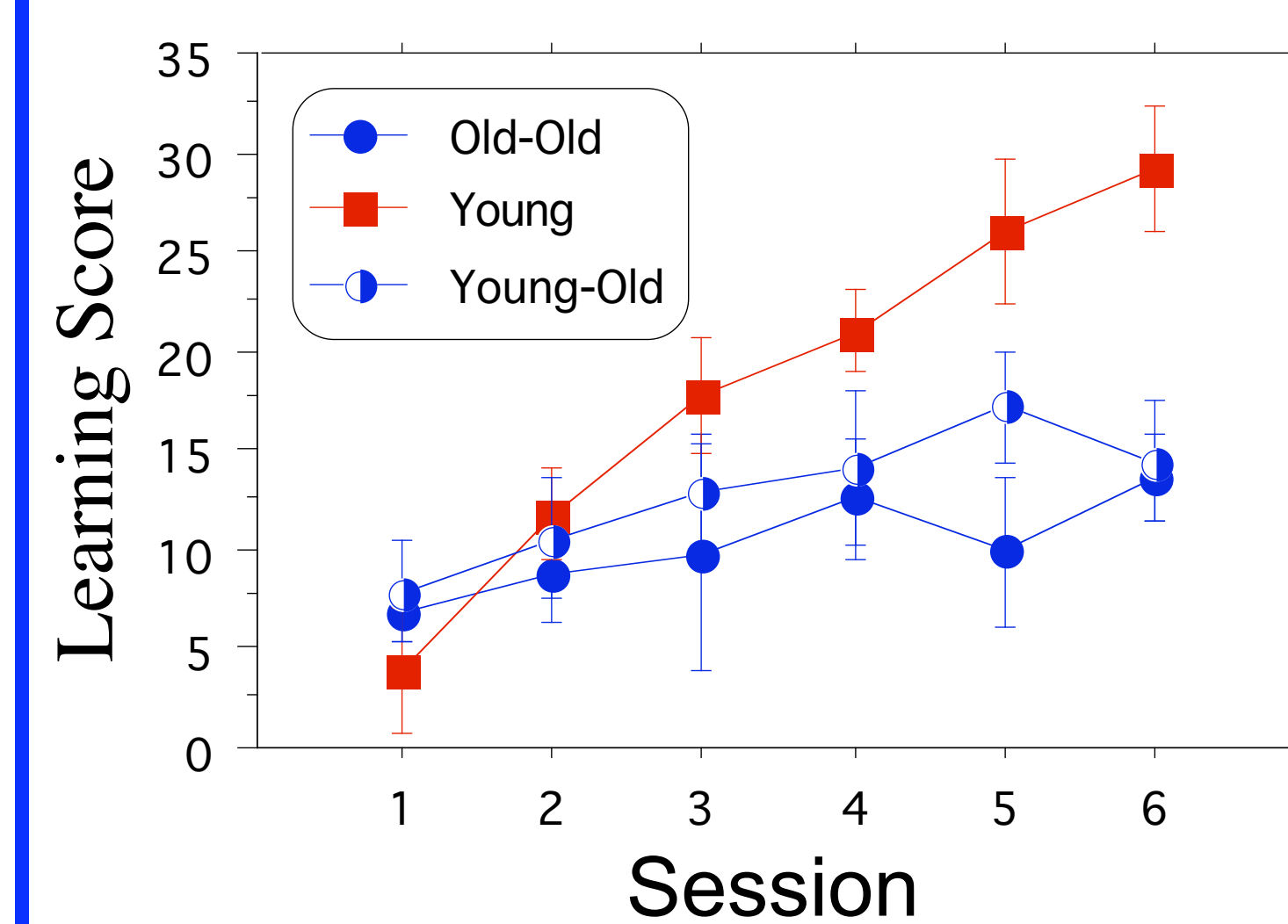
Sequential behavior underlies many daily activities such as language comprehension and social interaction. Since its introduction by Nissen & Bullemer in 1987, the serial reaction time (SRT) task has become the laboratory benchmark for investigating implicit sequence learning. Although initial studies using simple sequences suggested that learning in this task is preserved in healthy aging, recent work with more complex sequences has found age-related deficits. In the present experiment we investigate the possibility that age deficits arise from slower and more variable responses caused by perceptual impairments. To mimic the perceptual impairments associated with normal aging, young adults performed six sessions on an alternating version of the SRT task (ASRT) with degraded visual stimuli. Learning in this perceptual degradation condition was compared with results from previous studies in which both older and young adults learned the same subtle sequential regularities, but with non-degraded stimuli. Results reveal performance deficits for the young people under perceptual degradation that are similar to those found for older adults with non-degraded stimuli. However, a detailed analysis suggests that stimulus degradation impairs performance early in training, rather than impairing learning itself. Nevertheless, this raises the possibility that the age deficits previously observed are influenced by age-related perceptual-motor processing impairments, and/or associated cognitive slowing.

Background

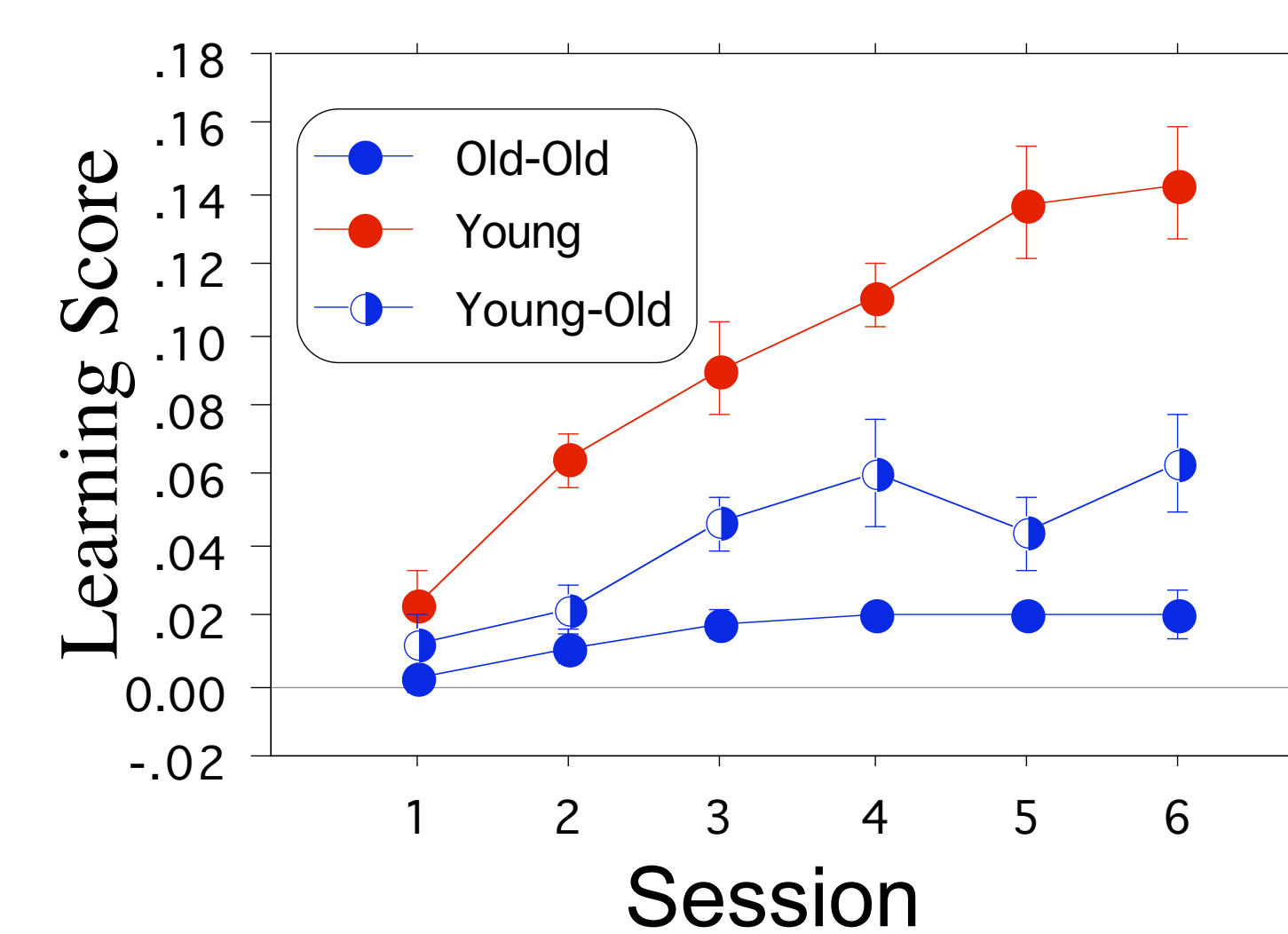
- Older adults show implicit learning of higher-order sequences, but age-related impairments in implicit learning occur.

Howard *et al* (1997). *Psychology and Aging*. 12(4), 634 - 656.

Reaction Time Difference Score



Accuracy Difference Score

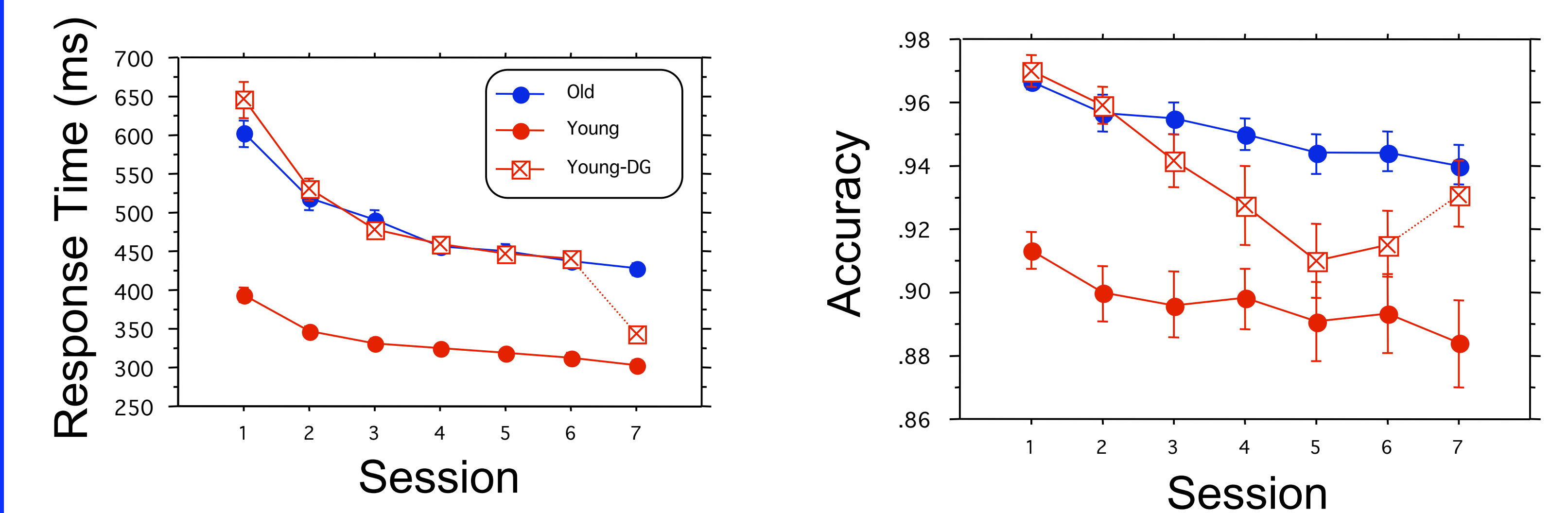


Questions:

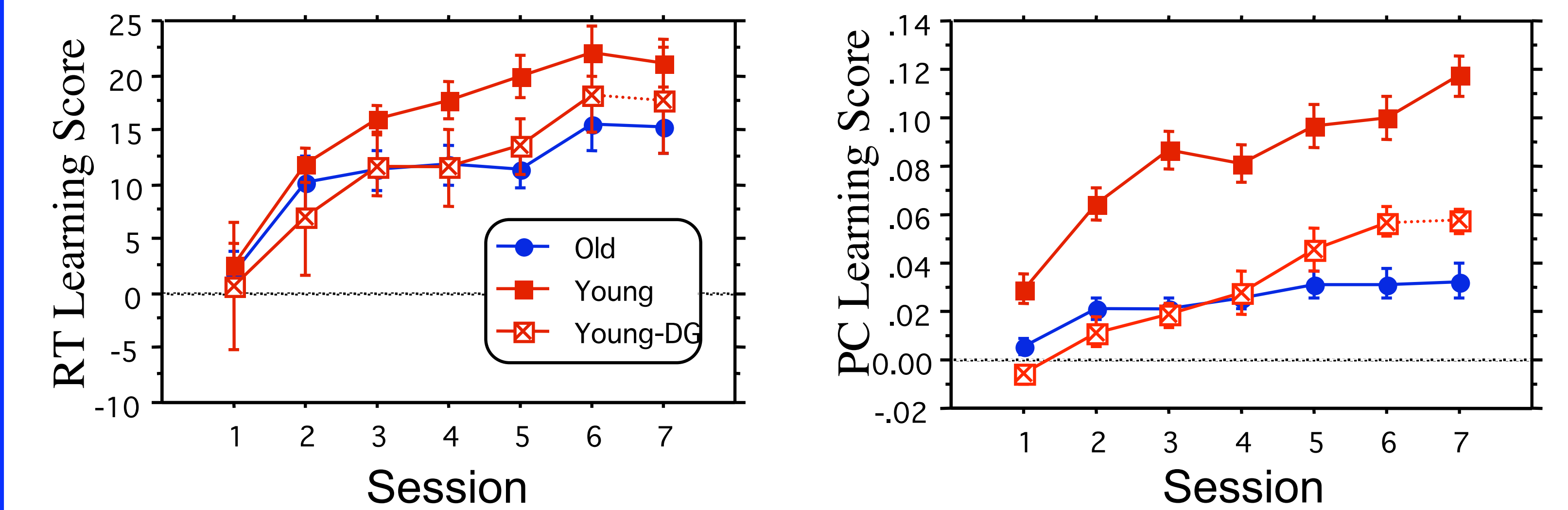
- Does slower responding contribute to this difference in learning?
- Do these reflect performance rather than learning deficits?

Results

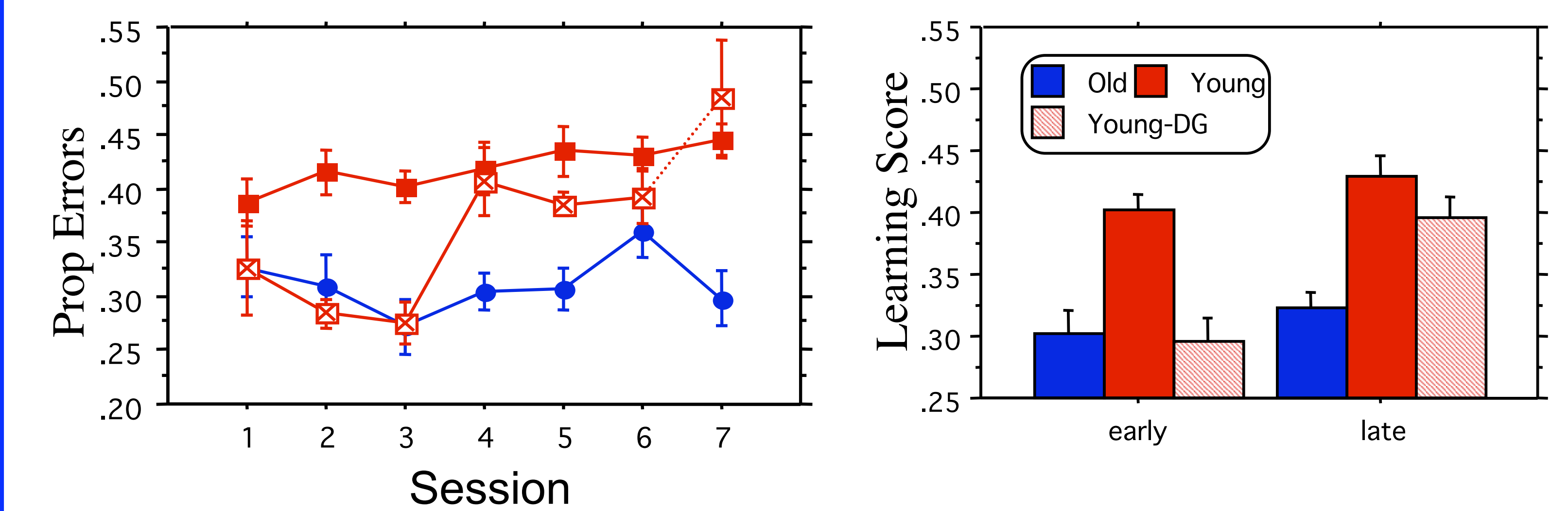
Degrading stimuli slowed young to match older adult response time.



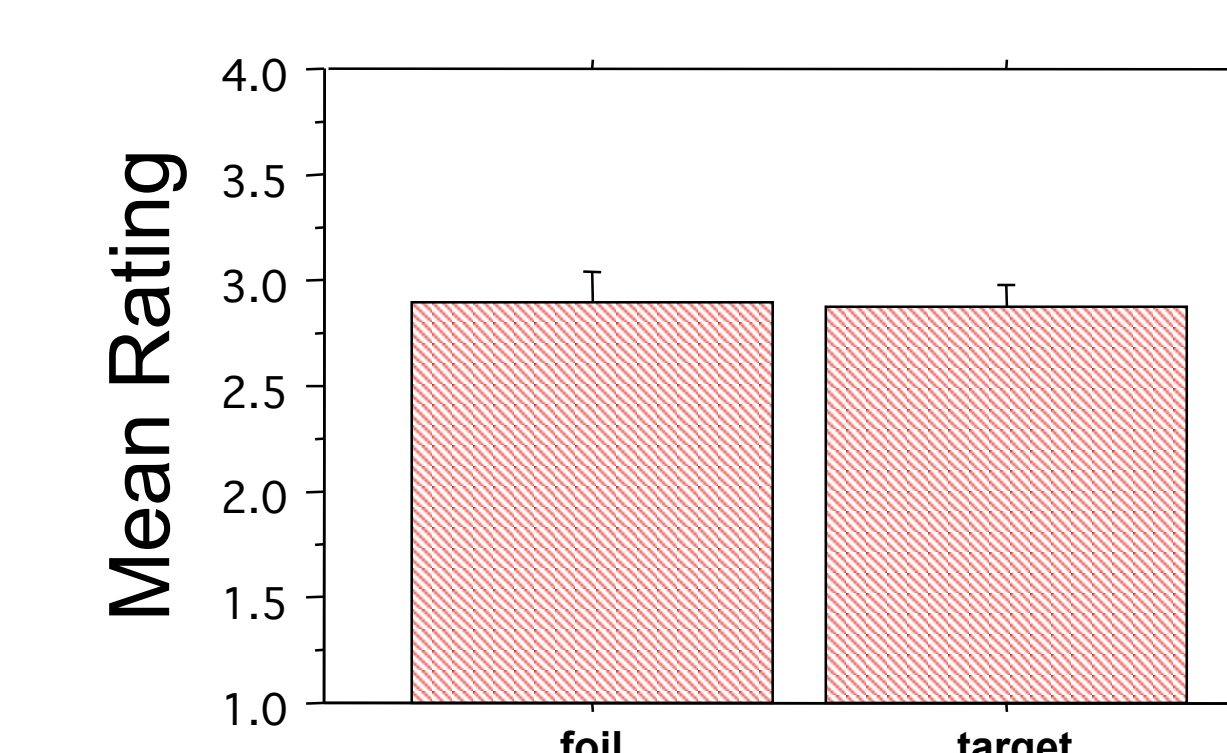
Young participants with degraded stimuli show reduced learning that is similar to that seen in older adults especially in early sessions.



Proportion of errors that are pattern consistent also show old-like learning in early sessions, but not in late sessions.



There is no evidence of explicit knowledge in either recognition (below) or post-experimental interviews.



Participants

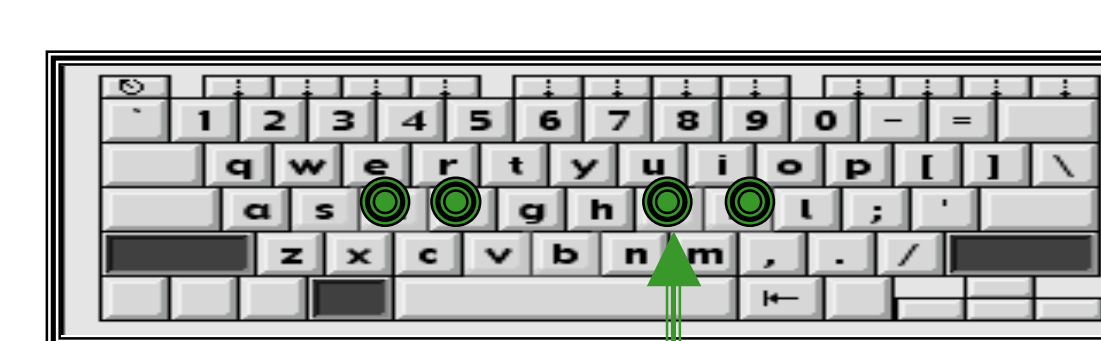
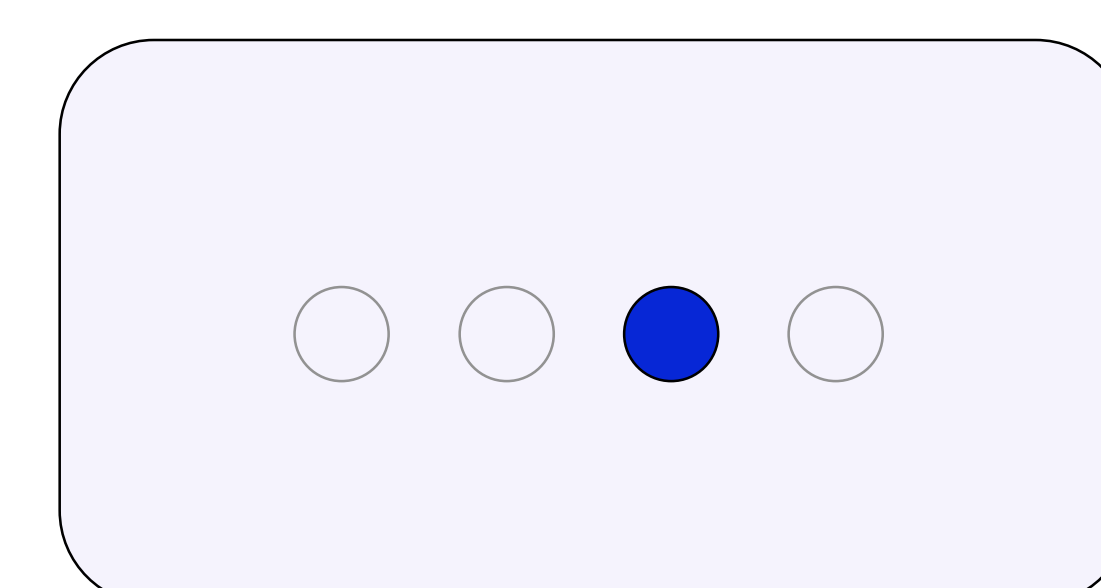
| | Group | Mean Age | Education |
|---------------------|----------------|----------|-----------|
| New Data | Young-degraded | 20.7 | 14.6 |
| Howard et al (2004) | Young | 19.8 | 13.9 |
| | Old | 71.0 | 16.7 |

Interpretation and Conclusions

- Perceptually-degraded stimuli slowed young to RT level of older adults
- Degradation effect mimics age deficits in early, but not late learning
- Degradation influences learning not only performance
- Suggests slow responding contributes to age-related learning deficits, but cannot account for all age deficits

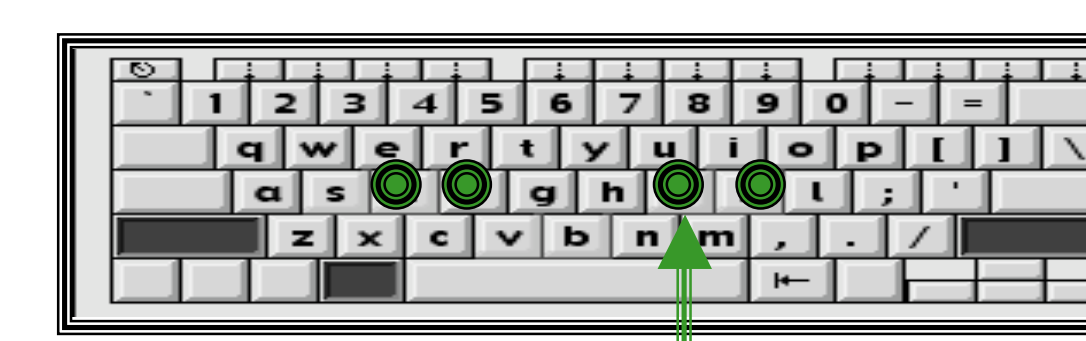
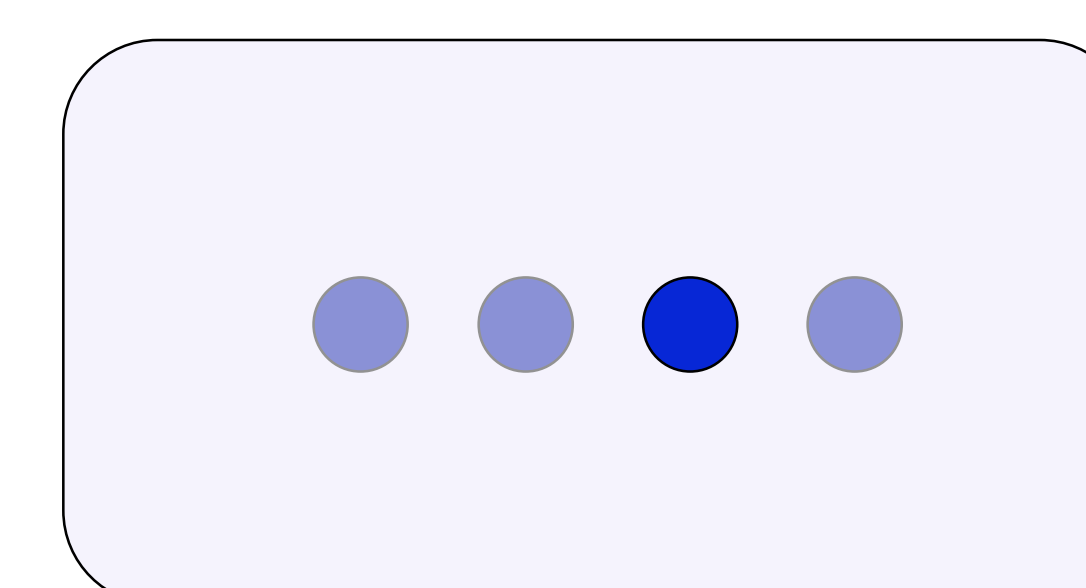
Method

- Repeating sequence (e.g. 1r2r3r4r...)
 - pattern events alternate with random events
 - learning measure: differences between pattern & random events
- Session 1-6: 21 blocks each (degraded)
- Session 7: 21 blocks (non-degraded)
- 90 trials per block
 - 10 random
 - 80 alternating
 - respond with corresponding key
- Test for explicit knowledge
 - recognition test with backward foils
 - post-experimental interview



Response

Standard Stimuli



Response

Degraded Stimuli

Gerontological Society of America, Washington, DC, 11.22.2004

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