

AGING AND IMPLICIT LEARNING OF A SIMPLE REGULARITY: EVIDENCE FOR LEARNING INDEPENDENT OF STIMULUS CHARACTERISTICS



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Goal

To determine whether implicit learning of a simple positional regularity is spared in normal aging and whether such learning is independent of perceptual characteristics of the stimuli.

Abstract

Although explicit learning declines in healthy aging, the extent to which implicit learning does so is unclear. Studies of perceptual/motor sequence learning suggest that age deficits in implicit learning occur when the regularity to be learned is structurally complex, hence calling on greater processing demands, but not when the regularity is simple (e.g., Curran, 1997; Howard & Howard, 1997, Howard & Howard, 2001). Here we use a task developed by Frick & Lee (1995) to examine the implicit learning of a simple positional regularity, i.e., that the same letter always occurred in the second position of studied lists. In the Frick & Lee study, young adults first attempted to recall letter strings, each of which contained the regularity (study phase). Later (discrimination phase), they were able to discriminate strings containing this regularity from those that didn't, even though they were unable to report the nature of the regularity. Our earlier research (Howard, LaVine, Dennis, & Howard, 2001) indicated that young and elderly learn this regularity equally well in the absence of explicit knowledge. The current study extended these findings by giving young and elderly participants lower-case strings during the study phase, and upper-case during the discrimination phase. Young and elderly participants showed equivalent and above-chance (50%) discrimination performance (mean of 65% correct for both ages). We conclude that this form of implicit learning is not tied to the perceptual characteristics of the stimuli and remains intact in healthy aging.

Method

Study Phase Participants were told that the experiment was a test of immediate memory. They were shown one seven-letter-long string at a time on a computer screen and were asked to recall it immediately following its disappearance. There were 24 trials in this phase.

Discrimination Phase This occurred immediately after the study phase. On each of 20 discrimination trials, people were shown two seven-item-long letter strings, side-by-side on the computer screen. They were asked to choose the letter string "which looks more familiar".

Assessment of declarative knowledge Participants were then asked three questions.

(1) "Can you describe any particular reason for choosing one of the letter strings over the other? If so, please explain that reason. Even if you are unsure, please make a guess."

(2) "You may have noticed that there was a pattern among all of the string sets which you were asked to recall. Do you have any idea what the pattern was? Even if you are unsure, please make a guess."

(3) "In fact, the pattern consisted of one letter always occurring in a certain position in the list. Can you make a guess as to what the letter was and in what position?"

Participants

	Young	Elderly
Gender	4M / 8F **	8M / 4F **
Age* (years)	19.87 (1.62)	71.50 (5.27)
Education*	13.08 (1.88)	15.75 (2.18)
Comp Span*	49.58 (50.36)	10.83 (15.14)
WAIS-R Vocabulary	29.42 (7.48)	39.83 (11.61)
Logical Memory I	43.67 (13.67)	34.17 (9.26)
MMSE	29.67 (.65)	29.08 (1.73)

*p < 0.05

** Two Young and 5 Elderly gained declarative knowledge of the regularity, as assessed by correctly answering the third post-experimental question.

Exclusion of these individuals from analyses did not change the significance of the results

Letter Strings

Study Phase

"Recall each string. . ."

xhcrjvc

thyvxcn

A total of 24 letter strings were created. Each was 7 consonants long with no consonants repeating within a string. The strings were the same for all participants, with the exception of the critical second letter. Each of the following 6 critical letters was used for 2 participants of each age: H, K, M, W, F, & D. This same critical letter occurred as the second letter in all 24 strings for a given person. For example, the strings above are the first two seen by a participant whose critical letter was H.

Discrimination Phase

"Choose the letter string that looks more familiar. . ."

QH**B**VCNX

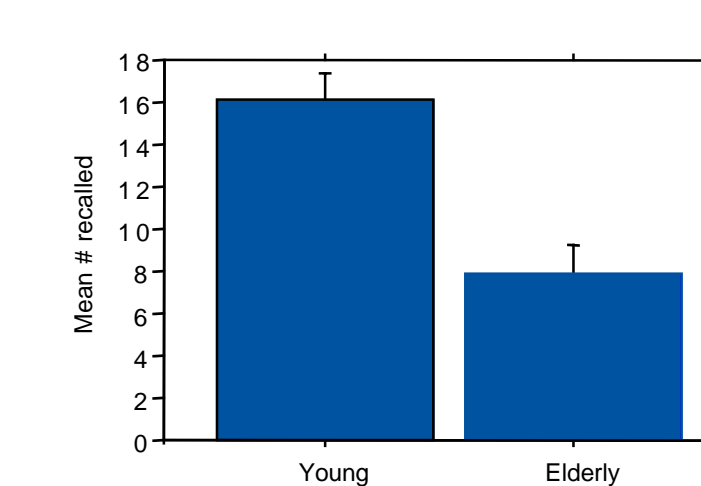
CN**Q**VXBH

Neither of the strings in a discrimination pair had been seen previously. Both strings contained the same letters but in different positions. In one of the strings, but not the other, the critical letter was in the second position, and so conformed to the regularity encountered during the learning phase.

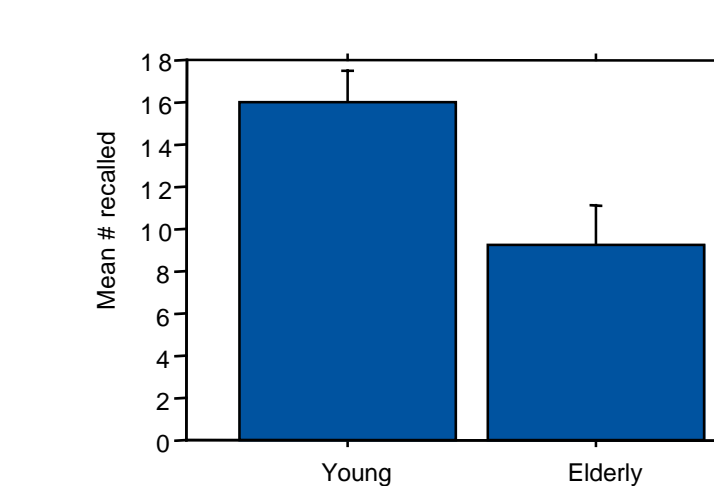
NOTE: All letters actually appeared in black.

Age differences in immediate recall?

All participants



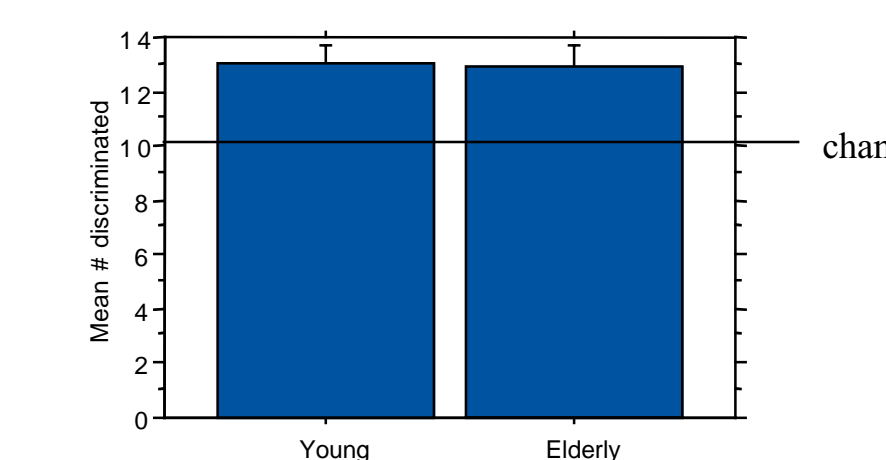
Implicit only



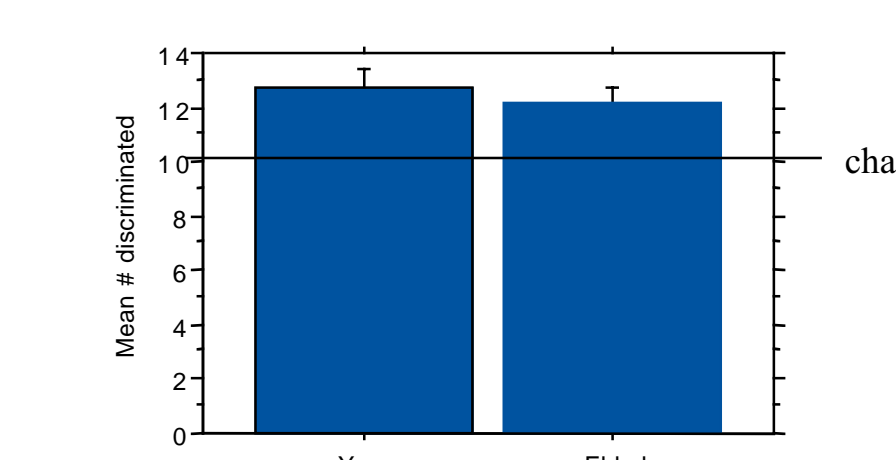
*Yes, young adults performed significantly better on an explicit test of immediate memory

Age differences in discrimination?

All participants



Implicit only



*No, young and elderly demonstrated significant and equal learning of the positional regularity, despite the difference in perceptual characteristics of the stimuli between the study phase and discrimination phase.

Conclusions

- Age differences on a task of immediate recall
- No age deficits in implicit learning of a simple positional regularity
- Implicit learning of a simple positional regularity is independent of stimulus characteristics for both young and elderly adults

References

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