



The independence between statistical learning and episodic memory: Evidence from individual differences

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Introduction:

- Hippocampus & the Medial Temporal Lobe (MTL)
 - critical to the formation of **Episodic Memory**.
 - important to one's **Statistical Learning (SL)** ability.
 What's the relationship between SL & Episodic Memory?
- Are there fundamental differences in different types of SL tasks?

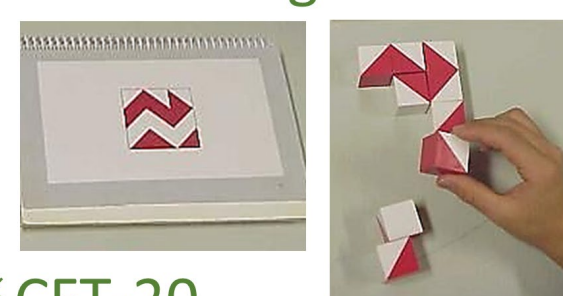
Method:

- Participant: 80 (F: 49/ M:31) (between 20-30 years old)
- Design: Examine individual difference in tests of **SL**, **Episodic Memory**, **Working Memory** and **Intelligence**

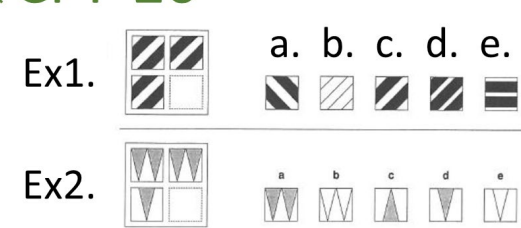
Task Name	Modality	Properties	Cognitive ability
Visual Statistical Learning (VSL)	Visual	Nonverbal	Statistical Learning
Verbal Paired Associates (VPA)*	Auditory	--	Episodic Memory
Family Pictures (FP)*	Visual	--	Episodic Memory
Number-Zodiac Sequencing	--	Phonological	Working Memory
Serial Reaction Time task (SRTT)	--	--	Statistical Learning
(delayed) Verbal Paired Associates*			
(delayed) Family Pictures*			
Block Design	--	--	Intelligence
Auditory Statistical Learning (ASL)	Auditory	Nonverbal	Statistical Learning
Logical Memory (LM)*	Auditory	--	Episodic Memory
Corsi block-tapping test	--	Visuo-Spatial	Working Memory
Culture Fair Intelligence Test (CFT) 20	--	--	Intelligence
Cambridge Face Memory Test (CFMT)	Visual	--	Episodic Memory
(delayed) Logical Memory*			

* Subtest of WMS-III (Chinesever.)

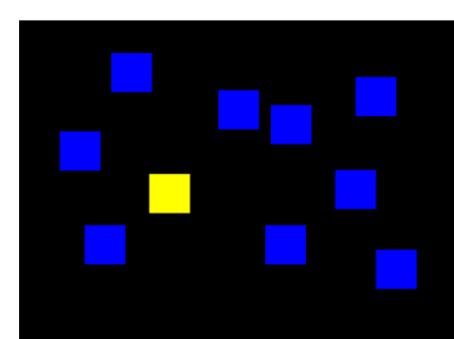
Block Design



CFT-20



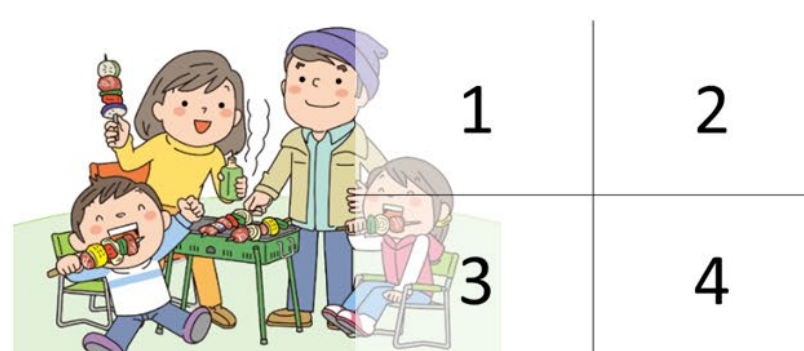
Corsi block



Number-Zodiac Seq

(Question) 8-牛-6-狗 → (Answer) 6-8-牛-狗
cow dog cow dog

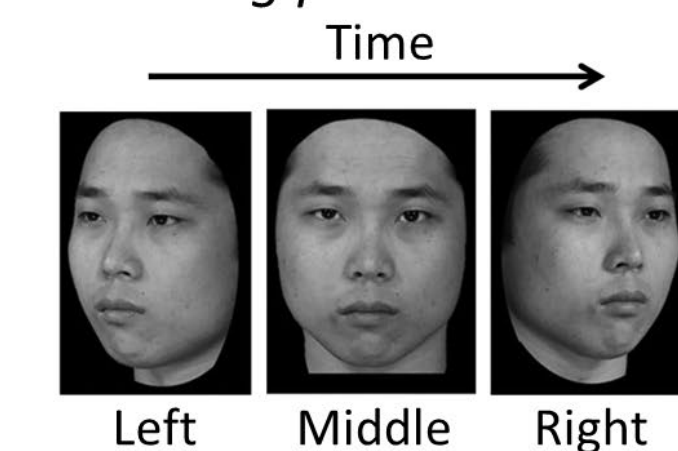
Family Pictures



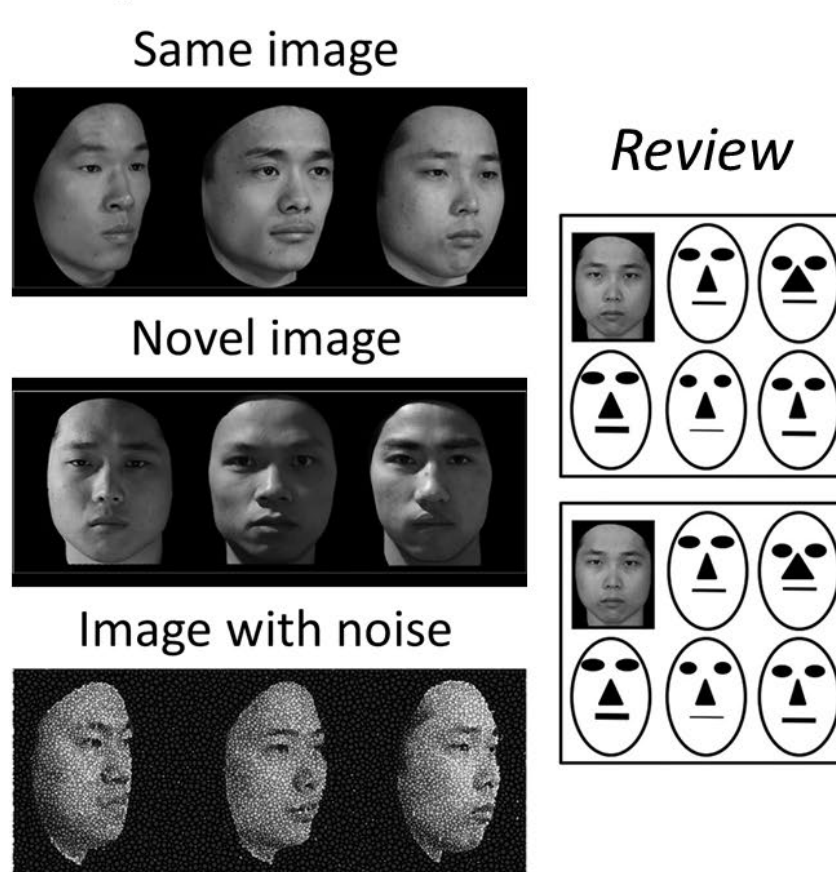
CFMT (Chinese faces)

McKone et al. (2012)

Learning part:



Question Part:



VSL

Siegelman et al. (2017)

SRTT

(Reber & Squire (1998))

ASL

Siegelman et al. (2018)

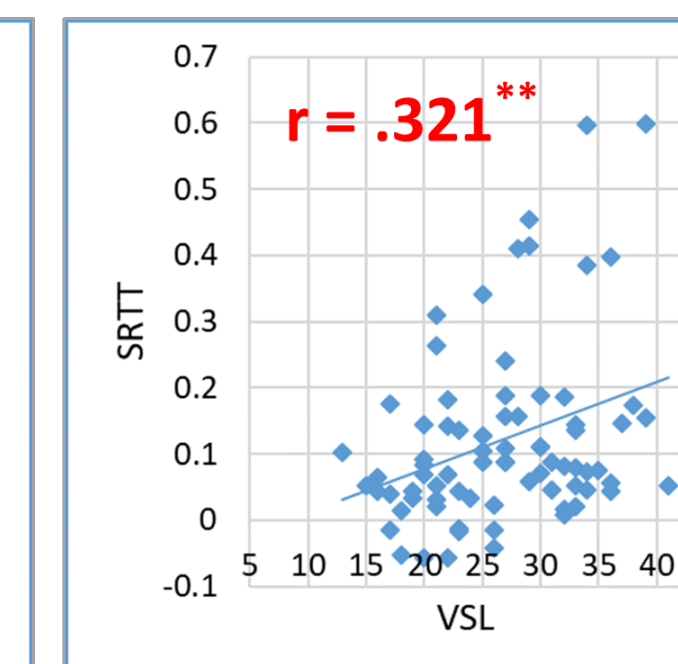
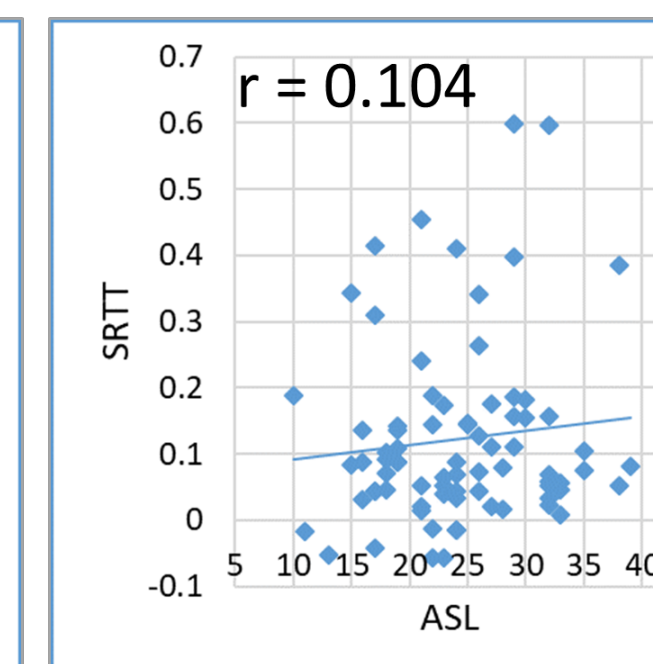
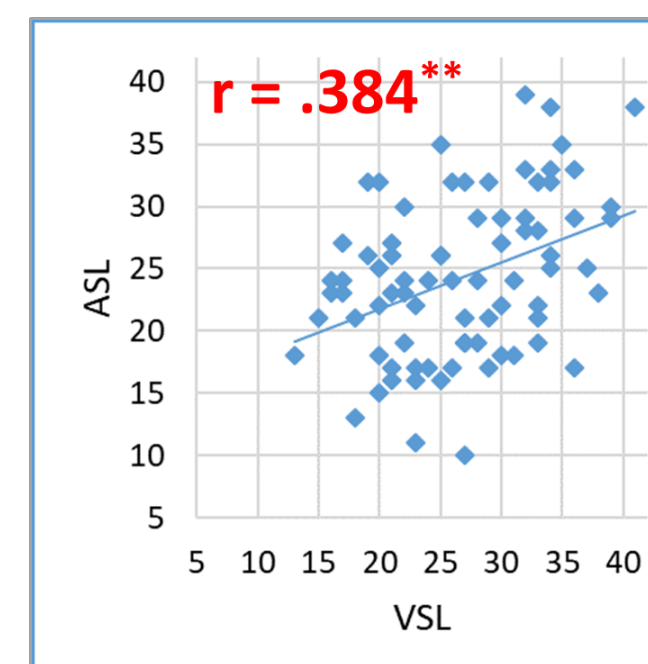
ASL

Siegelman et al. (2018)

Results:

- Pearson correlation analysis
- Remove scores outside 3SD

Among SL tasks



** p<.01, *<.05

Descriptive Statistics of Participants' Score:

Task Name (N)	Fullmark	min	Max	Mean	SD
VSL (79)	42	13	41	26.7	6.61
ASL (80)	42	10	39	24.1	6.48
SRTT (77)	--	-0.058	0.599	0.124	0.138
CFMT (72)	72	43	71	54.7	7.00
Verbal Paired (72)	19	6	15	10.3	2.10
(delayed) VPA (71)	19	8	13	11.7	1.20
Family Pictures (72)	19	3	16	10.8	2.38
(delayed) FP (72)	19	5	17	10.9	2.34
Logical Memory (71)	19	10	19	13.5	2.20
(delayed) LM (68)	19	10	18	13.3	1.99
Corsi block (79)	18	10	17	13.0	1.66
Number-Zodiac (79)	7	3	7	5.4	1.16
Block Design (80)	9	4	9	7.0	1.19
CFT-20 (80)	12	5	12	9.7	1.52

WMS results have been converted to scale scores

Among SL tasks & Working Memory, IQ

	Corsi block	Number-Zodiac	Block Design	CFT-20
VSL	0.019	0.086	0.066	0.197
ASL	0.017	0.164	0.155	0.220
SRTT	-0.022	0.215	0.004	0.157

marginal significance (1 > p > .05)

Among SL tasks & Episodic Memory tests

	CFMT	Verbal Paired	Family Pictures	Logical Memory
VSL	0.165	0.225	0.050	0.091
ASL	.276*	0.152	0.032	.256*
SRTT	-0.048	-0.142	0.162	0.139

after the consider of Bonferroni correction critical r = .338 (N=70) or r = .317 (N=80)

Discussions and Conclusions:

- Nonverbal ASL and VSL show positive correlation (0.384, p<0.001).
 - Consistent with previous literature. (Siegelman & Frost, 2018)
- VSL shows positive correlation with SRTT (0.321, p=.005), but ASL doesn't.
 - The mechanisms underlying VSL and SRTT are different from those underlying VSL and ASL.
 - Implicit and explicit SL may be different.
- The SL abilities is not highly correlated with other fundamental cognitive abilities.
 - Consistent with previous literature. (Siegelman & Frost, 2015)
- After the correction for multiple comparisons, the correlation between SL tasks and episodic memory tests were not significant.
 - SL and long-term memory may rely on different specific neural mechanisms supported by the hippocampus and the MTL.