



Investigating error-related processing in incarcerated adolescents with self-report psychopathy measures

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ABSTRACT

Disparate results have been found in previous reports when incorporating both interview-based and self-report measures of psychopathic traits within the same sample, suggesting such assessments should not be used interchangeably. We previously found Total and Facet 4 scores from Hare's Psychopathy Checklist: Youth Version (PCL:YV) were negatively related to amplitude of the error-related positivity (Pe) event-related potential (ERP) component. Here, we investigated using the same previously published sample whether scores on four different self-report measures of adolescent psychopathic traits (the Antisocial Process Screening Device [APSD], Child Psychopathy Scale [CPS], Inventory of Callous-Unemotional Traits [ICU], and Youth Psychopathic Traits Inventory [YPI]) were similarly associated with reduced Pe amplitude. Unlike our previous results, adolescent self-report psychopathy scores were not associated with reduced Pe amplitude in multiple regression analyses. Results obtained in the current report support previous research observing incongruent findings when incorporating different assessment types within the same sample.

Psychopathy is a multifaceted personality disorder characterized by interpersonal, affective, and behavioral dysfunction (Hare, 1991, 2003). Currently, the most widely used measure to assess psychopathic traits in adult samples is Hare's Psychopathy Checklist – Revised (PCL-R) (Hare, 2003), due to its reliability across different samples and its predictive utility, particularly regarding violent recidivism (Bolt, Hare, Vitale, & Newman, 2004; Hemphill, Hare, & Wong, 1998). Despite the number of advantages of the PCL-R, the assessment requires extensive training, lengthy interviews, and access to institutional files to review collateral information. As such, self-report measures were developed to assess psychopathic traits in a more time efficient manner in community samples without access to collateral information, including the Psychopathic Personality Inventory (PPI) (Lilienfeld & Widdows, 2005), Levenson Self-Report Psychopathy Scale (Levenson, Kiehl, & Fitzpatrick, 1995), Self-Report Psychopathy (SRP) Scale (Paulus, Hemphill, & Hare, 2009), and the Triarchic Psychopathy Measure (TriPM) (Patrick, Fowles, & Krueger, 2009).

In addition to adult samples, researchers have tested the applicability of the psychopathy construct in younger children and adolescent

samples. The prevailing view is that intervention efforts targeted towards youth will have a better chance of altering life-course persistent problematic behavior if such interventions are started early (Caldwell, 2011; Caldwell, McCormick, Umstead, & Van Rybroek, 2007). Similar to assessments used in adult samples, psychopathic traits in youth and adolescent samples are typically measured using either interview-based instruments or self-report measures. Psychopathic traits in youth samples can also be assessed using parent- or caregiver-report. However, antisocial attitudes and behavior in adolescents are often better assessed using self-report compared to parent- or caregiver-report (Jolliffe et al., 2003; Kamphaus & Frick, 2002). Incarcerated youth tend to have less adult supervision and typically come from families where parents have not had enough recent contact with the adolescent to provide current ratings of the child's characteristics (Fink, Tant, Tremba, & Kiehl, 2012; Loney, Frick, Clements, Ellis, & Kerlin, 2003). Therefore, there is an increased discrepancy between caregiver-reports and self-reports in incarcerated youth (De Los Reyes & Kazdin, 2005), which is often not apparent in other populations, such as youth in the community who meet criteria for attention-deficit/hyperactivity disorder

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(ADHD) (Bied, Biederman, & Faraone, 2017; McLoughlin, Rijdsdijk, Asherson, & Kuntsi, 2011).

It appears as if interview-based and self-report measures of psychopathic traits should not be used interchangeably. For example, self-report measures of adolescent psychopathic traits have shown poor classification agreement across measures (Cauffman, Kimonis, Dmitrieva, & Monahan, 2009; Fink et al., 2012; Lee et al., 2003; Skeem & Cauffman, 2003). Self-report measures of adolescent psychopathic traits have also shown to be poorer predictors of delinquency and antisocial indices compared to the interview-based Hare Psychopathy Checklist: Youth Version (PCL:YV) (Forth, Kosson, & Hare, 2003), a downward extension of the PCL-R modified for age appropriateness (Boccaccini et al., 2007; Cauffman et al., 2009; Douglas, Epstein, & Poythress, 2008; Fink et al., 2012; Sharp & Kine, 2008; Spain, Douglas, Poythress, & Epstein, 2004). Interestingly, a few studies to date have been performed showing dissimilar executive functioning (Baskin-Sommers et al., 2015) and functional neuroimaging (Harenski, Harenski, & Kiehl, 2014) deficits when assessing psychopathic traits using both interview-based and self-report measures within the same sample. This suggests that self-report measures of adolescent psychopathic traits do not provide a compatible assessment of psychopathic traits measured via interview-based instruments, suggesting further refinement of such tools may be warranted (Fink et al., 2012).

In a recent publication, we found that PCL:YV Total and Facet 4 scores were associated with reduced amplitude of the error-related positivity (Pe) event-related potential (ERP) component (Maurer, Steele and Cope et al., 2016). Reduced Pe amplitude suggests that youth with elevated psychopathic traits assessed via the PCL:YV can detect when an error has occurred, but exhibit specific dysfunction in post-error related processing (Brazil et al., 2009; Maurer, Steele and Edwards et al., 2016), including processing the motivational (Ullsperger, Harsay, Wessel, & Ridderinkhof, 2010) or affective (Overbeek, Nieuwenhuis, & Ridderinkhof, 2005) significance of such stimuli. Results were most strongly supported through the use of principal component analysis (PCA), which provides a robust decomposition of overlapping variance between and within ERP components. This approach has been incorporated in several reports, providing a more sensitive and predictive measure compared to traditional time-domain ERP analyses (Anderson, Steele, Maurer, Bernat, & Kiehl, 2015; Fink et al., 2016; Maurer, Steele and Edwards et al., 2016; Steele et al., 2015, 2014; Steele, Maurer, Bernat, Calhoun, & Kiehl, 2016). Dysfunctional Pe amplitude has also been found in adults scoring high on the PCL-R (Brazil et al., 2009; Maurer, Steele and Edwards et al., 2016; Steele and Maurer et al., 2016).

Following up on previously published reports in which disparate results were obtained depending on the specific psychopathy instrument used within the same sample, particularly neuroimaging results (Harenski et al., 2014), in the current report, we sought to investigate whether self-report measures of adolescent psychopathic traits would be negatively related to Pe amplitude. Based on previous evidence that self-report measures do not provide an interchangeable assessment of psychopathic traits with the PCL:YV (Fink et al., 2012), we hypothesized self-report measures of adolescent psychopathic traits would be associated with unique error-related electrophysiological deficits. In the current report, we investigated the following four self-report adolescent psychopathy measures: the Antisocial Process Screening Device (APSD) (Frick & Hare, 2001), Child Psychopathy Scale (CPS) (Lynam, 1997), Inventory of Callous-Unemotional Traits (ICU) (Essau, Sasagawa, & Frick, 2006), and the Youth Psychopathic Traits Inventory (ICU) (Andershed, Kerr, Stattin, & Levander, 2002).

Factor analyses of these varying self-report assessments yield different factors, ranging in their ability to measure interpersonal/affective traits and lifestyle/antisocial traits. The ICU focuses strictly on affective deficits associated with youth with elevated psychopathic traits, whereas the CPS assesses interpersonal/affective traits, in addition to severe behavioral problems that arise early in life. On the other

hand, the APSD and YPI both assess interpersonal/affective and lifestyle traits, but largely ignore early criminogenic behavior. As such, we hypothesized that individual self-report measures would be associated with unique error-related cognitive dysfunction using traditional time-domain ERP and PCA analyses. Specifically, we hypothesized CPS scores would be negatively related to Pe amplitude, as this instrument measures severe behavioral dysfunction like the PCL:YV, whereas APSD and YPI scores should be associated with normal Pe amplitude, as these assessments do not measure behavioral dysfunction arising early in life. However, the APSD and YPI do measure lifestyle traits, including impulsivity. Populations scoring higher on measures of impulsivity typically exhibit reduced error-related negativity (ERN/Ne) amplitude, related to initial, automatic error-detection and action-monitoring processes (Dikman & Allen, 2000; Hall et al., 2007; Heritage & Benning, 2013; Pasion & Barbosa, 2016). Thus, we hypothesized APSD and YPI scores would be negatively related to ERN/Ne amplitude, but unrelated to the Pe. We did not make any *a priori* hypotheses regarding ICU scores.

1. Method

1.1. Participants

Participants included $n = 142$ incarcerated adolescent offenders recruited from a maximum security juvenile correctional facility who participated in a larger study (Southwest Advanced Neuroimaging Cohort – Youth (SWANC-Y)). Participants were excluded from analyses for meeting the following criteria: previous history of traumatic brain injury accompanied with a significant loss of consciousness ($n = 4$), significant movement during data collection, or behavioral performance (i.e., making less than four errors) ($n = 16$). Reliability analyses suggest that the ERN/Ne and Pe can be quantified in as few as four to six trials (Olvet & Hajcak, 2009; Pontifex et al., 2010; Steele et al., 2016). Participants were also excluded for meeting criteria for mood disorders, including major depression ($n = 10$) and anxiety disorders including post-traumatic stress disorder (PTSD) ($n = 3$), due to the important role these disorders play for both the ERN/Ne (Chiu & Deldin, 2007; Olvet & Hajcak, 2008) and Pe (Bridwell, Steele, Maurer, Kiehl, & Calhoun, 2015) amplitude. Finally, female participants ($n = 9$) were excluded from final analyses, as there were not enough participants to power gender effects. This resulted in a final sample of $n = 100$ incarcerated male offenders, ranging from 16 to 20 years of age ($M = 17.38$ years, $SD = 0.86$) at the time of electroencephalography (EEG) collection. The sample was predominantly right-handed, with 7% of the sample reporting left-hand dominance. Participants largely self-identified as Hispanic/Latino (76%), with the remaining self-identifying as Black/African American (12%), White (10%), or more than one ethnic category (2%). Initial contact was made with potential study participants through announcements made by research staff at the correctional facility. Meetings were scheduled with interested participants and informed consent was obtained. Individuals 18 years of age or older provided written informed consent, and individuals younger than 18 years of age provided written informed assent in conjunction with parent/guardian consent. Participants were informed of their right to terminate participation at any point, the lack of direct institutional benefits resulting from their participation in the study, and that their participation would not affect their facility status or parole. Participants received remuneration at the hourly labor wage of the facility. The University of New Mexico Health Center Human Research Review Committee and the Office of the Human Research Protections approved all procedures. Important to note, the relationship between PCL:YV scores and error-related ERPs has been previously published incorporating this same sample of $n = 100$ incarcerated male offenders (Maurer, Steele and Cope et al., 2016). In the current report, we sought to investigate whether self-report measures of adolescent psychopathic traits would be negatively related to Pe amplitude, as PCL:YV Total and

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