

Functional Assessment of the fMRI-derived Extraction of Meaning Network

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Introduction

The Extraction of Meaning Network (LANG) is one of the twelve fMRI-derived functional brain networks identified through Task-based Functional Magnetic Resonance Imaging (fMRI) and Constrained Principal Component Analysis (CPCA) [1]. The LANG network is hypothesized to be recruited for the generation of semantic associations

Objectives

Determine the function of the LANG network through analyzing the influences of task conditions on network recruitment

Methods

- Previous studies extracted functional brain networks through fMRI-CPCA [2,3,4], and we compiled all the cognitive tasks that showed recruitment of the LANG; three are presented here. LANG networks were identified by characteristic activation and suppression patterns.
- Corresponding estimated HDRs were created and examined for condition effects and interactions using IBM SPSS.

Significance

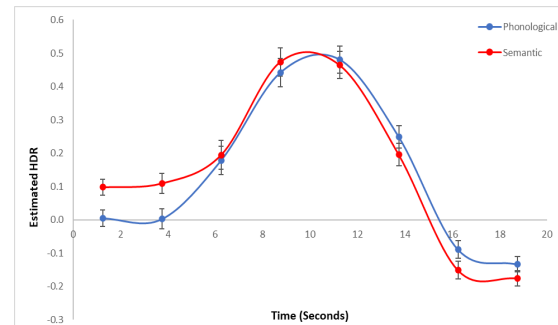
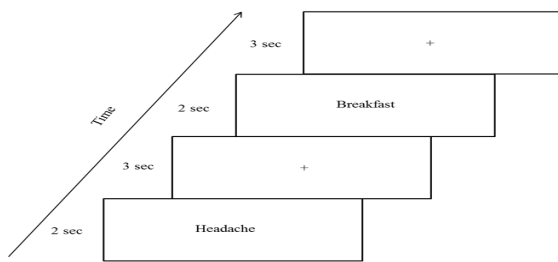
Identification of the differences in activation and deactivation of the LANG network in patients with schizophrenia and healthy controls will increase our understanding of functional neural connectivity in schizophrenia patients and contribute to the future use of neuromodulation as a possible treatment option for schizophrenia.

Conclusion

LANG network is recruited for the cognitive 'super-process' of semantic processing, regardless of type of stimulus

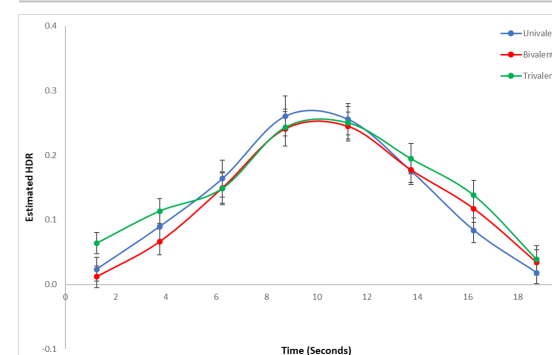
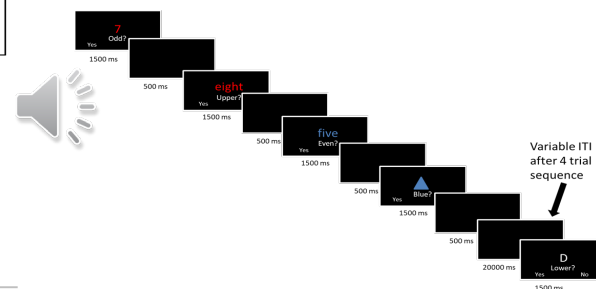
Metrical Stress Task [2]

- Participants (n=79) tasked with evaluating auditory and semantic characteristics of words
- Two conditions: Phonological and Semantic:
- In Phonological condition, participants had to judge which syllable stress was placed on.
- In the Semantic Condition, participants had to evaluate if the presented word was positive or negative
- No statistical significance between the two conditions, demonstrating that LANG network responds to both phonological and semantic mediums of lexical stimuli



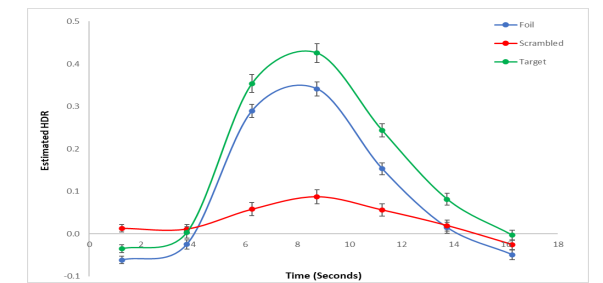
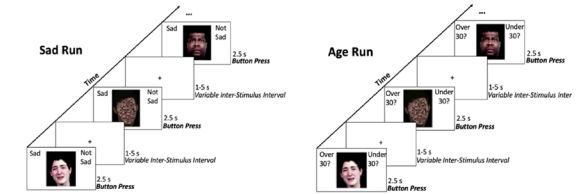
Task Switching Task [3]

- Participants (n=44) tasked with performing 3 discrete tasks in alteration: (1) judging whether shapes are blue or red, (2) judging whether numbers are odd or even, and (3) judging whether letters are uppercase or lowercase.
- Manipulated variable is that the judged-stimuli can contain one, two or all three task dimensions, termed as stimulus valency
- No statistical significance of stimulus valency on response, demonstrating that LANG network is not influenced by volitional attention



Facial Discrimination Task [4]

- Participants (n=70) were presented with facial discrimination conditions and asked to respond "target" or "nontarget" with button presses.
- Facial discrimination conditions included: Angry, Fear, Happy, Sad, and Age.
- Significant effect of target condition, demonstrating that the LANG network responds to non-lexical stimuli



Reference / Bibliography

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