# Characterization of a Novel Task-Based fMRI Functional Brain Network: Focus on Visual Features

Chantal M. Percival[1,2] & Todd S. Woodward[1,2]

[1]Department of Psychiatry, University of British Columbia, Vancouver, BC    [2]BC Mental Health & Substance Use Services, Vancouver, BC

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CNoS — Cognitive Neuroscience of Schizophrenia Lab
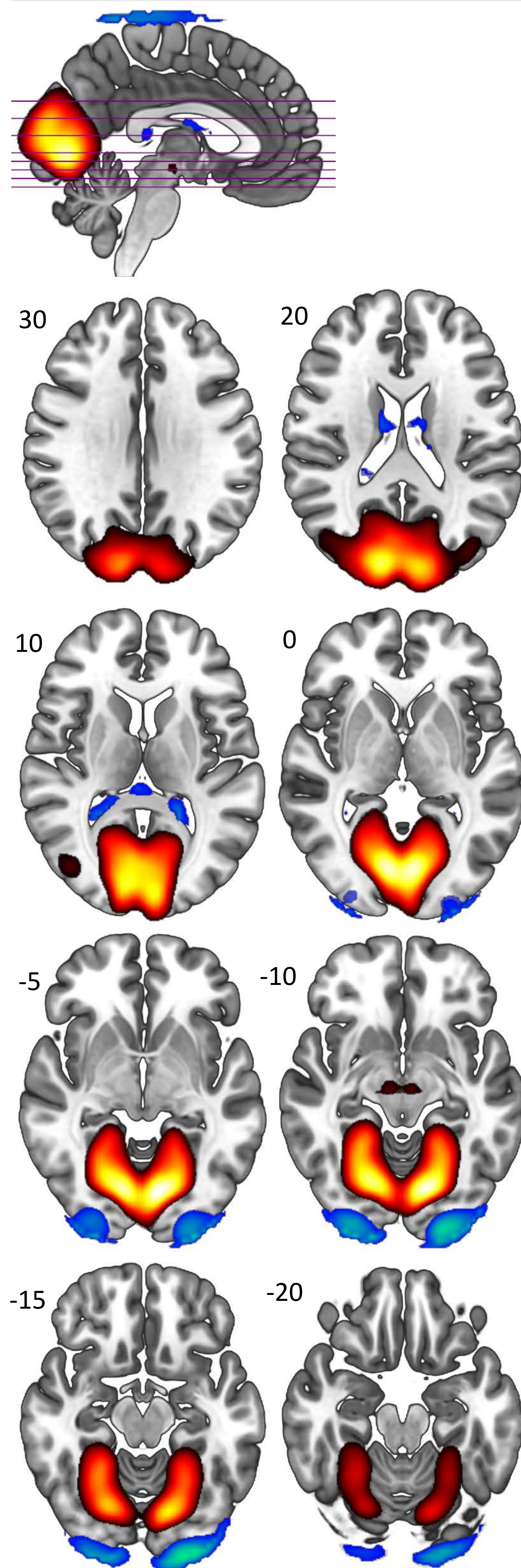
## INTRODUCTION

The novel focus on visual features (FVF) functional brain network has emerged in several task-based fMRI studies. FVF displays activation in the medial occipital and parietal cortex, with reciprocal suppression in the lateral occipital cortex (Sanford et al., 2020). However, the influence of task demands and conditions on activity remains ambiguous. Estimated hemodynamic responses (HDRs) may help contextualize FVF function.

## METHODS

- Previous works extracted functional brain networks with constrained principal component analysis for fMRI (fMRI-CPCA).
- FVF networks were identified by characteristic activation and suppression patterns, and a voxel-wise region-specific correlation with previously identified FVF networks.
- Corresponding estimated HDRs were examined for condition effects and interactions.

## RESULTS

### Thought Generating Task [3]

- Participants (n=32) either mentally generated or listened to a definition of a noun.
- FVF activation when studying pictures.
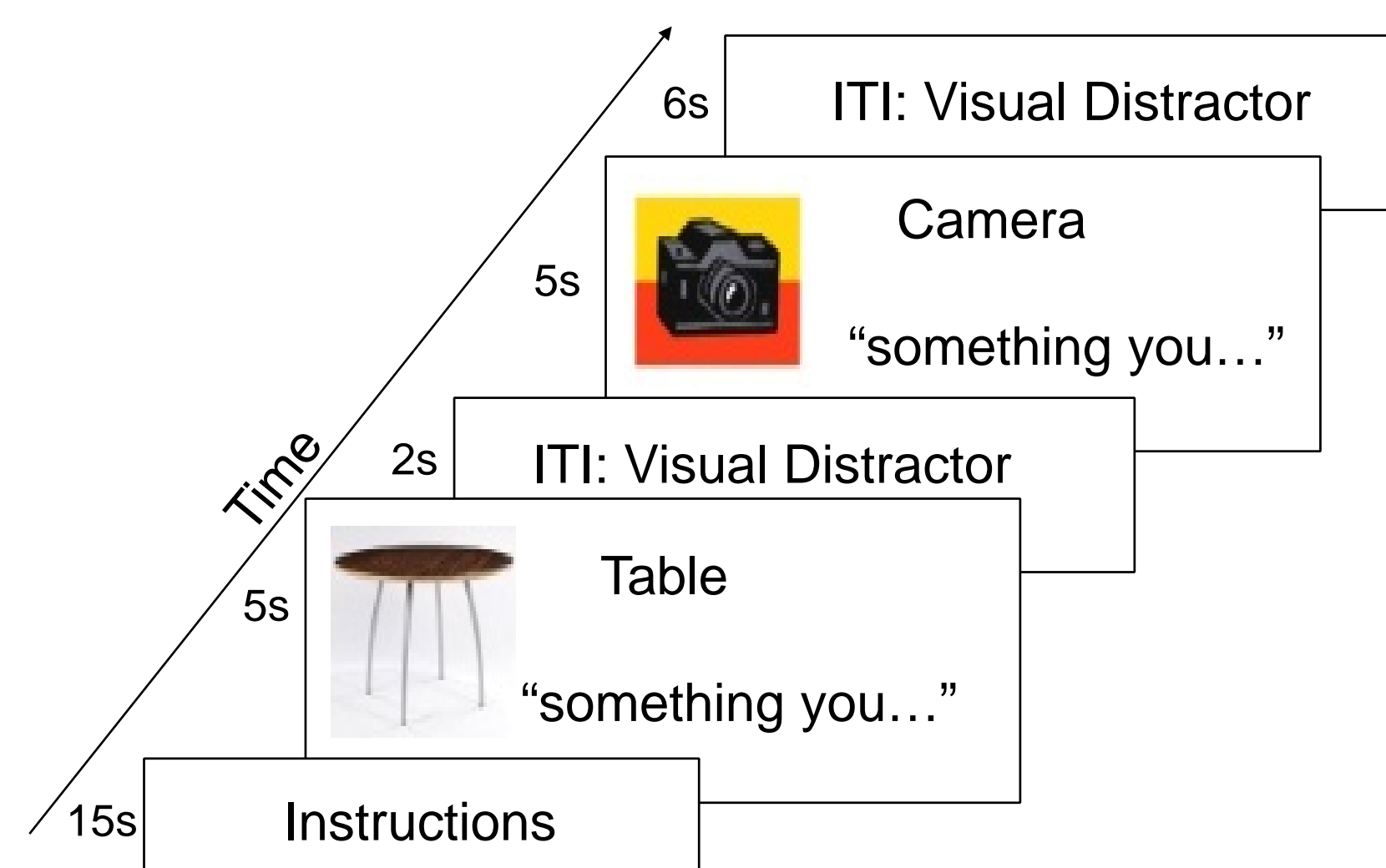
### Working Memory [3]

- Participants (n=37) were presented with 4 or 6 letters, then were asked if a probe letter was found in the initial string immediately after, or after a 4 second delay.
- FVF suppression when remembering previously viewed letters.
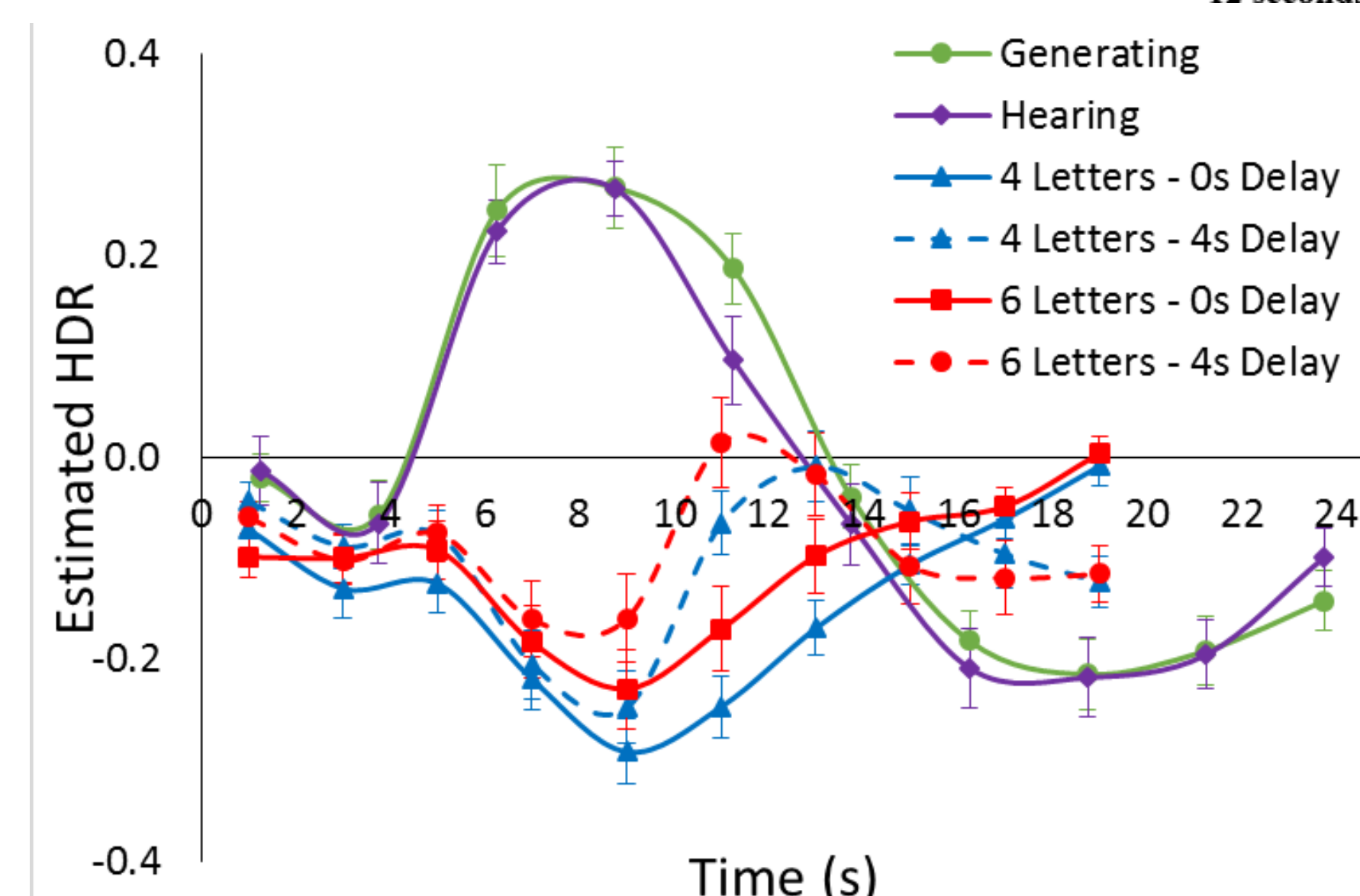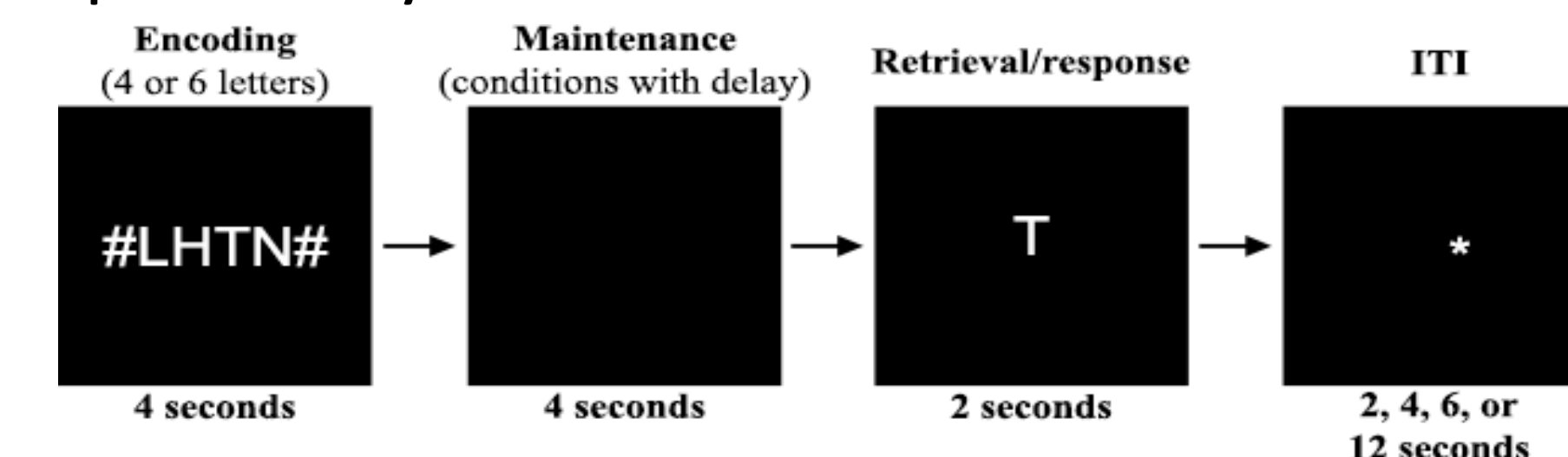
### Alcohol Working Memory [1]

- Participants (n=71) were presented with 5 letters, then an image for 1.5 seconds. They were then asked if a probe letter was found in the initial string.
- Alcohol group received alcohol infusion, controls received saline infusion.
- Increased FVF activation upon presentation of image.
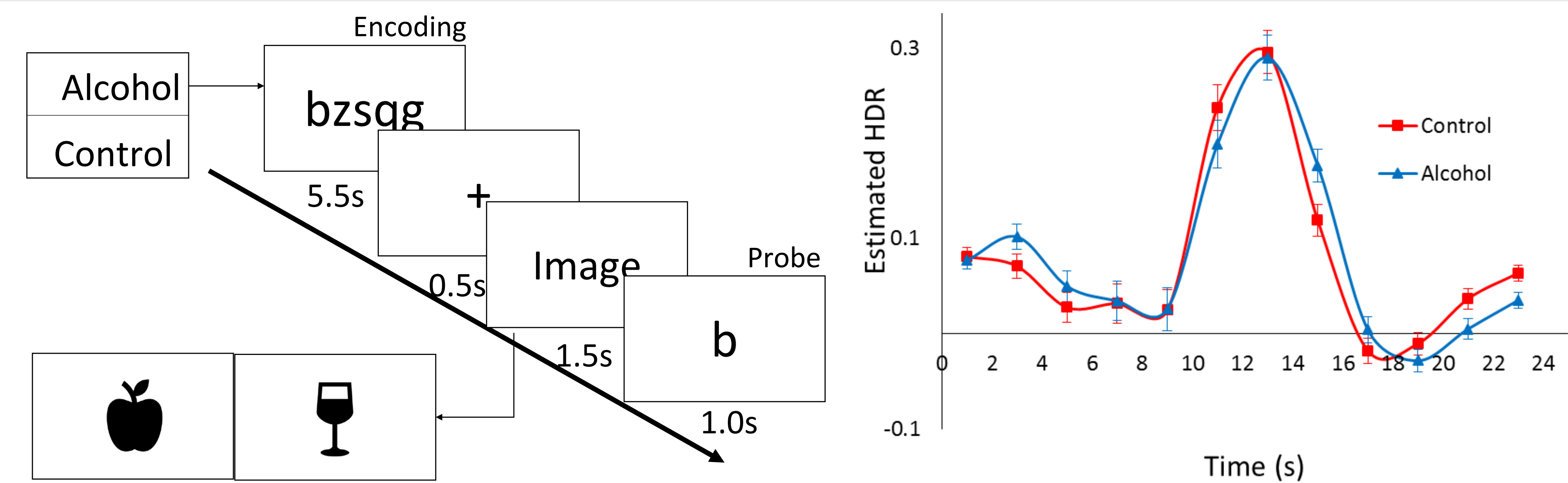
### Task Switch Inertia [2]

- Participants (n=27) read colour words presented in neutral (white font) or incongruent coloured fonts. This followed blocks of colour naming with neutral (letter X) or incongruent (incongruent colour word) conditions.
- FVF suppression greatest in word incongruent conditions, when the visual features of presented stimuli had to be ignored.
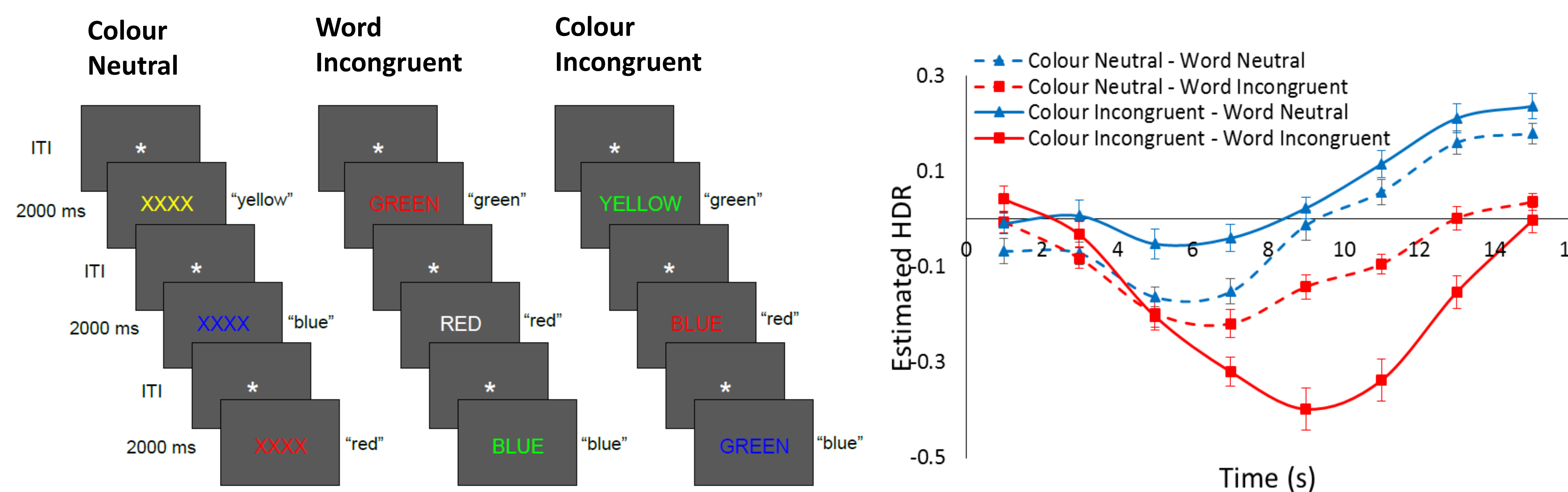
### Raven's Standard Progressive Matrices

- Participants (control: n=18, bipolar: n=24) viewed matrix for 5 seconds before being given 8 seconds to determine if a suggested answer was correct.
- FVF activation when examining matrices.
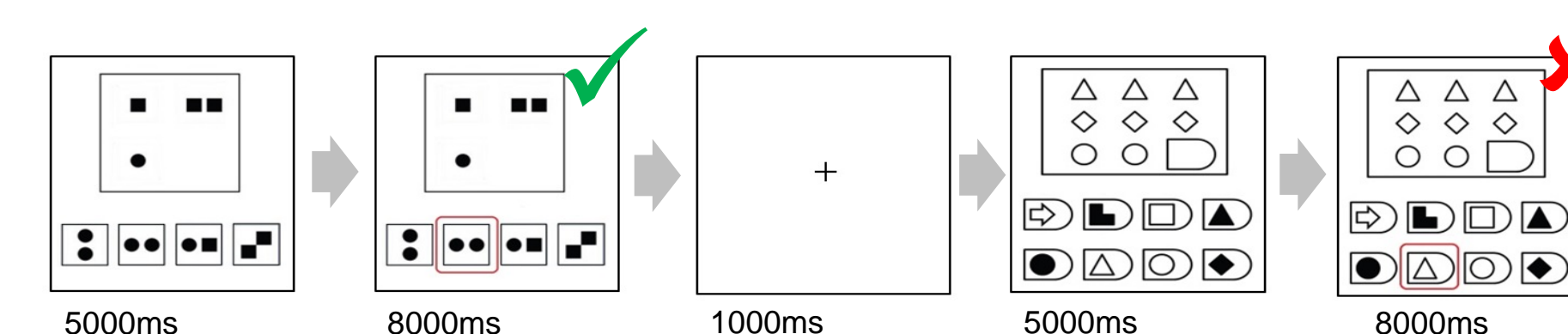
### Lexical Decision Task

- Participants decided whether four-letter sequences were real English words or not.
- FVF suppression when thinking of word formation rather than visual details.
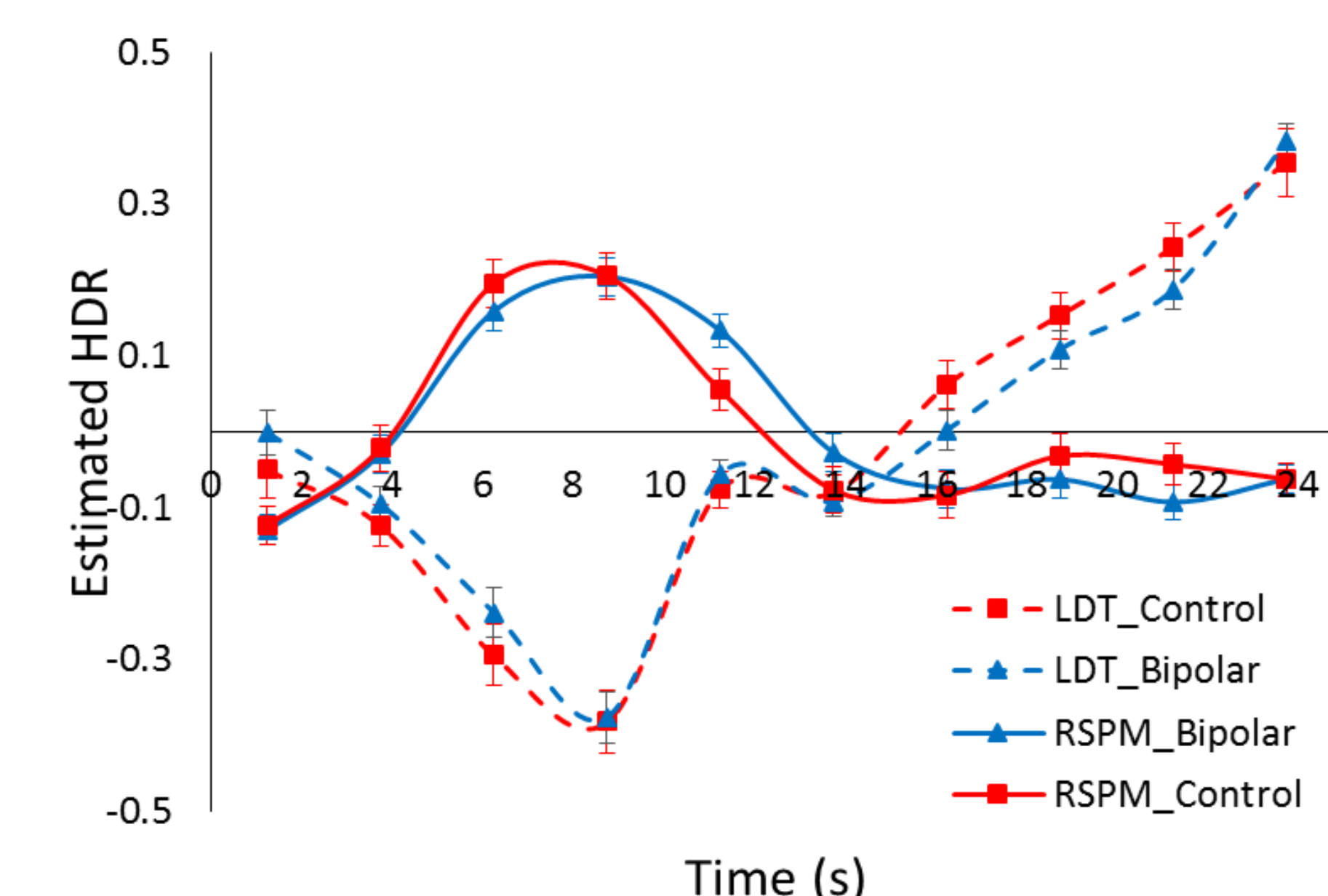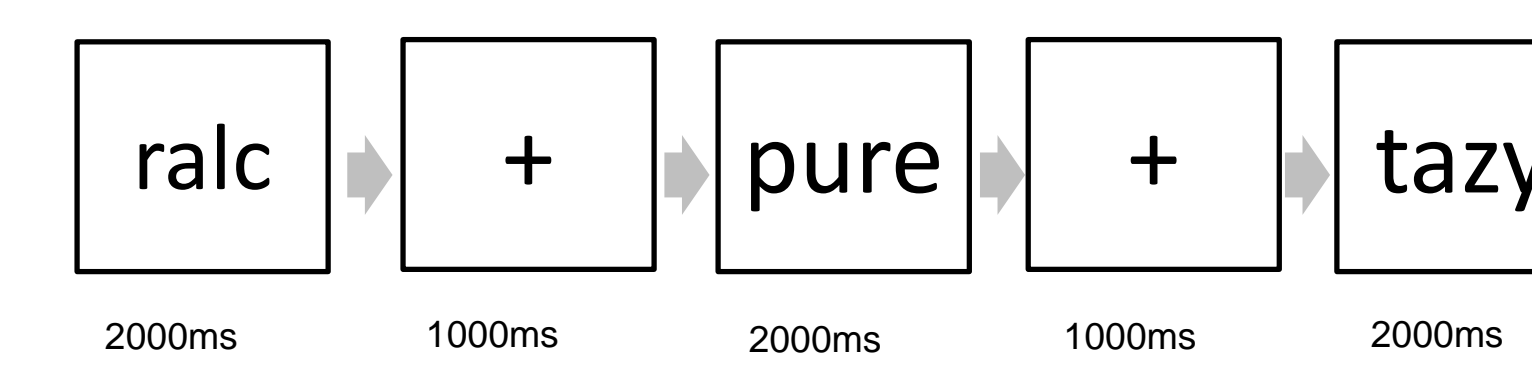
## CONCLUSION

- Results suggest that FVF activation occurs when having to focus on presented visual features, or in the presence of an image irrespective of task relevance.
- FVF appears to be suppressed when removing focus from presented visual features in order to perform task demands, such as focusing on semantic meaning of presented word, word formation, or encoding and maintaining in working memory.

## REFERENCES

[1] Brotchie, J. (2020). The Effect of Alcohol on the Functional Brain Networks Underlying Working Memory. [Unpublished]. University of British Columbia.

[2] Sanford, N. (2019). Functional Brain Networks Underlying Working Memory Performance in Schizophrenia: A Multi-Experiment Approach. [Unpublished doctoral dissertation]. University of British Columbia.

[3] Sanford, N., Whitman, J. C., & Woodward, T. S. (2020). Task-merging for finer separation of functional brain networks in working memory. Cortex, 125, 246-271. doi:10.1016/j.cortex.2019.12.014