2020

The Influence of Anhedonic Symptom Severity on dmPFC Connectivity in PTSD

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ABSTRACT

This study examined resting-state functional connectivity (rsFC) of the dorsal medial prefrontal cortex (dmPFC) as a function of anhedonia in individuals with posttraumatic stress disorder (PTSD). Results showed that anhedonia positively correlated with hyperconnectivity between the dmPFC and the left retrosplenial cortex. These findings support that anhedonia is associated with increased rsFC within the default mode network (DMN) for PTSD.

INTRODUCTION

- Anhedonia is one of the signature symptoms involved in depression, substance-use disorder and PTSD.
- Anhedonia is marked by deficits in consummatory and anticipatory reward processing phases.
- The dmPFC has been implicated in the evaluation of reward stimuli and reward-based decision-making.
- Studies have found both increased and decreased rsFC within the DMN for people with PTSD.
- This study examines the influence of anhedonia severity in PTSD on the rsFC of the left and right dmPFC.

HYPOTHESES

- There will be increased functional connectivity of the dmPFC and anterior regions of the DMN in relation to increased anhedonic symptom severity.
- There will be reduced functional connectivity of the dmPFC and posterior regions of the DMN in relation to increased anhedonic symptom severity.
- There will be increased functional connectivity of the dmPFC and regions of the reward circuit in relation to anhedonia.

METHODS

PARTICIPANTS

- 71 women diagnosed with PTSD resulting from interpersonal trauma
- Resting-state functional MRI scans collected on a 3T Siemens Tim Trio MRI scanner

	n	M	SD
Age	71	31.93	9.39
MASQ AD	62	73.79	15.29

ANHEDONIA SEVERITY SCORE

- Mood and Anxiety Questionnaire (MASQ)
  - Anhedonic Depression (AD) subscale
- Frequency ratings of feelings in the past week such as “felt like nothing was very enjoyable” and “felt really slowed down”

SEED-BASED VOXELWISE rsFC ANALYSES

- Standard seed-based voxel-wise rsFC analyses
- Left and right dmPFC seed regions of interest *(seeds pictured in Fig. 1)*
- Family-wise error (FWE) cluster-correction at the whole brain level (pFWE < .025)

STATISTICAL ANALYSES

- Multivariate regression to examine the relationship between anhedonia severity and rsFC of left and right dmPFC

RESULTS

SEED-BASED VOXELWISE rsFC ANALYSES

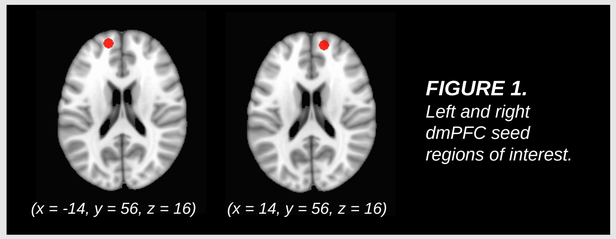

FIGURE 1. *Left and right dmPFC seed regions of interest.*

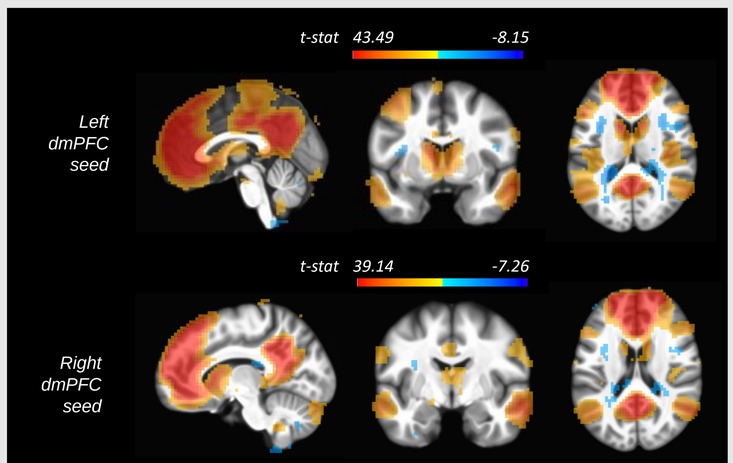

FIGURE 2. *Results of seed-based voxel-wise analysis, showing mean resting-state connectivity across the group for the left and right dmPFC seeds.*

MULTIVARIATE REGRESSION

- Increased rsFC between the left dorsal medial prefrontal cortex seed and cluster in the left retrosplenial cortex
  (Cluster size = 36; peak = [-10, -45, 12]; t = 4.43, $pFWE$ < .05)
  (cluster and connectivity as a function of anhedonia pictured in Fig. 3)

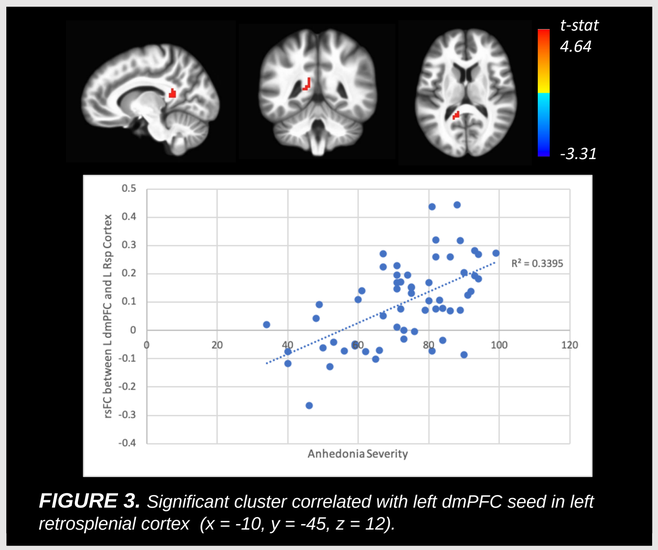

FIGURE 3. *Significant cluster correlated with left dmPFC seed in left retrosplenial cortex (x = -10, y = -45, z = 12).*

MULTIVARIATE REGRESSION cont.

- Increased rsFC between the right dorsal medial prefrontal cortex seed and cluster in the left retrosplenial cortex
  (Cluster size = 42; peak = [-16, -48, 15]; t = 4.80, $pFWE$ < .05)
  (cluster and connectivity as a function of anhedonia pictured in Fig. 4)

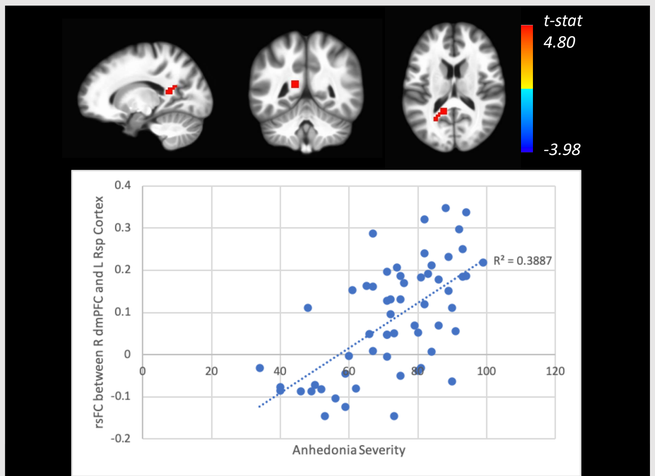

FIGURE 4. *Significant cluster correlated with right dmPFC seed in left retrosplenial cortex (x = -16, y = -48, z = 15).*

DISCUSSION

- **Findings are counter to the second hypothesis, but provide partial support for the first and third hypotheses**
- Evidence for increased connectivity of default mode network in association with anhedonia in PTSD
- As mean anhedonic symptom severity increases, connectivity increases between the left and right dmPFC seeds and cluster of the left retrosplenial cortex
- Significant cluster in the left retrosplenial cortex is consistent with previous research on depression
- Transdiagnostic evidence of anhedonia in the form of DMN hyperconnectivity

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ACKNOWLEDGEMENTS

Funding for this project was provided by the National Institutes of Health under Grant No. K23 MH090366-01 and RC1 MH089704-01.