



Decision making in older adults: The influence of learning on a cued prediction task

Kendra L. Seaman¹, Alissa Forman-Alberti¹, Darlene V. Howard² & James H. Howard, Jr.^{1,2,3}

Department of Psychology, The Catholic University of America¹; Department of Psychology, Georgetown University²; Department of Neurology, Georgetown University³



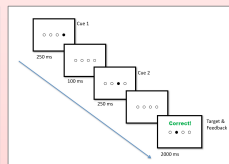
Background

- Older adults are increasingly asked to make critical decisions regarding housing, personal finance and health care, emphasizing the importance of understanding how decision making changes with age.
- Mixed results in research on decision making in older adults
 - Some studies report no age-related differences.^{1,2}
 - Other studies report a subset of older adults who perform significantly below young adults.^{3,4}
- Age-related differences in decision making could be due to differences in learning and strategy.^{2,5}
- In this study we sought to examine age-related differences in the influence of learning and strategy on decision making in a cued prediction task.

Methods

Participants

Measure	Young Adults	Older Adults
N	14	10
Gender*	10 females, 4 males	7 females, 3 males
Age (in years)	19.34 (1.82)	67.90 (7.25)
Self-rated Health*	4.57 (0.65)	4.10 (0.99)
WAIS digit coding	90.57 (10.80)	66.90 (12.06)
NAART vocabulary*	15.50 (8.09)	8.80 (5.12)
WMS-III digit span forward*	10.71 (1.73)	11.00 (2.16)
WMS-III digit span backward*	6.50 (1.63)	8.10 (1.91)



Triplets Prediction Task⁶

- Participants saw two successive visual cues.
- Participants predicted the spatial location of a target with a key press.
- Feedback was given at the end of each trial with both the accuracy of the prediction and the correct spatial location of the target event.
- There were 6 sessions, with 4 blocks per session and 70 trials per block, for a total of 1680 trials.

Accuracy

- For each trial, we coded the response as accurate if the person predicted the high probability target for that cue pair.
- Higher accuracy reflects better learning of cue-target relationships.

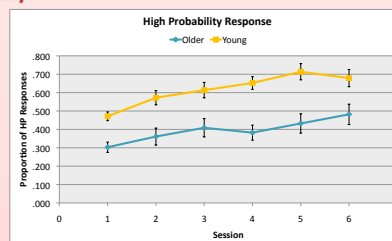
Stay Score (S-Score)⁶

- First, trials were grouped based on the cue(s) presented.
- Then, trials were grouped based on the response on the next trial with the same cue(s).
 - Stay was defined as making the same response.
 - Shift was defined as making a different response.
- Stay Score = Stay/Shift
- Higher stay scores reflect an exploitative strategy.

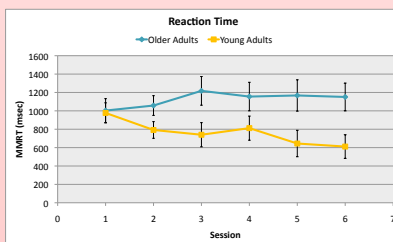
Results

Accuracy

- Participants in both age groups demonstrating learning of cue-target relationships
 - $F(2.45, 53.99) = 23.10, p < .001$
- Young adults had significantly higher accuracy throughout the task.
 - $F(1,22) = 16.71, p < .001$



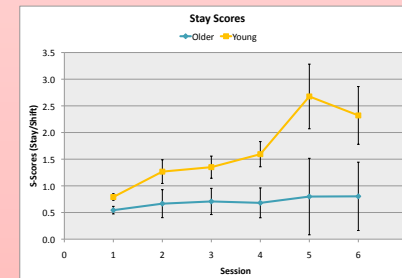
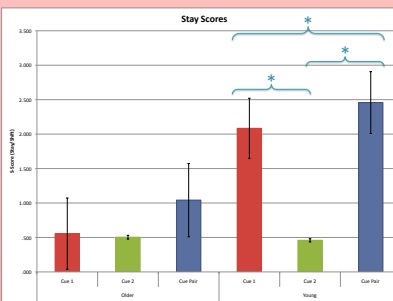
Reaction Time



- Young adults showed a decrease in reaction time across sessions, demonstrating skill learning, while older adults showed no change in reaction time during the task.
 - $F(2.70, 59.47) = 5.447, p = .003$

Decision Making

- There was a significant increase in S-Scores over session, suggesting an increase in exploitative decision making strategy.
 - $F(1.31, 28.90) = 4.33, p = .037$
- Young adults were more likely to use an exploitative strategy compared to older adults
 - $F(1,22) = 4.59, p = .043$
- Visual inspection suggests that the increase in S-Scores is driven by a change in strategy for young adults.



- Subjects were more likely to use the Cue Pair to make predictions than either cue alone
 - $F(1.10, 24.30) = 9.97, p = .003$
- Young adults were more likely to differentiate between Cue 1, Cue 2, and the Cue Pair than older adults
 - $F(1.10, 24.30) = 4.61, p = .039$

Discussion

- Both young and older adults demonstrate learning of the cue-target relationships, but young adults were better at predicting the high probability response.
- Strategy analyses suggest that young adults are better able to differentiate between cues than older adults.
- These findings provide additional support for the assertion that age-related differences in decision making are due to differences in learning and strategy.
- Our task differs from traditional decision making tasks in that the optimal choice depends on the context.
- Recent studies have implicated lateral prefrontal regions in linking context and decision making.^{7,8}
- These results could be interpreted as support for the frontal hypothesis of aging, which suggests that older adults are impaired on tasks engaging the frontal cortex.⁹
- In contrast, recent work shows older adults demonstrate superior performance to that of young adults on state-dependent decision making tasks.^{10,11}
- The authors suggest this could be due to compensatory activation of the prefrontal cortex.^{10,11}
- Our results suggest the superior performance of older adults in these tasks could be due to other factors like task structure.⁵

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