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Neurophysiological Correlates of Callous-Unemotional Traits in ADHD

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Abstract

Introduction

Although ADHD is a highly heterogeneous disorder, some children experience difficulties not just with inattention and hyperactivity-impulsivity, but also with co-occurring emotional problems. This includes a group with elevated callous-unemotional (CU) traits and a lack of empathy. While the presence of CU traits in ADHD is well-documented, the neurophysiological mechanisms remain unclear. Here, we hypothesize that CU traits in ADHD are associated with blunted neurophysiological response to negative emotional stimuli.

Methods

Adolescents (ages 11-18; N=199; 96 with ADHD) underwent comprehensive diagnostic assessment for ADHD. Parents also completed the Inventory of Callous-Unemotional Traits. Teens completed an emotional go/no-go task while 32-channel EEG data were recorded. N170 and LPP event-related potential amplitudes to happy, fearful, and neutral emotional faces assessed early emotional arousal and later, regulatory processing of emotional stimuli, respectively.

Results

Individuals with low CU had larger N170 amplitude to fearful faces than those with moderate to high CU, $F(2, 193)=5.46, p=.01$, consistent with blunted early response to negative emotions. In addition, a significant ADHD*CU interaction, $F(2, 191)=3.85, p=.02$, indicated that children with ADHD and high CU had larger LPP to happy stimuli than controls and children with ADHD and lower CU traits, suggesting enhanced elaborative processing of the happy stimuli.

Discussion

Children with high CU traits show blunted early response to fearful stimuli, consistent with literature suggesting less arousal to negative emotions in this group. The lack of interaction suggests a similar mechanism regardless of diagnosis. Children with ADHD and high CU traits also showed increased regulatory response to positive stimuli, which was not present for other groups. CU traits in the general population are not associated with dysregulated positive affect. However, the combination of under-arousal to negative stimuli and weaker regulation of positive affect may be a unique mechanism contributing to high CU in ADHD.

