

Introduction

- Naturalistic memories are the result of creating events from a continuous stream of perceived information^{1,2}
- The brain segments this perceived information into meaningful events by spontaneously creating event boundaries^{1,2}
- Event boundaries are critical for how information is encoded and structured in memory²
- The objective of this research was to determine the brain regions active when encountering event boundaries within complex narratives**

Methods: fMRI data

58 participants (29 males, mean age=22 years old)

- Participant fMRI data was taken from the “Narratives” collection³
- fMRI data was collected as participants listened to “Pie Man,” a naturalistic spoken story by Jim O’Grady
- The brain data was normalized and averaged between all subjects
- Data was extracted for brain activity during event boundaries, non-event boundaries, and for the complexity of the segment (time)

Excerpt of “Pie Man” story with segmentation

I began my illustrious career in journalism in the Bronx where I **toiled as a hard-boiled** reporter for the Ram, the student newspaper in Fordham **University. And** one day, I am walking towards the campus centre and out comes the elusive Dean McGown, **architect of a policy** to replace Fordham’s traditionally working to middle class students with wealthier, more prestigious **ones.**

- - Event boundary
- - Non-event boundary

Methods: Event boundaries

- The narrative stream was segmented into 19 event boundaries by 205 raters who listened to the story and indicated a boundary when one natural and meaningful unit ended and another began, based on the methods and results of Michelmann et al. (2020)⁴
- Non-event boundaries were defined as the time point in between two event boundaries; complexity of an event is determined by the length in time of the segment

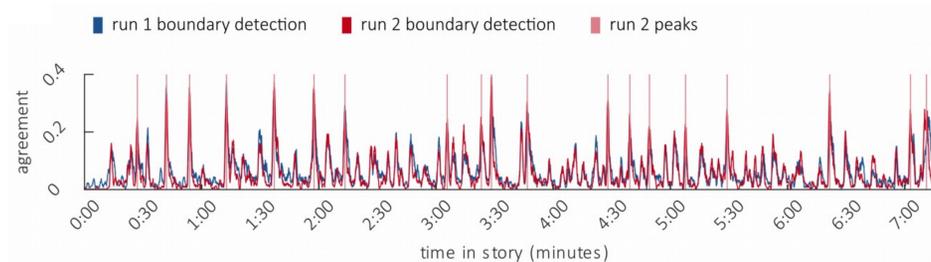
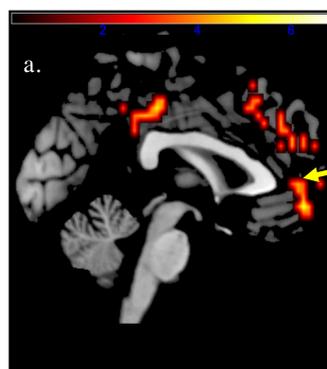


Figure 1. Event segmentation and boundary detection for the “Pie Man” story during run 1 and run 2 of auditory presentation (figure taken from Michelmann et al. (2020))

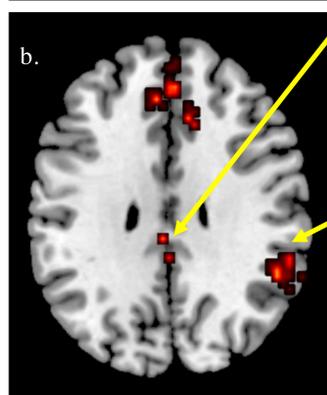
fMRI Analysis and Results

After standard preprocessing (Freesurfer, fMRI Prep), General Linear Models were constructed with SPM12 that identified contrasts between event and non-event boundaries, and event boundaries and complexity of previous segments.

Event boundaries > Non-event boundaries



Ventromedial PFC
Event Schemas and Models



Posterior Cingulate Cortex
Event Schemas and Models

Middle Temporal Gyrus
Auditory Processing

Event boundaries > Segment complexity

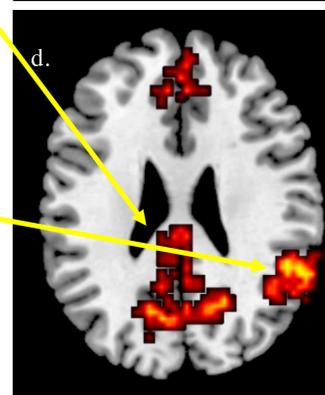
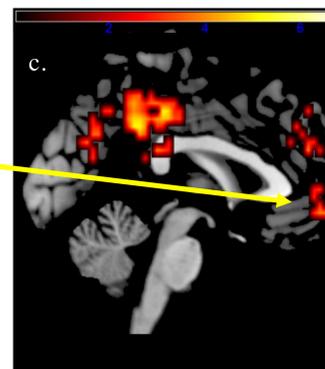


Figure 1. (a, b) Voxels with orange illustrating the patterns associated with event and non-event boundaries ($p < 0.005$), (c, d) Voxels with orange illustrating the pattern associated with event boundaries and segment complexity (length) ($p < 0.005$).

Discussion

- Event boundaries were associated with increased auditory processing activity in brain regions involved in forming discrete event models
- These processes are modulated and increased when the information leading up to the segmentation is more complex
- Event boundaries play an important role in determining how continuous information is perceived and encoded in memory, possibly forming the general structure of an event
- Future work will examine differences in hippocampal connectivity at event and non-event boundaries, as it plays a significant role in the formation of mental representations and memory. Seeing brain activity as participants listen to the story for a second time will give further insight into the relationship between memory, event boundaries, and hippocampal engagement⁵

References

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Acknowledgments

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