



AGE-RELATED LEARNING DEFICITS IN AN IMPLICIT SEQUENCE LEARNING TRANSFER TASK

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Background

This study explored the transfer of implicit sequence learning across different higher-order regularities in younger and older adults using the Alternating Serial Reaction Time (ASRT) task. In this task, participants respond to visual stimuli that follow a repeating spatial pattern, but with random locations occurring on alternate trials (Howard & Howard, 1997). Evidence of learning is observed through performance differences in reaction times and accuracy between predictable events and unpredictable (random) events (the trial-type effect). Learning is implicit in that participants are unable to describe or recreate the sequence regularity.

Older adults display deficits in higher-order probabilistic sequence learning tasks such as the ASRT compared to younger adults (Howard & Howard, 1997). LeBlanc (2007) found that prior learning of both structured and random sequences interfered with learning a new sequence regularity in the ASRT task with young adults. This study investigates (1) if there are age differences in implicit learning when transferring to a new sequence structure and (2) if implicit knowledge of the original sequence structure is retained following transfer by either young or older adults.

Young and old adults were tested in a 3-session ASRT experiment. A total of 18 younger adults (ages 18 – 26) and 13 older adults (ages 68 - 85) were tested over 3 days, each receiving the same sequence structure on day 1 and day 3 with a different pattern sequence administered on day 2. It was hypothesized that both groups would demonstrate reduced implicit learning with the introduction of a new sequence pattern but the younger group would retain the knowledge of the original sequence structure across days better than older adults.

References:
 Howard, J. H., Jr., & Howard, D. V. (1997). Age differences in implicit learning of higher order dependencies in serial patterns. *Psychology and Aging*, 12, 634-656.
 LeBlanc, N. (2007). *Transfer effects in implicit sequence learning*. Unpublished master's thesis, The Catholic University of America, Washington, DC.

Participants

(Means and Standard Deviations)

	Old ^a	Young ^b
Gender	7F/4M	6F/10M
Age	74.87 (4.94)	19.13 (2.00)
Education (in years)*	16.82 (3.28)	12.25 (.58)
Digit Span Fwd	9.73 (2.41)	10.25 (2.14)
Digit Span Bwd	7.45 (2.84)	6.69 (2.18)
WAIS-III Vocabulary	47.60 (10.55)	44.31 (5.99)
WJ-III Word Attack	25.09 (7.04)	27.31 (2.96)
WJ-III Letter Word ID	70.91 (7.01)	69.44 (2.73)

^a Two older participants were omitted (incomplete testing and outlier).
^b Two younger participants were omitted after receiving incorrect pattern combinations.
 * $p < .05$, two-tailed.

Conclusions

Common Group Features:

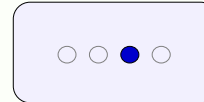
- Displayed general skill learning.
- Showed sequence-specific learning.
- Previously learned sequence structure did not interfere with learning a new sequence structure on Day 2.
- Displayed sensitivity to within-day sequence structure.

Performance Differences:

- Younger adults demonstrated sensitivity to both sequences (H1 & H2) on Day 3 whereas the older group did not (H1 only).
- Young adults showed greater sensitivity than older adults to the global sequence structure across the three days.

Alternating Serial Reaction Time Task

- Pattern trials alternate with Random trials
- Example sequence: 1r3r4r2r (Day 1 & 3)
 - Reverse sequence: 2r4r3r1r (Day 2)



- Learning Measures (Trial-type effect):
- Faster response to high vs. low frequency trials
 - Higher accuracy for high vs. low frequency trials

- High frequency trials (or triplets) have a high probability of occurring in the pattern sequence.^c
- High frequency triplet (H1) for Day 1 & 3 would be: 1x3, 3x4, etc.
 - H2 for Day 2 would be: 3x1, 4x3, etc.



^c Excludes repetitions (e.g., 111, 333, etc.) and trills (e.g., 121, 131, etc.).

Method

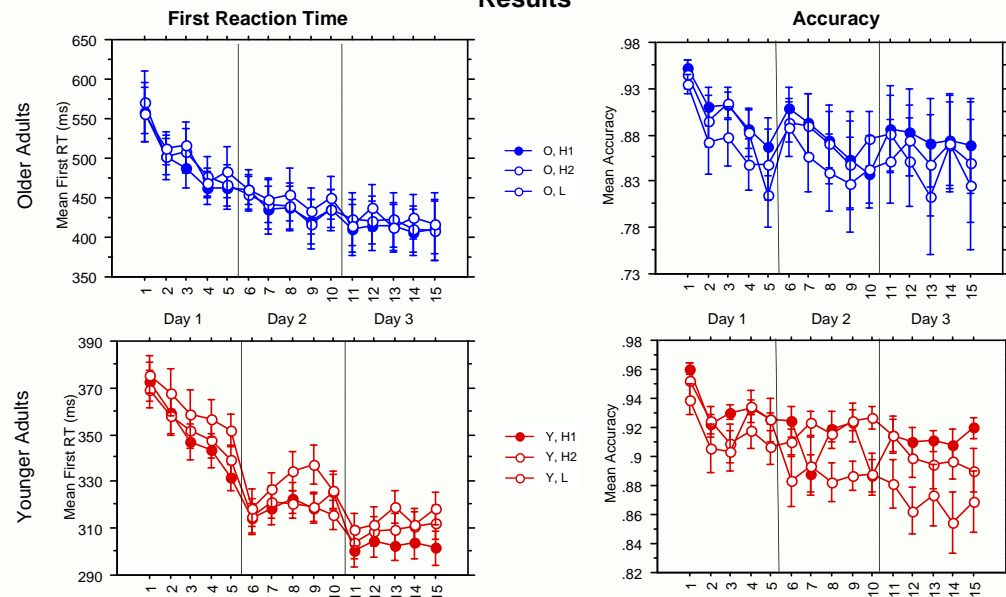
ASRT task

- 2nd order, 4 element ASRT task
- Each Day: 5 epochs (4 blocks per epoch)
- 1 block: 80 trials (10 cycles of 8 events).

Procedure

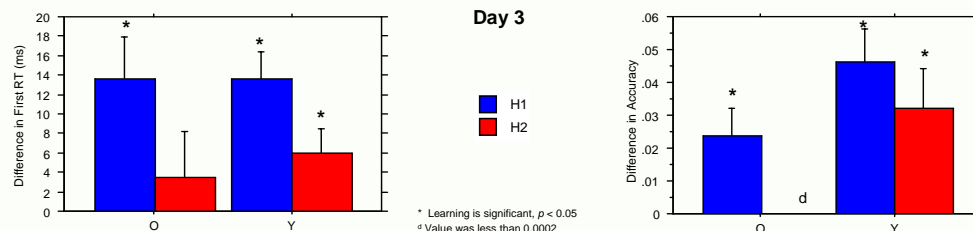
- 3 days of ASRT
 - Sequence pattern 1 (H1): Day 1 & Day 3
 - Sequence pattern 2 (H2): Day 2
- 2 groups: Young, Old

Results



Sequence Sensitivity on RT or Percent Correct

	Day 1	Day 2	Day 3
Old			
Seq 1	+	+	+
Seq 2	-	+	-
Young			
Seq 1	+	+	+
Seq 2	+	+	+



* Learning is significant, $p < 0.05$
^d Value was less than 0.0002