

Introduction

- Links between internalizing behaviors and brain structure have been documented in clinical populations of all ages (e.g., Busso et al., 2017; Li, Xu, & Lu, 2018; Lu et al., 2018; Ma et al., 2012; Tu et al., 2012)
 - History of child abuse has been associated with reduced cortical thickness in the middle temporal gyrus in school-age children (Busso et al., 2017).
 - The medial temporal lobe may contribute to the pathophysiology of internalizing psychopathology via its role in emotion processing or regulation (Busso et al., 2017).
 - History of maltreatment has been associated with reduced volume in amygdala and hippocampus 9-15 year old children (Hanson et al., 2015).
- However, whether these same associations are present in typically developing children is lacking.
- **Purpose:** Examine relations between the middle temporal gyrus, hippocampus, and amygdala with subclinical levels of internalizing behaviors in children ages 4-8 years.

Methods

Participants

- 200 children, 4-8 years ($M_{age} = 6.21$ years, $SD = 0.107$) participated as part of a larger longitudinal study examining the development of memory.
- 156 children provided useable questionnaire and neuroimaging data for the present analyses.

Child-Behavior Checklist (CBCL) Ages 1.5-5 and 6-18 years

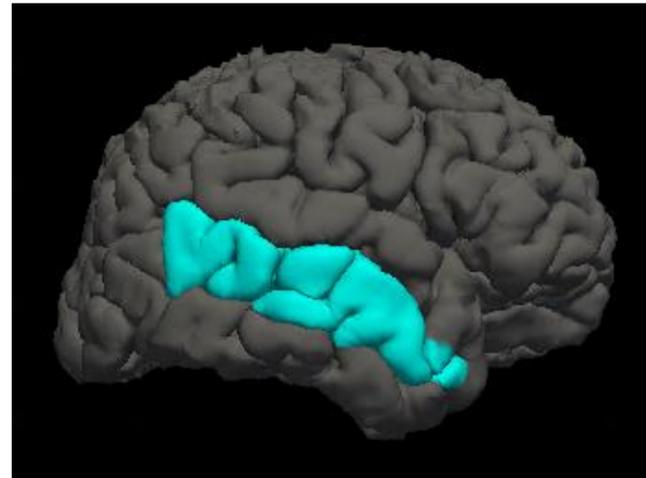
- Participant parents filled out the age appropriate version of the internalizing and externalizing symptom scale.
- Scores were averaged out of total possible points to create a normalized score across the two different questionnaires.

Structural MRI Data

- A T1-weighted structural MRI scan (.9 mm³) was obtained using a Siemens 3T scanner with a 32-channel coil.
- Hippocampal volumes were extracted via Freesurfer v5.1 and adjusted using Automated Segmentation Adapter Tool (Fischl, 2012; Wang et al., 2011). Volumes were adjusted for intracranial volume (ICV).
- Cortical thickness was calculated by measuring the distance from the gray and white matter boundary to the pial boundary (Fischl & Dale, 2000). The Desikan-Killiany Atlas was used for cortical parcellation (Desikan et al., 2006).
- ICV was used as a covariate.

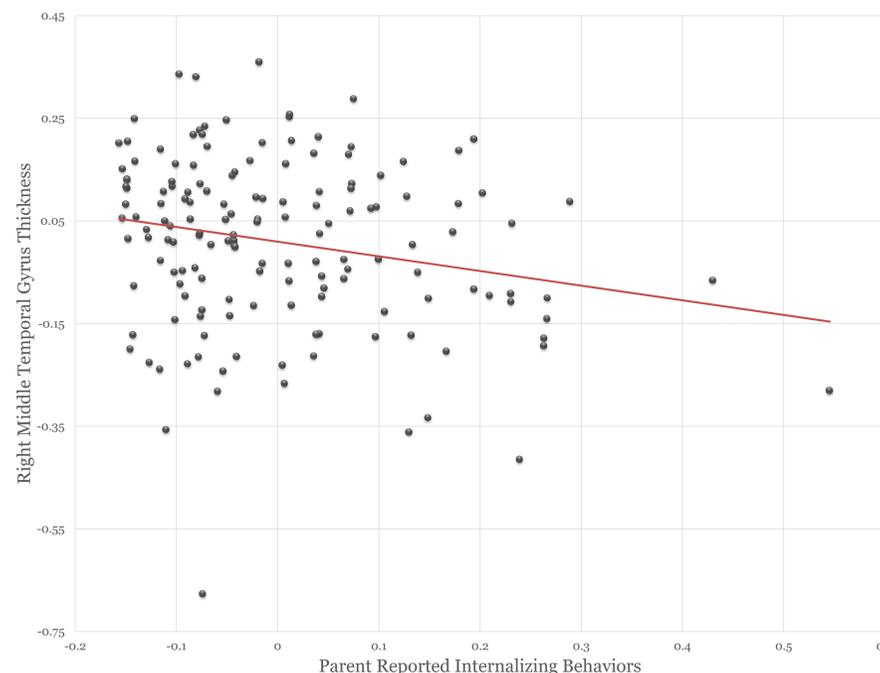
Middle Temporal Region

Figure 1. Lateral view of the middle temporal region.



Results: Right Middle Temporal Gyrus

Figure 2. Higher internalizing behavior scores were related to decreased cortical thickness of the right middle temporal gyrus when controlling for age and ICV, $r(150) = -.218, p = .007$.



Results: Hippocampus and Amygdala

There were no associations with the hippocampus and/or amygdala, $ps > .136$.

Discussion

- Results suggest relations between internalizing behaviors and the right middle temporal gyrus may exist even at sub-clinical levels.
- This study is one of the first to examine relations between brain regions and internalizing symptoms in a typically developing population.
- Lack of associations between the hippocampus, amygdala, and internalizing behaviors may suggest that the relation between these factors may only exist in clinical populations.
- Future work will explore additional brain regions and will seek to replicate these findings in additional typically-developing samples.

Take-Home Message

Results suggest that internalizing behaviors are related to decreased cortical thickness in the right middle temporal gyrus in a typically developing sample of young children.

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