

Association between Total Hippocampal Volume, Cortical Thickness, and Episodic Memory in Early to Mid Childhood

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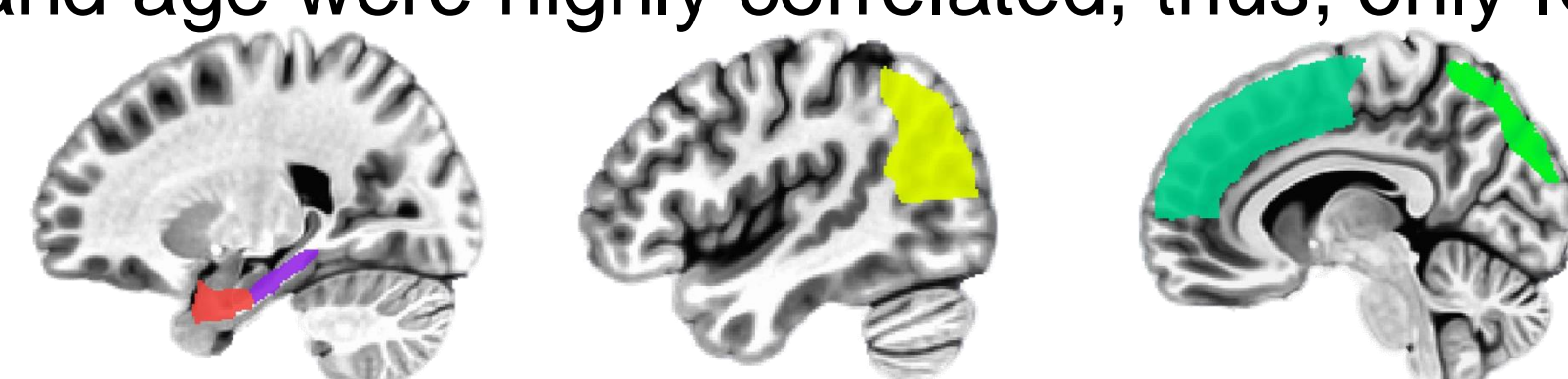
Introduction

- Hippocampal structure has been implicated in the development of several types of memory processes in young children (Ghetti & Bunge 2012)
- Cortical areas in the medial temporal and frontal lobes have previously been implicated in performance on memory tasks in older children and adults (Tang et al, 2017)
- This link has been underexplored especially in early childhood

GOAL: Investigate whether episodic memory relates to observed differences in hippocampal volume and cortical thickness in memory-related regions in early childhood

Analysis

- Multiple linear regression analyses were used to examine associations between task performance and total hippocampal volume and cortical thickness
- ROIs:** Superior frontal gyrus (SFG), Entorhinal cortex (EC), Parahippocampal Gyrus (PhG), Superior Parietal Lobule (SPL), and Inferior Parietal Lobule (IPL)
 - Based on prior research suggesting their involvement in memory (Geng et al., 2022)
- Participant sex and intracranial volume (ICV) were entered as covariates in each model.
 - ICV and age were highly correlated, thus, only ICV was used



Conclusions

Larger total hippocampal volume is associated with better performance on temporal, visuospatial, fact, and source memory tasks in children aged 4 to 8 years old

Cortical structure in the frontal lobe is linked to temporal memory with thinner Superior Frontal Gyrus being associated with higher memory performance

Methods

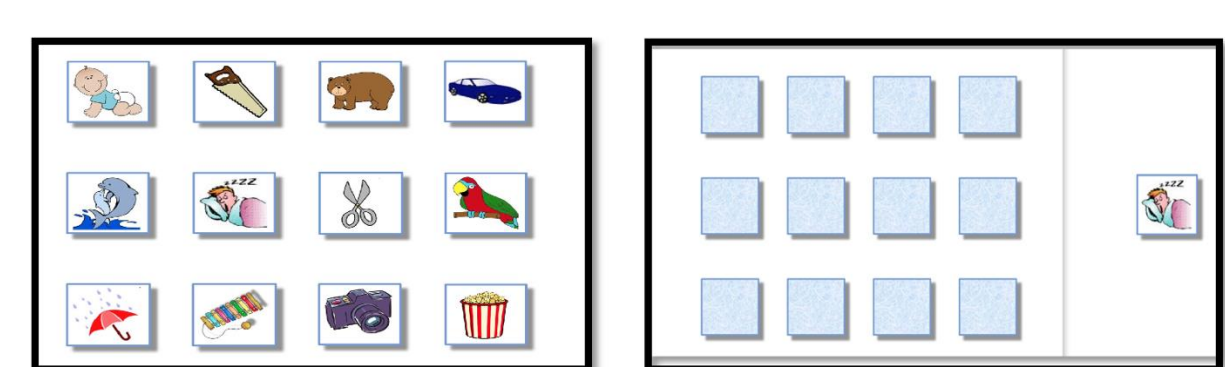
Participants: 178 participants, ages 4 to 8 years old (M = 6.29, SD = 1.49, 87 female) who were part of a larger longitudinal study investigating typical development of episodic memory across childhood

Neuroanatomical Data:

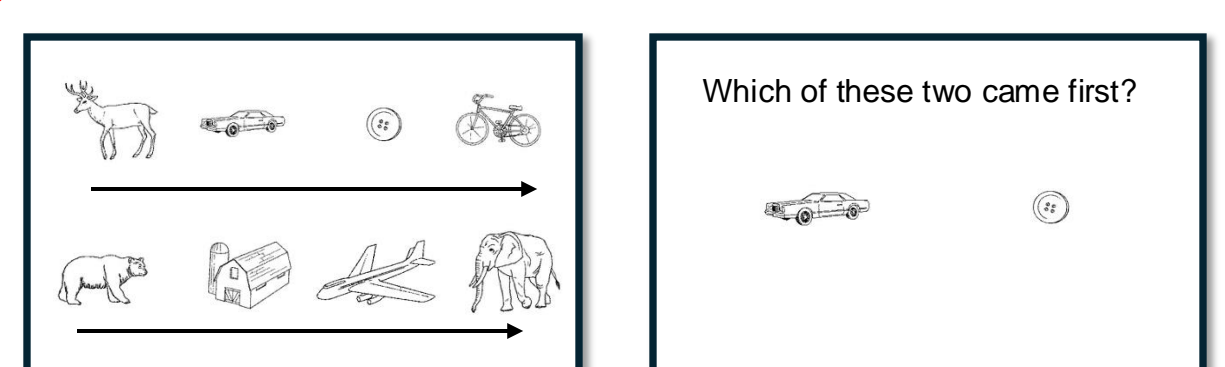
- T1-weighted MRI images were obtained with a 32-channel coil on a Siemens 3T Trio Scanner
- Freesurfer v5.1 and Automatic Segmentation Adapter Tool were used to reconstruct and segment the T1 images

Behavioral Data:

- During a separate visit, participants completed 4 measures of episodic memory



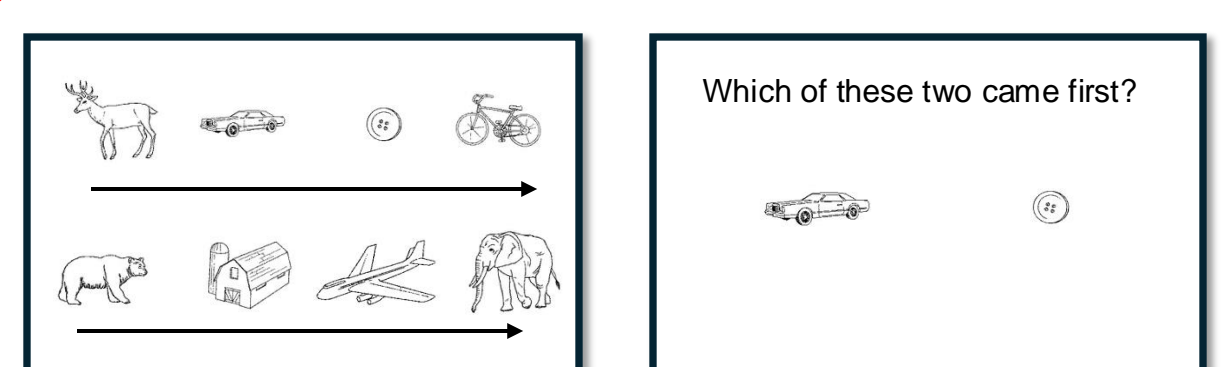
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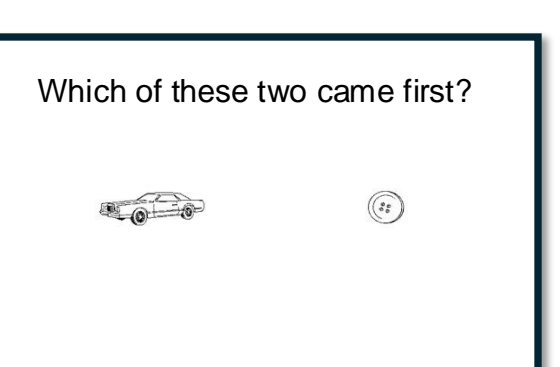
Recall

Lorsbach Task (Visuospatial Memory)

(Lorsbach & Reimer, 2005)



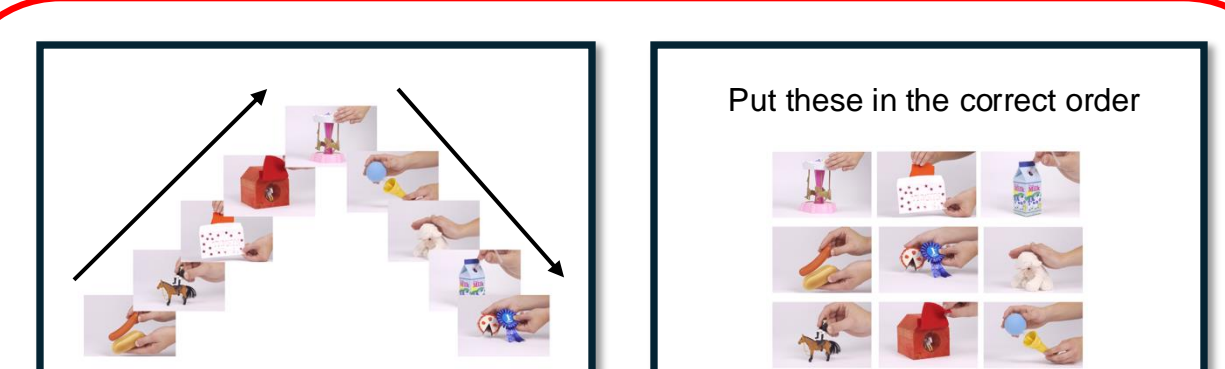
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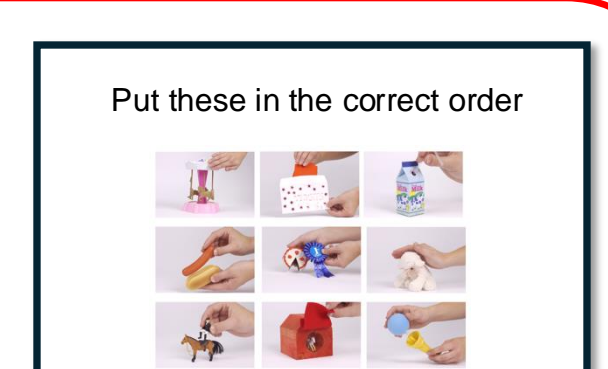
Recall

Recognition of Temporal Order Task

(Mathews & Fozard, 1970)



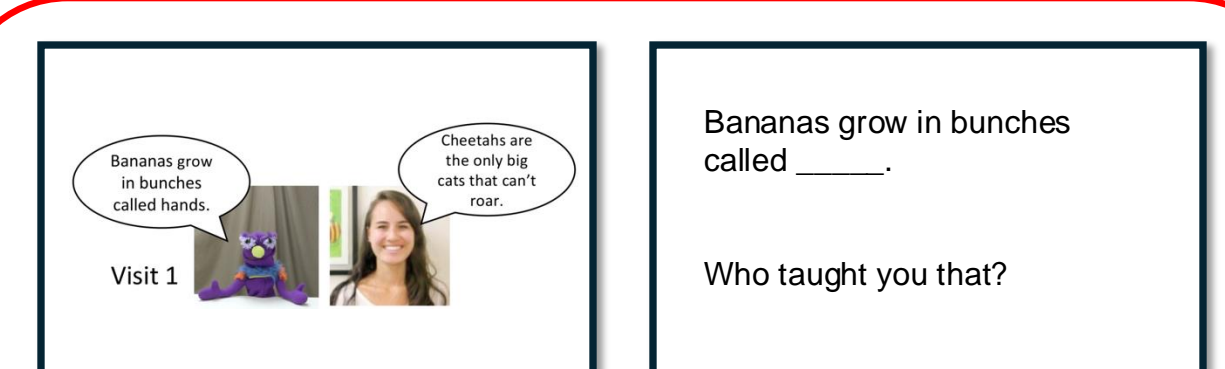
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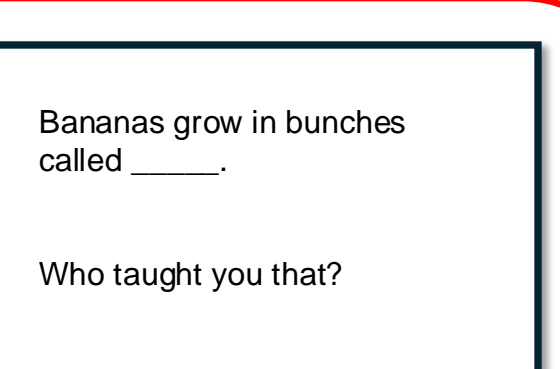
Recall

Recall of Temporal Order Task

(Bauer et al., 2013)



Encoding

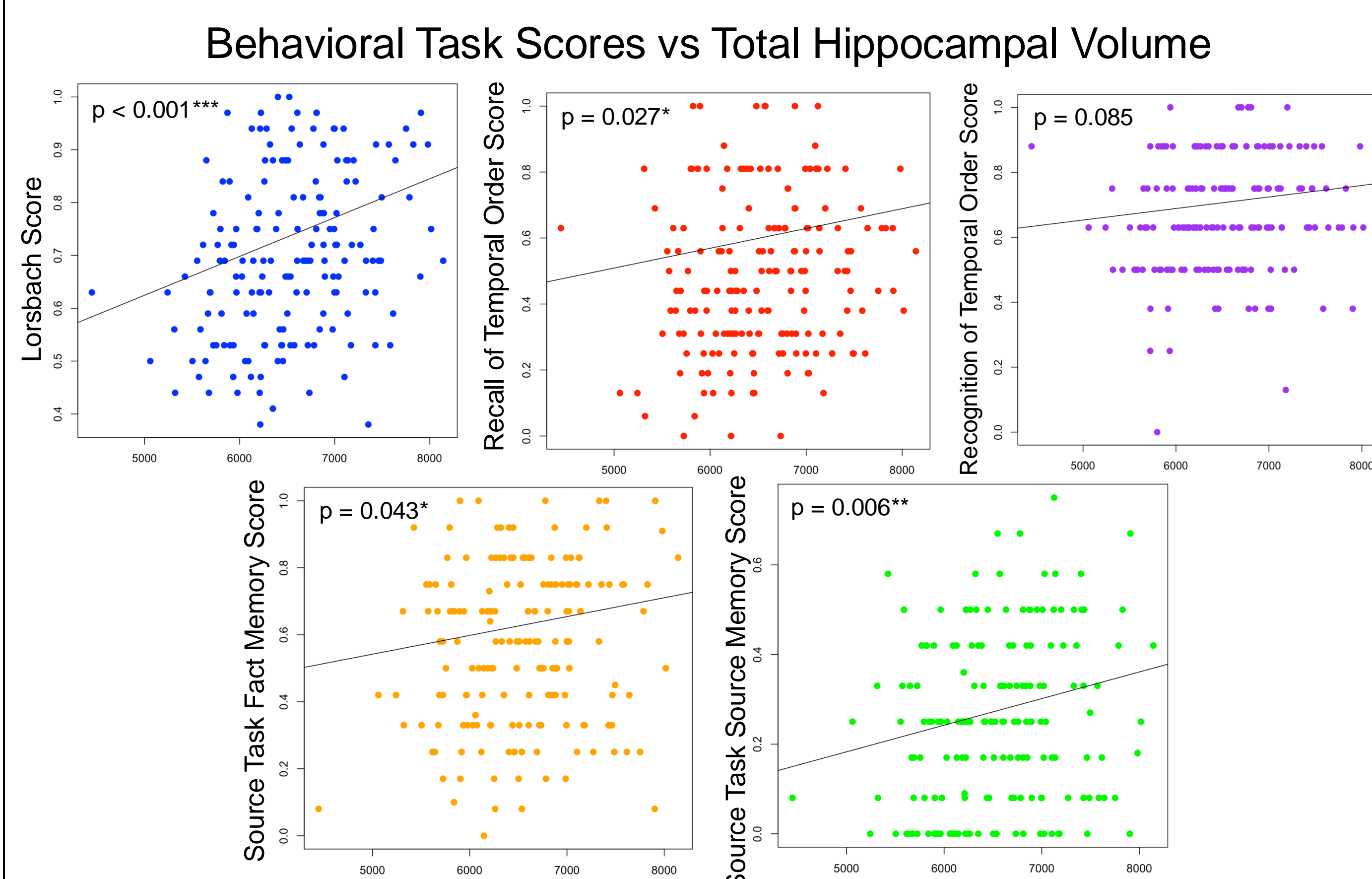


Recall

Source Memory Task

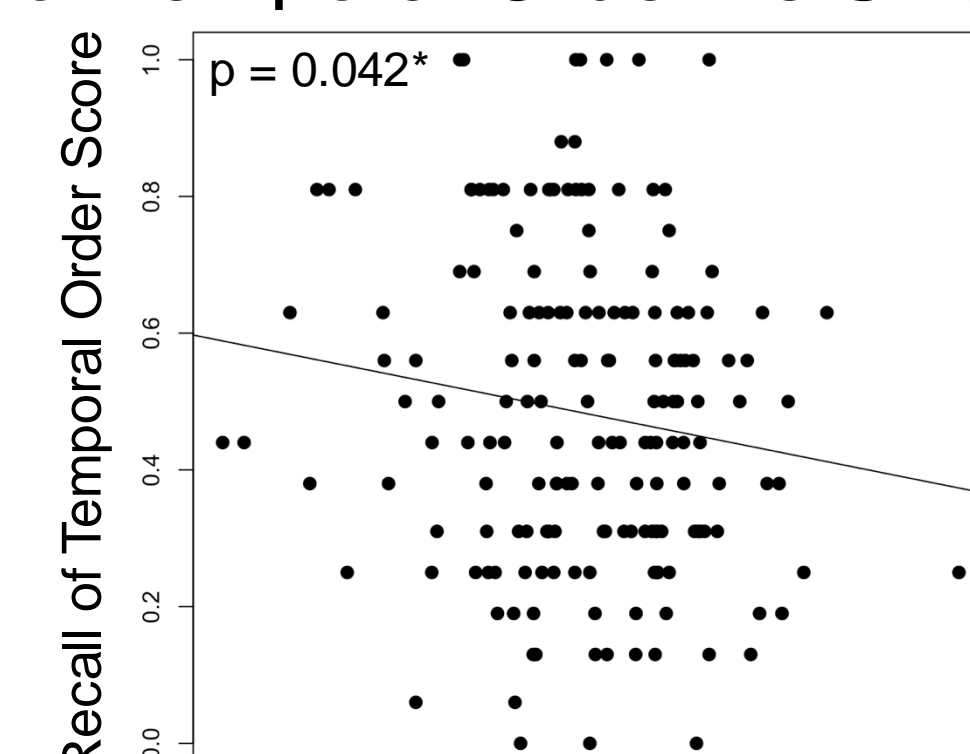
(adapted from Schacter et al., 1984; Drummy & Newcombe, 2002; Riggins, 2014)

Results



Note: Source Task Fact Memory Score's finding did not survive correction for multiple comparisons

Recall of Temporal Order vs SFG Thickness



Note: Recall of Temporal Order vs SFG Thickness did not survive correction for multiple comparisons

No other analyses of ROIs were significant

Future Directions

- Complete a longitudinal investigation into the link between hippocampal and cortical structures and memory performance in early childhood
- Explore other measures of cortical structure, such as surface area, in relation to memory performance

References

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