

Brain Mechanisms of Autobiographical Memory Recall in PTSD

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Introduction

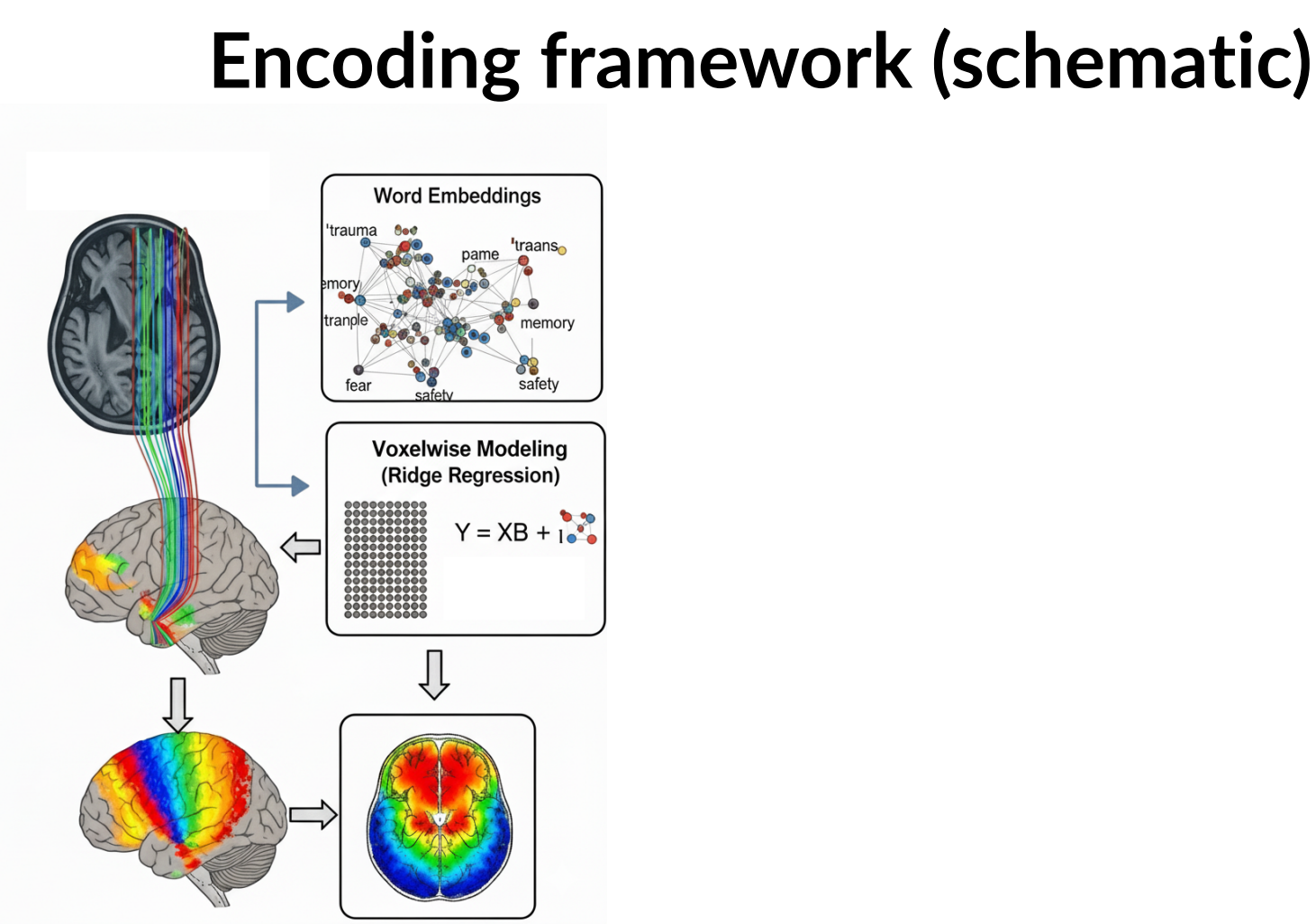
- PTSD is characterized by intrusive traumatic memories and impaired regulation of these memories.
- Autobiographical memory recall recruits pre-frontal, limbic, and default-mode systems.
- Voxelwise encoding with word embeddings links the semantic content of recall to brain activation time series.

Methods

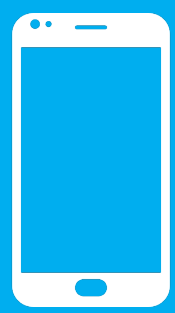
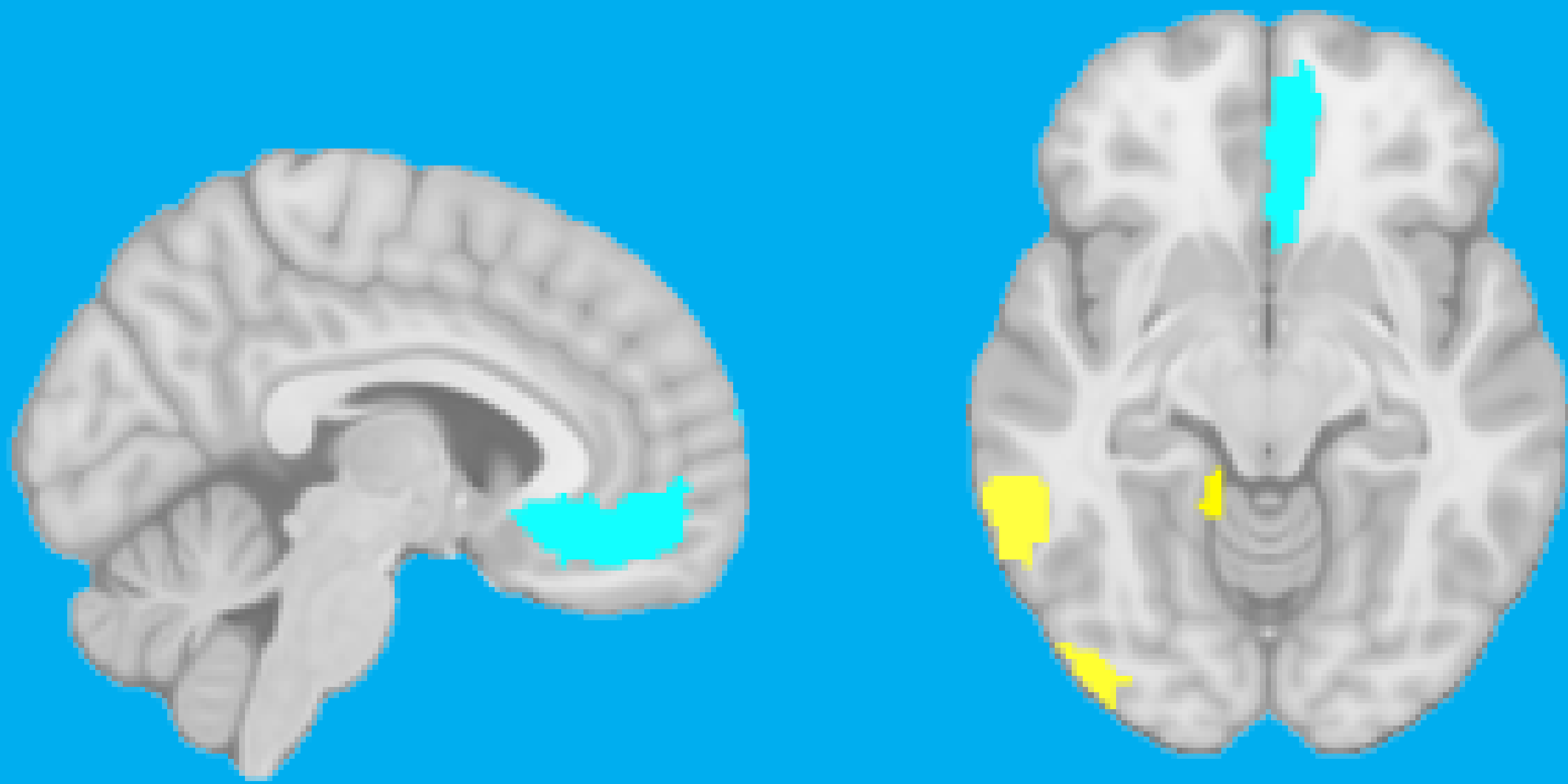
- **Participants:** 16 adults (8 PTSD; 8 healthy controls).
- **Task:** fMRI-based recall of personally relevant traumatic and mundane events.
- **Model:** Voxelwise modeling using word embeddings as predictors of voxel time series.
- **Contrasts:**
 - PTSD vs. control (between groups)
 - Trauma vs. mundane recall (within the PTSD group)
- **Outcomes:** Regional contribution maps and ROI-level summaries.

Pipeline

1. Preprocess fMRI data
2. Extract time series
3. Preprocess audio transcripts into time-word tables
4. Apply NLP embedding (Word2Vec)
5. Ridge regression: predict ROI activation from embeddings (train on part of the data)
6. Validate by predicting held-out time series
7. Test correlation between predicted and actual data



PTSD trauma recall shows reduced prefrontal engagement vs. Healthy Trauma recall, indicating impaired top-down regulation.



Scan for repo & full poster

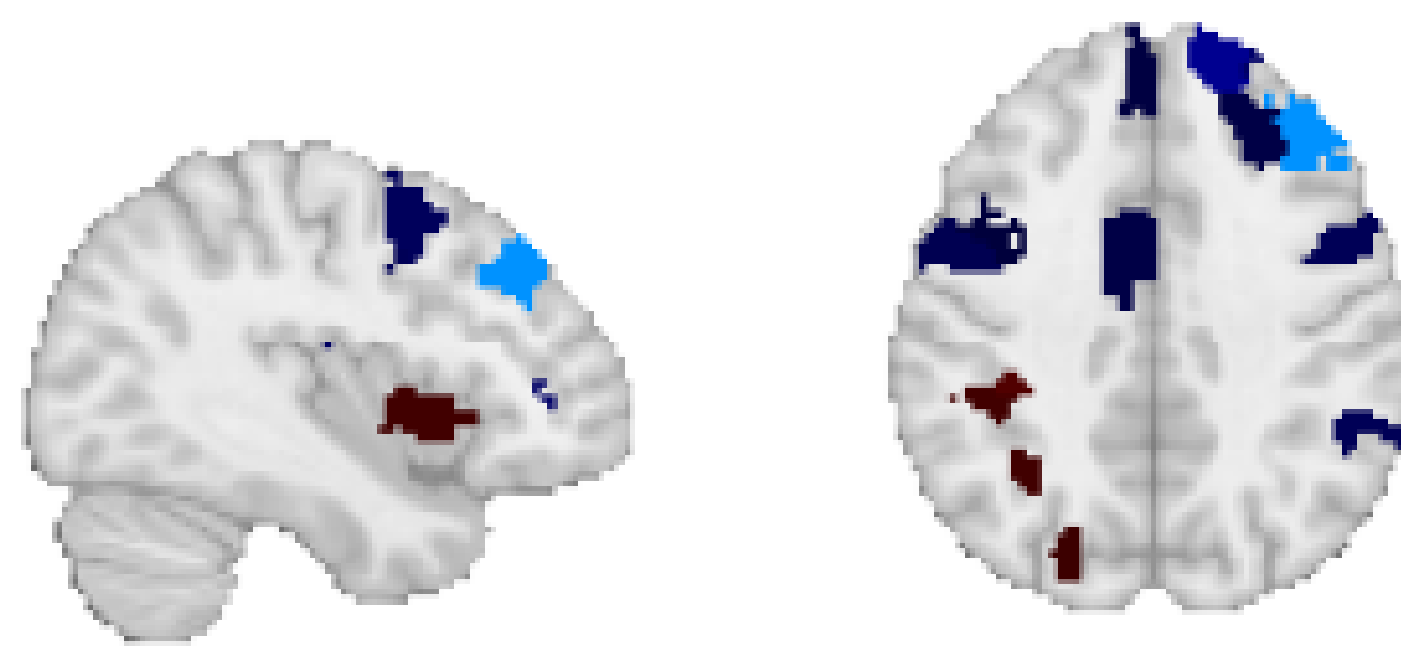


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Results

- PTSD participants showed reduced pre-frontal engagement during trauma compared with mundane recall.
- PTSD participants showed higher limbic engagement during trauma vs. mundane recall.
- Compared with healthy controls, PTSD participants showed reduced vmPFC engagement during traumatic recall (main figure).
- Controls maintained prefrontal engagement during trauma recall.

Trauma–Mundane in the PTSD group



Discussion & Implications

- This is the first study to use free recall (a naturalistic stimulus) in combination with voxelwise modeling of brain activation.
- Findings are consistent with impaired top-down regulation during trauma recall in PTSD.
- These results are preliminary, given the small sample size (N=16).
- This method enables investigation of naturalistic traumatic (and other autobiographical) memories, helping to unravel the brain mechanisms underlying them.

References

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2. Huth AG, de Heer WA, Griffiths TL, Theunissen FE, Gallant JL. Natural speech reveals the semantic maps that tile human cerebral cortex. Nature. 2016;532(7600):453–458.
3. Perl O, Duek O, Kulkarni KR, Kelmendi B, Amen S, Gordon C, et al. Neural patterns differentiate traumatic from sad autobiographical memories in PTSD. Nat Neurosci. 2022;26(12):2226–2236.

