

# PTSD and the social brain: affect-related disruption of the default and mirror networks

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## Introduction

- Post-traumatic stress disorder (PTSD) is strongly associated with impairments in social inference<sup>1</sup>
- The etiology of social inference impairments in PTSD is unknown due to a lack of neuroimaging studies<sup>1</sup>
- Social inference recruits default-mode network (DMN) and mirror-neuron system (MNS)<sup>2</sup>
  - MNS represents observable sensorimotor features
  - DMN infers unobservable mental states, traits, and intentions
- We probed DMN & MNS regions in the first neuroimaging study of social inference in PTSD

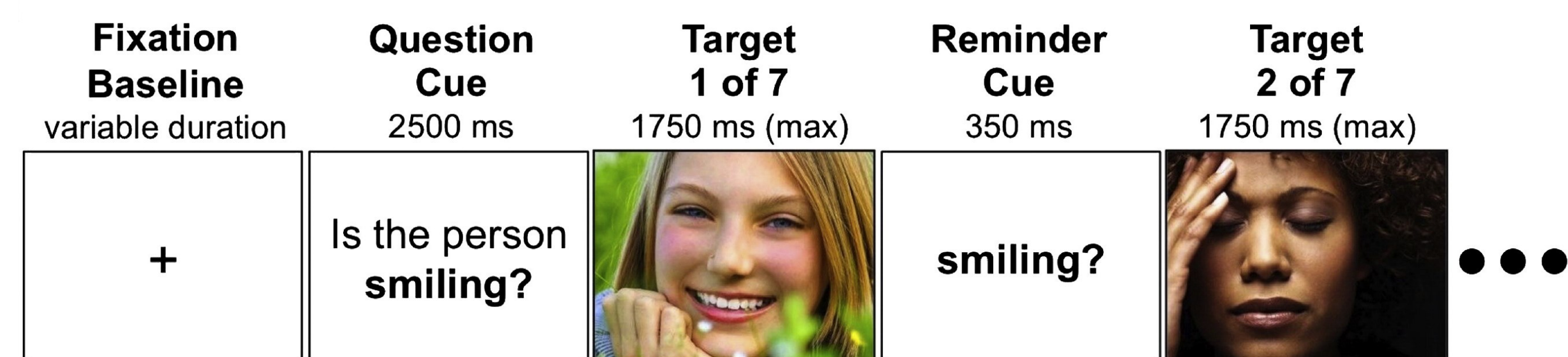
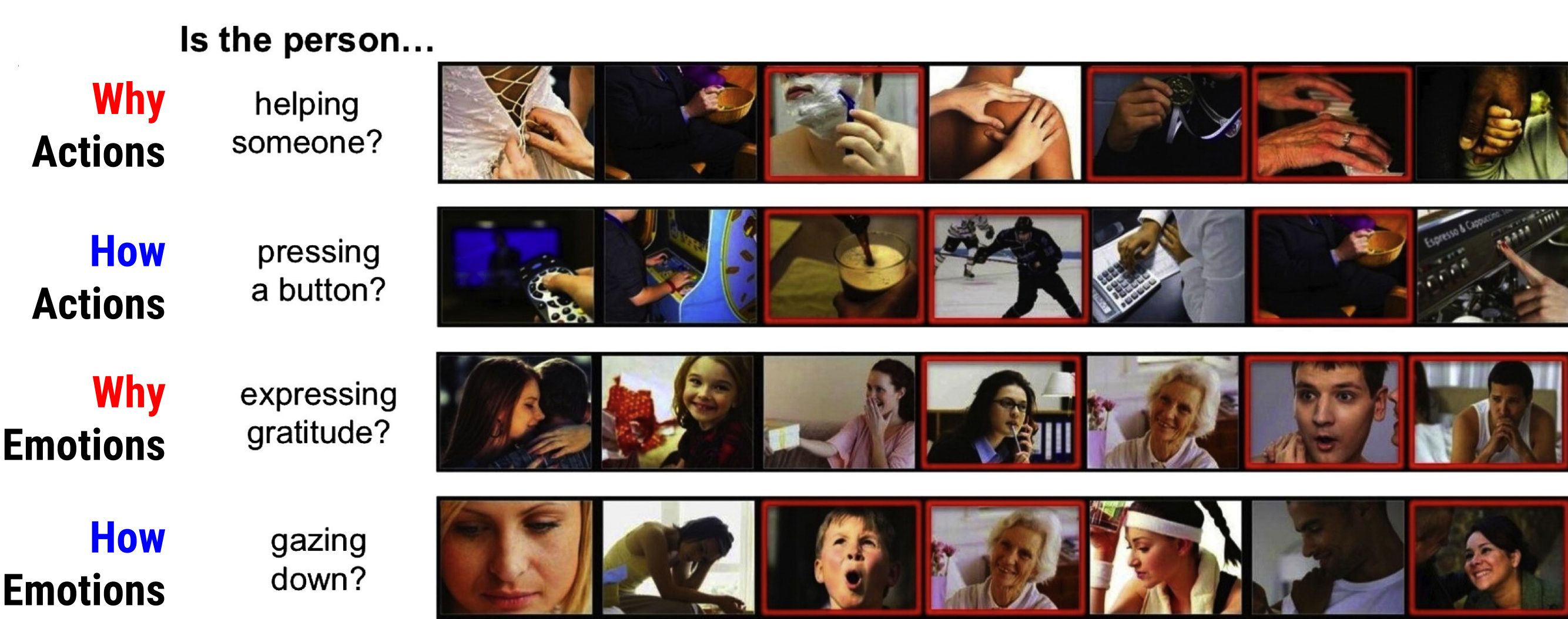
## Materials & Methods

**Participants** – 35 combat trauma-exposed US veterans with & without PTSD (PTSD  $N = 18$ )

### Procedure

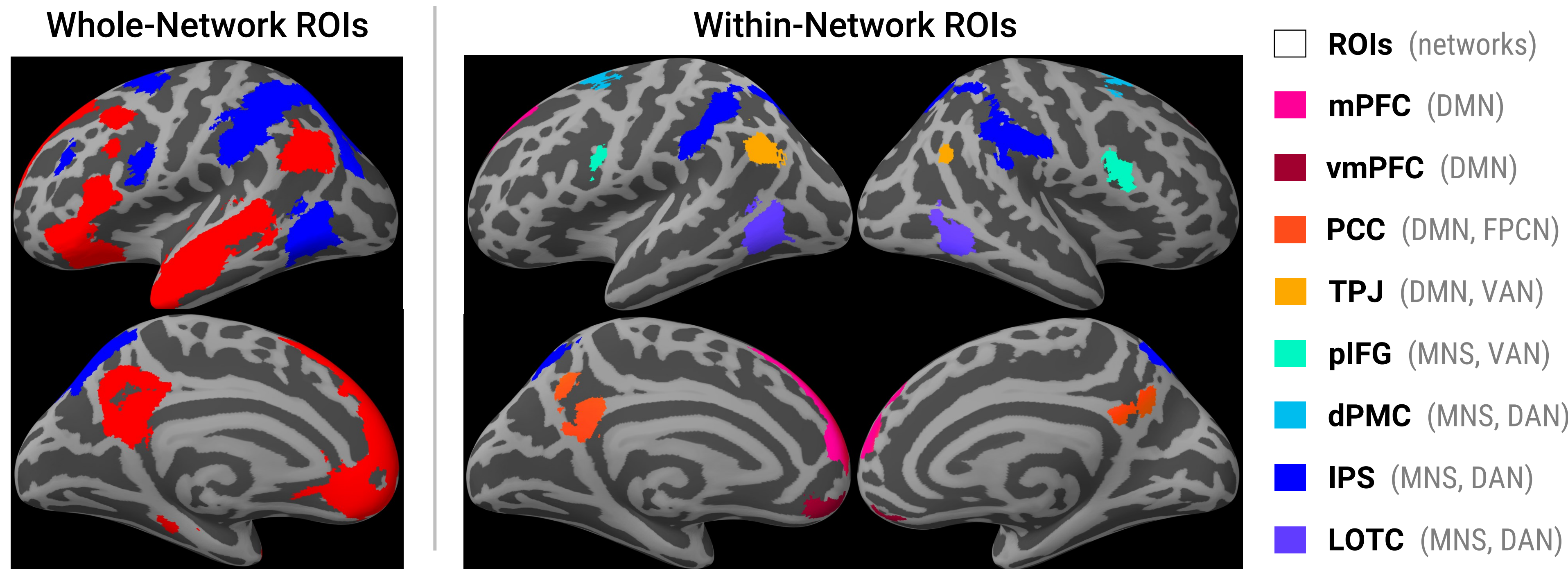
- Pre-treatment session:** baseline clinical interview (Clinician Administered PTSD Scale; CAPS) & fMRI (Siemens TimTrio 3T)
- Affect labeling therapy:** PTSD group continued with 3 weeks of psychotherapy using inhibitory affect regulation strategies<sup>3</sup>
- Post-treatment session:** PTSD patients who completed therapy ( $N = 13$ ) underwent second clinical interview & fMRI

## Why/How social inference task



- Prompts** – Why (mentalizing) & How (action identification)
- Stimuli** – Emotions (emotional expressions) & Actions (intentional actions)
- Why-How contrast dissociates DMN & MNS activity<sup>2</sup>
- Why-How contrast within stimulus type used for all fMRI analyses here

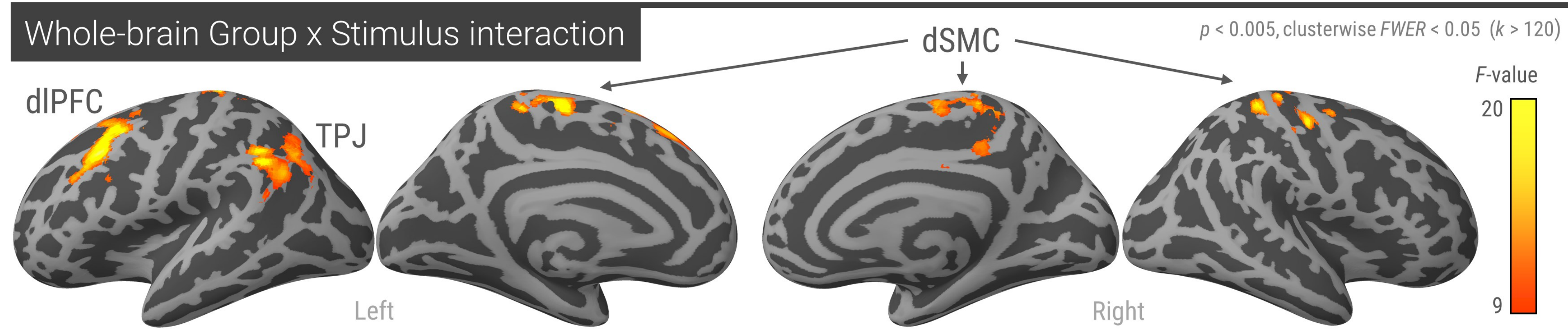
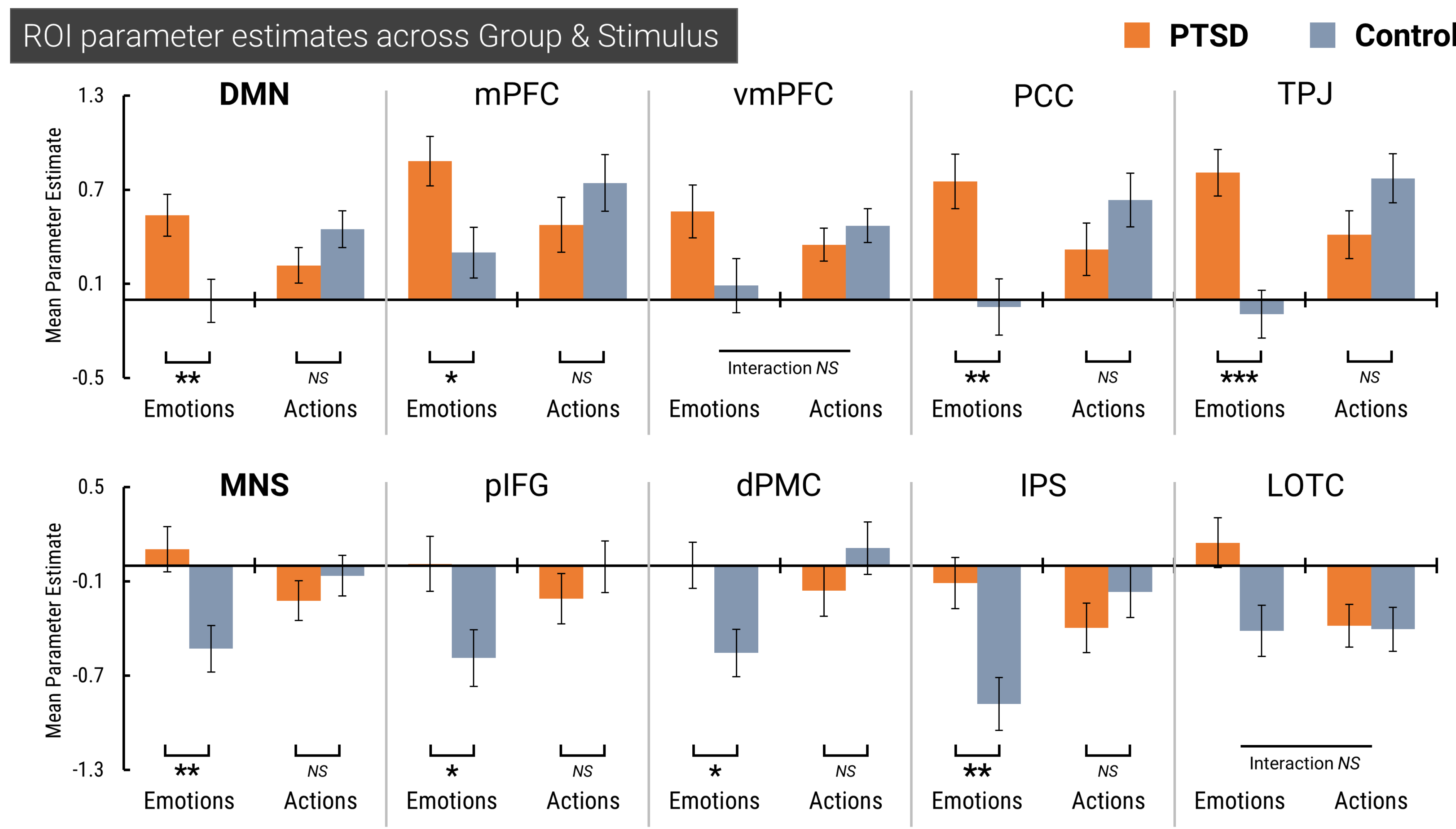
## Regions of Interest (ROIs)



■ **DMN** (why > how)  
■ **MNS** (how < why)

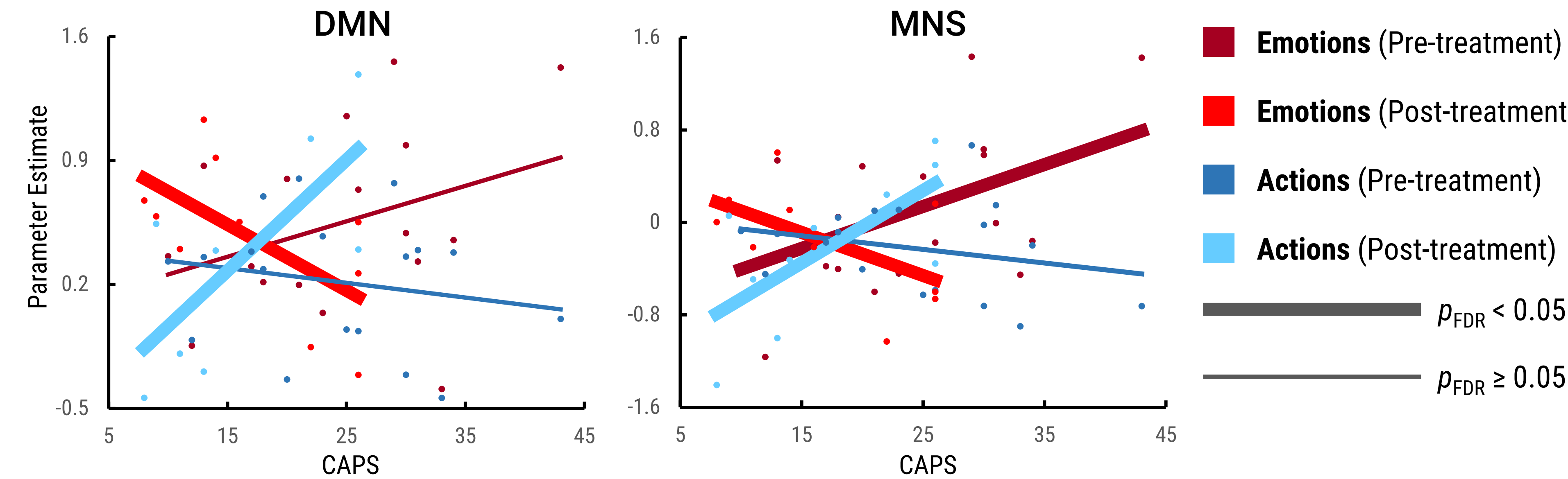
- ROIs defined by Why-How contrast in an independent dataset<sup>2</sup> ( $N = 50$ )
- Within-network ROIs thought to be key nodes of DMN & MNS<sup>2,4</sup>

## PTSD vs controls (pre-treatment)



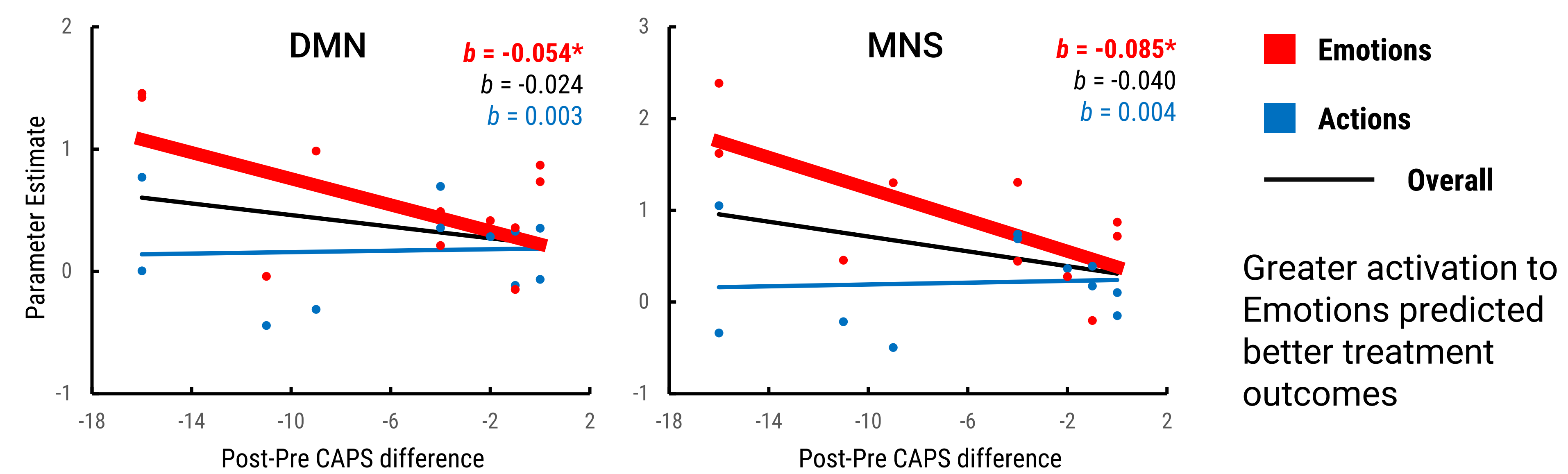
- Main effect of Group not significant, CAPS x Stimulus interaction was robust
- Emotions elicited hyperactivation in the PTSD group relative to controls
- Actions did not elicit significant Group differences

## Symptom severity correlations (PTSD only)



Correlation between Emotions-evoked activation & PTSD severity was positive pre-treatment but negative post-treatment

## Predicting treatment outcomes from pre-treatment activation (PTSD only)



Greater activation to Emotions predicted better treatment outcomes

## Discussion

- Hyperactivation to emotional stimuli may be a defining characteristic of social inference processing in PTSD
- No PTSD-related effects significant in core affect regions like vmPFC, OFC, amygdala & insula
- PTSD-related effects strongest in whole-network DMN & MNS ROIs, and in regions that overlap with the attention networks
- Affective attentional biases, not altered core affect processing, may drive widespread affect-selective processing during social inference in PTSD
- Many studies show that attention is inordinately biased towards emotional stimuli in PTSD<sup>4</sup>
- Attentional biases in PTSD are associated with affect-evoked hyperactivation in DMN & attentional regions<sup>4</sup>
- Future studies should independently manipulate affect & attention, include functional localizers for the attention networks, and have larger sample sizes

### References

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