Prefrontal Cortex Involvement in Resisting Emotional Distraction

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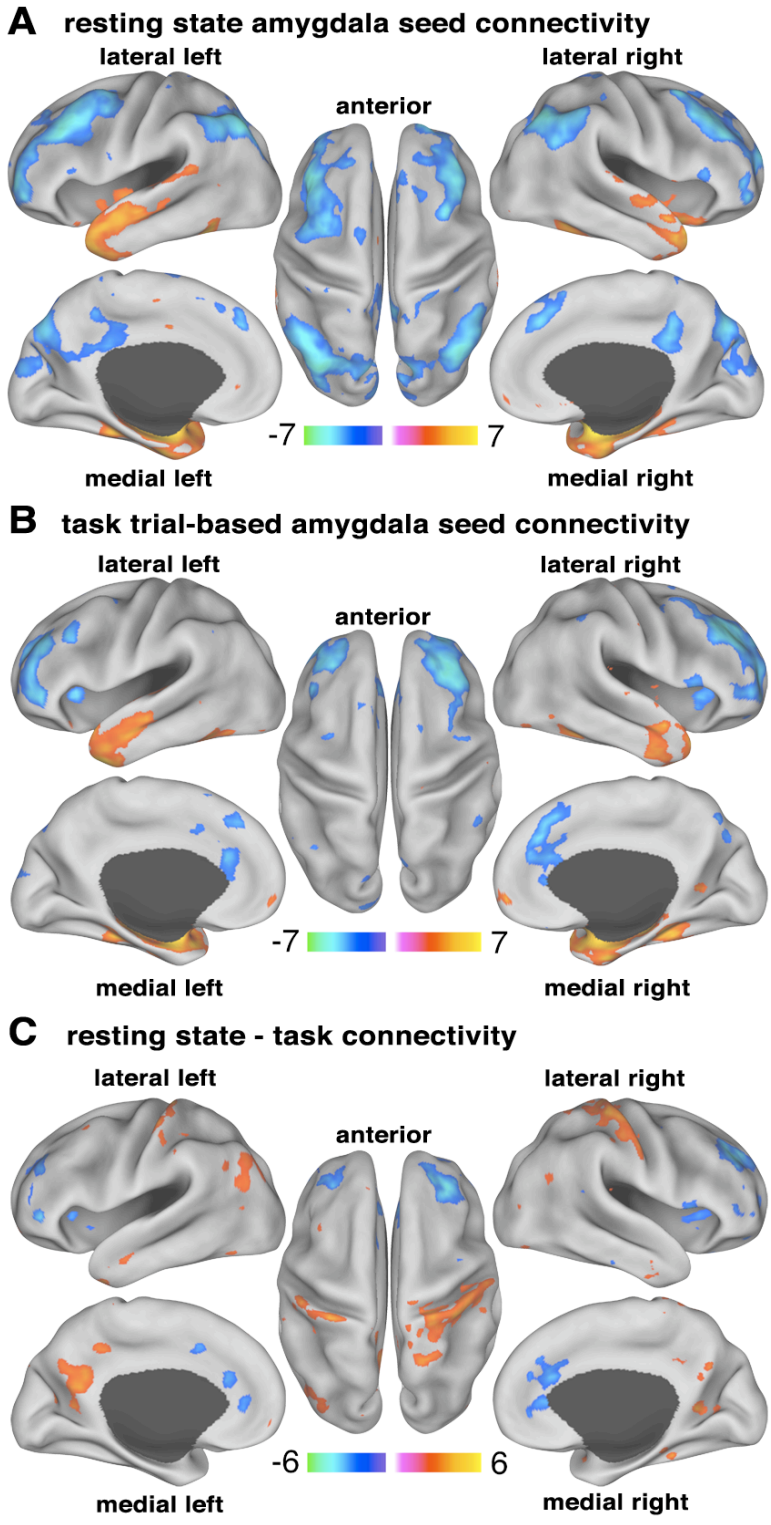
Survival-relevant information often commands privileged access to attentional resources. However, there are times when emotional inputs need to be suppressed in the service of ongoing goals. Humans have the unique ability to suppress distraction and deploy attention in a goal directed fashion, regardless of incoming information. This ability is thought to rely on dorsal frontal-parietal cortical regions engaged in a wide range of cognitive operations such as maintenance and manipulation of information in working memory (WM). In the context of WM function, previous work has shown that emotional distracters have strikingly different effects on dorsal prefrontal regions, resulting in marked signal reductions. However, one question not fully explored is the relationship between signals in these cortical regions during emotional interference and behavioral performance as well as their relationship with the amygdala. Here we employ slow event-related fMRI at 3T allowing us to discern signals at different phases of a WM. First, we show that frontal, but not parietal nodes of the dorsal task network show a within-subject relationship with performance during emotional distraction. Specifically, less deactivation was associated with better performance. Conversely, in ventral frontal regions more activation was associated with better performance. Also, we demonstrate that, across-subjects, less amygdala signal correlates with better performance for all distracter types. Lastly, using resting-state (Figure 1A) and task-based functional connectivity (Figure 1B), we demonstrate that amygdala signal is more negatively coupled with regions overlapping the cinguloopercular control system, specifically during WM faced with emotional distraction when compared to resting-state (Figure 1C). Together, these finding suggest that the source of regulation over transient emotional distraction may originate from dorsal and ventral frontal, but not posterior cortical regions.

Figure 1.


A
resting state amygdala seed connectivity
lateral left
lateral right
anterior
-7
7
medial left
medial right
B
task trial-based amygdala seed connectivity
lateral left
lateral right
anterior
-7
7
medial left
medial right
C
resting state - task connectivity
lateral left
lateral right
anterior
-6
6
medial left
medial right