Boys with conduct problems and callous-unemotional traits: Neural response to reward and punishment and associations with treatment response

Amy L. Byrd, Samuel W. Hawes, Jeffrey D. Burke, Rolf Loeber, Dustin A. Pardini

ARTICLE INFO

Keywords:
Conduct problems
Callous-unemotional (CU) traits
Reward
Punishment
fMRI

ABSTRACT

Abnormalities in reward and punishment processing are implicated in the development of conduct problems (CP), particularly among youth with callous-unemotional (CU) traits. However, no studies have examined whether CP children with high versus low CU traits exhibit differences in the neural response to reward and punishment. A clinic-referred sample of CP boys with high versus low CU traits (ages 8–11; n = 37) and healthy controls (HC; n = 27) completed a fMRI task assessing reward and punishment processing. CP boys also completed a randomized control trial examining the effectiveness of an empirically-supported intervention (i.e., Stop-Now-And-Plan; SNAP). Primary analyses examined pre-treatment differences in neural activation to reward and punishment, and exploratory analyses assessed whether these differences predicted treatment outcome. Results demonstrated associations between CP and reduced amygdala activation to punishment independent of age, race, IQ and co-occurring ADHD and internalizing symptoms. CU traits were not associated with reward or punishment processing after accounting for covariates and no differences were found between CP boys with high versus low CU traits. While boys assigned to SNAP showed a greater reduction in CP, differences in neural activation were not associated with treatment response. Findings suggest that reduced sensitivity to punishment is associated with early-onset CP in boys regardless of the level of CU traits.

1. Introduction

Although childhood-onset conduct problems (CP) have been consistently associated with the development of severe and chronic antisocial behavior, many children who exhibit severe CP do not engage in severe delinquency during adolescence or adulthood (Moffitt, 1993; Byrd et al., 2012). A growing number of studies have found that callous-unemotional (CU) traits (e.g., lack of empathy and guilt) may help further delineate a subgroup of children with CP at heightened risk for exhibiting severe and persistent delinquency (Frick et al., 1996; Matthys et al., 1998). Moreover, there is increasing interest in identifying unique etiological factors that may underlie the development of CP among youth with CU traits.

Abnormalities in reward and punishment processing have long been implicated in the development of CP, particularly among youth with CU traits (Byrd et al., 2013; Blair et al., 2016; Hyde et al., 2013). Theoretically, researchers have suggested that a heightened sensitivity to reward and reduced sensitivity to punishment (i.e., loss of a desired stimulus or presentation of an unpleasant stimulus) increase risk for the development and persistence of CP. Behavioral studies have found that CP youth exhibit a greater affinity for large, immediate rewards using risk taking paradigms (Fairchild et al., 2009; Sengelak et al., 2009; Schutter et al., 2011), and difficulty inhibiting a previously rewarded response in the face of increasing punishment during passive avoidance (Hartung et al., 2002) and response reversal paradigms (O'Brien et al., 1994; O'Brien and Frick, 1996; Matthys et al., 1998). Moreover, there is some evidence to suggest that these deficits are most pronounced among CP youth with high CU traits (Budhani and Blair, 2005; Frick et al., 2013, 2003; Byrd et al., 2013). However, these studies assess ‘overall performance’ using behavioral tasks that include aspects of both reward and punishment processing, limiting our ability to disentangle whether the observed performance differences are due to abnormalities in processing reward, punishment, or both. Additionally, it is unclear whether CP youth exhibit deficits in processing reward and...
punishment at a particular stage of learning (e.g., initial encoding/receipt, acquisition, extinction) or across multiple stages (Balsam et al., 2010).

Over the last several years, neuroimaging studies have attempted to address these limitations by disaggregating the neural response to reward and punishment across various stages of learning. Some evidence indicates that, relative to healthy controls (HC), youth with CP exhibit functional abnormalities in regions associated with reward processing (i.e., ventral and dorsal striatum), punishment processing (i.e., amygdala), and higher-order regulatory function (i.e., medial prefrontal cortex, mPFC; anterior cingulate cortex, ACC) (for reviews see Byrd et al., 2013; Hyde et al., 2013; Blair et al., 2016; Alegria et al., 2016). This altered functional activation has been documented using tasks involving either reward or punishment anticipation and/or receipt (Bjork et al., 2010; Cohn et al., 2013). As well as tasks incorporating aspects of both reward and punishment during acquisition and/or extinction (Finger et al., 2008, 2011; White et al., 2013, 2016; Crowley et al., 2010; Cohn et al., 2015a). While prominent theory posits that a hypersensitivity to reward and a hyposensitivity to punishment underlies the development of CP and CU traits (Newman and Wallace, 2008), potential differences in reward/punishment processing are associated with treatment response among CP youth with high versus low CU traits. In exploratory analyses, this study examined whether abnormalities in the neural correlates of reward and/or punishment processing predicted post-treatment levels of CP following random assignment to an empirically supported multi-modal intervention (i.e., Stop-Now-And-Plan; SNAP).

2. Methods

2.1. Participants

Participants were 64 boys 8- to 11-years-old (M = 10.68; SD = 1.18): 37 boys exhibiting CP and 27 matched HC. CP youth were recruited from a larger treatment study (Burke and Loeber, 2014) and deemed eligible if they presented with clinically significant behavior problems (i.e., externalizing composite T-score > 64; aggressive behavior, rule breaking, conduct problems subscale T-scores > 70) according to the Child Behavior Checklist (CBC-L; Achenbach, 1991) for further details on inclusion and exclusion of CP youth, see Burke and Loeber (2015). HC were recruited predominantly from local pediatricians’ offices in the community and matched as a group to CP youth on age and race. Inclusion criteria necessitated problems below the at-risk threshold on all externalizing and internalizing scales of the CBCL (T-score < 60). All procedures were reviewed and approved by the Institutional Review Board. Written informed consent was obtained from parents/guardians and youth provided assent prior to each assessment.

2.2. Procedure

All CP youth and HC controls completed a baseline assessment, which included measures of CP, CU traits and covariates (e.g., demographics, IQ). Eligible CP and HC youth also completed an fMRI scan. Following the fMRI scan session, CP youth were randomly assigned to one of two treatment conditions: 1) a multimodal CBT/PMT intervention (i.e., SNAP; n = 21) or 2) standard services (SS; n = 16) in the community as a part of the larger treatment study (see Burke and Loeber, 2015). Finally, CP youth were reassessed 3-months later, after treatment was completed. Due to attrition, post-treatment data was only collected on 34 CP boys (19 assigned to SNAP; 15 assigned to SS). For review of the larger intervention, see Burke and Loeber (2015).

2.3. SNAP Intervention

The SNAP program is an empirically supported, manualized intervention and takes a multimodal approach by focusing on two core components: 1) child CBT groups emphasizing self-control skills and problem-solving techniques; 2) parent PMT groups focused on behavioral strategies for consistent reward and punishment implementation. Groups use modeling, behavioral rehearsal/role plays and home practice exercises and are offered simultaneously for 90-min for 12 consecutive weeks. For further details on this intervention see Augimeri et al. (2007).
دریافت فوری متن کامل مقاله

| ISI Articles | مرکز مقالات تخصصی ایران |
|--------------|----------------------------|
| ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی | ✓ امکان دانلود نسخه ترجمه شده مقالات |
| ✓ پذیرش سفارش ترجمه تخصصی | ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله |
| ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله | ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب |
| ✓ دانلود فوری مقاله پس از پرداخت آنلاین | ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات |