

Examining Memory Span and Implicit Rule Knowledge across Language and Music Abilities in Children

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Introduction

Implicit Learning

- Implicit learning system supports language development by tracking regularities in word boundaries and grammar (Gomez, 2002; Saffran, Aslin, & Newport, 1996)
- Patterns in music, such as key membership and harmonic structure, are learned implicitly through exposure (e.g., Trainor & Corrigan, 2010; Schellenberg, Bigand, Poulin-Charronnat, Garnier, & Stevens, 2005)

Pattern Violations

- Children with language impairment less likely to detect grammar violations than peers (Redmond & Rice, 2001)
- Preschoolers can identify deviations from typical chord progressions (Corrigan & Trainor, 2010), but children with language impairment less likely to notice (Jentschke, Koelsch, Sallat, & Friederici, 2008)

Short Term Memory across Domains

- Articulatory suppression interferes with reproduction of rhythms in adults (Saito & Ishio, 1998)
- Digit recall correlates with rhythm imitation in adults (Saito, 2001)

Study Questions

- If both music and linguistic ability are supported by implicit pattern learning, how similar is performance on pattern violation tasks across domains?
- Is recall for memory and verbal material correlated in children?

Methods

Participants: n=17; ages 5;2 (4;1–7;1)

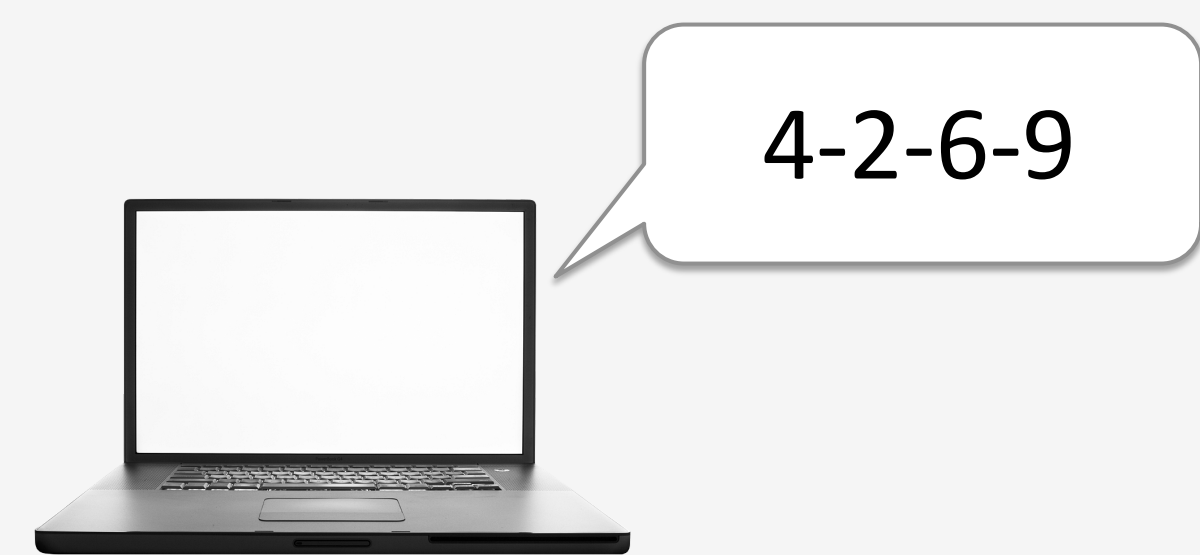
Procedures: All participants completed all tasks with either parent or RA assistance. Parents completed a survey on literacy and music exposure in the home

Language Tasks

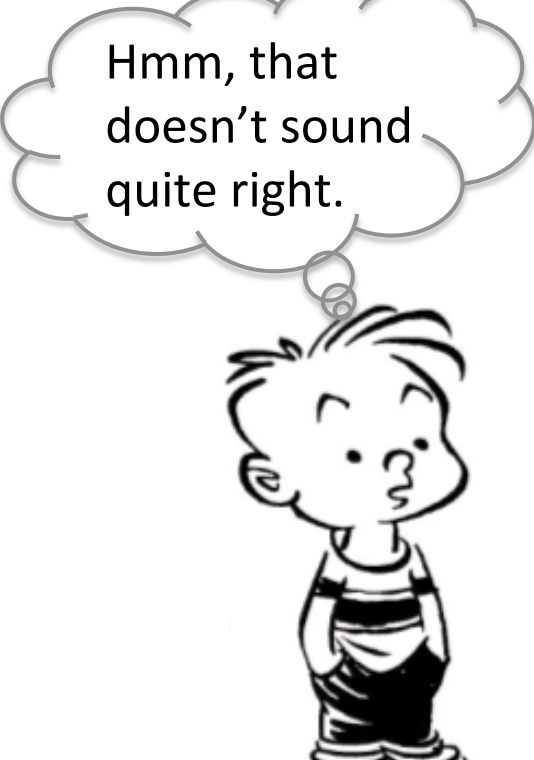
Memory Span

Digit Recall

- Repeat lists of 2 to 6 digits
- 15 trials, increasing list length

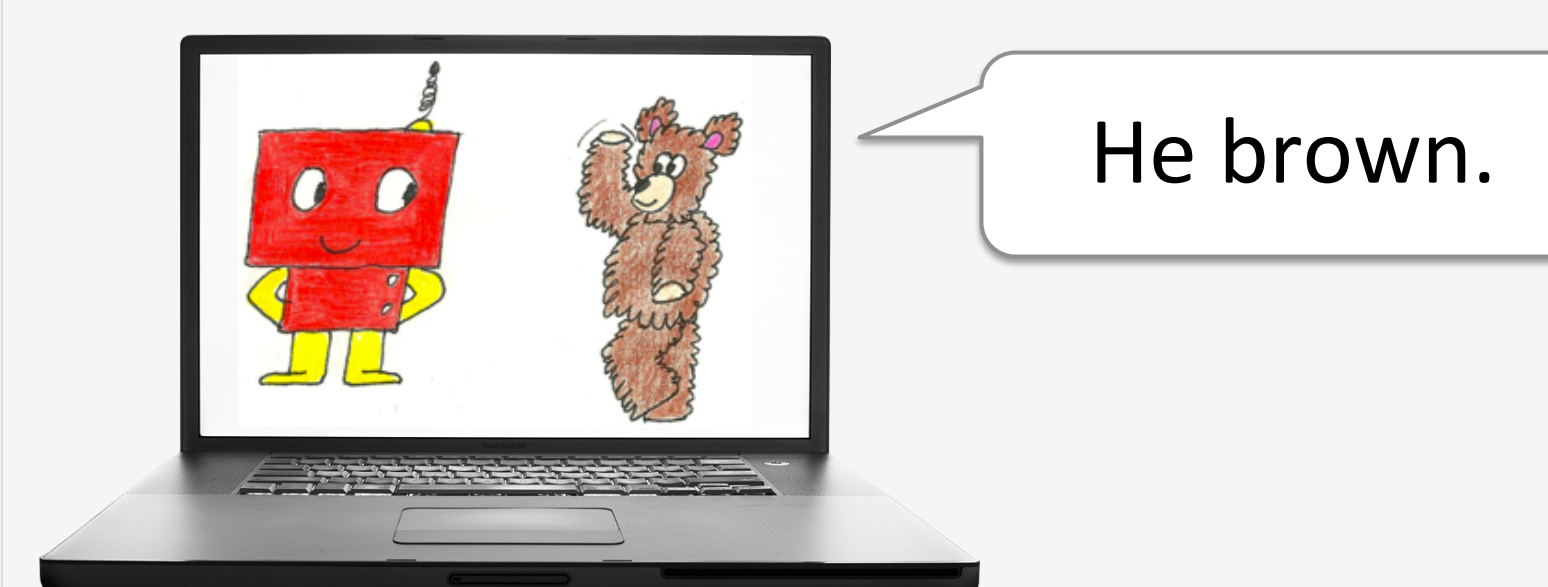


Implicit Rule Knowledge



Grammaticality Judgment

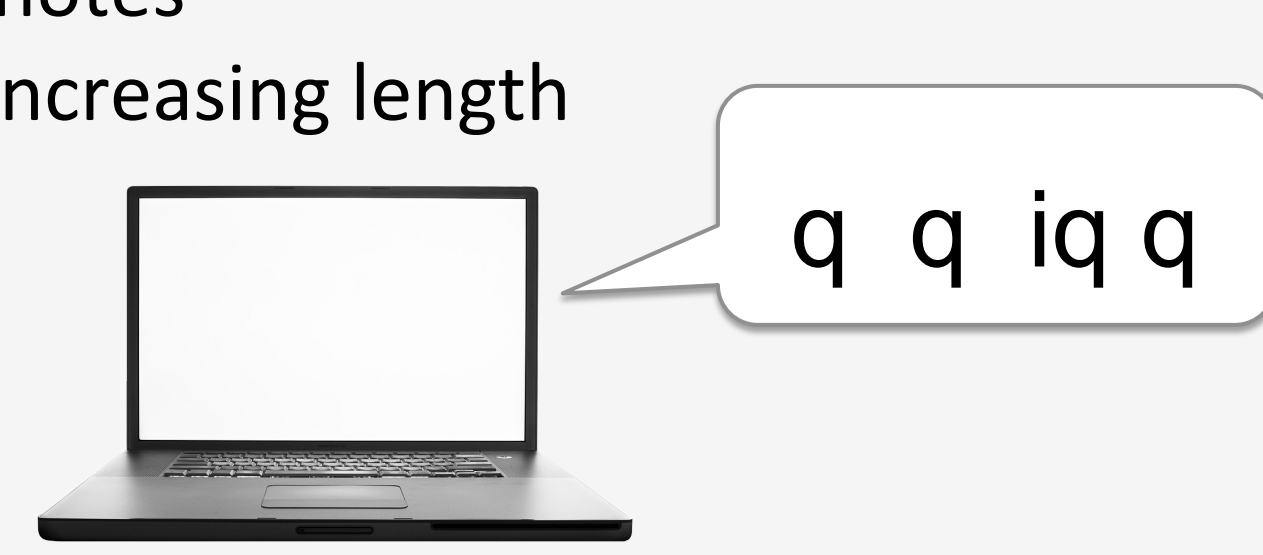
- 18 sentences embedded in a story
- 13 trials contained violations of 3rd person -s, copula, -ing, subject-verb agreement



Music Tasks

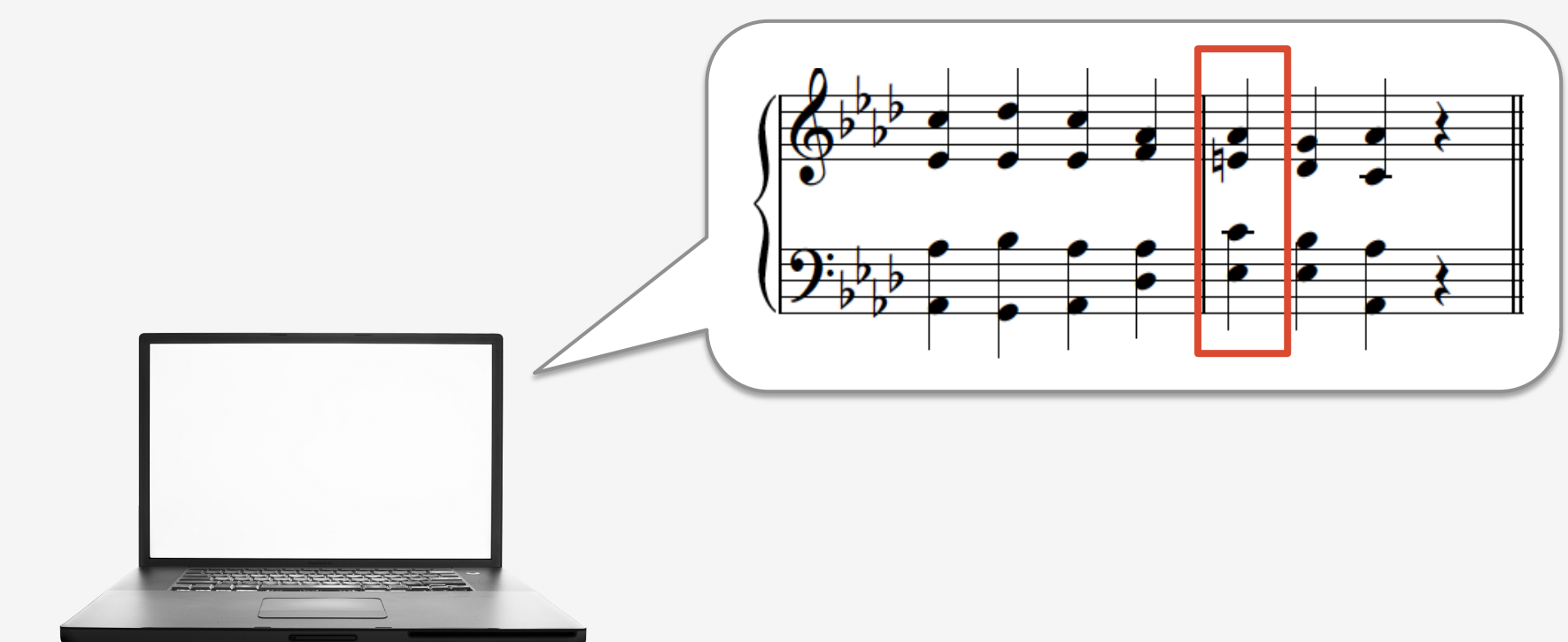
Rhythm Recall

- Repeat rhythms of 2 to 6 beats
- Rhythms comprised of quarter notes and pairs of eighth notes
- 16 trials, increasing length



Music Judgment

- 16 musical phrases, 7 beats long
- 11 trials contained violations of key, harmony, or both



Results

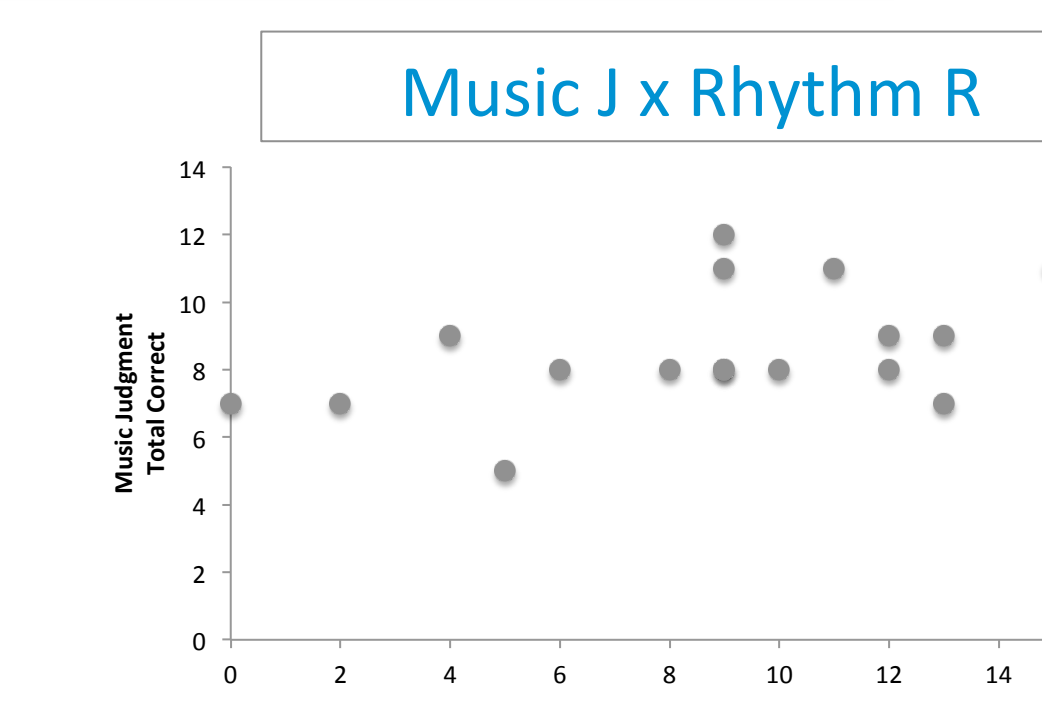
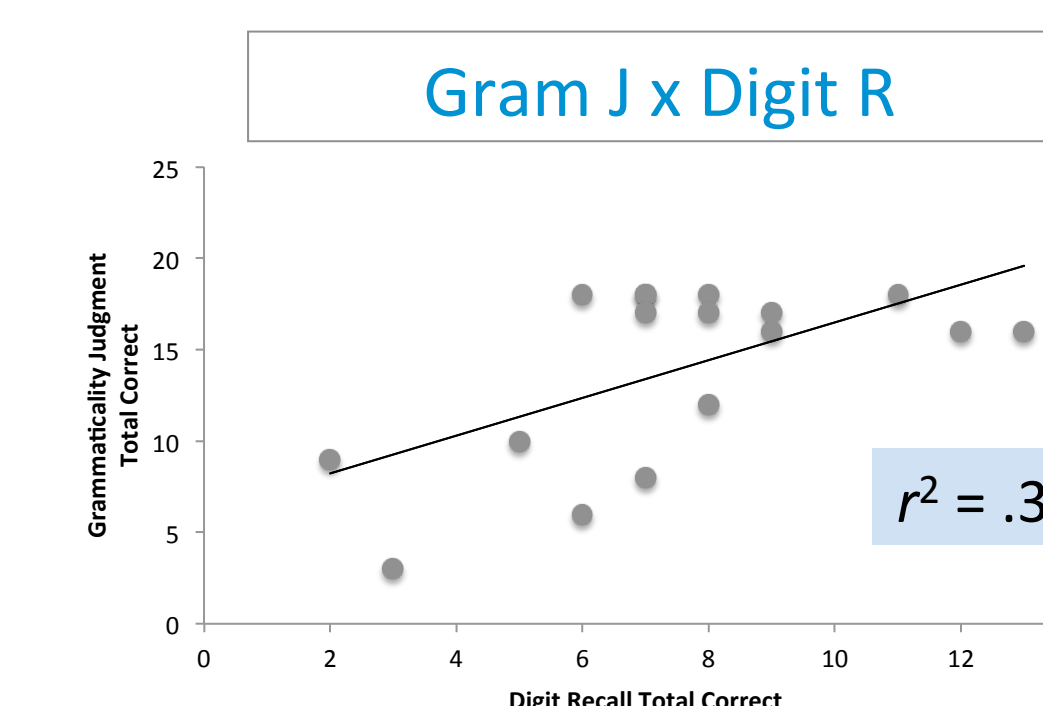
Correlations Between Tasks

	Digit Recall	Grammaticality Judgment	Rhythm Recall	Music Judgment
Digit Recall		.664 (.010)	.797 (.001)	.229 (.430)
Grammaticality Judgment	.601 (.011)		.776 (.001)	.437 (.118)
Rhythm Recall	.769 (.000)	.768 (.000)		.530 (.051)
Music Judgment	.178 (.493)	.392 (.119)	.451 (.069)	

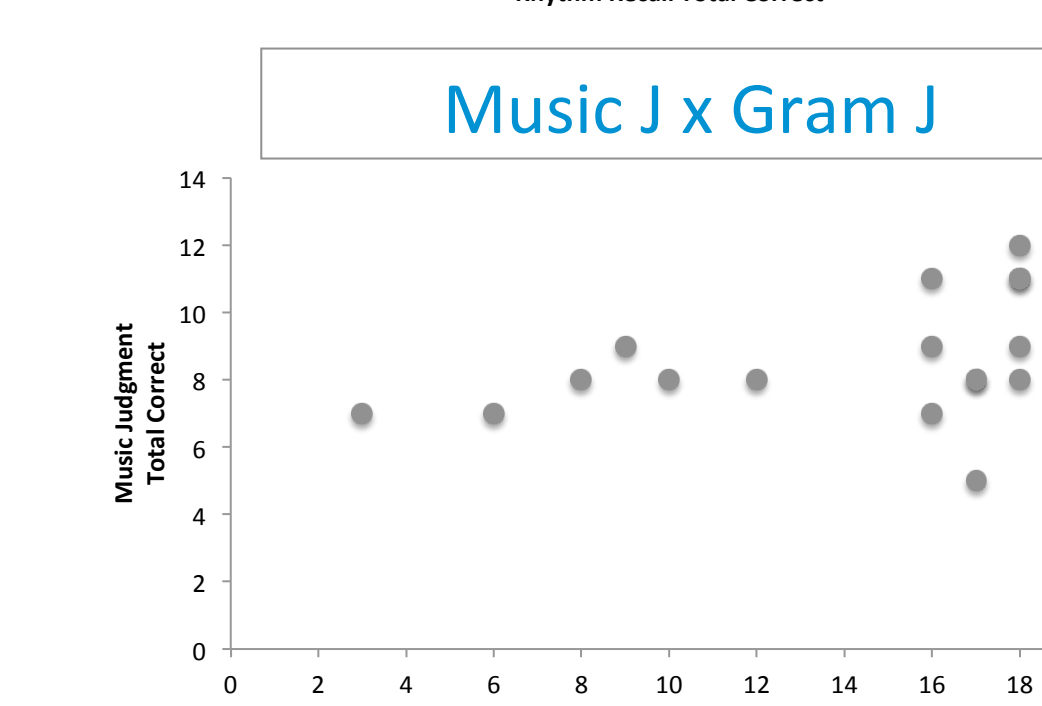
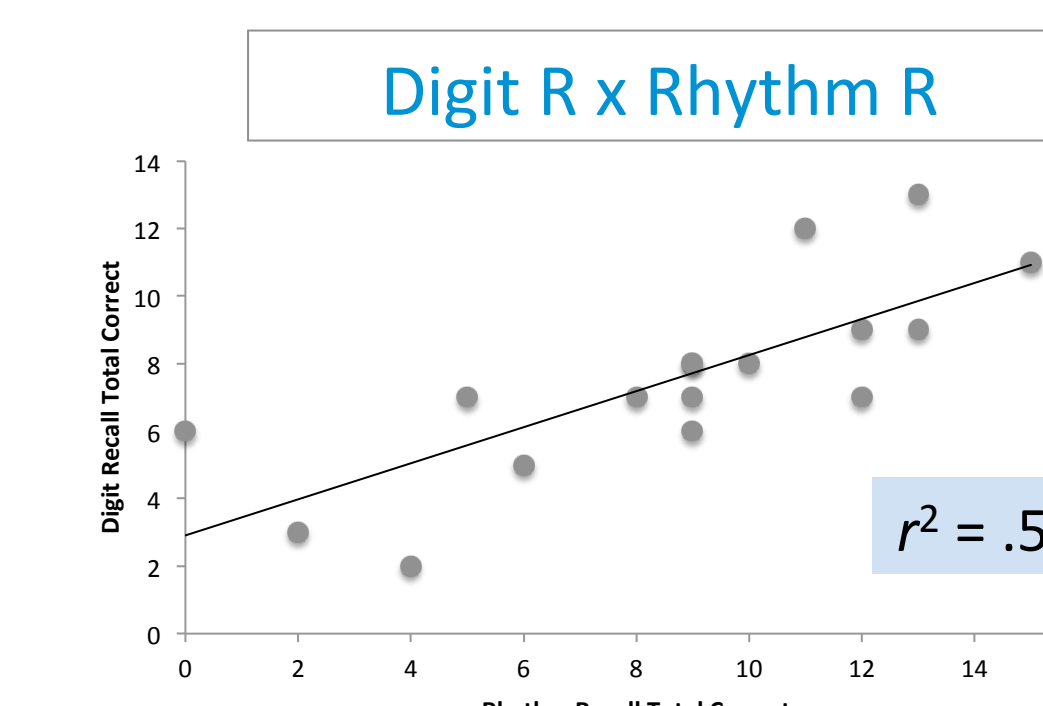
Zero-order correlations

Controlling for age in months

Within Domain



Across Domain



Predicting Performance on Judgment Tasks

Grammaticality Judgment			
	r ²	F	Sig
Rhythm Recall	.592	18.831	.001
Excluded variables:			
Age in months	Parental music making		
Library visits	Digit Recall		
Mother education	Music Judgment		
Father education			

Music Judgment			
	r ²	F	Sig
Rhythm Recall	.279	5.035	.043
Excluded variables:			
Age in months	Parental music making		
Library visits	Digit Recall		
Mother education	Music Judgment		
Father education			

References

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 Gomez (2002) *Psychological Science*, 13(5), 431–436.
 Jentschke, Koelsch, Sallat, & Friederici (2008) *J Cog Neurosci*, 20(11), 1940–1951.
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 Saffran, Aslin, & Newport (1996) *Science*, 274, 1926–1928.
 Saito (2001) *Memory*, 9(4/5/6), 313–322.
 Saito & Ishio (1998) *Japanese Psychological Research*, 40(1), 10–18.
 Schellenberg, Bigand, Poulin-Charronnat, Garnier, & Stevens (2005) *Dev Science*, 8(6), 551–566.
 Trainor & Corrigan (2010) *Current Research and Future Directions*, ed. Jones et al., 89–127.

Task Performance

Task	M	SD
Digit Recall (/15)	7.53	2.85
Grammaticality Judgment (/18)	13.94	4.91
Rhythm Recall (/16)	8.65	4.11
Music Judgment (/16)	8.59	1.81

Conclusions

- Strong correlations between recall tasks replicates findings from adults (Saito, 2001) and suggests that musical memory taps phonological memory
- Rhythm Recall correlated with and explained most variance in both judgment tasks
- Possible floor effects on Music Judgment task may have limited correlation