

# Relations Between Autobiographical Memory and Hippocampal Subregion Volume in Early Childhood

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## Introduction

- Autobiographical memory refers to recollections of personal experiences and events
- Autobiographical memory requires traveling back in time mentally to recall details of previous events (e.g., Bauer & Larkina, 2016)
  - Ex: “I went to the beach.” vs. “I like the beach.”
- The ability to recall details from previous events, develops dramatically in early childhood (Riggins, 2014).
  - This development may be due to brain development during this period (Willoughby et al., 2012; Bauer et al., 2017).
    - In particular, the hippocampus is a region that may contribute to these changes (e.g., Riggins et al., 2016).
- The goal of this study was to examine the relations between autobiographical memory and hippocampal volume in early childhood.**

## Methods

### Participants

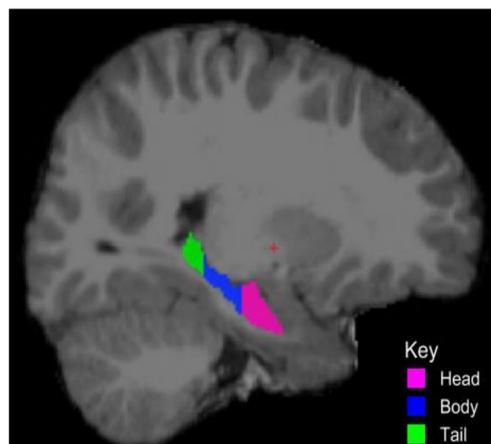
- 173 participants, 4-8 years ( $M=6.31$ ,  $SD = 1.47$ )
- Participants underwent an autobiographical memory interview (AMI) as well as a magnetic resonance imaging (MRI) scan.

### Materials

- Audio recordings of the AMI were transcribed using the Child Language Analysis (CLAN) program and transcription guidelines (MacWhinney, 2000).
- Mean length of Utterance (MLU), a measure of linguistic productivity, was calculated using CLAN.
- Transcriptions were segmented and tagged manually using the General Architecture for Text Engineering (GATE) (Cunningham, Maynard & Bontcheva, 2011).

### MRI Data Collection and Processing

- A T1-weighted structural MRI scan ( $.9 \text{ mm}^3$ ) was obtained using a 32-channel coil on a Siemens 3T Trio scanner.
- T1 images were reconstructed and segmented using Freesurfer v5.1 (FSL) (surfer.nmr.mgh.harvard.edu; Fischl, 2012) and Automatic Segmentation Adapter Tool (ASAT, nitrc.org/projects/segadapter; Wang et al., 2011).
- The hippocampus was divided into head, body, and tail subregions using standard anatomical landmarks (Weiss et al., 2005; Riggins et al., 2015) and adjusted for Intracranial Volume (Raz et al., 2005) derived from Freesurfer.



## Autobiographical Memory Interview (AMI)

- Participants' parents provided details on two recent events in the child's life.
- Interviews involved three phases: Free Recall (the event title), Prompted Recall (parent-provided details), and Specific Prompts (Q+A).
- Interview transcripts were coded and scored using a modified Levine et al., 2002 protocol to sum all episodic details mentioned across the three phases.
- All event-internal details over all three phases of the interview (free recall, prompted recall, and specific prompts) for both events were summed up to obtain a measure of **total episodic recall** for these events.

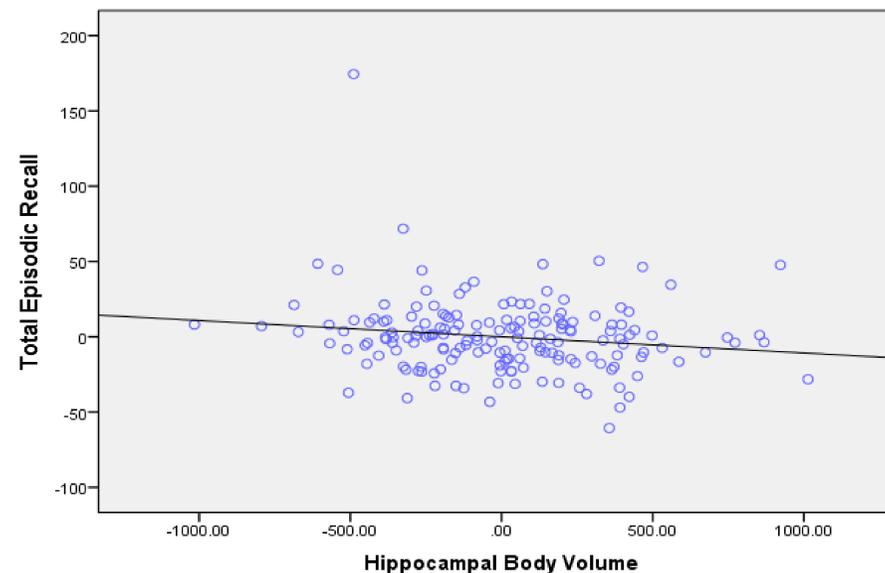


*RSR:	What can you tell me about your first rock concert? .	Free Recall Start
*CHI:	I saw Heart .	Event
*CHI:	It was at Wolftrap .	Coarse-grained Location
*CHI:	Really &-um really far away .	Emotion
*CHI:	But it was fun .	Repetition
*CHI:	A lot of fun .	

## Hippocampal Subregion Results

- A linear regression was used to examine relations between bilateral hippocampal head, body, and tail volumes and total episodic recall controlling for age, gender and MLU.
- Results revealed volume of the hippocampal body (but not head/tail) was correlated with total episodic recall scores ( $b = -.102$ ,  $SE = .006$ ,  $p = .041 < .05$ )**

Partial Regression Plot



## Discussion

- This study builds on previous findings which suggest improvements in autobiographical memory may be related to brain development.
- In particular, when controlling for age, sex, and MLU, volume of the hippocampal body significantly correlated with total episodic recall scores, which reflect the details children remembered about their previous life experiences.
- The relation between autobiographical memory and hippocampal body volume was negative, meaning smaller body was related to higher scores.
- These results align with developmental data suggesting 'bigger' does not always mean 'better' (De Master et al., 2013).
- In addition, these findings are consistent with current theories about long-axis specialization of the hippocampus (Poppenk et al., 2013; Riggins et al., 2016).
- In sum, results support the notion of relations between autobiographical memory and hippocampal development in early childhood.

## Future Directions

- Future work will examine relations between autobiographical memory and other regions of the brain related to memory, such as frontal and parietal cortices.
- In addition, future work will examine the role of social factors on both autobiographical memories and the brain.

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## Acknowledgments

We would like to thank the families for participating in this study and members of the Neurocognitive Development Lab for assistance with this project, particularly Jacob Hansen, Kelsey Canada, Morgan Botdorf, and Oyindamola (Dee) Adedipe. This research was supported by the National Institutes of Health HD07951.