OLD PIANISTS HAVE BETTER WORKING MEMORY, SPEED OF PROCESSING AND VOCABULARY BUT NOT IMPLICIT SEQUENCE LEARNING

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Abstract

Prior research has shown that musicians have superior visuo-spatial perception, imagery and mental rotation (Brochard et al., 2004) and faster reaction time (Hughes & Franz, 2007) compared to non-musicians, but little is known about their performance on implicit tasks. The present study compared 13 older life-long pianists (mean age 75.88) with 13 age- and education-matched non-musicians (mean age 72.78) on a range of standardized cognitive tasks, including Digit Span, Spatial Span and Digit Symbol Coding. They were also compared on an implicit sequence learning task, the Alternating Serial Reaction Time Task (ASRTT, Howard et al., 1997; 2004) in which sequential dependencies exist across non-adjacent spatio-temporal events.

Procedure

Alternating Serial Reaction Time (ASRT) task:

- 4-element, repeating sequence
- Pattern trials alternate with Random trials (e.g. 1r2r3r4r…)
- 8 epochs of 20 blocks of 80 trials (8-item sequence repeated 10 times)
- Measure of Implicit Learning: Trial-Type Effect: Difference between High Frequency (Pattern) and Low Frequency (Random) trials

Digit Span:

- Participants respond verbally to increasing number spans
- Forward and Backward version

Spatial Span:

- Participants observe and tap the same blocks the experimenter taps
- Forward and Backward version

Digit Symbol Coding:

- Numbers are paired with symbols.
- Participants fill-in boxes containing numbers with the corresponding symbol for 120 seconds

Vocabulary:

- Participants define words that increase in difficulty.

Alternating Serial Reaction Time Task

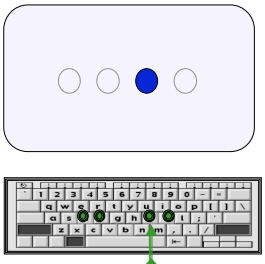
Pattern trials alternate with Random trials

Example sequences:

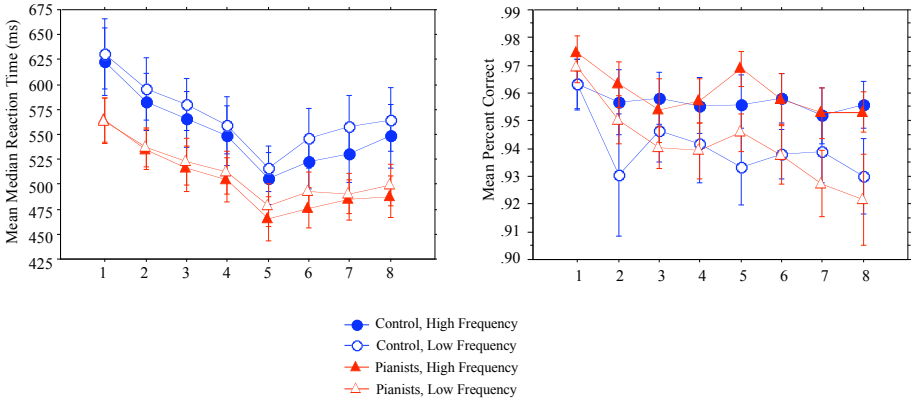
1r2r3r4r…

1r3r4r2r…

1r4r3r2r…



- For Reaction Time, both groups show learning: high frequency trials and low frequency trials diverge across epochs.
- No group difference in learning.
- Same pattern for Accuracy.

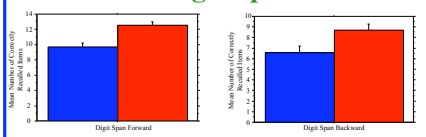


Participants

	Controls	Pianists
Gender	8 F / 5 M	6 F / 7 M
Age (in years)	72.78 (66-84)	75.88 (68-89)
Education (in years)	17.62 (12-20)	15.69 (12-20)
Self-Rated Heath*	4.39 (3-5)	4.46 (3-5)
Perceived Stress Scale	9.31 (1-19)	10.46 (2-19)

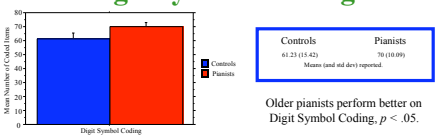
*Responses ranged from 1 (*poor*) to 5 (*excellent*). Means (and ranges) reported. No significant group differences.

Digit Span



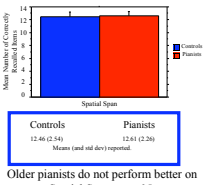
Older pianists perform better on both Digit Span Forward and Backward, $p < .01$.

Digit Symbol Coding



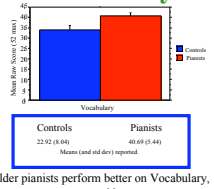
Older pianists perform better on Digit Symbol Coding, $p < .05$.

Spatial Span



Older pianists do not perform better on Spatial Span, $p > .05$.

Vocabulary



Older pianists perform better on Vocabulary, $p < .02$.

Conclusions

Older pianists performed better than non-pianists on measures of short-term memory, working memory, psychomotor speed and vocabulary, but not on measures of implicit sequence learning and spatial span. Results suggest that life-long piano playing is associated with better performance on some declarative aspects of cognition, but not on implicit sequence learning.

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