Mapping fear affect and inhibitory control in young adult brains: Insights from resting-state functional connectivity

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Introduction

The cognitive component of anxiety, measured using Fear Affect scale of the National Institutes of Health toolbox, stems from perceived threats of events distant in space and time. Since anxiety is known to impact higher cognitive functions in daily life, potentially leading to cognitive-behavioural disorders, we aimed to identify salient whole-brain resting state functional connectivity (rsfc) patterns that explain the negative affect associated with it and the role it plays in influencing the rsfc patterns related to an aspect of executive function (inhibitory control on visual distractors) using Human Connectome Project dataset.

Methods

1. Exploratory, whole-brain multiple regression analyses with **parcel-to-parcel rsfc** as the independent and **fear affect** indices of individuals as the dependent variable (y) after controlling for age, gender, and zygosity were performed. (n=400; females = 199; age--range= 22-36 years).

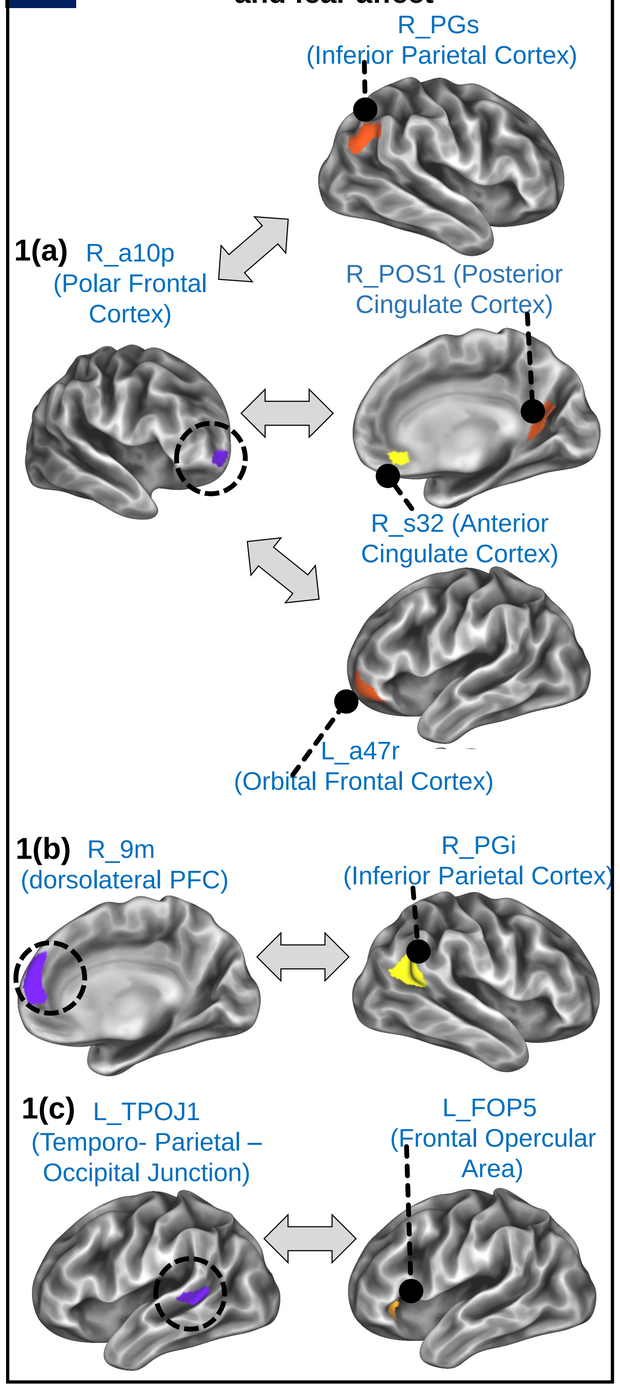
   y~1+age+gender+ zygosity+ rsfc+ ϵ

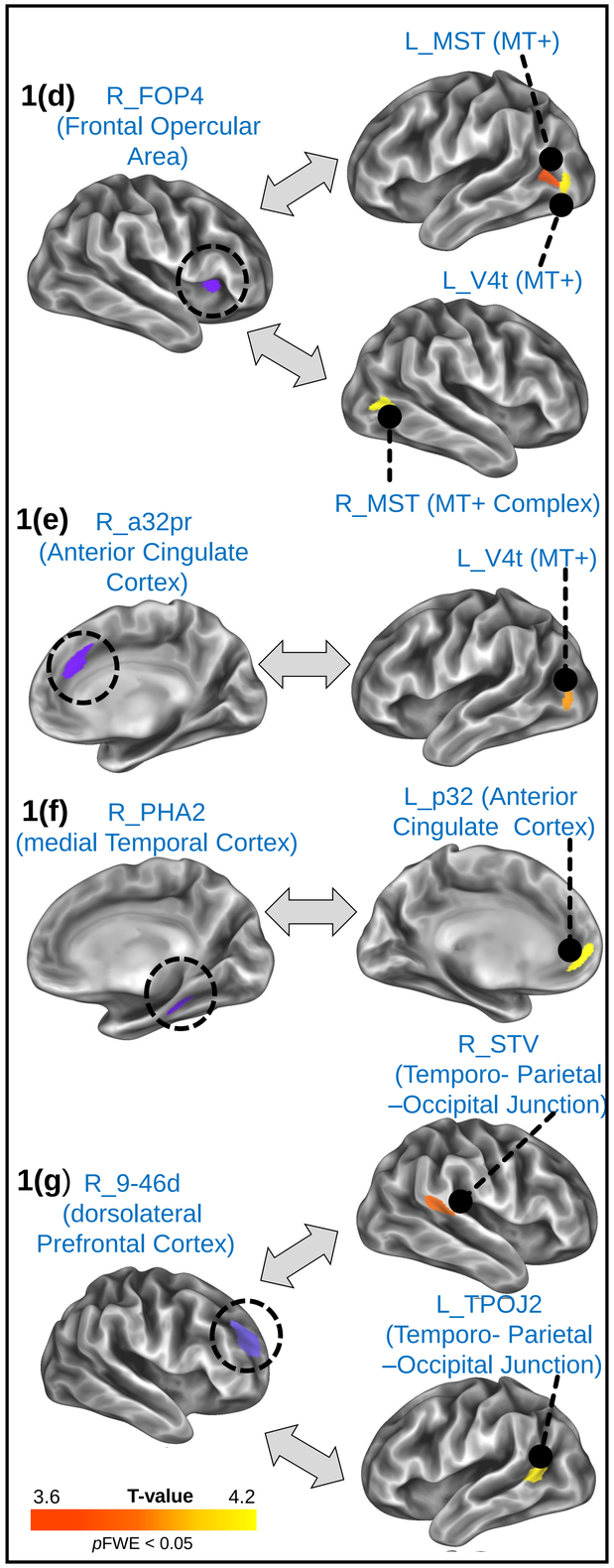
2. To measure the **interaction** between **rsfc** and **fear affect** towards explaining the **executive inhibitory control** (y- measured by flanker inhibition task), we split the anxiety scores using median scores in low (≤ 51.2 [median]) and high anxiety groups (> 51.2 [median]) and controlled for the nuisance covariates – age, gender, and zygosity.

   y~1+age+gender+ zygosity+ rsfc+ Low fear affect (group1) + High fear affect (group2) + Interaction1 (rsfc X group1) + Interaction2 (rsfc X group2) + ϵ

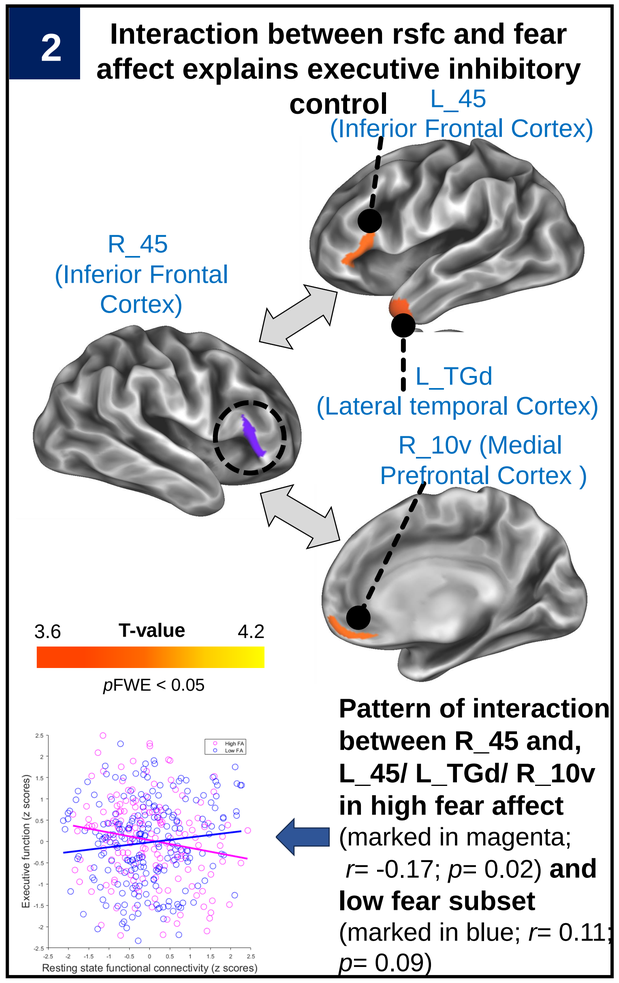
Results

1 Positive association between rsfc and fear affect





2 Interaction between rsfc and fear affect explains executive inhibitory control



Pattern of interaction between R_45 and, L_45/ L_TGd/ R_10v in high fear affect (marked in magenta; r= -0.17; p= 0.02) **and low fear subset** (marked in blue; r= 0.11; p= 0.09)

Conclusions

1. A positive correlation between rsfc and fear affect was observed in 13 pairwise connections of parcels (with)in the a) visual & cingulo-opercular network, b) frontoparietal network, c) cingulo-opercular & the default mode network, d) ventral attention & dorsal attention network, and e) default mode network.
2. The findings illuminate the brain rsfc architecture and its effect on fear affect.
3. The findings disentangle the role in modulating the influence of rsfc on inhibitory control differentially.

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