Cortisol response to stress, hippocampal volume, and depressive symptoms in young children.

Carina H. Fowler & Michael S. Gaffrey, Ph.D.

I. Significance & Rationale

- Reduced hippocampal volume and elevated levels of the stress hormone cortisol have been repeatedly linked to Major Depressive Disorder in adults.[1]
- Rodent studies suggest that cortisol shrinks the hippocampus.[2]
- Children as young as three may show depressive symptoms.[3]
- Like adults, children with elevated depressive symptoms also demonstrate higher cortisol following stress, which has been previously demonstrated using this dataset.[4]
- No research to date has explored the relationship among cortisol, hippocampal volume, and depressive symptoms in young children.

II. Hypotheses

- Higher depressive symptoms in children will correlate with:
  1. Greater salivary cortisol response to an in-lab stressor
  2. Reduced hippocampal volume
- Reduced hippocampal volume will explain the relationship between elevated cortisol and elevated depressive symptoms.

III. Participants

- 40 children, M_{age} = 6.14 years , SD = 0.67, 43 % male
- During recruitment, children with elevated depressive symptoms were prioritized for study participation.

Completed Study	High Quality Cortisol	High Quality T1	High Quality Cortisol & T1
N = 74	N = 52	N = 47	N = 40

IV. Imaging Method

Hippocampal volume

- T1 images were segmented and labeled in Freesurfer 6.0.[5]
- Analyses controlled for whole brain volume, child age in months, and child gender.

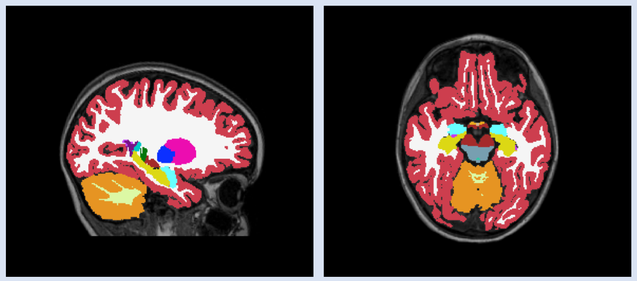


Figure 1. Example of a participant's volumetric segmentation in the sagittal and axial views. The hippocampus is in yellow.

IV. Method

- **Depressive Symptoms**
  - Measured with the Preschool Feelings Checklist (PFC)—a 23 item measure with a 0-4 scale.[6]
  - Analyses controlled for maternal depression
- **Frustration Task**
  - Children completed a stress-inducing frustration task that reliably induces a cortisol response in preschoolers
- **Cortisol Samples**
  - Measured as Area Under the Curve with respect to ground

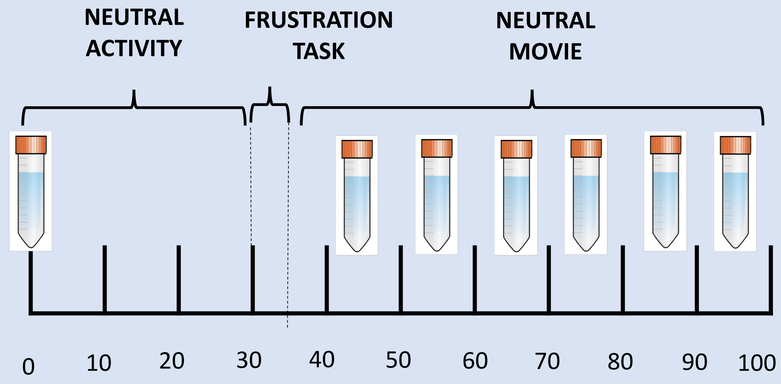
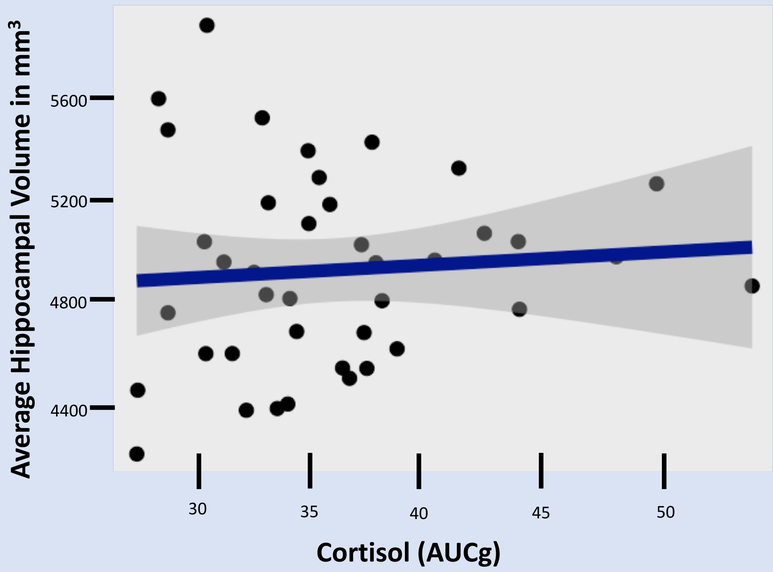


Figure 2. Illustration of cortisol collection procedure. Cortisol was sampled at baseline and then every 10 minutes after the frustration task.

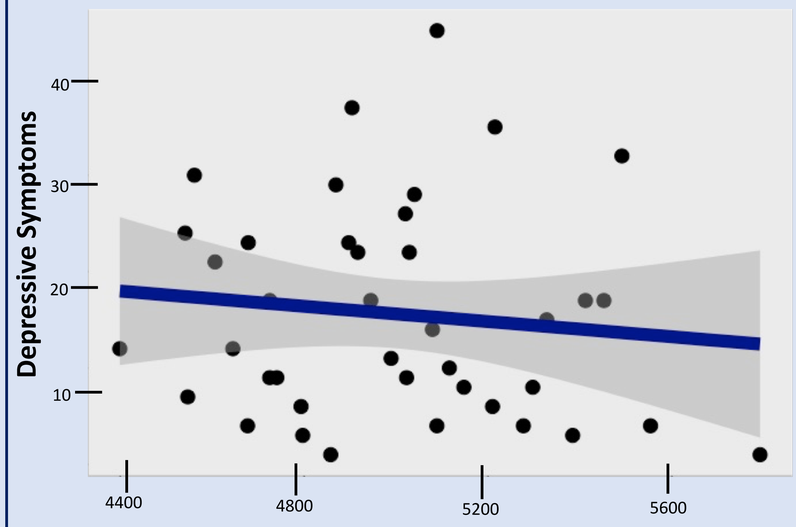
V. Results: Cortisol & Hippocampal Volume

- Cortisol response to an in-lab stressor did not correlate with left (b = 10.04, t = 1.2, p = .24), right (b = 9.64, t = .85, p = .40), or average (b=10.02, t = 1.08, p = .29) hippocampal volume.



VI. Results: Hippocampal Volume & Depressive Symptoms

- Depressive symptoms did not correlate with average (b = -9.831 x 10^{-4}, t = -.28, p = .82), right (b = -6.35 x 10^{-4}, t = .18, p = .86), or left (b=-3.33 x 10^{-3}, t = -.72, p = .47) hippocampal volume.

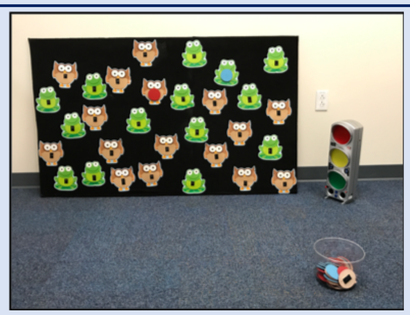


VII. Conclusions

- Cortisol response did not correlate with hippocampal volume.
- Hippocampal volume did not correlate with depressive symptoms.
- In adults, there is a robust relationship between hippocampal volume and depressive symptoms, with some studies finding that stress response mediates this relationship.[7]
- Perhaps cortisol's influence on hippocampal volume occurs gradually and has not yet begun in children.
- This idea corresponds to work in adults suggesting that volume loss is greater depending on duration and number of episodes.[8]
- It is also possible also that we were underpowered to detect this relationship.

Figure 3. Image depicting the frustration task.

Children were timed while they matched colored stickers to animals on the board.



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