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Attention-deficit hyperactivity disorder and children's emotion dysregulation: A meta-analysis

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HIGHLIGHTS

- We examined the link between ADHD and four domains of emotion dysregulation.
- Youth with ADHD have the greatest impairment on emotion reactivity/lability.
- The ADHD & CU traits link is weakened in the presence of conduct problems.
- Conduct problems did not moderate the link between ADHD and emotion regulation.
- Cognitive functioning moderates the link between ADHD and emotion reactivity/lability.

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ABSTRACT

While executive functioning deficits have been central to cognitive theories of Attention-Deficit Hyperactivity Disorder (ADHD), recent work has suggested that emotion dysregulation may also play a key role in understanding the impairments suffered by youth with ADHD. However, given the multiple processes involved in emotion dysregulation, the extent to which youth with ADHD are impaired across multiple domains of emotion dysregulation including: emotion recognition/understanding (ERU), emotion reactivity/negativity/lability (ERNL), emotion regulation (EREG), and empathy/callous–unemotional traits (ECUT) remains unclear. A meta-analysis of 77 studies ($n = 32{,}044$ youths) revealed that youth with ADHD have the greatest impairment on ERNL (weighted ES $d = .95$) followed by EREG (weighted ES $d = .80$). Significantly smaller effects were observed for ECUT (weighted ES $d = .68$) and ERU (weighted ES $d = .64$). Moderation analyses indicated that the association between ADHD and ERNL was stronger among studies that had a sample containing older youth (no other demographic factors were significant). Additionally, the association between ADHD and ECUT was significantly weaker among studies that controlled for co-occurring conduct problems. Co-occurring conduct problems did not moderate the link between ADHD and any other emotion dysregulation domain. Lastly, the association between ADHD and ERNL was significantly weaker when controlling for youth's cognitive functioning. Cognitive functioning did not moderate the link between ADHD and ERU, EREG, or ECUT, respectively. Theoretical/practical implications for the study of emotional dysregulation in youth with ADHD are discussed.

Contents

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1. Introduction

Attention-Deficit Hyperactivity Disorder (ADHD) is one of the most common childhood psychiatric disorders with prevalence rates ranging from 5 to 7% worldwide (Polanczyk, Willcutt, Salum, Kieling, & Rohde, 2014; Willcutt, 2012). The core symptoms of ADHD, consisting of inattention, hyperactivity, and impulsivity, are associated with significant impairment across youth's social, cognitive, academic, behavioral, and familial functioning (Loe & Feldman, 2007; Mash & Barkley, 2003) resulting in significant societal costs (annual societal cost of $42.5 billion; Pelham, Foster, & Robb, 2007). In terms of the etiology of ADHD, the past two decades have seen a resurgence of cognitive theories that along with empirical data have stressed the role of executive functioning (EF) processes or cognitive control (Barkley, 1997; Harms, Martin, & Wallace, 2010; Marsh & Blair, 2008). More recently, however, researchers have emphasized *emotion dysregulation* as a core feature of ADHD and a significant contributor to the functional impairment suffered by youth and adults with ADHD (Barkley & Fischer, 2010; Bunford, Evans, & Wymbs, 2015; Nigg, Blaskey, Stawicki, & Sachek, 2004; Shaw, Stringaris, Nigg, & Leibenluft, 2014).

Broadly speaking, *emotion dysregulation* occurs when an individual fails to modify an emotional state so as to promote adaptive behaviors that are necessary to accomplish his/her goals (Thompson, 1994). Within the ADHD literature, emotion dysregulation has been conceptualized as emotional impulsiveness, difficulty in effortful regulation of induced emotions, and/or difficulty inducing positive, more acceptable mood states (Barkley, 2010; Bunford, Evans, & Wymbs, 2015). However, as outlined by Gross (1998) model of emotion generation, there are several processes that occur in the modification of an emotional state prior to the overall "dysregulation" that may be eventually observed. These processes include the individual's ability to select, attend to, and appraise/evaluate emotionally arousing stimuli that lead to the experience of an emotional state in both a physiological and behavioral manner. Subsequently, modulation efforts take place both unconscious or consciously in response to such emotional state to promote an adaptive emotional response. It is also important to acknowledge that an individual's selection into a particular situation plays a role in the emotional cues that inherently may be triggered by the situation.

Despite such recognition of the complexity and multiple processes involved in emotion dysregulation, it remains unclear as pointed out recently by Shaw et al. (2014), which aspects of the emotion generation process are impaired among children with ADHD. Examining which aspects of the emotion generation process are impaired among youth with ADHD is particularly important given that overall emotion dysregulation is found across other externalizing and internalizing disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Zlomke & Hahn, 2010). Hence, it is important to examine whether any associations between ADHD and various emotion dysregulation domains remain after accounting for co-occurring conduct problems (CP; e.g., aggression and/or Oppositional Defiant Disorder/Conduct Disorder) which are highly co-morbid with ADHD. Lastly, given the important role of evaluating/appraising emotional cues, as part of the emotion generation process, it is not surprising that individual differences in cognitive functioning impact an individual's capacity to regulate emotions (Zelazo & Cunningham, 2007). Given the heterogeneity in cognitive/executive functioning deficits exhibited by children with ADHD (Barkley, 1997; Nigg, Blaskey, Huang-Pollock, & Rappley, 2002; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005), an accurate understanding of which domains of emotion dysregulation are affected by ADHD needs to account for individual differences in cognitive functioning. Modeled after Gross (1998) emotion generation process, Fig. 1 outlines our framework for examining the multiple levels of emotion dysregulation that may be affected in ADHD as well as moderating factors.

1.1. Emotion recognition/understanding (ERU)

While entry into a situation that contains emotional cues is recognized as the first step of Gross (1998) model of emotion generation, the current study focuses on individual differences that occur after the exposure to such emotional cues starting at the second and more evaluative step in terms of an individual's emotion recognition/understanding (ERU). ERU refers to youth's ability to process and infer the emotions of others as well as one's self. Measurement of ERU entails correctly identifying emotional states in various forms of communication including facial and/or bodily expression, gestures, and speech prosody (Etcoff, 1986; Regenbogen et al., 2012). Various research groups have created reliable and valid standardized tasks assessing youth's ERU such as asking youth to name emotions presented in pictures of faces or video vignettes (Boakes, Chapman, Houghton, & West, 2007; Da Fonseca, Seguier, Santos, Poinso, & Deruelle, 2009; Denham, 1986; Ekman & Friesen, 1976), or the use of a Prosody Test (Tucker, Watson, & Heilman, 1977). From a neural mechanism perspective, the activation of the amygdala has been shown to be a bottom-up response to emotional stimuli (Brown, Ryan, & Creswell, 2007; Deveney et al., 2013)