Behavioural and Neural Sustained Attention Deficits in Disruptive Mood Dysregulation Disorder and Attention-Deficit/Hyperactivity Disorder

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Abstract

Objective
Disruptive mood dysregulation disorder (DMDD), characterised by severe irritability, and attention-deficit/hyperactivity disorder (ADHD) are highly comorbid. This is the first study to characterise neural and behavioural similarities and differences in attentional functioning across these disorders.

Method
Twenty-seven healthy volunteers, 31 patients with DMDD, and 25 patients with ADHD (8-18-year-olds) completed a functional magnetic resonance imaging (fMRI) attention task. Group differences in intra-subject variability in reaction time (ISVRT) were examined. The current fMRI analytic approach precisely quantified trial-wise associations between reaction time and brain activity.

Results
Group differences manifested in the relationship between reaction time and brain activity (all regions: p<.01, F>2.54, \( \eta^2 > 0.06 \)). Patients with DMDD showed specific alterations in the right paracentral lobule, superior parietal lobule, fusiform gyrus, and cerebellar culmen. In contrast, both patients with DMDD and ADHD exhibited blunted compensatory increases in activity on long reaction time trials. Additionally, youth with DMDD exhibited increased activity in the postcentral gyrus, medial frontal gyrus, and cerebellar tonsil and decline (all regions: p<.05, F>2.46, \( \eta^2 > 0.06 \)). The groups in the imaging sample did not differ significantly in ISVRT (F[2,79]=2.664, p=.076, \( \eta^2 = 0.063 \)), though ISVRT was significantly elevated among youth with DMDD and ADHD when including those not meeting strict motion and accuracy criteria for the imaging analysis (F[2,96]=4.283, p=.017, \( \eta^2 = 0.083 \)).

Conclusion
Patients with DMDD exhibited specific alterations in the relationship between pre-stimulus brain activity and reaction time. Both patients with DMDD and ADHD exhibited similar blunting of compensatory neural activity in frontal, parietal, and other regions. Additionally, patients with DMDD demonstrated elevated reaction time variability relative to healthy youth. This work is the first to identify common and unique behavioural and neural signatures of DMDD and ADHD.