

Introduction

- Episodic memory is known to be well-developed in adults and less mature in younger children.
- The differences in underlying neural mechanisms across development supporting this ability is less understood.
- An early neural response appearing early that is negative and maximal over frontal-central leads differentiates between items that are correctly remembered as new versus correctly remembered as old.

Purpose of Current Study:

To examine developmental differences in the neural mechanisms, specifically early frontal negativity, supporting memory recall across development

Method

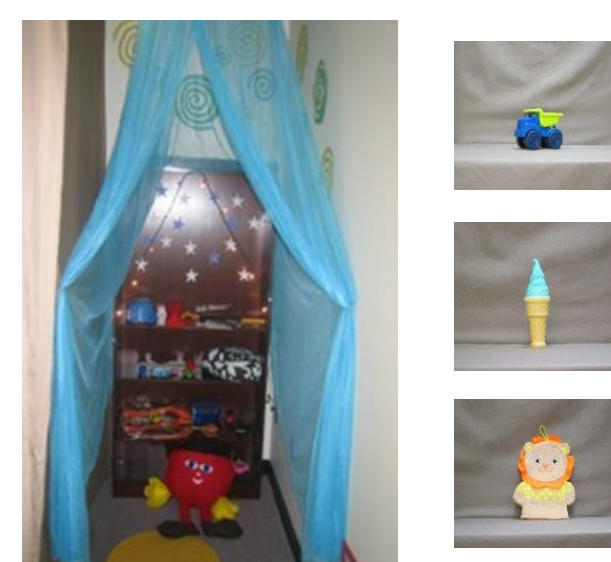
Participants

- 95 3- to 6-year-old children ($M_{age}=4.73, SD_{age}=1.06$)
- 17 young adults ($M_{age}=20.63, SD_{age}=2.09$)



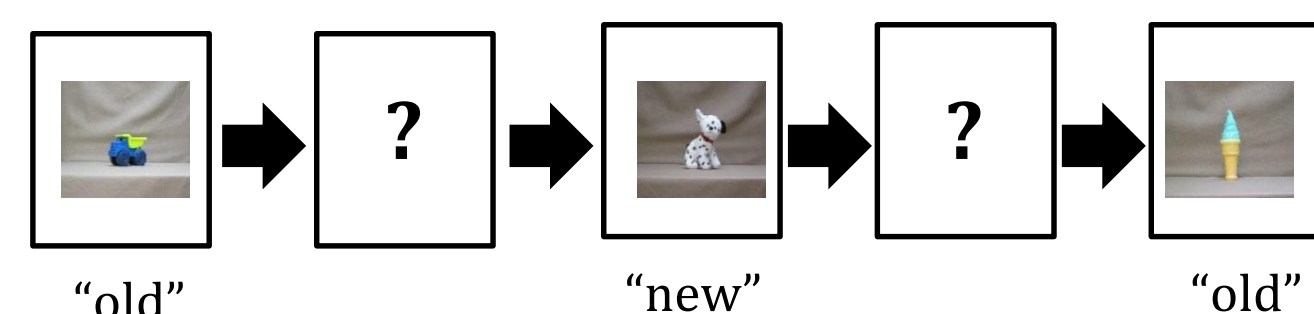
Encoding:

Familiarized to 54 toys



Retrieval:

1) Viewed 54 old toys and 27 new toys while brain activity was recorded



2) Sorted toys as old "played with" or new "not played with"

Procedure

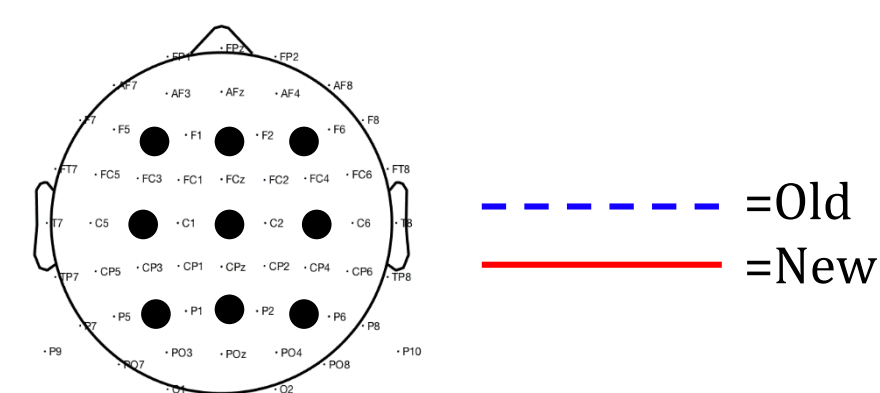
- Memory paradigm with encoding and retrieval phase.
- EEG recorded during passive viewing with a sampling rate of 512 Hz (BioSemi Active 2) from 64 active Ag-AgCl scalp electrodes and two vertical and two horizontal electrooculogram (EOG) channels.
- ERP data utilized an average reference and was included if participants provided a minimum of 20 trials per condition.
- Electrodes analyzed (9 total): **F3, Fz, F4; C3, Cz, C4; P3, Pz, P4**

Measures

- Memory measuring using: proportion of correctly identified new items (New) and proportion of correctly identified old items (Old)
- Early frontal negativity examined between 350 – 550 milliseconds (ms)

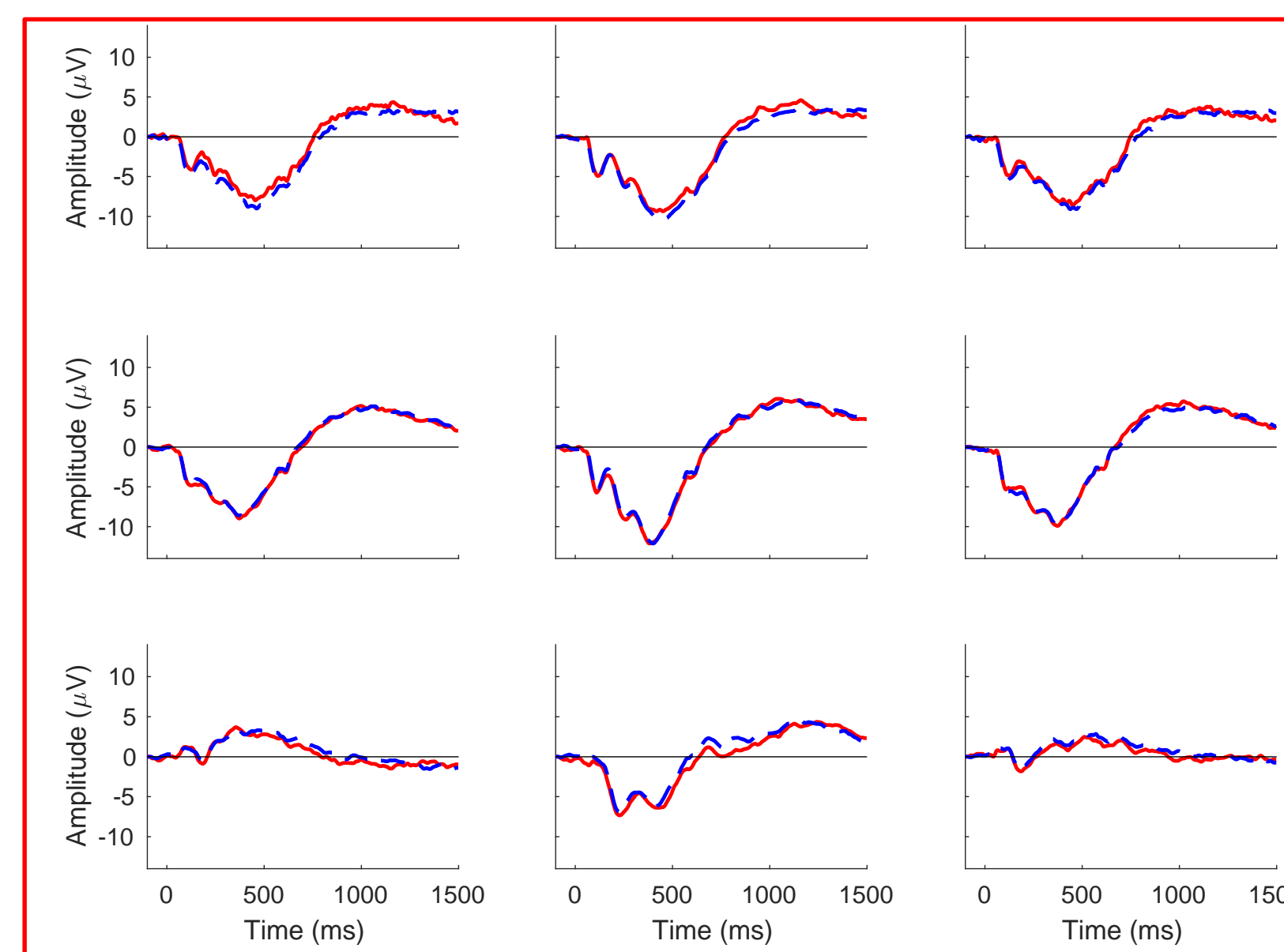
Results: ERPs

Early frontal activity (350- 550 ms) was more negative for trials where participants correctly identified an item as "New" compared to trials when an item was correctly labeled as "Old" for all participants



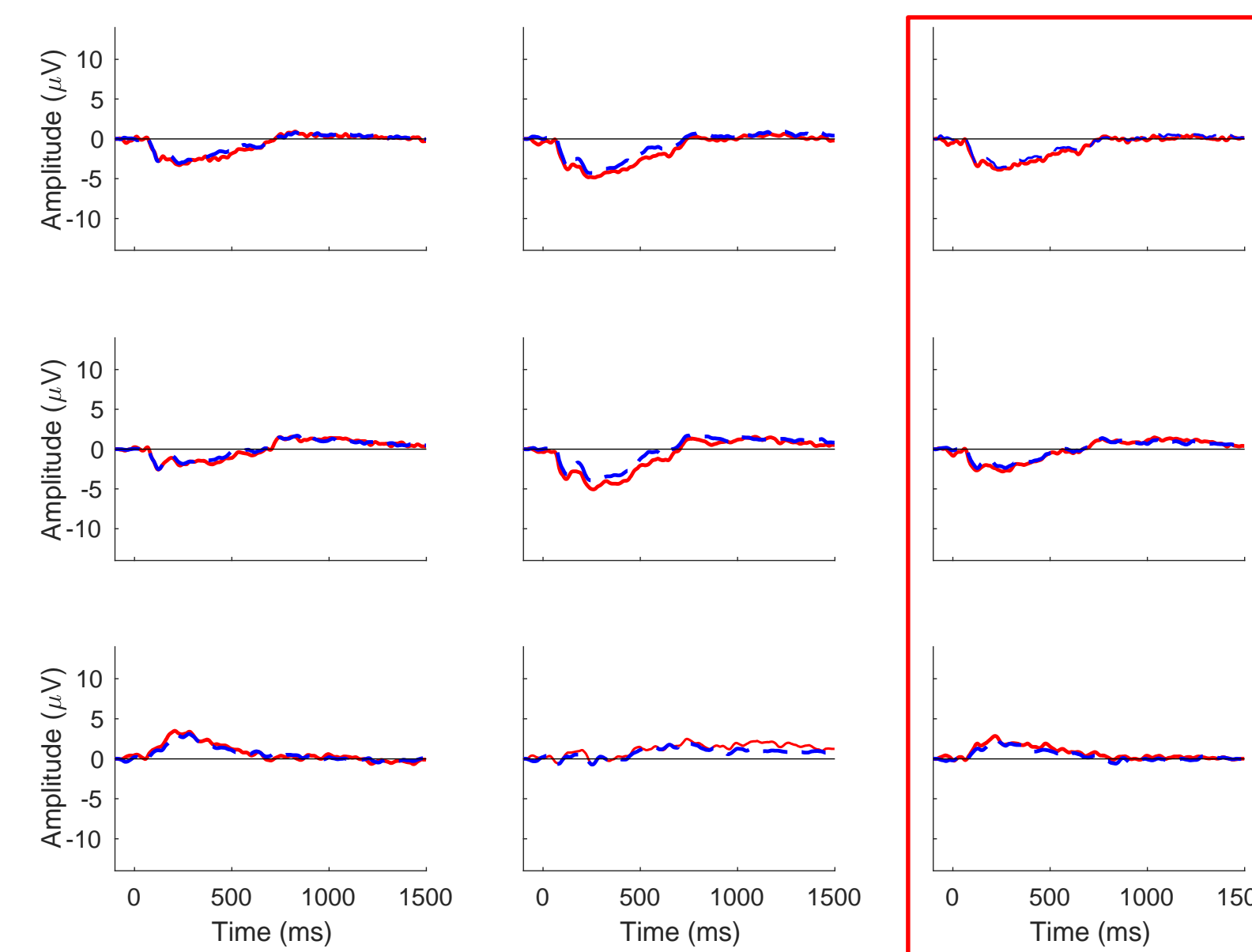
Children; n= 95

Early negative activity averaged **across all electrodes** showed more negative amplitudes for new compared to old items .



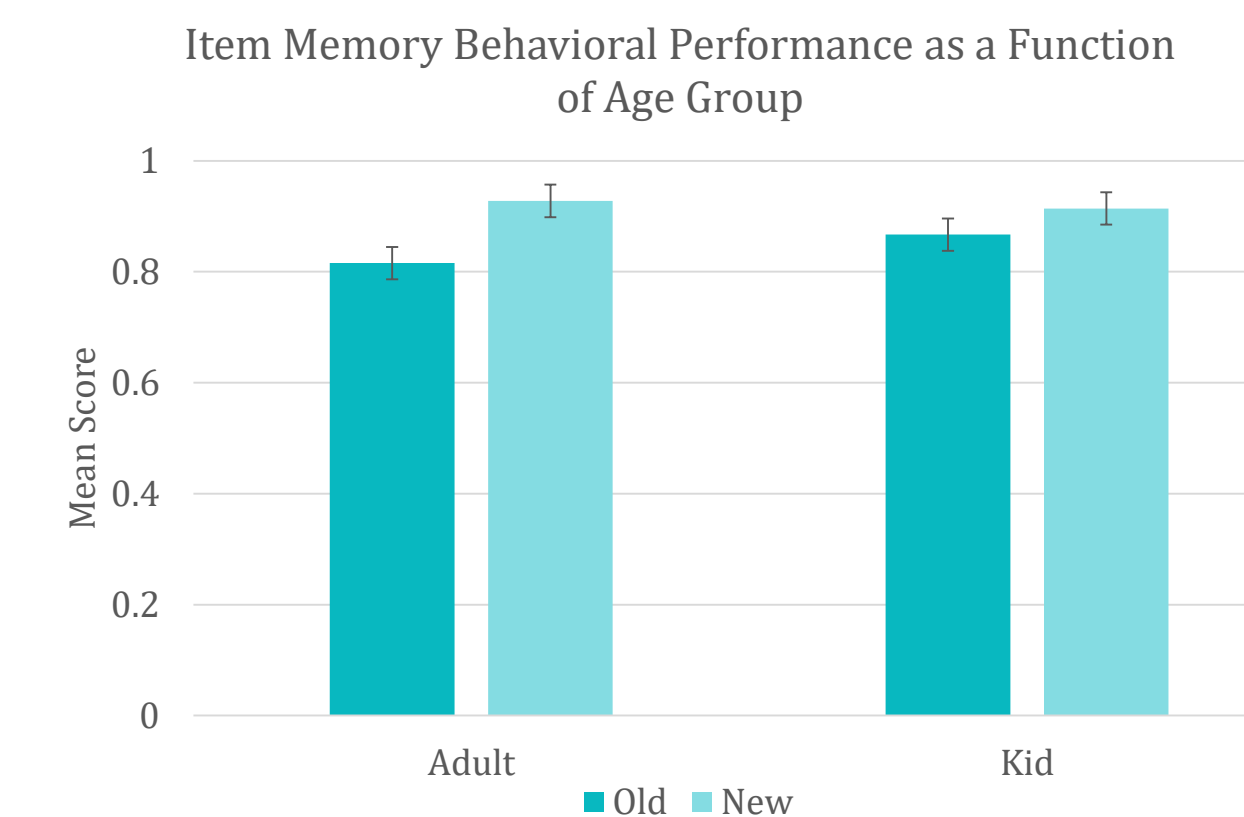
Adults; n= 17

New and Old items only reliable in the **right hemisphere**.



Results: Behavior

No behavioral difference between adults and children.



	Adult	Child	Group differences
Old	.82 (.03)	.87 (.02)	<i>n.s.</i> $F(1,110) = 1.39; p = .241$
New	.93 (.03)	.91 (.02)	<i>n.s.</i> $F(1,110) = .115; p = .735$

Note. Mean (SD)

Discussion

- Behavioral performance did not differ between adults and kids.
- Suggests that the ability to recognize items is relatively well-developed in early childhood.
- Neural activity in both adults and kids indexed different recruitment of resources for old versus new items.
- Consistent with previous research (Riggins, Rollins & Graham, 2013), early frontal activity was more negative when a new was correctly identified, versus when an old item was correctly identified.
- Effect was widespread in kids and localized to right hemisphere in adults, consistent with past research (Riggins, Rollins & Graham, 2013).

Suggests that although behaviorally adults and kids are able to complete this task, the way the brain supports this ability continues to change into adulthood.

References

- Riggins, Rollins & Graham (2013). *Developmental Neuropsychology*.
- Riggins & Rollins (2015). *Child Development*.
- Rollins & Riggins (2017). *Developmental Science*.

Acknowledgements

I would like to give a special thanks to my mentor, Kelsey Canada for her dedication to assisting me on this project and to Dr. Tracy Riggins and the entire Neurocognitive Development Lab for their support.