Introduction

The cognitive evaluation (CEN) functional brain network has been observed through various fMRI task-based studies. The CEN involves activation in the orbitofrontal cortex, inferior frontal gyrus, and parietal cortex. A previous study showed less CEN activity in patients with schizophrenia experiencing delusions compared to controls during an evidence integration task.

The function of the CEN and how task demands and conditions affect CEN activity is not well understood.

Objective

To compare CEN activity and the relative timing of the CEN and response network (active when a participant responds to the task) in healthy participants across different task-based studies to gain insight on the CEN's potential function.

Methods

The components for each study were previously extracted using constrained principal component analysis for fMRI (CPCA-fMRI).

The CEN was identified based on characteristic activation patterns, and a voxel-wise correlation with a previously identified CEN spatial template.

SPSS Repeated Measures ANOVAs was used to obtain estimated hemodynamic response plots.

Results

Task Switch Inertia

- Participants (n=27) were presented with a series of alternating color naming and word reading blocks.
- Each block had either a neutral or incongruent condition.
- Increase in CEN activity observed for incongruent word reading only. Response peak at time bin 4, CEN peak at time bin 5.

Animal Bias Against Disconfirmatory Evidence

- Participants (n=39) were presented with an image of two animals morphed together. Participants rated the degree to which the image was one animal or the other. Then a second, mildly distorted image of either the same ratio of each animal (confirm) or different ratio of each animal (disconfirm) was displayed, and participants were asked to re-rate.
- Higher CEN activity for disconfirm condition. Response peak at time bin 5, CEN peak at time bin 9 or 10.

Semantic Association

- Participants (n=32) were shown a prompt word and asked which of three other listed words it was most related to.
- Two task conditions: high for words that were closely related, or low for words that were distantly related.
- Higher CEN activity was observed for the low condition. Response peak at time bin 5, and CEN peak at time bin 6 for all conditions.

Conclusions

- Consistent presence of CEN peak after the response peak suggests that the CEN may be active when the individual evaluates their response to the task.
- CEN activity is higher when responding to disconfirming evidence compared to confirming evidence.
- Understanding the potential function of the CEN could provide biological underpinnings for delusions.

References