

Relations Between Hippocampal Volume and Story Recall in Early Childhood

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Introduction

- Hippocampus plays an important role in verbal memory for both adults and children (e.g., Ezzati et al., 2015; Gold & Trauner, 2014)
- However, there is little research on links between hippocampus and verbal memory in early development.
- This is important to study before age 6 because:
 - Memory changes rapidly during early childhood (e.g., Riggins, 2014)
 - Relations between source memory and hippocampal subregion volumes vary in early childhood (e.g., Riggins et al., 2015)
- Purpose: to investigate potential relation between hippocampal subregion volumes and verbal memory in early childhood.**

Methods

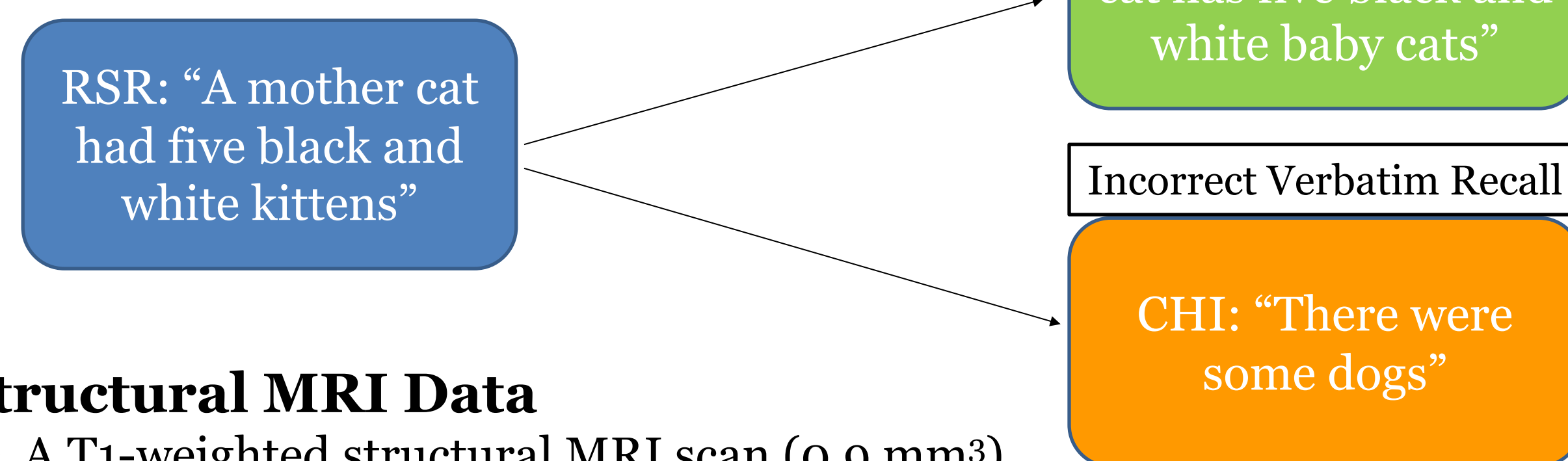
Participants

- 200 children aged 4-to 8-years-old ($M = 6.21$ years, $SD = 0.11$, 100 female) participated in a larger longitudinal study on memory and brain development.
- Of these, 176 provided usable behavioral and MRI data.

Memory Assessment

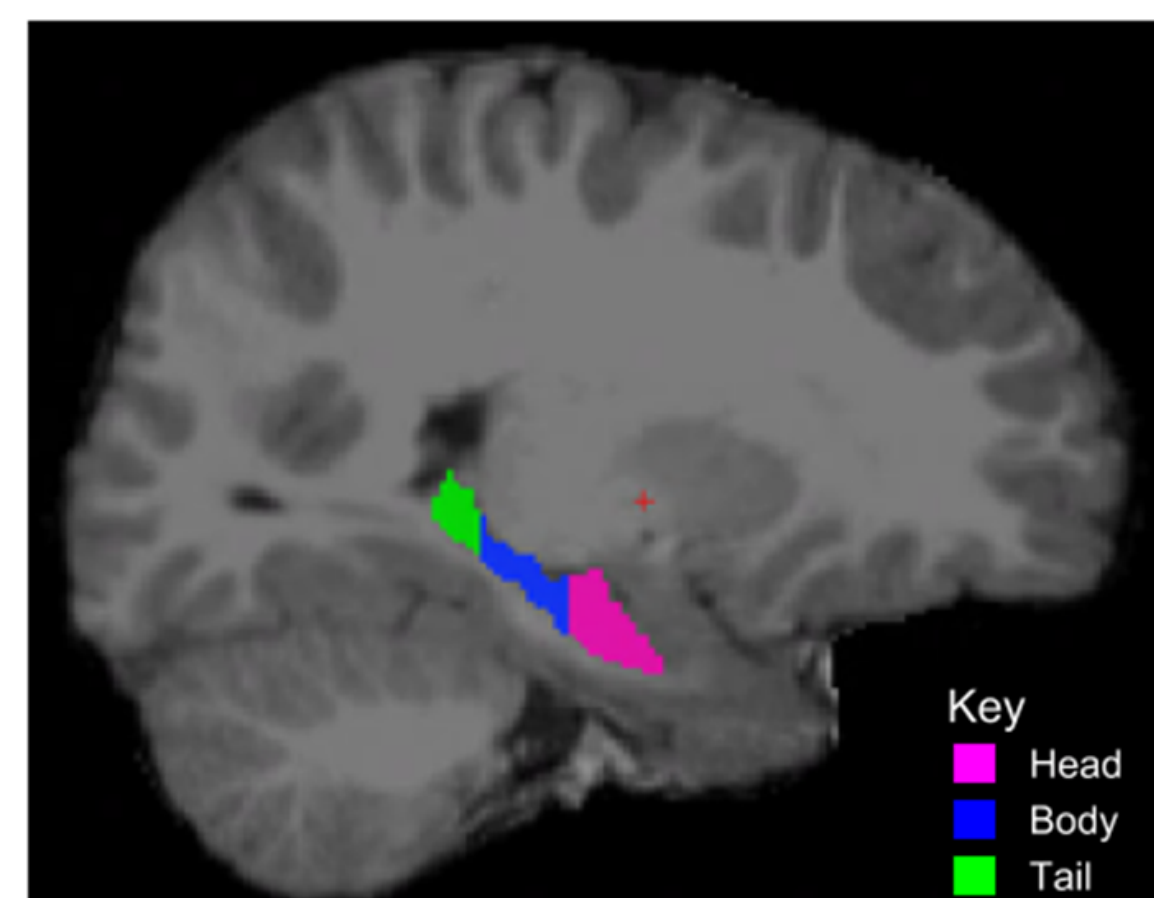
- Task: Stories Subtest of the Children's Memory Scale (Cohen, 1997).
- Participants heard two stories read aloud by the researcher and were asked to verbally recall the stories immediately, one hour later, and one week later.
 - The current study focused on the one-hour delay measure.

- Performance was determined by the number of remembered verbatim story units ($M = 22.90$, $SD = 13.314$, range = 50).



Structural MRI Data

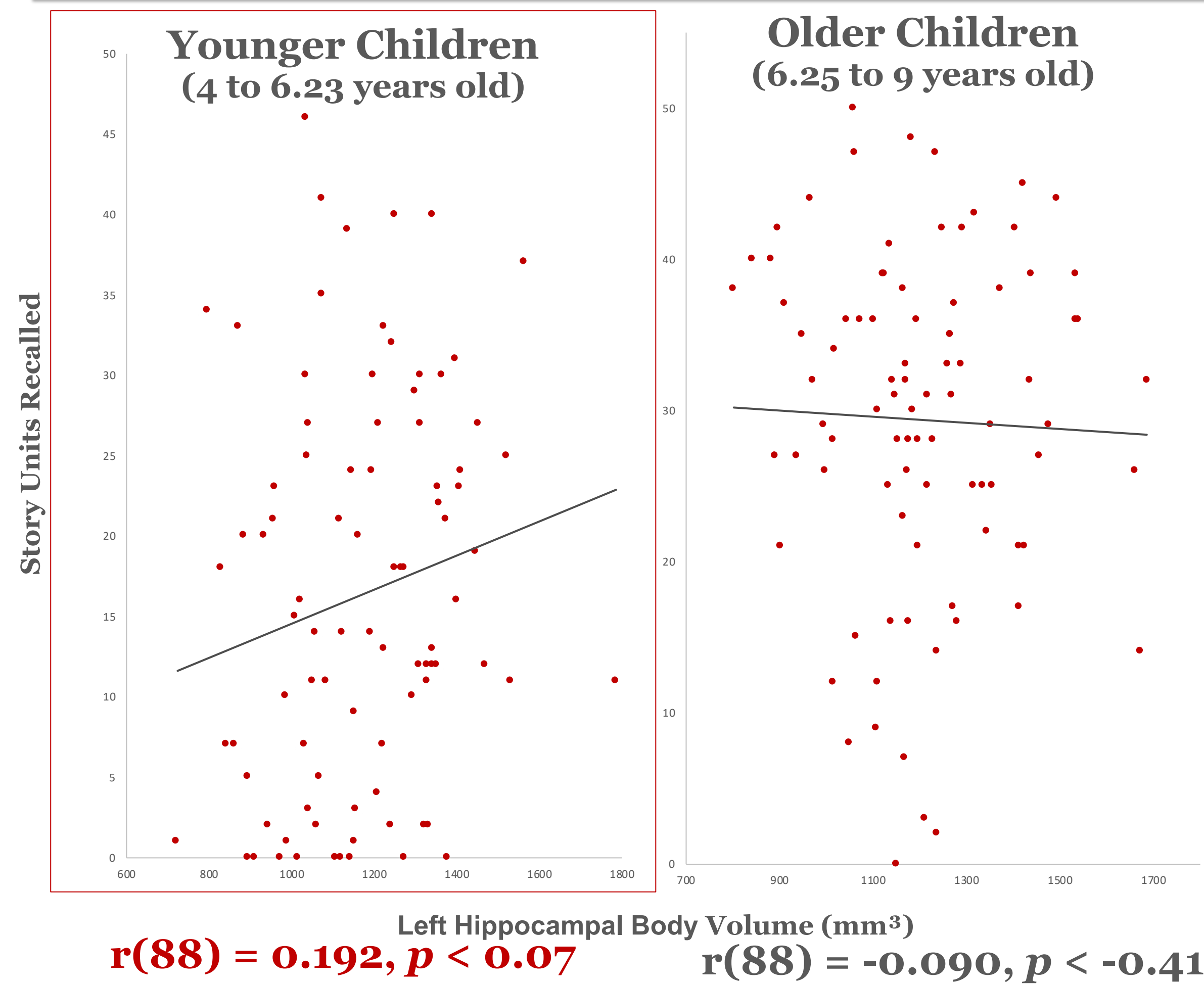
- A T1-weighted structural MRI scan (0.9 mm^3) was obtained using a Siemens 3T scanner with a 32-channel coil, approximately one week following the verbal memory task.
- Hippocampal volumes were extracted via Freesurfer v5.1 (Fischl, 2012) and adjusted using Automated Segmentation Adapter Tool (ASAT, Wang et al., 2011).
- Hippocampal subregions (head, body, tail) were defined using standard anatomical landmarks (DeMaster et al., 2013; Riggins et al., 2015).



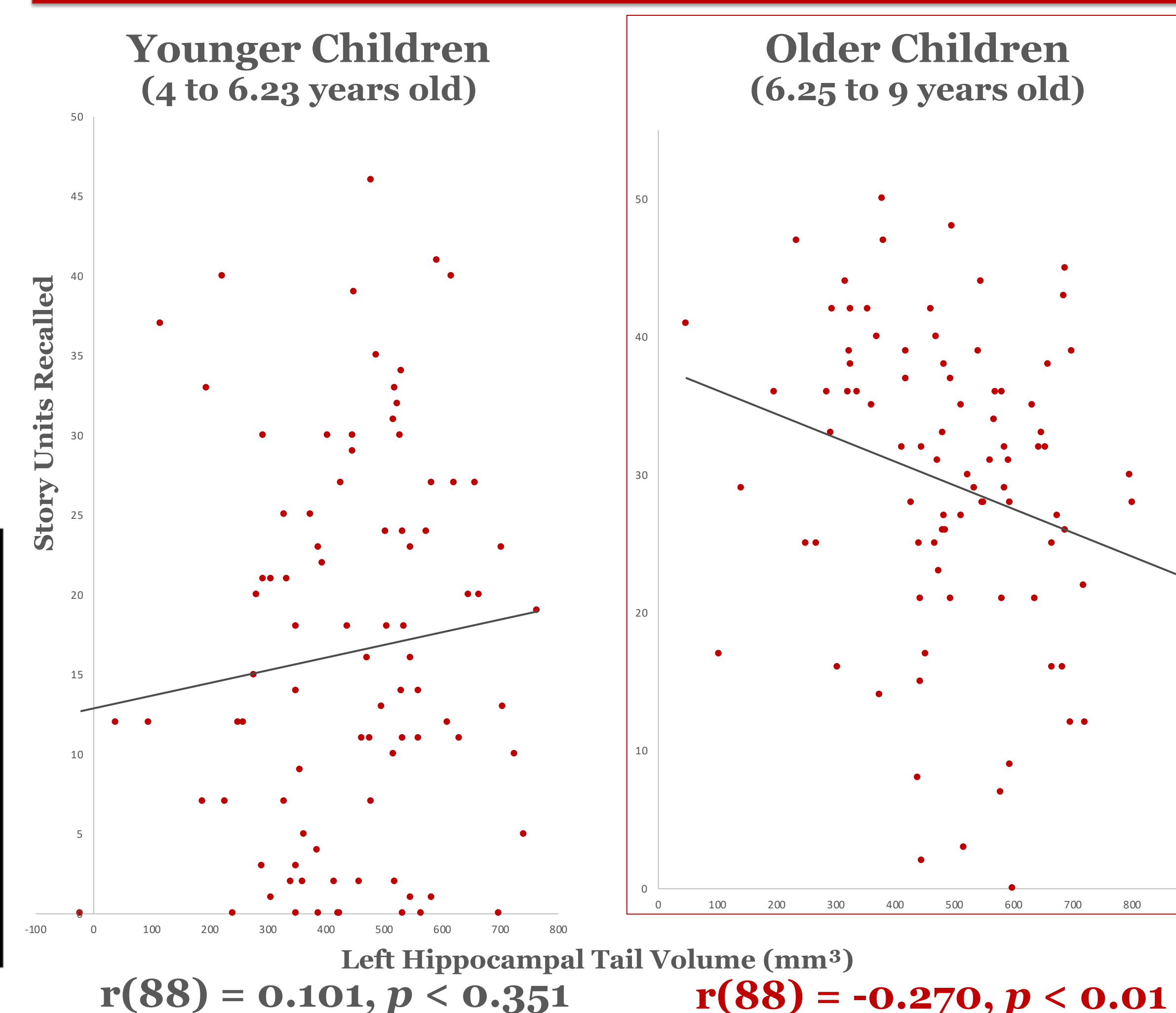
Preliminary Results

- Associations between hippocampal volume and one-hour delayed recall was assessed via partial correlations.
 - Age was used as a covariate.
- Age was positively related to verbal memory performance.
 - $r(176) = 0.576, p < 0.001$

Results: Body-Performance



Results: Tail-Performance



Discussion

Results

- A mature hippocampus is not necessarily larger in size.
- Reinforces idea of age-related differences between hippocampal subregion volumes and verbal memory performance in early childhood.
 - These findings are consistent with previous research that suggests differences in brain-behavior relations during this period (Riggins et al., 2015).

Future Directions

- The current study utilized cross-sectional data; future analyses can explore the longitudinal sample.
- Investigate regions outside hippocampus that may also be involved in verbal memory recall.
- Examine the potential relations between immediate, hour, and week verbal memory recall and hippocampal subregion volumes.



Take-Home Message

A larger left hippocampal body may be better for verbal memory recall in younger children and a smaller left hippocampal tail may be better for older children's verbal memory recall.

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