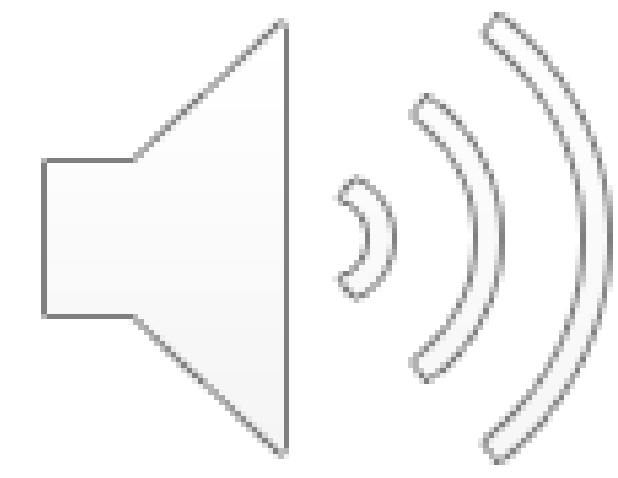


fMRI analysis of functional brain networks involved in memory tasks and visual and verbal discrimination tasks in healthy individuals

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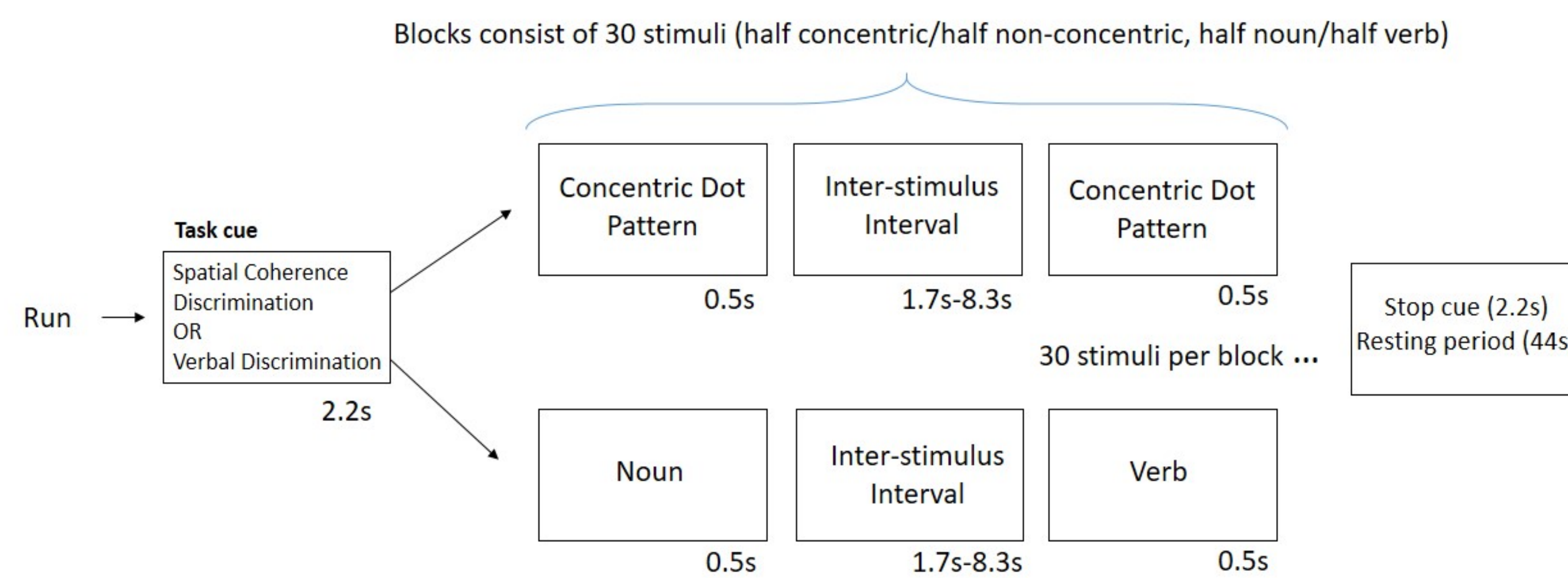
INTRODUCTION

One possible alternative treatment option for neuropsychiatric disorders is neuromodulation, applying electric current to the head to modify the neural networks in the brain. However, in order to develop an effective treatment procedure for neuromodulation, an extensive knowledge and detailed understanding of the spatial location of the brain networks and fine temporal resolution of neuron electrical impulses is required. This study aims to identify functional brain networks that are differentially activated in response to visual discrimination and verbal discrimination, as well as in response to memory for faces, scenes, and words, by analyzing fMRI data of healthy individuals from the Midnight Scan Club (MSC) dataset, a previously completed study.

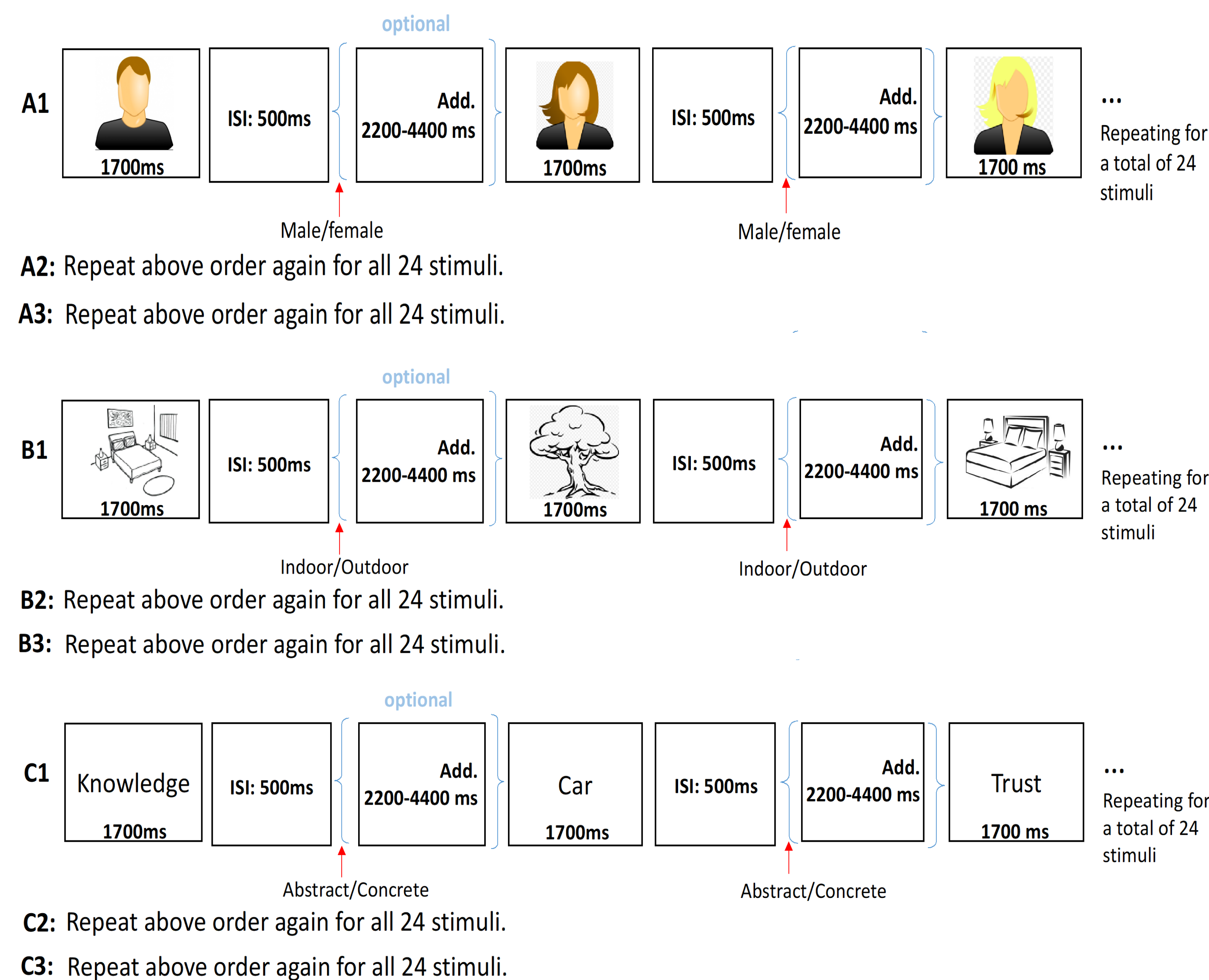
METHODS

Coherence Semantic Task

Mixed block/event-related design task



Incidental Memory Task



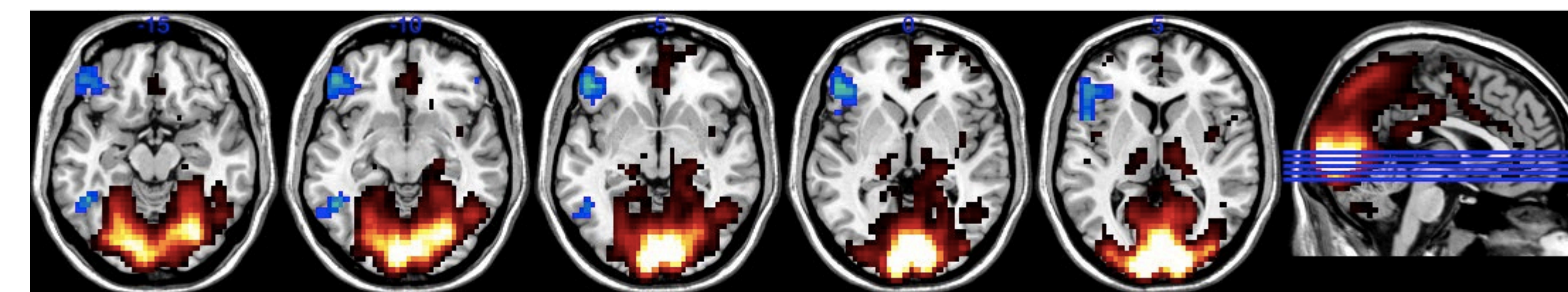
Analysis

- fMRI-CPCA was used to determine functional brain networks and associated hemodynamic responses engaged in the tasks.
- The functional brain networks underlying each cognitive task was determined using a MATLAB-based algorithm.
- Statistical significance of hemodynamic responses was determined with repeated measures ANOVAs.

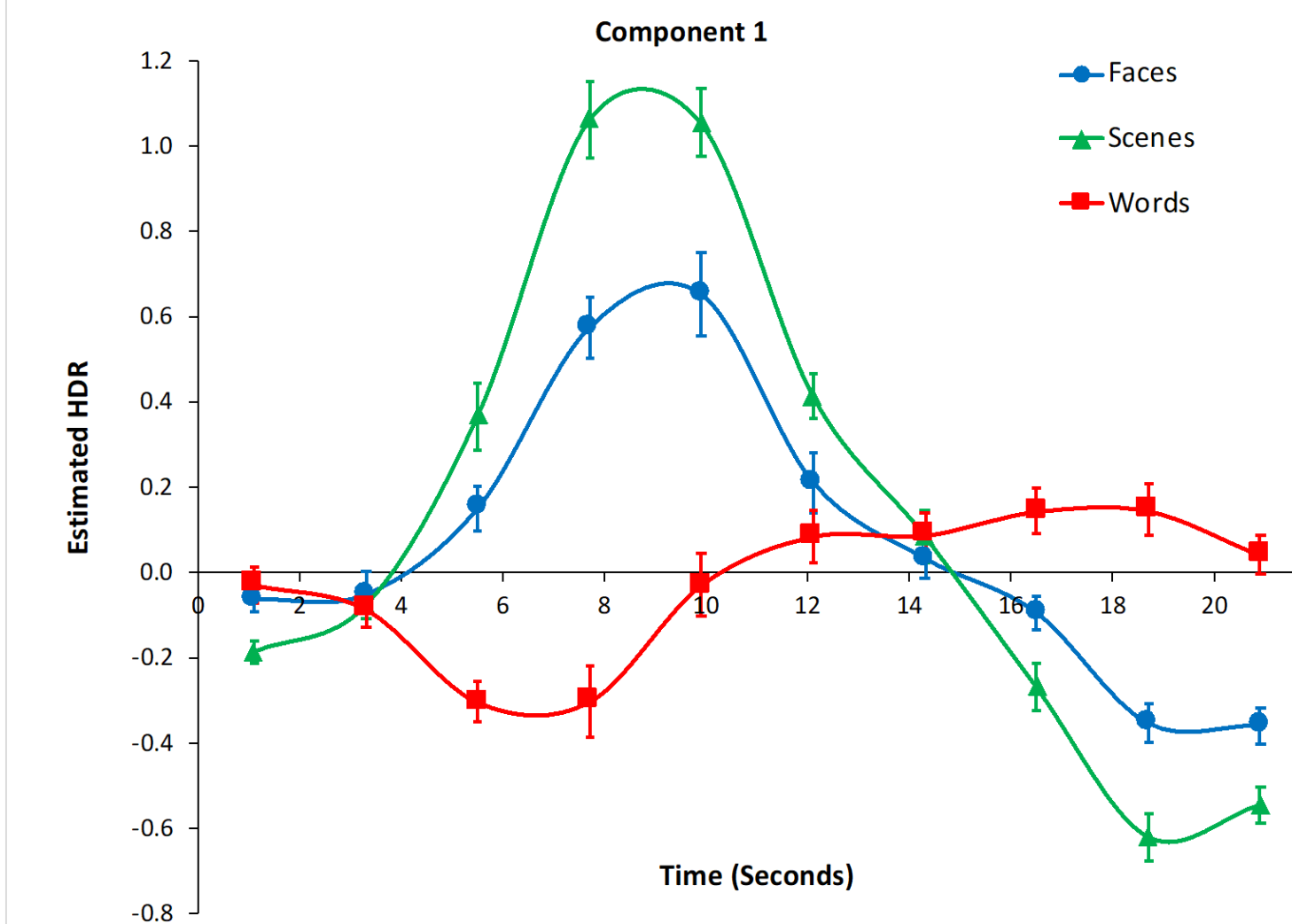
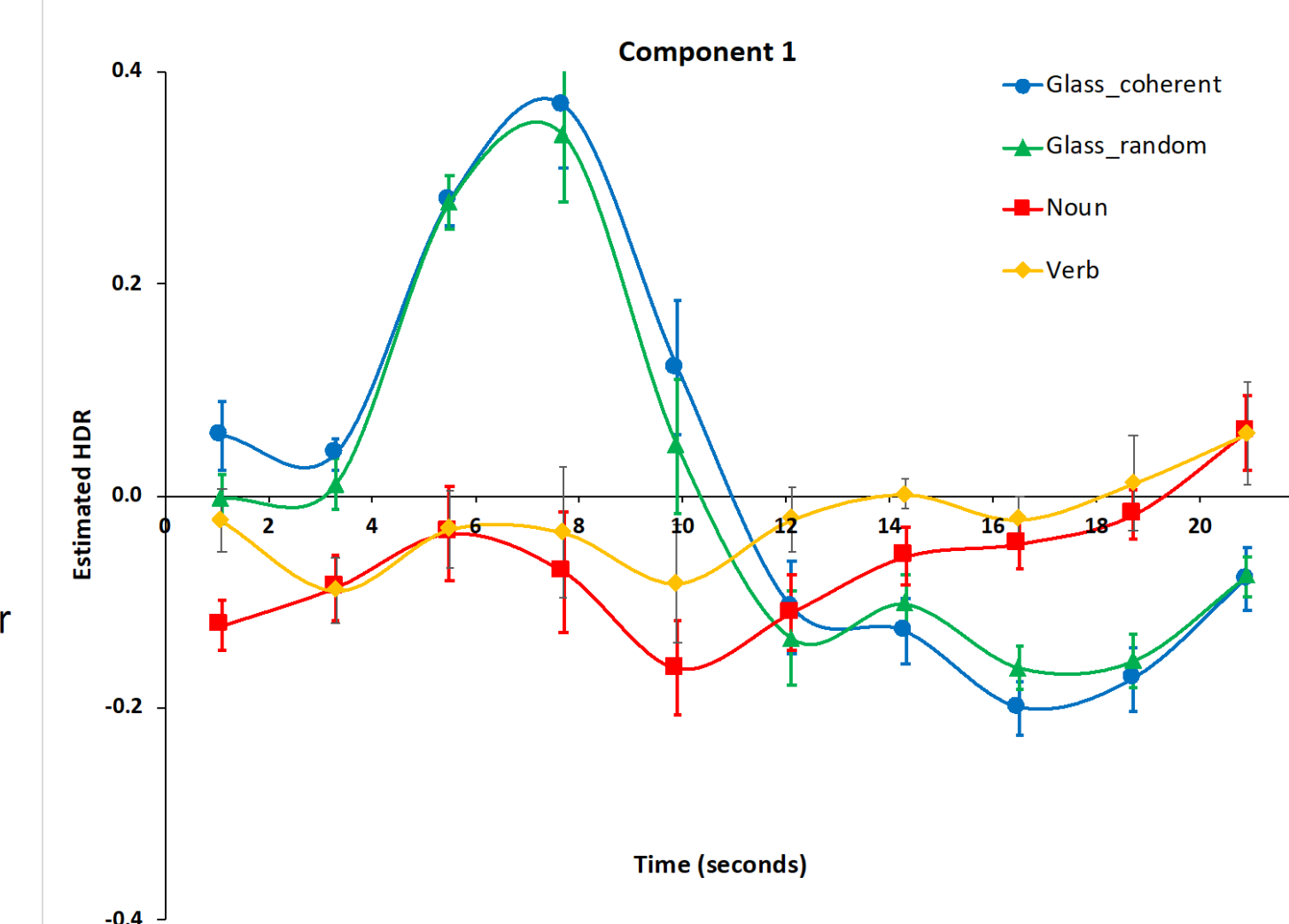
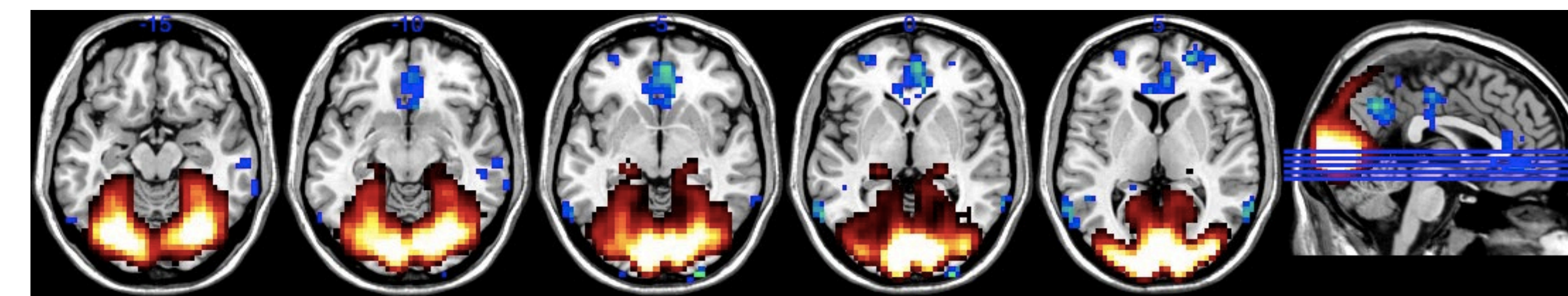
RESULTS

- Four networks were identified for the Coherence Semantic Task: Focus on Visual Features, Traditional Default Mode, Novel Default Mode, and Linguistic Processing.
- Five networks were present in the Incidental Memory Task: Focus on Visual Features, Two-Handed Response, Traditional Default Mode, Linguistic Processing, and External Attention.

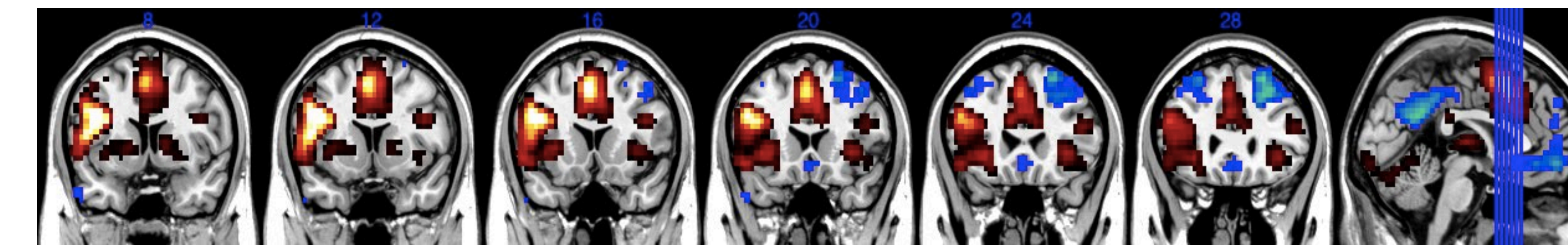
Focus on Visual Features (FVF) Coherence Semantic Task – Component 1



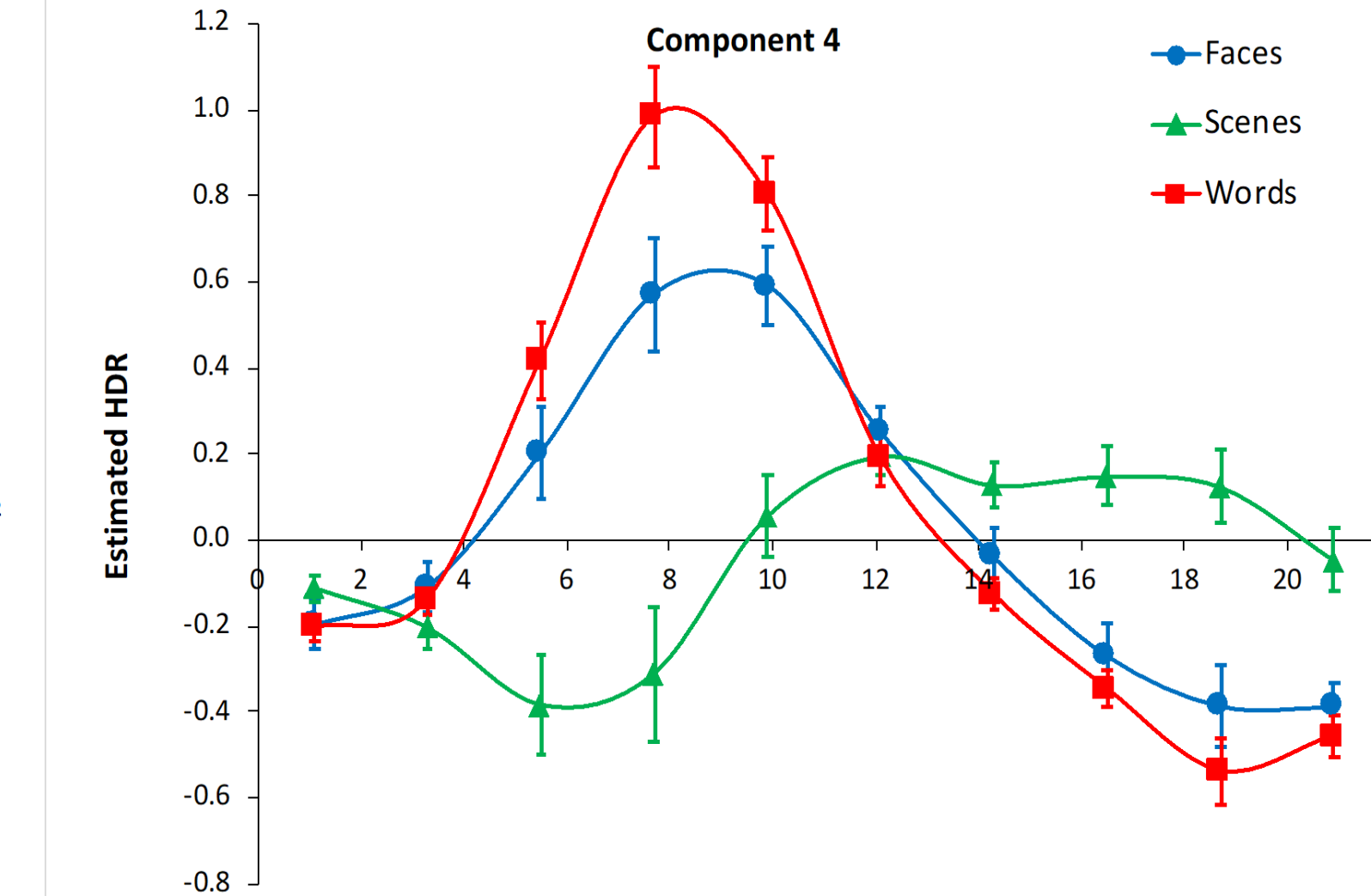
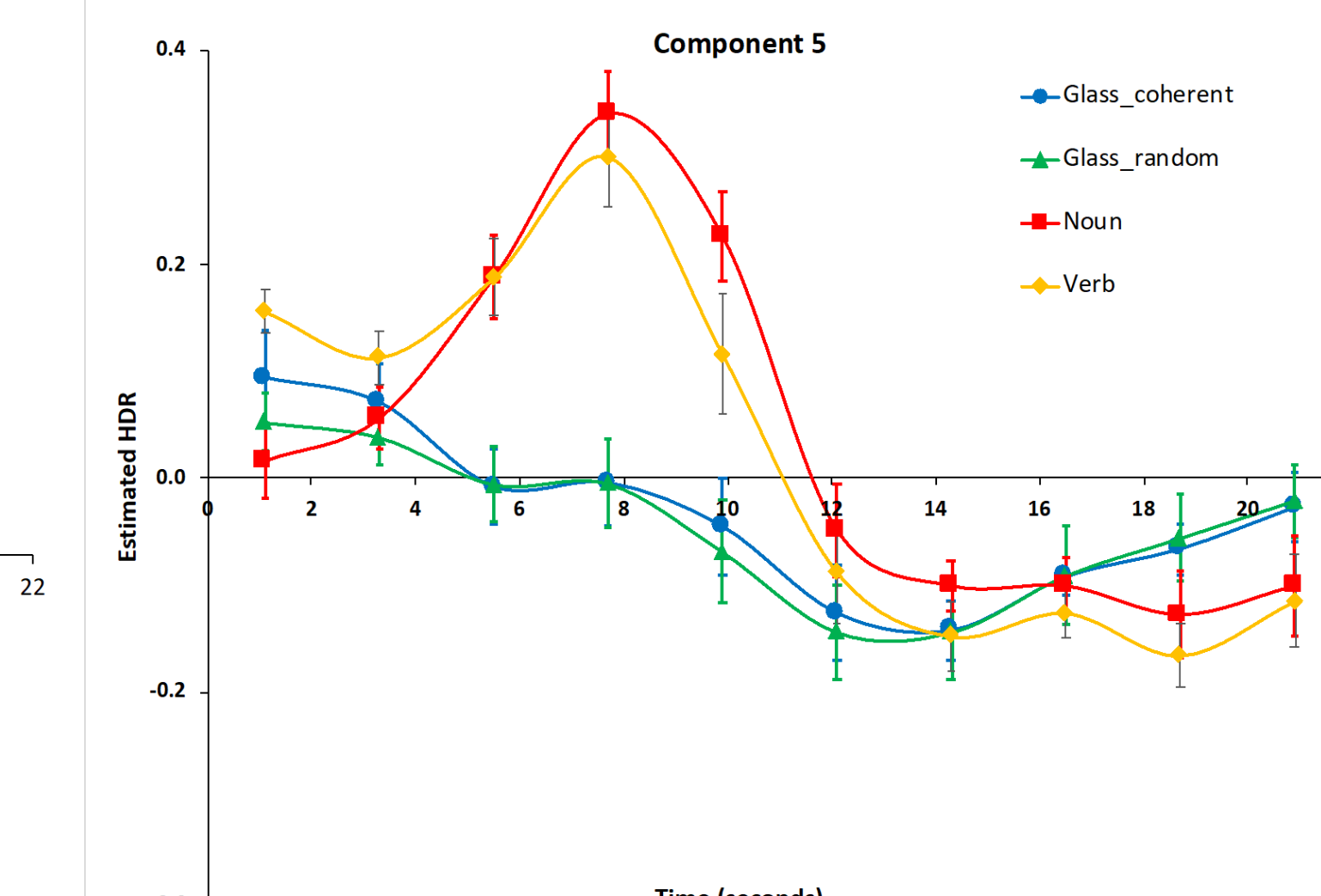
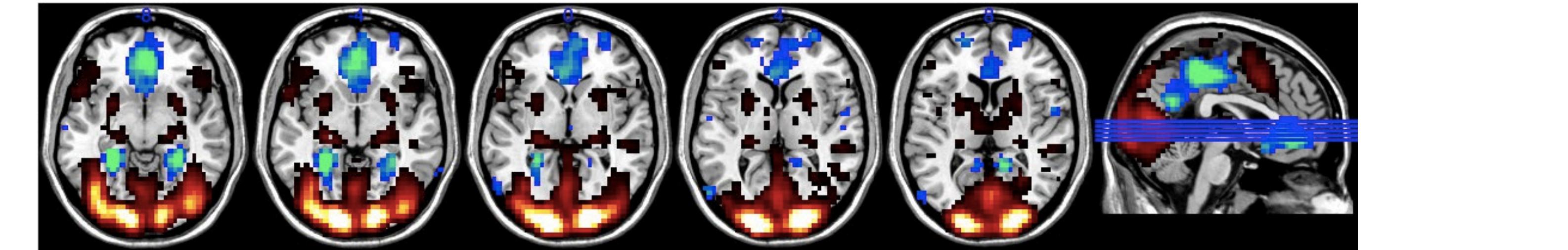
Incidental Memory Task – Component 1



Linguistic Processing (LANG) Coherence Semantic Task – Component 5



Incidental Memory Task – Component 4 (With EXT)



CONCLUSION

- FVF Network was activated for tasks involving visual information processing and interpretation but suppressed for tasks involving competing cognitive processes
- LANG Network displayed opposite patterns of activation and deactivation to that of the FVF Network: it was activated for tasks involving linguistic processes but suppressed for tasks involving visual information processing and interpretation.

REFERENCES

Gordon, E. M., Laumann, T. O., Gilmore, A. W., et al. (2017). Precision Functional Mapping of Individual Human Brains. *Neuron*, 95(4), 791–807.e7. <https://doi.org/10.1016/j.neuron.2017.07.011>