AGE-RELATED DIFFERENCES IN IMPLICIT LEARNING OF SHORT HIGHER-ORDER SEQUENTIAL PATTERNS

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Abstract

The goals were to investigate whether there are age deficits in learning short, subtle regularities, and whether such learning occurs without people's ability to develop declarative knowledge about the pattern. We tested 24 young and 24 older adults on a variation of an Alternating Serial Reaction Time (ASRT) task, in which a 3-item pattern alternated with random trials (e.g., 1r2r3r). We wanted to find out whether age deficits documented in earlier studies using 4-item alternating sequences (e.g., 1r2r3r4r) extend to shorter patterns that have fewer items and a smaller number of triplets to be learned, and yet the same lag-2 structure. Learning was measured by the difference in performance between predictable and unpredictable trials (trial-type effect) on response time and accuracy. Explicit knowledge was probed by post-experimental interview, card sorting, production, and recognition. We found that older people showed significantly less learning of these sequences compared to young people, particularly on accuracy. Further, all probes of declarative knowledge indicated that for both age groups, the trial type effect occurred without awareness about the pattern, suggesting that the learning was implicit. These findings indicate that older people have difficulty learning subtle and complex sequential patterns. This suggests that it is the lag-2 structure, rather than the number of triplets to be learned, which causes the age deficit, consistent with context processing and simultaneity theories of aging.

Goals

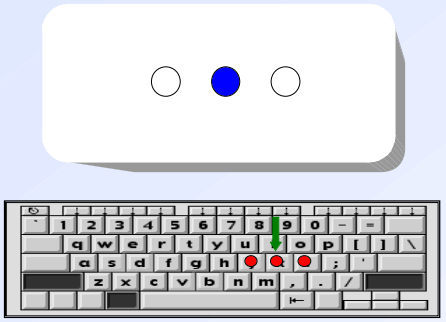
- To determine whether people show implicit learning of short but higher-order regularities.
- To determine whether there are age-related differences in learning short but higher-order regularities
- To determine whether such learning occurs in the absence of declarative knowledge about the pattern.

Participants

	Young	Elderly
Gender	15F, 9M	15F, 9M
Age	19.4 (1.1)	70.4 (4.8)
Education	13.4 (1.1)	16.2 (2.2)
Self-rated health	4.6 (0.6)	4.6 (0.6)

Note: Standard deviations in parentheses

Serial Reaction Time Task



Procedure

- 3-element ASRT Task
- Pattern trials alternate with Random trials **(e.g., 1-r-2-r-3-r)**
- 1 block = 70 trials (6-item sequence repeated 10 times; 10 warm-up trials)
- 4 epochs; 1 epoch = 5 blocks (20 blocks)

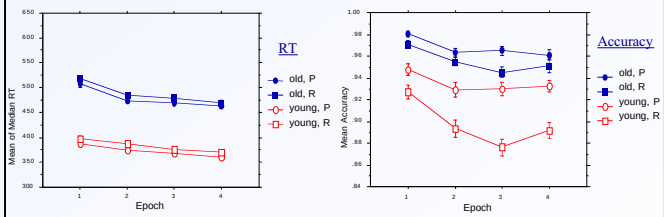
Measure of learning:

Trial-Type Effect: difference in performance between pattern and random trials on RT and accuracy measures.

Explicit measures: Verbal reports, Card Sorting task, and Recognition task.

Results #1:

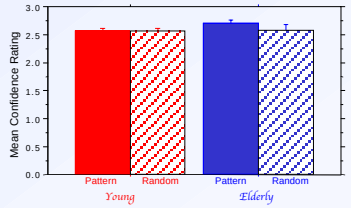
Age-Related Deficits in Pattern Learning



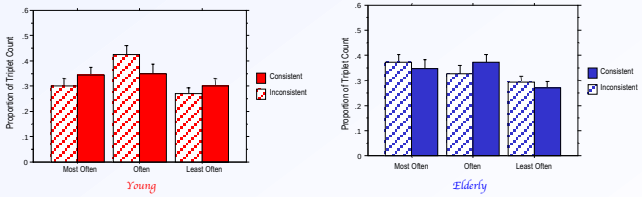
Results #2:

Pattern Learning Occurred Without Awareness

Recognition Task



Card Sorting Task



Conclusions

- The learning was implicit in that no one was able to describe the pattern accurately or discriminate between pattern and random trials
- There were age deficits in learning the short but higher-order patterns.
- These findings implicate a general deficit in learning higher-order regularities, and suggest the roles of working memory and prefrontal cortex in learning such regularities.

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