

Systematic review of neural correlates of psychopathy in adolescent offenders

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Introduction

The construct of psychopathy has been considered one of the most important concepts to enter the field of forensic psychology (Nicholls & Petrilla, 2005). Psychopathy has been considered to be a developmental disorder with some evidence of stability of callous unemotional (CU) traits from adolescence into adulthood (Crowe & Blair, 2008; Lynam et al., 2007). Improved neuroimaging technology has led to an influx of brain imaging research that attempts to support neurobiological theories of psychopathy that implicate dysfunction in the amygdala, prefrontal cortex, and other extended paralimbic structures in adult psychopaths and adolescents high in CU traits (for a review see Anderson & Kiehl, 2012; Yang & Raine, 2009). Review papers have identified heterogeneity in the neuroimaging research results for psychopathy, implicating a number of methodological flaws such as inconsistent assessment tools, sampling concerns, and comorbid diagnoses (Koenigs et al., 2011; Anderson & Kiehl, 2012). However, few research studies have investigated whether cultural factors may play a role in heterogeneity, despite previous research elucidating important differences on how psychopathic traits manifest across some cultural groups.

Accordingly, the present systematic review aims to: 1) assess the extent to which adolescents are the population of interest within neuroimaging research on psychopathy in criminal offenders; 2) assess the extent to which this research has incorporated or included ethnic minority group members and female adolescent offenders; and 3) review the various brain structures and functions identified in neuroimaging findings for adolescent offenders with CU traits.

Methods

This study is using a subset of articles from a larger dataset composed of neuroimaging psychopathy research articles for adults and adolescents. The purpose of that study was twofold: 1) to conduct a systematic review on the extent research has included ethnic minority group members, females, and adolescents; and 2) to conduct a meta-analysis. The focus of the current study is to examine the neuroimaging psychopathy research on adolescent offenders.

Search and retrieval

A systematic review of the literature was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). Six databases were selected to identify peer reviewed articles that examined neuroimaging outcomes of adolescent offenders with psychopathic or CU traits. In order to identify grey literature not found in the initial search, searches were conducted on six additional databases. A series of Boolean search strategies were conducted, aiming to capture all relevant studies. Search terms

focused on keywords associated with psychopathy, neuroimaging, criminal offenders, race/ethnicity, gender, and age. After reviewing for exclusion criteria, a total of 94 studies were identified for inclusion.

Results

Of the 94 articles identified for inclusion, only 20 (21%) identified including a sample of adolescent offenders with psychopathy or CU traits. Of those 20 articles, 95% reported the gender makeup of their sample and only one study included female participants. Next we examined the number of articles that reported the race/ethnicity of participants. We found that 30% of articles did not report or mention the race and/or ethnicity of their sample. Within the 14 articles (70%) that did report race/ethnicity, the vast majority contained predominantly White participants ($n = 9$; 64%), followed by Native American ($n = 6$; 43%), Black ($n = 5$; 36%), and Pacific Islander ($n = 2$; 14%). Half of these articles reported having participants that identified as Hispanic/Latino ($n = 8$; 57%). Approximately 64% ($n = 9$) of articles had an “Other” category which included the following categories: other/unspecified ($n = 2$), minority ($n = 2$), chose not to respond ($n = 1$), non-western European ($n = 2$), more than one race ($n = 2$), Northwestern European ($n = 1$). Of those articles reporting race/ethnicity, the average number of racial/ethnic groups reported was 2.71 ($SD = 1.77$). Importantly, only six articles (30%) identified cultural factors as being a limitation of their study. Eight articles (40%) suggested future lines of research involving one or more cultural variables. Of those, the majority ($n = 7$; 88%) recommended additional research on adolescents, three (38%) suggested research focused on female participants, and only one article (13%) identified race/ethnicity as an important consideration for future research.

Measurement of psychopathy. A wide variety of approaches and measures of psychopathy and CU traits were captured in this sample of articles with 50% utilizing two or more measures. The following measures were identified as the studies’ primary measure: Youth Version of the PCL ($n = 9$; PCL: YV; Forth, Kosson, & Hare, 2003), Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children ($n = 8$; KSADS; Kauffman et al., 1997), Youth Psychopathic Traits Inventory ($n = 7$; YPI; Andershed, Kerr, Stattin, & Levander, 2002), Inventory of Callous-Unemotional Traits ($n = 4$; ICU; Frick, 2004), The Diagnostic and Statistical Manual of Mental Disorders ($n = 4$; DSM-IV), Diagnostic Interview Schedule for Children version IV ($n = 2$; DISC-IV; Shaffer et al., 2000), Antisocial Process Screening Device ($n = 1$; APSD; Frick & Hare, 2001), and the Child Psychopathy Scale ($n = 1$; CPS; Lynman, 1997).

Neuroimaging techniques and results. Regarding neuroimaging techniques, three articles used more than one imaging techniques. Functional MRI (fMRI) was the most commonly used technique ($n = 10$; 65%), followed by Magnetic Resonance Imaging (MRI; $n = 7$), Diffusion Tensor Imaging (DTI; $n = 2$), Electroencephalography (EEG; $n = 2$), Event-Related Potential (ERP; $n = 1$), and Magnetic Resonance (MR) spectroscopy ($n = 1$). Of note, no articles in this sample reported neuroimaging results by cultural groups.

fMRI

Functionally, psychopathic traits were associated with dysfunction of the executive control network, default mode network, basal ganglia, ventral striatum, bilateral insula, regions of the prefrontal cortex and anterior cingulate cortex, and subregions of the amygdala (Aghajani

et al., 2016; Aghajani et al., 2017; Cohn et al., 2015). Regional gray matter volumes in the limbic, paralimbic, amygdala and anterior insula were also related to psychopathic traits (Cohn et al., 2016; Cope et al., 2014). Harenski et al. (2014), identified correlations between psychopathy scores and hemodynamic responses in the anterior temporal cortex and left amygdala.

MRI

Decreased regional gray matter volumes in paralimbic regions were associated with psychopathic traits (Steele et al., 2017). Gray matter volume levels in the amygdala and hippocampus were correlated with dimensions of psychopathy (Walters et al., 2015).

DTI

Different facets of psychopathic traits were differentially related to structural connectivity in numerous white matter tracts. For example, white-matter microstructural abnormalities in the uncinate fascicle were also associated with psychopathic traits (Passamonti et al., 2012).

Discussion

Although over half of articles reported participant race/ethnicity and gender, most studies focused on majority groups (i.e., White males) reflecting a significant lack of cultural inclusion in this body of literature. Additionally, initial review of neuroimaging findings supports heterogeneity in the brain structures and functions associated with CU traits in youth. Altogether, these results indicate the critical need for neuroimaging research on youth with CU traits to improve its inclusion and reporting of culture within study participants, not only to be representative of diversity, but also to improve the quality of the research which could help attenuate the heterogeneity of the results in this body of literature.

Citation

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References

Anderson, N. E., & Kiehl, K. A. (2012). The psychopath magnetized: insights from brain

imaging. *Trends in Cognitive Sciences*, 16(1), 52-60.

Crowe, S. L., & Blair, R. J. R. (2008). The development of antisocial behavior: What can we

learn from functional neuroimaging studies? *Development and Psychopathology*, 20(4),

1145-1159.

Koenigs, M., Baskin-Sommers, A., Zeier, J., & Newman, J. P. (2011). Investigating the neural

correlates of psychopathy: A critical review. *Molecular Psychiatry*, 16(8), 792.

Lynam, D. R., Caspi, A., Moffitt, T. E., Loeber, R., & Stouthamer-Loeber, M. (2007).

Longitudinal evidence that psychopathy scores in early adolescence predict adult psychopathy. *Journal of Abnormal Psychology, 116*(1), 155-165.

Nicholls, T. L., & Petrila, J. (2005). Gender and psychopathy: An overview of important issues and introduction to the special issue. *Behavioral Sciences & the Law, 23*(6), 729-741.

Yang, Y., & Raine, A. (2009). Prefrontal structural and functional brain imaging findings in antisocial, violent, and psychopathic individuals: a meta-analysis. *Psychiatry Research: Neuroimaging, 174*(2), 81-88.