

## Background

- There is a proposed functional differentiation along the hippocampal long axis<sup>1</sup>, including differences in the overlap of signals within hippocampal subregions.<sup>2,3</sup>
- Prior work has sometimes shown higher correlation of hippocampal signals within the anterior versus within the posterior hippocampus<sup>2</sup>, and sometimes shown higher correlation of posterior hippocampal signals<sup>3</sup>.
- How older age affects intrahippocampal signals along the hippocampal long axis is not known, but dedifferentiation of posterior hippocampal signals could relate to declines in episodic memory.

## Does older age affect signal similarity across posterior-anterior subregions of the hippocampus?

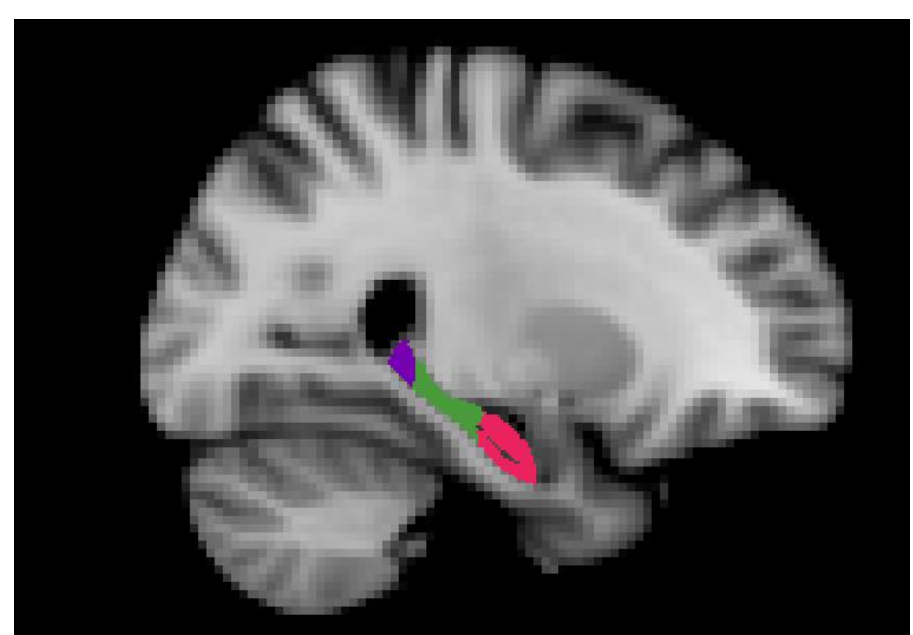
## Adult Lifespan Sample

Cambridge Center for Aging and Neuroscience Data<sup>4</sup>

- 650+ participants ages 18-88
- Resting state scan used
- 323 included in fMRI data only analyses
- 157 included in brain-behavior analyses

Age group	fMRI data only analyses			Brain-behavior analyses		
	N included	% Female	MMSE Score	N included	% Female	MMSE Score
18-29	51	55%	29.2	26	46%	29.4
30-39	67	46%	29.2	32	50%	29.3
40-49	71	46%	29.2	33	55%	29.3
50-59	43	63%	29.4	24	62%	29.6
60-69	45	42%	28.9	19	42%	28.8
70+	46	33%	28.1	23	30%	28.1
<b>Total</b>	<b>323</b>	<b>47%</b>	<b>29.0</b>	<b>157</b>	<b>48%</b>	<b>29.1</b>

## Hippocampal regions

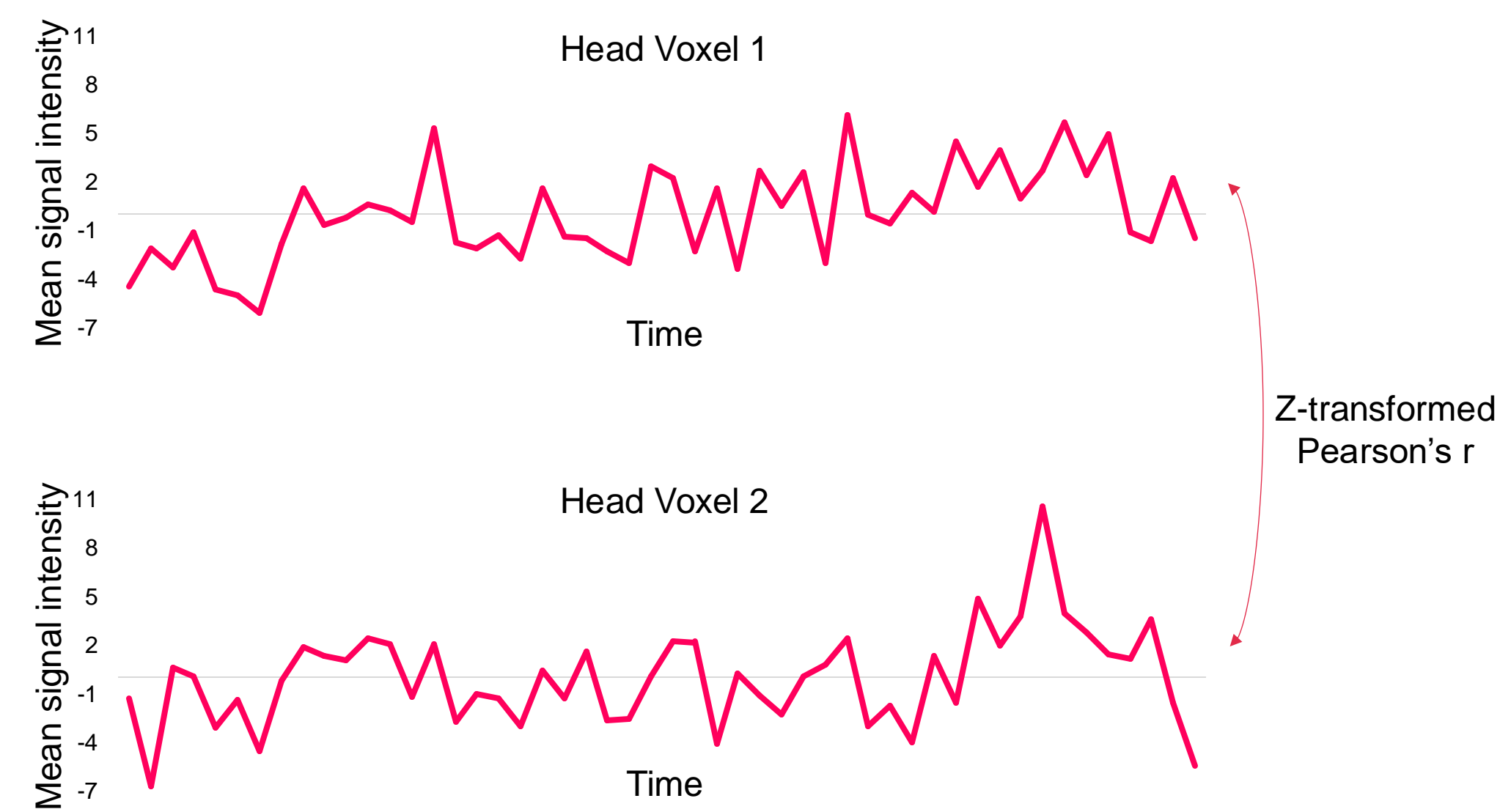


■ Tail ■ Body ■ Head

Freesurfer hippocampal segmentation<sup>5</sup>.

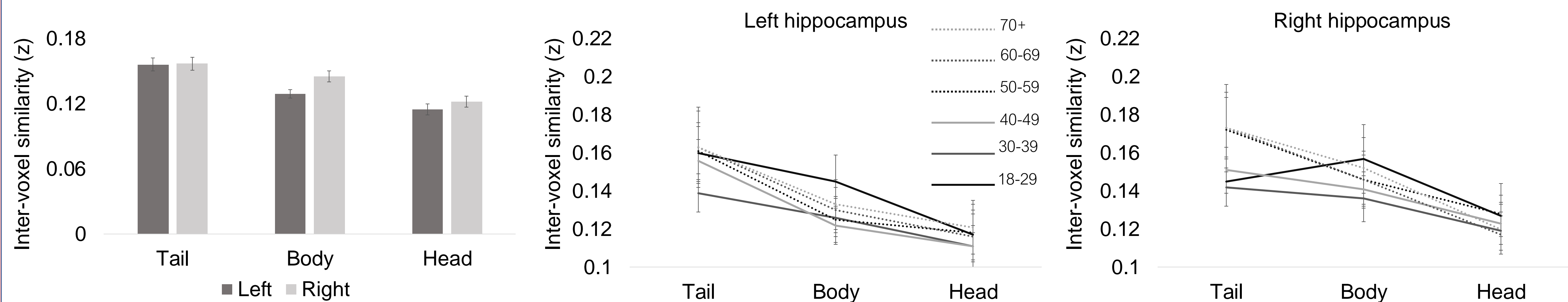
- Tail = most posterior, Head = most anterior
- Separate right, left hemisphere ROIs

## Inter-voxel similarity<sup>2</sup> (IVS)



- Following pre-processing,
- computed partial correlations between time courses for each pair of voxels within a subregion, removing timepoints with excessive motion and including motion covariates.
  - averaged z-transformed correlations across all voxel pairs for each subregion.

## Are there differences in intra-region signals along the hippocampal long-axis?



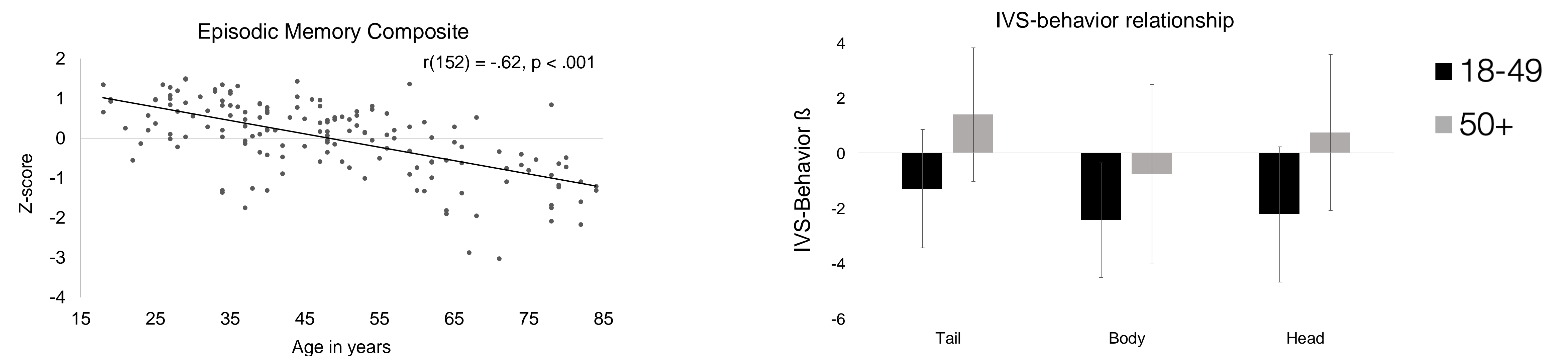
- IVS highest in the tail and relatively less similar in the body and head, except the 18-29 group in right hippocampus.
- Larger difference between tail vs. body and head in older age groups.

## How does aging impact patterns of hippocampal signal similarity?



- Older age associated with a slight increase in IVS in tail of the right hippocampus.
- Age effect directionally negative in body and head.
- Overall age x hippocampal subregion interaction driven by divergence between tail and more anterior regions.

## How do patterns of hippocampal signal similarity relate to episodic memory?



- Age-related decline in episodic memory in this sample.
- Episodic memory performance not well explained by individual differences in IVS.

## Summary

- Across ages, hippocampal signals were most similar in the posterior hippocampus and became less similar in anterior hippocampus.
  - High similarity in posterior hippocampus contradicts some theories,<sup>1,2</sup> but is in line with other recent findings.<sup>3</sup>
- Divergence between posterior hippocampus and more anterior regions in older age.
- Similarity of hippocampal subregion signals was not related to episodic memory performance.

## References

1. Poppenk et al., (2013). *Trends in Cognitive Sciences*.
2. Brunec et al., (2018). *Current Biology*.
3. Thorp et al. (2022). *The Journal of Neuroscience*.
4. Shafto, et al., (2014). *BMC Neurology*.
5. Iglesias, et al., (2015). *NeuroImage*.

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