What's the Score: Music-Evoked Reactivation of Naturalistic Events

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Introduction

• Music has the power to transport us back to moments in our life due to its ability to forge associations between temporally-distant events.

• How are episodic memories reactivated by music?

• Previous studies on event perception have demonstrated that episodic memories are stored in high-level cortical regions, such as angular gyrus and posterior medial cortex (Chen et al. 2016), and event boundaries result in post-boundary encoding activity in the hippocampus (Baldassano et al., 2017; Ben-Yakov & Henson, 2018).

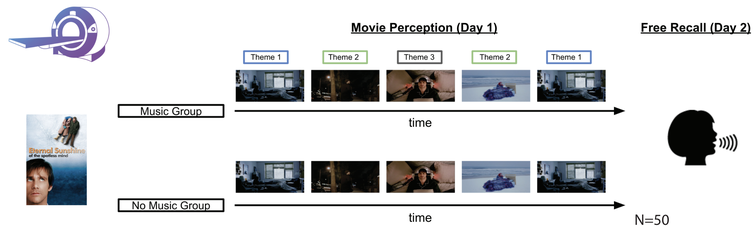
• This work also demonstrated that activity patterns in these regions are reactivated during retrieval.

• Recent work has also shown that higher-order areas overlapping with the DMN (e.g. precuneus, angular gyrus, and mPFC), as well as auditory cortex, represent high-level musical events (Williams et al., 2022).

• **Based on this prior work, we sought to find evidence that repetitions of musical themes in a film trigger retrieval of events in the film previously associated with the same theme.**

Methods

2-day fMRI Study Design



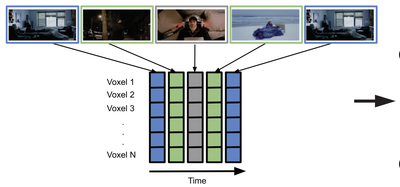
Measuring Neural Reactivation

Key Prediction:

Reactivation will occur in the music group (green arrow) but not in the no-music group (red arrows).

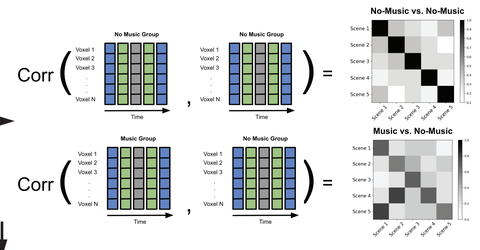
1. Create Average Event Patterns

Within each condition, record the multi-voxel spatial pattern associated with each scene.

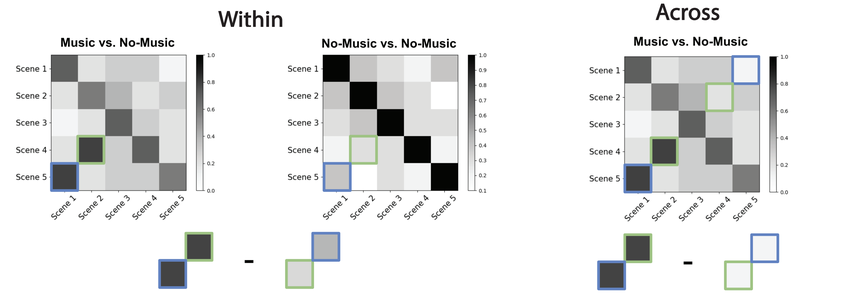


2. Compute Pattern Similiarity Between Events

Compute RSMs within no-music group and between both groups.



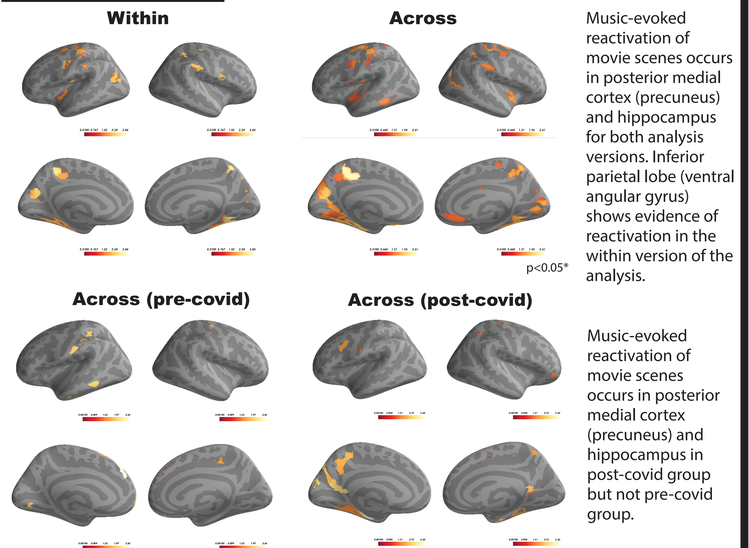
3. Take Difference Between Event Correlations (reactivation score)



Subtract "no-music group current scene vs. no-music group previous scene correlations" from "music group current scene vs. no-music group previous scene correlations".

Subtract "no-music group current scene vs. music group previous scene correlations" from "music group current scene vs. no-music group previous scene."

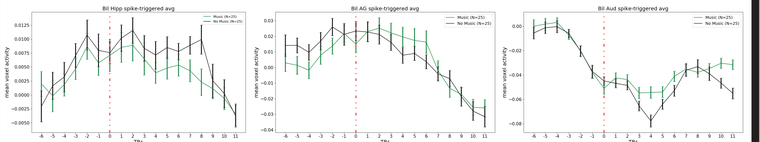
Results



Music-evoked reactivation of movie scenes occurs in posterior medial cortex (precuneus) and hippocampus for both analysis versions. Inferior parietal lobe (ventral angular gyrus) shows evidence of reactivation in the within version of the analysis.

Music-evoked reactivation of movie scenes occurs in posterior medial cortex (precuneus) and hippocampus in post-covid group but not pre-covid group.

Spike-triggered average at music offsets



Activity in hippocampus (left) and angular gyrus (middle) increases for both groups prior to offsets. The music group shows a delayed response in AG and a dampened response in Hipp. Auditory cortex (right) exhibits a decrease in activity around offsets (time courses were shifted by 4 TRs to account for the HRF).

Conclusions and Future Directions

• Music-evoked scene reactivation was detected in posterior medial cortex, angular gyrus, and hippocampus.

• Hippocampal and angular gyrus activity increases around music offsets for both conditions while auditory activity decreases prior to music offset.

• Analysis of free recall is currently underway.

• Next, we will relate cortical reinstatement effects to recall of scene information.

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