Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

______________________________ _______________

Patrick D. Sylvers July 22, 2010

Childhood Psychopathic Features and Aggression: A Test of the Fearlessness Hypothesis

By

Patrick D. Sylvers
Doctor of Philosophy

Clinical Psychology

Scott O. Lilienfeld, Ph.D.
Advisor

Patricia A. Brennan, Ph.D.
Advisor

Stephen Nowicki, Jr., Ph.D.
Committee Member

Stephan Hamann, Ph.D.
Committee Member

Michael Windle, Ph.D.
Committee Member

Accepted:

Lisa A. Tedesco, Ph.D. Dean of the James T. Laney School of Graduate Studies

Date

Childhood Psychopathic Features and Aggression: A Test of the Fearlessness Hypothesis

By

Patrick D. Sylvers
B.S., University of Washington, 2002

Advisors: Scott O. Lilienfeld, Ph.D. and Patricia A. Brennan, Ph.D.

An abstract of
A dissertation submitted to the Faculty of the
James T. Laney School of Graduate Studies of Emory University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in Clinical Psychology
2010

Abstract

Childhood Psychopathic Features and Aggression: A Test of the Fearlessness Hypothesis

By Patrick D. Sylvers

This study sought to test the fearlessness hypothesis (Lykken, 1957/1995) of psychopathy in an at-risk sample of 88 pre-adolescent children (ages 7 – 11). The sample consisted primarily of Caucasian (45%) and African American (44%) children. Psychopathy was measured using combined child- and parent-reported Antisocial Process Screening Device (APSD; Frick & Hare, 2001) scores. Emotion processing was evaluated at three levels, including: preattentive emotion recognition, explicit emotion recognition, and fear conditioning. As the nature of the explicit fear recognition deficits in children with psychopathic traits is controversial (e.g., Dadds et al., 2008), this study added to the literature by including a pre-attentive fear recognition measure. Results indicated that APSD callous unemotional factor scores, characterized by the affective deficits associated with psychopathy, predicted preattentive fear and disgust processing deficits. However, the pre-attentive fear processing deficits were observed in Caucasian, but not African American, children. APSD total scores and impulsivity/conduct problems factor scores predicted explicit fear recognition deficits. Moreover, the interaction of aggression and psychopathy factor scores predicted preattentive and explicit fear recognition deficits. In terms of fear conditioning deficits, results indicated that the cardiac-related sympathetic nervous system activation was characteristic of APSD callous unemotional factor scores when anticipating an aversive stimulus in African American, but not Caucasian, children. The implications of these findings, as well as future directions for research, are discussed.

Childhood Psychopathic Features and Aggression: A Test of the Fearlessness Hypothesis

By

Patrick D. Sylvers
B.S., University of Washington, 2002

Advisors: Scott O. Lilienfeld, Ph.D. and Patricia A. Brennan, Ph.D.

A dissertation submitted to the Faculty of the
James T. Laney School of Graduate Studies of Emory University
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy
in Clinical Psychology
2010

Acknowledgements

♧ Special thanks to Eunice Yang for all of her assistance in programming the continuous flash suppression paradigm. We could not have completed this study without you.

♧ Thank you to the numerous research assistants who helped with tasks from recruiting to scoring data. They were an invaluable part of the research team. A special thanks to Jie Jaio, Sarah Brislin, and Nicole Acoco.

♧ Thank you to my family who were willing to tolerate me while I was working weekends, locking myself away to write, and spending long hours working over the past six years. My success would not have been possible without all of you.

♧ Thank you to my advisors, Drs. Scott O. Lilienfeld and Patricia A. Brennan. You have been patient, understanding, and wonderful guides throughout my tenure at Emory University. During tough times with this project, I never felt anything but encouraged by you and I cannot tell you how much I appreciate it.

♧ Thank you to dissertation committee members, Drs. Stephan Hamman, Stephen J. Nowicki, and Michael Windle, for your time and input.

♧ Thank you to the Giles Robertson Alcohol Fund at Emory University and the Emory University Department of Psychology for their financial support.

This study is dedicated to Patrick Laden. May you rest in peace.

Table of Contents

List of Tables

Table 10.

Moderated Multiple Regression Analyses: Psychopathy and Conduct Disorder Measure X CBCL Aggression Interaction Terms Predicting Physiological Reactivity to Fear Conditioning

Table 11.

APQ Parenting Scale Scores Regressed on Child Aggression Scores

Table 12.

Interview and Questionnaire Measure Scores Regressed on Physiological Measures during the Lottery Task

Table 13.

Moderated Multiple Regression Analyses: Questionnaire and Interview Measure Scores X Ethnicity Interaction Terms Predicting Performance on Fear Recognition Tasks.

Table 14.

Moderated Multiple Regression Analyses: Questionnaire and Interview Measure Scores X Ethnicity Interaction Terms Predicting Reactivity to Fear Conditioning.

List of Figures

Childhood Psychopathic Traits and Aggression:

A Test of the Fearlessness Hypothesis

Psychopathy is a constellation of personality traits including a lack of empathy and remorse, shallow affect, proneness to boredom, a failure to inhibit punished behavior appropriately, and the persistent violation of social norms (Cleckley, 1988; Hare, 1999). Psychopaths are typically selfish, superficially charming, irresponsible, disloyal, incapable of guilt, and they do not learn from punishment (Hare). In combination, these traits may manifest as risky and dangerous behaviors (Hare). For example, several studies have found that psychopathy is associated with aggression in both criminals (e.g., Cima & Raine, 2009; Hare & McPherson, 1983; Swogger, Walsh, Houston, Cashman-Brown, & Connor, 2010) and noncriminals (e.g., Coyne, Nelson, Graham-Kevan, Keister, & Grant, 2010).

To understand its developmental course, researchers have started to investigate the downward extension of psychopathy to children and adolescents (e.g., Frick, 2009; Glenn, Raine, Venables, & Mednick, 2009). In particular, several recent studies (e.g., Blair, et al., 2002) have tested the fearlessness hypothesis (Lykken, 1957, 1995), which posits that temperamental fearlessness originates in childhood and lays a core foundation for the development of adult psychopathy, by investigating fear conditioning and recognition in children with psychopathic features. For example, Blair, Colledge, Murray, and Mitchell (2001) found that children with psychopathic traits exhibited an impaired ability to explicitly identify fear in facial expressions. However, explicit emotion recognition may be influenced by additional factors other than intrinsic defect, including the potential for cognitive biases (Pardini, Lochman, & Frick, 2003) and less eye gaze (Dadds, et al., 2006); therefore, studies investigating fear processing in the absence of these potential confounds are warranted. As posited by the fearlessness hypothesis, children with psychopathic features are not implicitly signaled by fearful faces.

The present study aims to investigate pre-attentive processing of fearful faces and fear conditioning in children with psychopathic traits. This study adds to the literature by investigating whether this fear processing deficit interacts with psychopathic traits to predict aggressive behavior. Furthermore, this study adds to the literature by investigating whether these deficits predict aggressive behavior above and beyond poor parenting.

Psychopathy in Adults

Psychopathic traits in adults manifest as pervasive and problematic patterns of behavior, interpersonal functioning, and affective experience. Factor analyses of measures designed to assess psychopathy suggest at least two underlying factors (Harpur, Hakstian, & Hare, 1988). In adult prison populations, the Psychopathy Checklist – Revised (PCL-R; Hare, 1991), a semi-structured interview measure that includes file reviews, is the most widely used and well-validated measure of psychopathy. The PCL-R commonly yields two factors referred to as factor 1, characterized by a glib and unempathetic interpersonal style, and factor 2, characterized by irresponsible and impulsive behavior. Some factor analytic studies have also suggested a 3rd underlying factor, referred to as the ‘deficient affective experience’ factor (see Cooke, Michie, & Hart, 2006, for a review). Further still, studies have evidenced a 4 factor solution (e.g., Vitacco, Neumann, & Jackson, 2007), encompassing: interpersonal, affective, behavioral impulsivity, and antisocial behavior factors. Recent taxometric analyses of the PCL-R and other measures of psychopathy suggest that psychopathy is a dimensional construct rather than a discrete taxon (Edens, Marcus, Lilienfeld, & Poythress, 2006; Lilienfeld & Andrews, 1996; Walters, et al., 2007; Walters, Duncan, & Mitchell-Perez, 2007).

Psychopathy is not synonymous with psychosis or violence, although the terms are often confused. In fact, psychopathic individuals rarely display any symptoms of psychosis (Cleckley, 1988). Although psychopathy is a strong predictor of the frequency and intensity of violent behavior (Das, de Ruiter, Lodewijks, & Doreleijers, 2007; Edens, Campbell, & Weir, 2007; Vitacco, Caldwell, Van Rybroek, & Gabel, 2007), violent behavior is not necessary or sufficient for the diagnosis. Psychopathic individuals' tendency toward impulsive and dangerous behavior may manifest itself in many other ways, including petty theft, fraud, adultery, substance abuse, and unprovoked verbal assaults, to name a few (Cleckley). As a result, psychopaths may experience repeated arrests, debt defaults, divorces, physical altercations, and substance use disorders (Cleckley). Associated with many of these behaviors is psychopaths' lack of insight regarding the culpability and consequences associated with their behaviors (Cleckley; Hare, 1999). Unfortunately, studies investigating the treatment of adult psychopathy have yielded largely disappointing results (see Harris & Grant, 2006, for a review). However, a recent study found evidence for a treatment response in psychopathic adolescent inmates who participated in an intensive treatment regime, whereby they were half as likely to violently reoffend when released to the community compared with psychopathic adolescent inmates in a *treatment as usual* program (Caldwell, Skeem, Salekin, & van Rybroek, 2006).

Psychopathy in Children

Given the tremendous interpersonal, societal, and monetary costs often associated with adult psychopathy, researchers have developed a number of instruments based on adult measures, in the hopes of identifying childhood precursors to psychopathy. One such measure, developed by Frick and Hare (2001), is the Antisocial Process Screening Device (APSD), a questionnaire measure and downward extension of the PCL-R in self-, parent-, and teacher-report form. The APSD is widely used in studies of psychopathic traits in children and is explained by three underlying factors referred to as the Callous Unemotional (CU), Impulsivity/Conduct Problems (ICP), and Narcissism (N) scales (Fite, Greening, Stoppelbain, & Fabiano, 2009; Frick, Boden, & Barry, 2000), although some authors have suggested that a two-factor solution mirroring the PCL-R is most parsimonious in clinical samples (Fite et al.). Yet still, others have suggested that three and four factor models, but not two factors, adequately represent childhood psychopathy (Salekin, Brannen, Zalot, Leistico, & Neumann, 2006). Studies have found that of the three factors, CU traits, akin to the deficient affective experience factor in adults, best account for the core characteristics of psychopathy in children and adolescents (e.g., Barry, et al., 2000). CU traits are a robust predictor of the recurrence of delinquency in longitudinal studies (Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005). Studies conducting taxometric analyses of psychopathy in children and adolescents have yielded mixed results, with some studies evincing a latent taxon (Skilling, Quinsey, & Craig, 2001; Vasey, Kotov, Frick, & Loney, 2005) and others a dimensional construct (Murrie et al., 2007).

When considering psychopathy in children, two primary concerns regarding the stability of these traits are typically raised—one is whether these traits are stable throughout childhood, and the other is whether childhood traits predict adult traits of psychopathy. Several studies have sought to investigate the stability of psychopathic traits in children (e.g., Frick, Kimonis, Dandreaux, & Farrell, 2003; Lynam, Charnigo, Caspi, Moffitt, Raine, & Stouthamer-Loeber, 2007; Obradovic, Pardini, Long, & Loeber, 2007; Pardini, Lochman, & Powell, 2007), and have found that these traits are moderately to highly stable throughout childhood. For example, Obradovic et al. investigated the temporal stability of callous unemotional traits in 506 (57% African American, 43% Caucasian) boys as part of the Pittsburgh Youth Study, a study designed to investigate the development of delinquent behaviors in at-risk children (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998). Assessments were conducted annually from child ages 8 – 16 years. At each assessment period, parents and teachers completed questionnaire measures assessing CU traits. Their results indicated that parent-reported CU traits were modestly to highly stable across childhood, with age 8 scores correlating 0.50 with age 16 scores. Parent-reported year to year scores correlated between 0.77 and 0.84. Teacher-reported CU traits were moderately stable across childhood, with age 8 scores correlating 0.27 with age 16 scores, and year-to-year scores correlating between 0.52 and 0.61.

Similarly, Frick et al. (2003) examined the 4 year stability of psychopathy traits in a sample of 100 3rd through 7th grade children using the APSD. To ensure adequate variance, they oversampled children who scored high on psychopathy. Consistent with Obradovic et al. (2007), their results indicated that, using intraclass correlation coefficients, the 2-year stability of APSD scores was 0.88 and the 4-year stability was

0.80. Taken together, these findings suggest that CU traits, and psychopathic traits more broadly, are relatively stable throughout childhood.

Recent studies have also examined whether psychopathic traits in childhood predict adult psychopathy. For example, Lynam et al. (2007) investigated the relationship between mother-reported psychopathy at age 13 years and children's PCL-R scores at age 24 years. They obtained data from 250 males from the Pittsburgh Youth Study for the analysis. They found a moderate correlation ($r = 0.32$) between assessments. However, the stability differed across factors of psychopathy, such that the impulsivity factor ($r = .29$) was more stable than the CU factor ($r = .19$), although the stability of both factors was relatively low. As the authors noted, a major limitation of this study was the use of different assessment measures and informants across time periods.

In contrast, Loney, Taylor, Butler, and Iacono (2007) assessed the stability of psychopathic traits from adolescence into adulthood using a single informant and measure design. Their sample included 475 17-year-old males who were recruited as part of the Minnesota Twin and Family Study. Follow-up assessments were conducted at age 23. Psychopathy was assessed using the Minnesota Temperament Inventory (MTI), a 19-item research-based measure of psychopathic traits that is composed of two subscales: antisociality and detachment. Intraclass correlation coefficients for the antisociality and detachment scales were 0.40 and 0.41, respectively, suggesting moderate stability of psychopathic traits from adolescence through adulthood. These findings, combined with the findings from studies of childhood stability, suggest that psychopathic traits are moderately stable throughout childhood and into adulthood. Therefore, assessing the external correlates of psychopathy in childhood may shed light on the pathogenesis of the syndrome in adulthood.

The Fearlessness Hypothesis

One promising etiological model of psychopathy is the fearlessness hypothesis (Lykken, 1957/1995). This hypothesis posits that innate fear processing impairments comprise the primary pathway to developing the core affective and interpersonal characteristics of psychopathy (i.e., CU traits). Lykken suggested that these impairments manifest in early childhood as a fearless temperament and an impaired ability to learn from punishment. In an average family, the punitive parenting practices that ordinarily mold children's behaviors fail to socialize children with a fearless temperament, as these children do not fear the consequences associated with their actions. Moreover, inadequate fear prevents the psychopathic child from developing a social conscience with peers. The combination of being undersocialized and fearless predisposes the psychopathic child to developing a CU affective and interpersonal style and engaging in risky behaviors. Lykken viewed fearlessness as part of a dimensional construct, which he termed the innate fear quotient. According to Lykken, individuals who are high on the fear quotient are excessively inhibited, whereas individuals who are low on the fear quotient are susceptible to developing core psychopathic traits.

Lykken (1957) described and tested the fearlessness hypothesis of psychopathy in an adult sample. In this study, he compared fear conditioning and avoidance learning in a control group composed of a university and high school student population, a group composed of inmates who did not appear to be psychopathic, and a psychopathic group. In the fear-conditioning paradigm, participants first heard a buzzer ring for 5 seconds followed by a 100-millisecond shock from a 700-volt AC supply over several trials in a fear conditioning task. Following the fear conditioning task, he administered an avoidance learning task to participants, wherein they were given 20 trials to learn a complex mental maze. In sum, results indicated that the psychopathic group exhibited poor avoidance learning and fear conditioning compared to the other two groups.

Schachter and Latane (1964) extended Lykken's (1957) findings by further testing avoidance learning in inmates using shock paradigms. They found that, similar to Lykken, psychopathic inmates were poor avoidance learners compared with non-psychopathic inmates. However, when injected with epinephrine (a drug found to facilitate Pavlovian fear conditioning in anesthetized rats [Weinberger, Gold, & Sternberg, 1984]), inmates scoring high on psychopathy exhibited significant improvements in avoidance learning, whereas inmates scoring low on psychopathy did not. Their findings suggested that manipulating physiological systems integral to the fear response resulted in changes in behavioral impairments associated with psychopathy.

Consistent with the fearlessness hypothesis, several studies have also reported deficient fear conditioning in incarcerated adolescents and adults endorsing high levels of psychopathy (see Lorber, 2004, for a review). For example, Hare (1965) asked adult inmates to sit through several trials of a countup to electric shock task. Participants' heart rate and electrodermal activity (EDA; sweat on the palms) were monitored while anticipating the shock. In healthy individuals, EDA increases in response to novel, emotionally evocative, or cognitively demanding stimuli (see Dawson, Schell, & Filion, 2007, for a comprehensive review of EDA). Hare (1965) found that inmates scoring high on psychopathy were less EDA reactive and reacted later during the countup period than inmates scoring low on psychopathy.

Similarly, Hare, Frazelle and Cox (1978) asked adult inmates to sit through several trials of a 12-second countdown followed by a 120-decibel white-noise blast while measuring their EDA and heart rate (HR). Hare et al. (1978) found that psychopathic inmates exhibited decreased EDA and increased HR reactivity during the countdown period while anticipating the aversive sound than non-psychopathic inmates, a finding that has since been well-replicated (e.g., Hare, 1982). Authors (e.g., Fowles, 1980) have attempted to explain this fragmented pattern of autonomic responding by suggesting that reduced EDA was indicative of a weakened behavioral inhibition system (BIS; Gray, 1987) and increased HR was indicative of an overactive behavioral activation system (BAS; Gray). In short, BIS refers to a neural network that inhibits behavior under threatening conditions, and BAS refers to a neural network that facilitates behavior under conditions of threat or reward (Gray). The countdown paradigm has since become a widely used indicator of fear reactivity in psychophysiological research (see Iacono, 1998).

More recently, fMRI studies have found associations between psychopathy and attenuated amygdalar, orbitofrontal, and dorsolateral prefrontal cortex activation during aversive conditioning paradigms, perhaps indicative of a dysfunctional fear conditioning circuit (e.g. Blair, Colledge, & Mitchell, 2001; Rilling et al., 2006). Studies have also found that adults with psychopathic traits display an impaired ability to recognize fearful faces (e.g., Blair et al., 2004; Montagne et al., 2004) and voices (e.g., Blair et al., 2002), consistent with the fearlessness hypothesis. Across studies, adults exhibiting high levels of psychopathy, and antisociality more broadly, display deficits in fear recognition (see Marsh & Blair, 2008 for a review). Conversely, studies have found that accuracy in fear recognition predicts prosocial behavior (Marsh & Ambady, 2007; Marsh, Kozak, & Ambady, 2007). However, a major limitation of adolescent and adult studies of neural and emotion processing deficits in psychopathy is the high co-occurrence of substance abuse disorders, which may lead to similar deficits in the absence of psychopathy (e.g., Taylor, Carlson, Iacono, Lykken, & McGue, 1999).

Deficient Fear Conditioning in Children

Consistent with studies in adult samples, studies of adolescents with psychopathic traits have observed fear conditioning deficits (e.g., Fung et al., 2005). Studies of physiological reactivity to fear conditioning paradigms in children typically assess two physiological signals: EDA and HR. Individuals with fearless dispositions typically exhibit EDA hyporeactivity, or less responsiveness, to aversive stimuli (Fowles & Kochanska, 2000).

For example, Fung et al. (2005) investigated fear conditioning in a sample of 130 (65 high psychopathy, 65 controls) adolescents (mean age 15.99). Within the sample, 57% were African American and 43% were Caucasian. They used a countdown task (see Taylor, Carlson, Iacono, Lykken, & McGue, 1999) that consisted of both signaled and unsignaled trials. During the signaled trials, participants watched a computer screen countdown from 12 (1 count per second). At the end of the countdown, a 105-db white noise blast was delivered through headphones. Their results indicated that the high psychopathy adolescents exhibited less EDA responding to signaled trials, but not unsignaled trials, than controls. Moreover, this relationship persisted even after controlling for potentially confounding variables, including attention-deficit/ hyperactivity disorder (ADHD), socioeconomic status (SES), IQ, and antisocial behavior. Although HR is commonly employed in adult fear conditioning studies (e.g., Hare, 1982), I could find no published studies investigating the relationship between cardiac measures and fear conditioning in children with psychopathic traits.

The primary limitation of HR as an index of autonomic influence on the heart is that it is influenced by both branches, sympathetic and parasympathetic, of the autonomic nervous system as well as endocrine functioning (see Beauchaine, 2001, for a review). These multiple influences make HR difficult to interpret. However, there are more sophisticated measures to help isolate the sympathetic influence on HR. Pre-ejection period (PEP; Sherwood et al., 1990), the time between left ventricular depolarization and ejection into the aorta, is a relatively recent non-invasive measure of sympathetic nervous system influence on HR. PEP is an inverse indicator of fight/flight/freeze responding (Kreibig, Willhelm, Gross, & Roth, 2007). In other words, PEP shortening (decrease in time between left ventricular depolarization and ejection into the aorta) is indicative of increases in sympathetic influence on the heart. No study has investigated the relationship between PEP reactivity during fear conditioning and child psychopathy.

Fear Recognition Deficits in Children

In addition to deficient fear conditioning, several studies have found that children with psychopathic traits exhibit deficits in recognizing others fearful expressions (See Table 1), with the exception of Woodworth and Waschbusch (2007) who found enhanced fear recognition in children with psychopathic traits. These findings are important, as processing the facial expressions of others is an integral component of socialization. As

Batty and Taylor (2003) pointed out, facial expressions represent a communication tool that allows us to quickly infer others' emotion states and allow for rapid social coordination. Hence, deficits in processing facial affect, and nonverbal behavior more broadly, may lead to serious impairments in social functioning (Nowicki & Duke, 2002), and are characteristic of serious psychopathological syndromes such as Asperger's (e.g., Ashwin, Baron-Cohen, Wheelwright, O`Riordan, & Bullmore, 2007). Several studies (e.g., Ekman & Friesen, 1971) over the past few decades have found that there are six universally recognized facial expressions, including sadness, happiness, fear, disgust, anger, and surprise. However, a recent study (Jack, Blais, Scheepers, Schyns, & Caldara, 2009) suggests that there may be cross-cultural differences in fear and disgust. Although most studies investigating facial emotion processing in children with psychopathic traits have investigated five of the six universal expressions (most did not include surprise), the only consistently observed deficit in recognition has been the identification of is fear, although some studies have noted additional recognition deficits.

For example, Blair, Colledge, Murray, and Mitchell (2001) investigated children's abilities to explicitly recognize emotion faces in 51 boys (20 high CU traits, 31 low CU traits), ages 9 - 17 years old. They presented the boys with faces that morphed from neutral to happy, sad, fearful, surprised, disgusted, and angry faces in stages. They found that children with high levels of CU traits exhibited selective impairments in recognizing sad and fearful faces, and no deficits with regard to the other emotion conditions. Moreover, children with high CU traits required more stages to correctly identify sad faces than children with low CU traits.

In an innovative study that attempted to understand processes that may mediate the well-replicated fear recognition deficit, Dadds, El Masry, Wimalaweera, and Guastella (2008) posited that children with psychopathic traits failed to recognize fear due to not attending to emotionally salient cues in their environments (i.e., other's eyes) rather than an innate emotion processing deficit. They tested their hypothesis in a sample of 100 boys (ages 8 – 15 years old). While wearing eye tracking goggles, participants were asked to rate emotional faces during free gaze, mouth gaze, and eye gaze conditions. For example, children were instructed to focus on the eyes of the photographed individuals during the eye gaze condition. Their results indicated that CU traits were negatively associated with identifying fearful faces in the free and mouth gaze conditions, consistent with previous research; however, CU traits were unrelated to identifying fearful faces in the eye gaze condition. From these data, the authors concluded that the fear recognition deficit characteristic of children with CU traits is one of attention. As a caveat to their findings, Dadds et al. noted, "the [eye gaze] instruction did not fully overcome the deficits seen in the high CU children. That is, even though as a group they showed increases in all of the eye-gaze indices, they maintained their relative position to the low CU traits children" (p. 461).

Taken together, these findings lend support to the fearlessness hypothesis of psychopathy. However, Dadds et al.'s (2008) findings call into question the nature of the fear processing deficit. Specifically, they suggest that children with CU traits are capable of correctly identifying facial expressions when instructed to focus on other people's eyes. From these data, Dadds et al. proposed that therapeutic interventions targeting attention to emotional cues may prove efficacious in remediating the fear processing deficits early in childhood. The Dadds et al. position implies that the fear processing deficits characteristic of psychopathy in children are learned interpersonal strategies or characteristic of inattention, which runs contrary to the fearlessness hypothesis. However, as others have pointed out (e.g., Batty & Taylor, 2003), processing of emotional facial expressions appears to occur quickly during pre-attentive, automatic processing in as little as 90ms. A more stringent evaluation of the fearlessness hypothesis, and possibly one that may address this controversy, should include pre-attentive measures of emotion processing to reduce the potential for inadvertently measuring faulty cognitive appraisals of emotion, inattentiveness, or indifference to the expressions of others.

A second major limitation to the current literature is the inclusion of predominately mixed child/adolescent and adolescent only samples. As described earlier, one potential confound introduced with adolescent samples, which is much less likely in pre-adolescent samples, is substance abuse/dependence. However, the inclusion of mixed child and adolescent samples is even more complicated when evaluating fear recognition deficits. Several studies have found that emotion recognition appears to improve throughout early childhood (e.g., Tremblay, Kirouac, & Dore, 2001). In a recent study, Thomas, De Bellis, Graham, and LaBar (2007) also found differences among children (ages 7 – 13 years), adolescents (ages 14 – 18 years), and adults (ages 25 – 57 years). Their study presented participants with a facial morphing task wherein participants chose a forced-choice emotion label during neutral-to-anger, neutral-to-fear, and fear-to-anger morph conditions. Their findings suggested that fear recognition abilities exhibited gradual developmental improvements from childhood to adolescence and then adulthood. Anger recognition, on the other hand, appeared to sharply improve from adolescence to adulthood. Taken together, their findings suggest that emotion recognition abilities improve with age, and that the trajectory of the age-related improvements differ across emotions. Studies investigating pre-attentive emotion processing (e.g., Batty & Taylor, 2006) have also found differences between children and adolescents. However, using functional imaging, Lobaugh, Gibson, & Taylor (2006) that 10-year-old children's brain activation to a pre-attentive emotion recognition task mirrored activation observed in adults, especially with regard to fear, suggesting potentially different underlying neural processes in pre-attentive versus explicit emotion recognition.

An additional limitation to the current literature investigating fear recognition deficits in children with CU traits is that all existing studies (Blair & Coles, 2000; Blair et al., 2001; Dadds et al., 2006; Dadds et al. 2008; Munoz, 2009; Woodworth & Waschbusch, 2007) have used primarily or in some cases entirely Caucasian samples. Of the studies that included ethnicities other than Caucasian in their sample (e.g., Blair & Coles, 2000), ethnicity was not included as a study variable. This is especially problematic given that a parallel literature investigating the relationship between childhood psychopathy and reactivity to distress cues (e.g., Kimonis, Frick, Munoz, & Aucoin, 2007; Kimonis, Frick, Fazekas, & Loney, 2006) has found that CU traits are related to impaired reactivity to others' distress in Caucasian but not African American children. Therefore, studies investigating whether ethnicity moderates the relationship between childhood psychopathic traits and fear recognition deficits are warranted.

Child Psychopathy and Aggression

In addition to emotion processing deficits, a second implication of the fearlessness hypothesis is that children with psychopathic traits are prone to engaging in violent and aggressive behaviors in part due to the relationship between psychopathic traits and fear recognition deficits. Blair (2003) explicated this potential implication of the fearlessness hypothesis in the Violence Inhibition Mechanism Model (VIMM). According to the VIMM, fearless children lack a fundamental inhibition mechanism responsible for curtailing violent and aggressive behavior. This neurological impairment prevents children with psychopathic traits from learning to interpret distress and submission cues in others as aversive. Consequently, aggressive and violent behaviors are not paired with aversive consequences in children with psychopathic traits. Individuals with high levels of psychopathic traits as well as fear processing deficits, therefore, can use aggression and violence as instruments to achieve a desired end with little or no remorse. Hence, the VIMM suggests that psychopathic traits and fear recognition deficits interact to predict aggressive and violent behavior.

As violent and aggressive behaviors in children are widespread in the United States and the consequences of these behaviors are financially and socially costly (Ziegler, Taussig, & Black, 1992), several researchers have investigated the correlates and risk factors associated with childhood aggression (e.g., Frick, Cornell, Barry, Bodin, & Dane, 2003). Studies of the relationship between childhood psychopathy and aggression have found that the CU factor of psychopathy is more closely tied to instrumental or proactive aggression, whereas the ICP factor is more closely tied to reactive aggression (Frick et al., 2003). Moreover, the hyporeactivity to distress cues characteristic of CU traits are related to proactive aggression (Kimonis, Frick, Fazekas, & Loney, 2006). One well-replicated finding is that CU traits are robust predictors of the intensity and frequency of aggression in children (Das, de Ruiter, Lodewijks, &

Doreleijers, 2007; Edens, Campbell, & Weir, 2007; Vitacco, Caldwell, Van Rybroek, & Gabel, 2007) and adjudicated adolescents (e.g. Brandt, Kennedy, Patrick, & Curtin, 1997; Toupin, Mercier, Dery, Cote, & Hodgins, 1995).

Munoz (2009) investigated the intersection of CU traits, violence, and emotion processing deficits in 55 boys (ages 8 - 16). Participants were asked to identify six different emotional expressions: happy, sad, fearful, angry, surprised, and disgusted. Partially consistent with previous research, Munoz found that CU traits were associated with fear and anger processing deficits. Additionally, she found that these deficits persisted even when controlling for violent behaviors, whereas violent behaviors were not associated with fear processing deficits when controlling for CU traits. However, no studies have tested whether CU traits interacted with aggressive behavior to predict fear processing deficits, as posited by the VIMM.

Childhood Psychopathy and Disruptive Behavior Disorders

As other childhood disruptive behavior disorders are also characterized by violent and aggressive behavior, it is essential to investigate the incremental contribution of psychopathy in predicting emotional and behavioral problems above and beyond these other disorders. Of particular relevance, studies are attempting to differentiate childhood psychopathy from early-onset conduct disorder (CD; e.g., Christian, Frick, Hill, Tyler, & Frazer, 1997). According to the Diagnostic and Statistical Manual of Mental Disorders, 4^{th} Edition (DSM-IV; American Psychiatric Association, 2000), CD is characterized by a persistent pattern of aggressive, deceptive, and rule-breaking behavior that begins in childhood or adolescence. The DSM-IV contains two subtypes of CD: childhood-onset and adolescent-onset. Childhood onset CD refers to children who exhibit at least one criterion before age 10, whereas adolescent onset refers to children who do not display any criteria until after age 10. Studies investigating the course of CD typically find that children with childhood-onset CD are more likely to persist with antisocial behaviors into adulthood (e.g., Frick & Loney, 1999). However, only a subset of individuals with childhood-onset CD continues on an antisocial trajectory into adulthood. Some authors have suggested that psychopathic traits may differentiate children with persistent antisocial trajectories from those who desist (Frick, Cornell, Bodin et al., 2003).

Although children with CD may exhibit CU and N traits, these traits are not necessary or sufficient for a CD diagnosis. The diagnostic criteria for CD largely reflect the ICP factor of the APSD. Whereas CD criteria and the ICP factor of the APSD are largely behaviorally based, the CU and N factors are largely affective and interpersonal, respectively. In terms of predictive utility, the interpersonal and affective components of psychopathy predict aggressive behavior above and beyond conduct problems alone (e.g., Edens, Campbell, & Weir, 2007). Moreover, empirically supported interventions (e.g. Hawes & Dadds, 2005) targeting parenting practices and child aggressive behavior are relatively ineffective in children exhibiting the interpersonal and affective traits of psychopathy, which might be a consequence of unique fear processing impairments.

Child Psychopathy and Parenting

According to Lykken (1957/1995), psychopathic individuals, who exhibit a fearless temperament, are prone to antisocial and aggressive behavior despite good parenting practices. As a caveat, Lykken did suggest that extraordinary parenting may serve as a buffer between a fearless temperament and aggression; however, those cases represented hypothetical outliers. In contrast, children with acquired sociopathy, who do not experience a fearless temperament, exhibit antisocial and aggressive behavior as a result of poor parenting. This distinction may help explain why parenting interventions for behavior problems are less effective in children with psychopathic traits than other children (e.g., Hawes & Dadds, 2005). The psychopathy / acquired sociopathy distinction has been supported in several studies (e.g., Oxford, Cavell, & Hughes, 2003; Wootton, Frick, Shelton, & Silverthorn, 1997).

For example, Wootton et al. (1997) investigated the relationship between CU traits and conduct problems in a sample of 166 6- to 13-year old children, 136 of which were clinic referred. They measured psychopathy using the PSD and parenting using the Alabama Parenting Questionnaire (APQ; Frick, 1991). Conduct problems were measured using the Computerized Diagnostic Interview Schedule for Children version 2.3 (DISC 2.3; Shaffer et al., 1996) in the clinic-referred sample and the Disruptive Behavior Disorders Rating Scale (Pelham, Gnagy, Greenslade, & Milich, 1992) in the community sample. Their results indicated that parenting only predicted conduct problems in children with low CU traits.

The role of negative and inconsistent parenting in the relationship between temperamental fearlessness and aggressive behavior is of particular relevance to the fearlessness hypothesis. Several studies over the past 40 years have found positive associations between inconsistent parenting and aggressive behavior in children (e.g., Deur & Park, 1970). A core tenet of the fearlessness hypothesis holds that children with a fearless temperament fail to learn from discipline, consistent or inconsistent, and are hence undersocialized (Lykken, 1957/1995).

Edens, Skopp, and Cahill (2008) sought to test this tenet in a sample of 76 adolescent offenders. They assessed psychopathic traits, harsh and inconsistent discipline, and antisocial behavior over the previous year. Results indicated that, as expected, inconsistent discipline predicted antisocial behavior when evaluating the entire sample. However, when considering psychopathy, inconsistent discipline did not predict antisocial behavior in participants scoring high on CU traits. Although these studies support the fearlessness hypothesis and VIMM by suggesting that the relationship between CU traits and aggressive behavior is undeterred by parenting practices, no study has examined whether fearlessness, as measured by laboratory tasks, provides incremental validity above and beyond parenting in predicting aggressive behavior.

The Present Study

This study seeks to test the applicability of the fearlessness hypothesis to pre-adolescent children with psychopathic traits. Specifically, it seeks to investigate whether psychopathic traits in children predict fear-processing deficits similar to those observed in prison samples. It also seeks to test whether these deficits occur at a specific level or across levels of fear processing, including pre-attentive and explicit recognition of fear in others and fear conditioning. By including a measure of pre-attentive processing, this study adds to the existing literature by addressing the controversy surrounding the nature of the fear processing deficit in children with psychopathic traits (i.e., is the deficit a function of pre-attentive processing deficits versus inattentiveness to emotionally salient cues).

In an innovative study, Yang, Zald, and Blake (2007) investigated pre-attentive processing of emotion faces in healthy individuals. They took advantage a phenomenon referred to as binocular rivalry (see Alais & Blake, 2005) using a technique termed continuous flash suppression (Tsuchiya & Koch, 2004). Binocular rivalry refers to a phenomenon whereby, when presenting different visual stimuli to each eye, human visual awareness oscillates between what each eye is viewing rather than superimposing what one eye sees over what the other eye sees. Continuous flash suppression refers to a technique wherein one eye is presented with a dynamic, continually changing visual stimulus (e.g., an array of Mondrian-scenes) and the other eye a static stimulus (e.g., a grayscale picture of a face). Invariably, the static stimulus is temporarily suppressed from visual awareness by the dynamic stimulus.

Yang et al. (2007) investigated the time (in milliseconds) it took happy, neutral, and fearful faces to break suppression in a sample of undergraduate students. They hypothesized that fearful faces would break suppression faster than neutral or happy faces as humans innately interpret others' fearful faces as indicative of threat. Consistent with their hypothesis, fearful faces broke suppression 252 ms faster than neutral faces and 610 ms faster than happy faces (both $p < .01$). The present study seeks to test whether pre-attentive fear processing deficits are characteristic of children with psychopathic traits, as posited by the fearlessness hypothesis, using a modified version of Yang et al.'s continuous flash suppression paradigm. Pre-attentive fear processing deficits would suggest a core characterological disposition, contrary to Dadds et al. (2008) suggestion that the deficit merely reflects inattention to others' eyes.

Moreover, this study seeks to investigate whether fear processing deficits moderate the relationship between psychopathic traits and aggressive behavior as suggested by the VIMM. Lastly, it seeks to test whether the relationship between emotion processing deficits and aggressive behavior occurs despite parenting behaviors as suggested by the fearlessness hypothesis. Lastly, it seeks to investigate whether the recognition deficits associated with psychopathy are specific to fear or to emotions more generally.

Hypotheses

The specific hypotheses are:

1. Psychopathic traits, specifically CU traits, will be associated with:
   a. pre-attentive fear recognition deficits.
   b. explicit fear recognition deficits
   c. fear conditioning deficits
2. Psychopathic traits, specifically CU traits, will moderate the relationship between aggressive behaviors and underlying fear processing deficits.
3. Poor parenting behaviors, specifically negative and ineffective parenting, will predict aggression as suggested by Lykken (1957/1995). However, the relationship between fear processing deficits and aggressive behavior will persist after controlling for poor parenting.

In addition, there were three exploratory analyses:

1. I investigated the relationship between psychopathic traits, aggressive behavior, and deficits in processing other emotions.
2. I conducted exploratory analyses investigating whether psychopathic traits were associated with physiological hyporeactivity to threatening tasks (i.e., the countdown task) or more broadly by investigating reactivity during a novel reward task.

3. I conducted exploratory analyses investigating whether ethnicity moderated the relationships between psychopathy and fear processing deficits.

Method

Participants

Participants included 88 boys, aged 7 to 11 years (M = 8.88, SD = 0.98), recruited from the community. The racial composition of the sample was 45.5% (n = 40) Caucasian, 44.3% (n = 39) African American, 6.8% (n = 6) Asian, and 3.4% (n = 3) Hispanic. Participants were recruited through flyers mailed to 15,000 families living in the Greater Atlanta metropolitan area. The recruitment flyers indicated that the study was looking to study families with 8 - 10 year old sons who were “handfuls” and got into trouble at home and school. Additionally, flyers were posted at university-affiliated medical clinics as well as Boys and Girls Clubs and YMCAs throughout the Greater Atlanta metropolitan area. If parents consented to the study, the study was explained to the boys and their assent was requested. Exclusionary criteria included child severe asthma, heart conditions, autism spectrum disorders, bipolar disorder, and mental retardation. This research was approved by the university’s institutional review board.

Of the 88 participants in the study, 54 completed all phases of the project, 1 participant’s data was lost from the modified - continuous flash suppression paradigm (described later) due to computer problems, 15 participants’ data were lost from the Diagnostic Analysis of Non-Verbal Accuracy paradigm (described later) due to technological error, 25 participants opted not to participate in the physiological portion of the study, and 10 participants’ psychophysiological data were corrupted due to experimenter error. Children who did not complete the physiological portion of the study did not score significantly differently than children who did complete the physiological portion of the study on any questionnaire or interview measures (all $p > .20$).

Measures

Aggression Scale (AS; Orpinas & Frankowski, 2001). The AS is an 11-item questionnaire that measures a child's overt aggressive behavior, including verbal (e.g., I threatened to hurt or hit someone) and physical (e.g., I pushed or shoved other students) aggression. Respondents are asked to indicate how many times that they have engaged in the behaviors over the previous week. The 2-year stability of the AS is moderate to high, with values ranging from 0.50 to 0.63. Studies have found positive associations between AS scores and school violence and weapon carrying (Escobar-Chavez, Tortolero, Kelder, & Kapadia, 2002). Internal consistency for the AS was adequate in this sample (Cronbach's $\alpha = 0.74$). As the AS total scores were skewed in this sample (SPSS skewness statistic = 1.58), these data were natural log transformed to reduce skew (transformed SPSS skewness statistic = -0.14).

Alabama Parenting Questionnaire – Parent Form (APQ; Shelton, Frick, & Wootten, 1996). The APQ is a widely used, 42-item self-report measure of parenting practices on a 5-point Likert-type scale. As designed by Shelton, Frick, and Wootten (1996), the APQ measures five parenting constructs: parent involvement, positive parenting, poor monitoring/supervision, inconsistent discipline, and corporal punishment. However, a large scale factor analysis (Hinshaw et al., 2000) suggested that the items from the measure can also be separated into three higher order factors: positive involvement (e.g., you have a friendly talk with your child), negative/ineffective discipline (e.g., you threaten to and then do not punish your child), and deficient monitoring (e.g., child out with friends unknown to you). The APQ has shown good 2 week test-retest reliability with individual scale values ranging from 0.84 to 0.90 (Dadds, Maujean, & Frasier, 2003). Internal consistencies for the positive involvement, negative/ineffective discipline, and deficient monitoring scales were adequate to good in this sample (Cronbach's α = 0.85, 0.77, & 0.73, respectively). All APQ scales scores exhibited skewness within acceptable limits in this sample (SPSS skewness statistic within +/- 1.0).

Antisocial Process Screening Device – Child and Parent Form (APSD; Frick & Hare, 2001). The APSD is a 20-item, 3-point Likert-type scale that assesses psychopathic traits in children. The item content of the APSD is based largely on the Psychopathy Checklist – Revised (PCL-R; Hare, 1991), a widely used and well validated measure of psychopathy in adult prison populations. Items from the APSD make up three subscales: impulsivity/conduct problems (ICP; e.g., acts without thinking); narcissism (NAR; e.g., brags excessively), and callous/unemotional (CU; e.g., does not show emotions). Several studies have found that the APSD possesses adequate internal consistency, test-retest reliability, and convergent validity with the PCL-R (e.g., Christian Frick, Hill, Tyler & Frazer, 1997; Fite, Greening, Stoppelbein, & Fabiano, 2009; Frick & Hare, 2001; Lee, Vincent, Hart, & Corrado, 2003).

In this study, both parent and child versions of the APSD were administered. As the measures correlated significantly (r = .31, p < .005), scores were combined as suggested by the APSD manual (Frick & Hare, 2001). The combined measure was comprised of the higher score for each item across informants (Frick & Hare, 2001; Piacentini, Cohen, & Cohen, 1992). Total scores exhibited good internal consistency in this sample (Cronbach's α = 0.80). Internal consistency of the individual factors were poor to adequate in this sample (CU: Cronbach's α = .46; ICP: Cronbach's α = .58; and NAR: Cronbach's α = .72). Therefore, analyses using the CU and ICP factor scores should be interpreted cautiously, as correlations between these and other measures are almost certainly attenuated (Schmitt, 1996). All APSD total and factor scores exhibited skewness within acceptable limits in this sample (SPSS skewness within +/- 1.0).

Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL is a widely used (in clinical and research settings) 118 item, 3-point Likert-type scale that assesses overall psychological functioning in children. Several studies have found that the CBCL possesses adequate reliability and moderate to high correlations with other commonly used measures of childhood behavioral disorders (e.g., Achenbach). For the purposes of this study, only the raw score of the mother-reported aggressive behavior scale was evaluated.

Computerized Diagnostic Interview Schedule for Children (C-DISC; NIMH, 1996). The C-DISC is a widely used structured clinical interview that assesses DSM-IV Axis I diagnostic criteria in children. Psychometric studies of the C-DISC suggest adequate reliability and construct validity (Schwab-Stone et al., 1996). The ADHD and CD modules were administered to the children in this study.

Laboratory Tasks - Non-physiological

Diagnostic Analysis of Nonverbal Accuracy Scale, 2nd Edition (DANVA-II; Nowicki & Duke, 1994) – The DANVA-II is a collection of emotionally valenced (sad, happy, angry, fearful) faces, postures, and voices. This study used only the facial expressions module. The intensity varies from low, or subtle emotional expression, to high, exaggerated emotional expression. Subjects viewed 24 adult facial expressions, presented individually on a 27” television screen, with an equal number of happy, sad, angry and fearful expressions of high and low intensities. Subjects viewed each face for 2 seconds and then chose (through forced choice options of happy, sad, fearful, and angry) which emotion they believed corresponded to the facial expression.

Wagner (1993) developed a statistical method, termed the unbiased hit rate (H_u), for calculating accuracy for forced-choice judgment measures. In terms of the DANVA-II, H_u represents the joint probability that a facial expression is correctly identified given that it is presented and a response is correctly used. One weakness identified by Wagner (1993) of only evaluating number correct or incorrect is the failure to take into account individuals’ patterns of responding. As a simplified example, if one individual chose the forced-choice ‘fear’ for all 24 DANVA-II stimuli, it would appear that he or she had superior accuracy at identifying fearful faces and poor accuracy at identifying all other facial expressions if one was only using number correct or incorrect for each expression. However, it becomes clear through the pattern of responding that this individual is not accurately identifying any facial expressions. H_u for the DANVA-II was calculated using the formula: $H_u = a^2 / ((a+b+c+d) \times (a+e+i+m))$. See table 2 for an explanation of symbols. Recent studies have begun using H_u when investigating emotion deficits in psychopathy using forced-choice judgment tasks similar to the DANVA-II (e.g., Munoz, 2009). The H_u statistic exhibited skewness within acceptable limits for all DANVA-II emotional expression scores (SPSS skew statistic within +/- 1.0).

Modified Continuous Flash Suppression (mCFS) – The *mCFS* is a pre-attentive processing paradigm modified from Yang, Zald, and Blake’s (2007) for use in children. It measures participants' pre-attentive processing of neutral, happy, fearful, and disgusted facial expressions taken from the standard set of Ekman expressions (Ekman & Friesen, 1976). The Ekman images were cropped to remove all features outside of the face. The current paradigm was modified from the original paradigm by using NuVision 60GX (McNaughton Inc., Beaverton, OR) stereoscopic goggles rather than mirror stereoscopes. Stereoscopic goggles do not require participants to maintain a particular focus for a prolonged period of time, as mirror stereoscopes do (personal communications with Eunice Yang and David Zald); therefore, I determined that goggles would be preferential in children. Throughout this paradigm, the monitor's (described later) refresh rate was set at 150 Hz to ensure that the presentation would appear seamless to participants (McVeigh, Grinberg, & Siegel, 1995). The current paradigm also included a fixation cross in the middle of the stimulus area, which was designed to help participants focus on the appropriate area of the screen prior to beginning each trial.

Stimuli were presented in the center of the video monitor (800 X 600 resolution) and were viewed against a uniform grey background. In the initial 1000 ms, one eye was presented with a full contrast dynamic mondrian image and the other eye viewed a face image, with increasing contrast at 2% every 20 ms. Once the face image reached full contrast (at 1s), the contrast of the mondrian image decreased at 2% every 100 ms for 5100 ms. The face image was presented in one of four quadrants in the stimulus square, and participants were asked to push a button (using a 4-button pad) corresponding to the quadrant that the face was presented in as soon as they recognized any part of a face in that quadrant. Prior to beginning the experiment, the buttons and tasks were explained to participants, and participants were quizzed regarding which buttons corresponded to which quadrants. After participants exhibited an understanding of the task (by answering questions correctly), the task was initiated. Trials were terminated when the participant pushed a button, and reaction time (RT) in ms and accuracy (correct quadrant versus incorrect quadrant) were recorded. The task consisted of 100 trials, with 25 repeated presentations of each stimulus type (neutral, disgust, fearful, and happy expressions). The overall accuracy was high in this sample (*M* = 93.99% correct, *SD* = 12.5%). Reaction times for all emotional expressions exhibited skewness within acceptable limits (SPSS skewness statistic within +/- 1.0).

Laboratory Tasks - Physiological

Countdown to aversive stimulus – The count-down to aversive stimulus task produces well-replicated results in the psychopathy literature (see Lorber, 2004 for a review). Prior to administering the paradigm, participants were informed that they will watch a screen countdown from 12, one count per second, and upon reaching the twelfth second they heard a loud noise (a 105-db white noise blast that is 1s in duration with minimal rise time). The task was performed for five trials, lasting 13 seconds/trial. Between each trial, subjects rested for a 2.5-minute baseline. Throughout this paradigm, participants' HR, EDA, and PEP were continuously monitored. Mean levels of EDA and HR, and ensemble-averaged PEP (described later) were calculated for the time period prior to the 12-second countdown (baseline) and during the 12-second countdown (task). The data used for the analyses were difference scores (task EDA, HR, or PEP - baseline EDA, HR, or PEP, respectively). All measures acquired during this paradigm exhibited skewness within acceptable limits (SPSS skewness statistic within +/- 1).

Lottery Task – The lottery task consisted of 5 twelve second countdown trials followed by 2.5 minute baselines. Participants drew a number from a hat before the task and were told that they would win a prize if their number was displayed at the end of one of the 5 countdowns. Each participant was given the same number (i.e., the hat will contain several copies of a single number). Each subject "won" the task at the end of the final countdown (i.e., the number from the hat appeared at the end of the 5^{th} countdown). Throughout this paradigm, participants' HR, EDA, and PEP were continuously monitored. These data were reduced and scored consistent with the countdown task. The PEP, HR, and EDA data acquired during this paradigm exhibited skewness within acceptable limits (SPSS skewness statistic within +/- 1).

Psychophysiological Measures

Electrodermal activity level – Electrodermal activity level (EDA) was measured using the Biopac GSR 100C (Biopac: Santa Barbara, CA) amplifier. Prior to affixing the electrodes, subjects were asked to wash their hands using soap and warm water to remove excess oils and dirt. Ag/AgCl electrodes were filled with .05 molar NaCl electrode paste and affixed to the medial phalanges of the 1st and 2nd fingers of the subject's non-dominant hand with velcro straps. The Biopac GSR 100C outputs a constant 0.5V current between the two electrodes. Electrodermal activity level (EDA) was measured as task EDA – baseline EDA, in μS/mm, during the countdown paradigm.

Pre-Ejection Period – PEP was measured using the Biopac Niko 100C (Biopac: Santa Barbara, CA) amplifier and the Biopac ECG 100C (Biopac: Santa Barbara, CA) amplifier. The experimenter cleaned the contact area using rubbing alcohol and a cotton swab prior to affixing the electrodes. Electrodes were configured according to previous research (Sherwood et al., 1990). The QRS and dZ/dt B waveforms were ensemble-averaged within the 12-second baseline and countdown periods using Impedance Cardiography Analysis Software (Mindware: Gahana, OH).

Psychophysiological Data Reduction - For the countdown to aversive stimuli task, EDA, HR, and PEP were measured during twenty twelve-second epochs: ten baseline epochs and ten experimental (5 aversive noise and 5 lottery) epochs. The mean of the baseline and countdown epochs were calculated for EDA, HR, and PEP.

Procedure

Upon entering the laboratory, study staff answered any questions that the mother had about the study and then obtained the mother's consent. Upon receiving her consent, study staff described the study to the child, answered any questions that the child had, and requested his assent. Upon obtaining consent and assent, the mother and child were taken to separate rooms, where they completed a battery of semi-structured interview and questionnaire measures. Prior to separating the dyad, both mother and child were handed walkie-talkies, and told that they could speak at any time during the experiment. Additionally, the mother was able to see but not hear the child in the experimental room throughout the study. Prior to engaging in each task, child participants' were reminded of the nature of the pending task, any questions that the child had about the task were answered, and his task-specific assent was requested.

After completing the interview and questionnaire measures, the child participated in the DANVA-II and mCFS tasks in random order. Given the duration and intensity of the countdown and lottery tasks coupled with the use of electrodes, the physiological tasks were performed last. Following the DANVA-II and mCFS, the child was asked to go to the restroom and clean his hands with soap and warm water (Dawson, Schell, & Filion, 2007). Following cleaning his hands, the child sat in a leather chair, approximately 72” from the stimulus screen, a 27” Magnavox monitor. The experimenter then described the electrode configuration to the child, asked the child if he had any questions, and affixed the electrodes. Prior to beginning data acquisition, the experimenter darkened the room. After ensuring that the child was comfortable, the experimenter initiated the physiological data acquisition process and left the room.

To ensure that the experiment ended on a positive note for the child, the countdown tasks preceded the lottery task. Moreover, the child receiving the reward for “winning” the lottery task prior to engaging in the countdown task probably would have introduced an unnecessary distracter into the study. Indeed, nearly all subjects expressed their excitement over “winning” the lottery task. Prior to the countdown task, subjects sat in the darkened room for a 5-minute baseline. A 5-minute baseline or rest period is recommended in physiological studies, as it allows participants to become more comfortable with their environment and having electrodes affixed to their skin, and it allows the electrodes sufficient time to set (Dawson, Schell, & Filion, 2007). In doing so, the potential for superfluous reactivity to the electrode paste setting was minimized.

Following the five minute baseline, the child participated in the countdown task. After the fifth countdown, the experimenter entered the room, reintroduced the child to the lottery task, and requested that the child choose a piece of paper with a number on it from a hat. The experimenter then left the room and the child sat for a 2.5 minute baseline prior to engaging in the lottery task. Following the lottery task, the child was given his prize for “winning” the task, the child and his mother were debriefed about the purpose of the experiment, the experimenter answered any questions that the participants had about the study, and participants were given referral information regarding local, low-cost psychological services. Parents were given a $30 gift card, and children a $10 gift card, as compensation for their time and effort.

Data Analysis

Preliminary analyses investigated the significance of age and ethnicity on performance on all questionnaire, interview, and lab task measures. Descriptive statistics for questionnaire and interview measures and laboratory and physiological measures are presented in Tables 3 and 4, respectively. Zero-order correlations among questionnaire and interview measures are presented in Table 5. The correlations between DANVA-II and mCFS fear ($r = -.03$) and happy ($r = .07$) recognition scores were nonsignificant. Mean CBCL aggression scale t-scores for the sample were 64.60 ($SD = 10.81$). Twenty (23.3%) of the sample reported being suspended from school, 5 (5.8%) reported stealing, 1 (1.2%) reported truanting, and 1 (1.2%) reported being in trouble with the police in the previous year.

One-way ANOVA revealed no significant differences in scores on interview or questionnaire measures, or laboratory tasks (all $p > 0.25$) when examined by ethnicity with the exception of DANVA-II fearful faces ($F\,(3,69) = 2.733$, $p = .05$): African American children were significantly less likely to accurately identify fearful faces. One-way ANOVA revealed no significant differences in scores on interview or questionnaire measures, or laboratory tasks (all $p > 0.25$) when examined by age with the exceptions of APSD total scores ($F(4,80) = 3.21$, $p < .05$), CDISC CD symptoms ($F(4,80) = 2.50$, $p <$

.05), and APQ positive involvement ($F(4,74) = 3.34$, $p < .05$). Age was controlled for in all analyses.

Prior to reporting regression analyses, several diagnostics were run to ensure that regression assumptions were not violated. As noted previously, all variables used in the analyses exhibited skewness within acceptable limits (all SPSS skewness statistics within +/- 1). For all regression analyses reported, I performed regression diagnostics including tolerance, Durbin-Watson coefficient, Cook's D, and studentized residuals plots to test for multicollinearity, independence, leverage, and heteroscedasticity, respectively. All reported regression analyses exhibited acceptable scores on these diagnostic tests.

Task Performance

Yang, Zald, and Blake (2007) found that healthy individuals responded to fearful faces faster than neutral faces and happy faces slower than neutral faces during the mCFS paradigm. To test for similar patterns of responding in this sample, I conducted one-sample t-tests comparing differences scores in these emotions. Similar to Yang et al. (2007), results from these analyses indicated that, when compared with neutral faces, participants observed fearful faces faster (*M* difference = -786 ms; $t(86) = -13.59$, $p < .001$) and happy faces slower (*M* difference = 197 ms; t(86) = 3.90, $p < .001$). However, there were no significant differences between neutral and disgust faces (*M* difference = -57 ms; $t(86) = -1.10$, $p = 0.27$).

The function of the countdown and lottery tasks is to elicit physiological, specifically sympathetic nervous system, arousal. To test whether this arousal occurred in the sample as a whole, I conducted one sample t-tests comparing task minus baseline differences scores for EDA, HR, and PEP. Results indicated significant increases in EDA during the countdown ($t(44) = 2.25$, $p < .05$) and decreases in EDA during the lottery task ($t(46) = -2.04$, $p < .05$). Half of the sample exhibited no responses, operationalized as fluctuations >= 0.05 uMho (Dawson, Schell, & Filion, 2007), to the countdown tasks, and the rate of nonresponse was similar across ethnicities ($\chi^2(2) = .29$, $p = .86$). Moreover, nonresponse status was nonsignificantly associated with APSD total and factor scores, CDISC CD symptoms, CBCL aggression scores, and AS total scores. The results also found no significant differences in HR and PEP during both tasks (all $p > 0.10$). These findings suggest that changes in cardiac functioning should be interpreted with caution given that the task did not result in the expected response to the paradigm.

Results

Hypothesis 1a-c

Hypothesis 1a predicted that APSD scores, specifically CU factor scores, would predict mCFS fear RT difference scores. To test hypothesis 1a, I performed hierarchical regression analyses examining the incremental contribution of APSD total and factor scores over age in predicting fear-task performance. To do this, age was entered in step 1 of the regression, APSD scores were entered in step 2, and mCFS fear RT difference scores were entered as the dependent variable. Supporting Hypothesis 1a (see Table 6), results indicated that CU factor scores significantly and positively predicted mCFS fear RT difference scores. The other APSD factors did not.

Hypothesis 1b predicted that APSD scores, specifically CU factor scores, would predict DANVA-II fear faces unbiased hit rates. Hypothesis 1b was tested similar to 1a with the exception of DANVA-II fear faces unbiased hit rates entered as the dependent variable. Partially supporting hypothesis 1b (see Table 7), there was a trend for APSD total scores and ICP factor scores predicting DANVA-II fear faces unbiased hit rates; however, the analyses using CU factor scores were nonsignificant.

Hypothesis 1c investigated whether physiological reactivity during the countdown task was predicted by APSD total and factor scores. Analyses testing physiological reactivity during the countdown task were found (see Table 8), partially supporting Hypothesis 1c, that CU factor scores predicted increased PEP reactivity during the countdown but was unrelated to EDA reactivity. Similarly, there was a trend for APSD total scores in predicting PEP hyperreactivity.

Across Hypotheses 1a – c, in separate analyses, the patterns of significance remained after controlling for C-DISC CD and ADHD scores.

Hypothesis 2

Hypothesis 2 predicted that APSD scores, specifically CU factor scores, would moderate the relationship between CBCL aggression scores and mCFS and DANVA-II fearful faces scores as well as EDA and PEP during the countdown task. I used moderated multiple regression analyses (MMRA) to test hypothesis 2. In these analyses: age-centered APSD scores, and centered CBCL aggression scores were entered in step 1; a centered APSD score X centered CBCL aggression score interaction term was entered in step 2; and scores from fear processing tasks were entered as the dependent variable.

Results from these analyses (see Table 9) indicated that APSD total scores did not moderate the relationship between CBCL aggression scores and fear recognition deficits. There was a trend for CU factor scores moderating the relationship between CBCL aggression scores and DANVA-II unbiased hit rates (see Figure 1) but not mCFS fear reaction times, whereas ICP factor scores moderated the relationship between CBCL aggression scores and mCFS fear reaction times (see Figure 2) but not DANVA-II unbiased hit rates. Neither the APSD total or its factor scores moderated the relationship between CBCL aggression scores and physiological reactivity during the countdown task (see Table 10).

Hypothesis 3

Hypothesis 3 predicted that APQ parenting scores, particularly negative/ineffective parenting, would predict CBCL and AS scores. Partially supporting Hypothesis 3, APQ negative/ineffective parenting and deficient monitoring but not positive involvement predicted CBCL aggression scores but not AS scores (see Table 11). Hypothesis 3 also predicted that aggression scores, as measured by the CBCL and AS, would provide incremental validity in predicting fear processing deficits above and beyond APQ parenting scores. AS total scores, but not CBCL aggression scores, predicted mCFS fear reaction times (see Table 6). I conducted hierarchical multiple regression analyses by entering age and APQ parenting scores in step 1; AS total scores in step 2; and mCFS fear as the dependent variable.

Consistent with hypothesis 3, AS total scores provided incremental validity above APQ negative/ineffective parenting scores in predicting mCFS fear reaction times (ΔF = 4.05, ΔR^2 = .05, β = .23, p < .05). Similarly, AS total scores provided incremental validity above APQ deficient monitoring scores in predicting mCFS fear (ΔF = 3.90, ΔR^2 = .05, β = .22, p = .05), as well as a trend for APQ positive involvement scores (ΔF = 3.16, ΔR^2 = .04, β = .20, p = .08). Taken together, these findings suggest that the relationship between deficient fear processing and aggressive behavior remains significant after taking parenting practices into consideration.

Exploratory Analyses

In the first set of exploratory analyses, mCFS and DANVA-II faces other than fear were regressed on APSD total and factor scores controlling for age. Results from these analyses suggested that APSD total and factor scores did not predict reactivity to mCFS and DANVA faces other than fear faces (see Tables 6 and 7) with the exception of CU factor scores and a trend for APSD total scores positively predicting mCFS disgust faces RT difference scores.

In the second set of analyses, I tested whether APSD total and factor scores predicted physiological reactivity during the lottery task. Results (see Table 12) indicated that APSD total and factor scores, after controlling for age, did not predict physiological reactivity during the lottery task, with the exception of ICP scores and a trend for total scores predicting PEP hyporeactivity. Although APSD total and factor scores did not predict EDA reactivity during the lottery task, CDISC CD symptoms scores predicted EDA hyporeactivity during the lottery task. Additionally, AS total scores predicted PEP hyporeactivity during the lottery task. As this test may have represented a frustration task, subsidiary analyses investigating only the 1st countdown were conducted. Results from these analyses found the same pattern of responding.

The final set of exploratory analyses tested whether ethnicity, specifically whether membership in Caucasian or African American ethnic backgrounds, moderated the relationship between fear recognition deficits and psychopathy and aggression as ethnic differences have been reported elsewhere (see Sullivan & Kosson, 2006 for a review). I conducted moderated multiple regression analyses with age, centered ethnicity, and centered APSD total and factor, AS total, CDISC CD symptom, and CBCL aggression scores (in separate analyses) entered in step 1, a centered ethnicity X centered APSD, AS, or CBCL interaction term in step 2, and DANVA-II, mCFS fear scores, and physiological indices from the countdown task (in separate analyses) entered as the dependent variable.

Results (see Tables 13 and 14) indicated a trend for ICP factor scores X ethnicity interaction term predicting DANVA-II fear faces unbiased hit rates. Ethnicity moderated this relationship such that ICP factor scores reduced task performance in Caucasian children but not African American children (see Figure 3). Ethnicity also moderated the relationship between CU factor scores and PEP reactivity during the countdown tasks such that African American children's, but not Caucasian, exhibited PEP hyperreactivity during the countdown (see Figure 4).

Discussion

This study sought to clarify the nature of the fear processing deficits characteristic of psychopathic traits, particularly CU traits, in children. Specifically, this study sought to investigate whether the well-replicated fear processing deficits observed in children with psychopathic traits were a result of inattention to others' eyes, as posited by Dadds et al. (2008), or occurred as part of pre-attentive processing. According to the fearlessness hypothesis (Lykken 1957/1995) and VIMM (Blair, 2001), one would predict that fear processing deficits were innate and occurring at the pre-attentive level of processing. A secondary goal of this study was to investigate whether psychopathic traits, primarily CU traits, moderated the relationship between aggressive behavior and fear processing deficits. This study also investigated whether fear processing deficits predicted aggression above and beyond poor parenting. Lastly, this study tested whether ethnicity, specifically Caucasian and African American status, moderated the relationship between psychopathic traits and fear processing deficits.

The results from this study indicate five important findings. First, this study was the first to find that pre-adolescent children with psychopathic traits, specifically CU traits, exhibit pre-attentive fear recognition deficits. These deficits were also related to ICP traits but only in highly aggressive children. Second, this study found that, contrary to previous studies, CU traits were related to explicit fear recognition deficits only in highly aggressive children. Conversely, explicit fear recognition deficits were characteristic of total psychopathy and ICP traits irrespective of aggression. Third, pre-attentive fear recognition deficits provided incremental validity in predicting self-reported aggression above and beyond parenting behaviors. Fourth, CU traits only partially predicted physiological reactivity during fear conditioning, whereby they were predictive of PEP hyperreactivity but not EDA reactivity while anticipating aversive stimuli. Lastly, the relationship between psychopathic traits and fear conditioning and recognition deficits differed across African American and Caucasian children.

The results from this study suggest that CU traits predicted deficits in the pre-attentive recognition of fearful faces, but not happy faces. This finding is consistent with the relatively large literature investigating explicit fear recognition deficits in children with CU traits (See Table 1). I also found, however, that CU traits predicted deficits in the pre-attentive recognition of disgust, which has rarely been found in the studies that have examined this emotion (see Table 1), but not happy faces. Taken together, these findings suggest that children with CU traits experience deficits in preattentively recognizing danger cues from others and are consistent with findings suggesting limbic system dysfunction in psychopathic individuals (e.g., Kiehl et al., 2001). These findings also call into question Dadds et al.'s (2008) suggestion that inattention to others' eyes explained fear recognition deficits in children with psychopathic features. Preattentive processing deficits suggest that more automatic and less consciously driven features of fear processing are characteristic of children with psychopathic traits.

These findings also have potential implications for the neural correlates of childhood CU traits. Several neuropsychological and imaging studies over the past decade have implicated different brain areas involved in the explicit processing of fear and disgust faces (e.g., Phillips et al., 1998). For example, Phillips et al. found that the amygdala was primarily involved in the processing of fear faces, whereas the anterior insula and striatum were primarily involved in the processing of disgust faces. In a recent neuroimaging study comparing reactivity to explicit and pre-attentive presentations of fear and disgust faces, Phillips et al. (2004) found results consistent with their earlier results regarding explicit emotion face presentations. In other words, they found amygdala activation in response to fear faces and insula activation in response to disgust faces. However, they found neither amygdala nor insula activation in response to fear and disgust faces, respectively, in the pre-attentive condition. Future studies investigating the relations between pre-attentive emotion recognition deficits and psychopathy should include a broader range of positive and negative emotions. Moreover, studies investigating the neural correlates of pre-attentive fear and disgust recognition deficits may help shed light on the etiology of these deficits.

Secondly, contrary to previous research (see Table 1), I found that explicit fear recognition deficits were not associated with CU traits in the overall sample. However, they were associated with CU traits in highly aggressive children. These findings are entirely inconsistent with Munoz's (2009) findings that CU traits and aggressive behavior were independently associated with explicit fear recognition deficits, and that CU traits provided incremental validity above and beyond aggressive behavior in predicting explicit fear processing deficits. There are two particularly relevant explanations for these unexpected finding that require further study. First, it is plausible that the relationship between explicit fear recognition and CU traits changes with age. In the existing literature, the only positive relationship between CU traits and explicit fear recognition deficits was in the youngest sample of all studies (M_{age} = 9.8; Woodworth & Waschbusch, 2007). Hence, children with CU traits may fail to improve their ability to explicitly recognize fear in adolescents, as healthy individuals do (Thomas et al., 2007). Second, my sample only included children whose parents described them as disruptive (i.e., frequently getting in trouble at home and school). It is plausible that explicit fear recognition deficits are characteristic of disruptive children more broadly in this age group (*M* correctly identified fear faces was 3.93 out of 6 possible in this sample).

Moreover, this study found a trend for overall psychopathic traits, and ICP traits specifically, predicting explicit fear recognition deficits among Caucasian but not African American children. These findings are consistent with a parallel literature (e.g., Kimonis, Frick, Fazekas, & Loney, 2006; Kimonis, Frick, Munoz, & Aucoin, 2007), which suggests that psychopathic traits in Caucasian children, but not African American children, are related to blunted reactivity to others' distress. Furthermore, these findings are consistent with findings from a recent study suggesting that amygdala responses to fear faces are greater when viewing faces of one's own ethnic group compared to when viewing faces from a different ethnic group (Chiao et al., 2008). Future studies investigating the role of ethnicity in the fear processing deficits associated with psychopathy are warranted.

Thirdly, the relationship between fear processing deficits and aggressive behavior remained even after considering parenting practices in this sample. This finding provides support for Lykken's (1957/1995) fearlessness hypothesis, and is consistent with a growing literature that suggests that poor parenting does not influence the relationship between CU traits and aggressive behavior (e.g., Edens, Skopp, & Cahill, 2008). Moreover, it supports research in the treatment literature that suggests that improvements in parenting practices do not improve behaviors in children with CU traits (e.g., Dadds, Maujean, & Frasier, 2003). Future research may consider investigating whether there are particular developmental periods where parenting mediates this relationship.

Fourth, partially supporting previous research and conceptualizations of psychopathy, I found that BAS hyperreactivity in African American children only, but not BIS, was characteristic of CU traits when anticipating an aversive stimulus. These findings are puzzling given the well-replicated finding that children and adults with psychopathic features exhibit EDA, as a broad indicator of BIS functioning, hyporeactivity while anticipating an aversive stimulus (e.g., Hare, 1965; Lykken, 1957; Fung et al., 2005). However, given my sampling strategy, it may also be that there was a restriction of range in this sample, as past research has found EDA hyporeactivity in children with conduct problems compared with controls in this age group (Schmidt, Solant, & Bridger, 1985). Future studies should investigate the relationship between physiological reactivity to fear conditioning in children across ethnicities and age groups.

Lastly, as evinced by the findings discussed above, psychopathic traits differentially predicted fear processing deficits across Caucasian and African American children. These findings add to a mixed literature suggesting that, in some instances, psychopathy and its factors represent somewhat different phenomena across Caucasian and African American individuals (e.g., See Sullivan & Kosson, 2006, for a review). As many have pointed out (e.g., Cleckley, 1988; Lykken, 1995), psychopathy appears to be a syndrome characterized by equifinality. As Lykken suggests, the core deficit associated with “primary” psychopathy is temperamental fearlessness. However, the mediators and moderators of this fearlessness in early childhood remain unclear at this time. As some have suggested, it is plausible that psychopathic traits in African American children represent an adaptive dissociation from hostile environments, potentially plagued with violence and racism (personal communications with Scott O. Lilienfeld, Ph.D.).

With regards to exploratory analyses investigating physiological reactivity during the reward task, CU traits were not associated with physiological reactivity during the reward task, whereas impulsive/antisociality traits were associated with PEP hyporeactivity. Moreover, aggressive behavior was associated with EDA hyporeactivity during the reward task. These findings are not surprising given that impulsive behaviors, such as aggression and antisocial behaviors, are associated with underaroused baseline reward systems in children (e.g., Sagvolden, Johansen, Aase, & Russell, 2005). Therefore, the nature of the task may not have provided ample reward in children scoring higher on aggression and ICP traits. Alternatively, the task may have inadvertently served as a frustration task as the children did not win the reward until the final countdown. It is plausible that an active reward task may produce different results, as suggested by previous research (e.g., O'Brien & Frick, 1996).

Limitations

Strengths of this study included the use of questionnaire and interview measures to assess psychopathology in the children, data from multiple informants to assess aggression and psychopathy, the inclusion of multiple levels of fear processing (pre-attentive recognition, explicit recognition, and reactivity to threat), an ethnically diverse sample, the inclusion of only pre-adolescent children, and the inclusion of parenting measures. That said, this study also had several important limitations. First, the use of the self-report version of the APSD yielded unreliable factor scores, as reported elsewhere (e.g., Dadds et al., 2008), thus excluding my ability to include self-reported psychopathy factor scores in the analyses. Although it only measures CU traits, the Inventory of Callous Unemotional traits (ICU; Essau, Sasagawa, & Frick, 2006) may provide a psychometrically sound alternative to measuring self-reported CU traits than the APSD. However, at present, studies investigating the reliability and validity of the self-report version of the ICU are limited to adolescent samples (e.g., Kimonis, et al., 2008). The psychometric properties of the Youth Psychopathy Inventory – Child Version (YPI-CV; van Baardewijk et al., 2008) have been promising in Dutch samples; however, there are no published psychometric studies in U.S. samples.

A second major limitation of the current study was the number of analyses run and the potential for type 1 error. Using a sidak-bonferroni correction for the primary a-priori hypotheses, for which there are 6 analyses, the adjusted α level equals .009. The two primary findings that remain significant under these conditions are that CU traits predict fear processing deficits during the mCFS task (p = .004) and that CU traits predict PEP hyperreactivity during the countdown task (p = .009). However, the exploratory nature of this study and the relatively small sample size suggest that this approach may be prohibitively conservative and that a replication of this study may provide a more appropriate evaluation of these findings.

A third major limitation of the current study was the limited number of participants who completed the physiological portion of the study without withdrawal or experimental error. Given the very small n for the physiological analyses, these findings should be interpreted with caution given the potential for Type II error. The large variability inherent in most biological measures and the potential for a moderate effect size at best suggest that a sample at least twice as large as the physiological "completers" in this study is required for a reasonable analysis of these data. For making comparisons across ethnicity, a sample at least four times as large is required for a reasonable analysis of these data. That said and despite the inadequate sample size, my findings with regards to physiological responding (e.g., impulsive/antisociality scores associated with PEP hyperreactivity during the countdown task, ethnic differences) suggest that a similar investigation using a larger sample size is warranted.

A third limitation was the use of primarily Caucasian faces (5/6 and 1 Asian) in the explicit fear processing task and only Caucasian faces in the pre-attentive processing task. Given that this study included a diverse ethnic sample and I conducted analyses investigating differences across ethnicities, a more appropriate measure of pre-attentive and explicit emotion recognition would include equal numbers of stimuli using faces from various ethnicities. In comparing Caucasian and African American children's emotion recognition abilities in relation to psychopathy, a measure with either equal African American and Caucasian faces or only faces from an entirely different ethnic background would be most appropriate. In that regard, participants would have to rate either an equal proportion of ingroup/outgroup faces or all outgroup faces, as research has found that individuals rate ingroup emotion faces with more confidence than outgroup faces (e.g., Beaupre & Hess, 2006).

Fourth, this study did not include measures of IQ or SES. Although mental retardation was an exclusionary criterion, I did not assess for more subtle IQ differences across participants. As both IQ and SES have been found to predict aggressive behavior in previous studies (e.g., Lefkowitz, Eron, Walder, & Huesmann, 1977), including them may provide additional insight into the relationships between a fearless temperament, psychopathy, and aggression. However, the majority of studies have found that these variables do not predict fear recognition deficits (e.g., Blair et al., 2001).

Implications for Future Research

This study provided overall support for the fearlessness hypothesis and VIMM of psychopathy. However, my findings also suggest that the relationships among the constructs of aggressive behavior, psychopathy, and fearlessness are complex and nuanced. Moreover, they suggest that ethnicity must be considered when exploring these relationships. This is an extremely important line of investigation as the forensic psychology journals and the legal system are using the construct as a means of evaluating criminal offenders. As research in psychopathy progresses, especially with regards to "successful" psychopaths (Widom, 1977), it is plausible that the assessment of psychopathy may become more widespread (e.g., schools and commerce).

At present and although researchers are making efforts to extend the concept of psychopathy to children, there is a dire need for development of a childhood (pre-adolescent) self-report measure of psychopathy. As noted in this study and others, the APSD and CU factor in particular does not exhibit adequate levels of reliability in children. Although revised measures of CU traits exist, such as the Inventory of Callous and Unemotional traits (ICU; Frick, 2004), the psychometric properties of these measures have only been evaluated in adolescent samples. Future studies should focus on the development of new measures or validity of existing measures in child populations (e.g., YPI-CV in U.S. samples).

Although the fearlessness hypothesis and VIMM posit that psychopathic individuals are born with a temperamental predisposition towards fearlessness, they do not imply that the psychopathy trajectory cannot somehow be disrupted. As Batty and Taylor (2006) point out, emotion face decoding and recognition is a developmental process that does not solidify until approximately 14 to 15 years old. According to Batty and Taylor, the ability to process emotion in others' faces changes throughout childhood. These findings suggest three major implications for continuing the current line of research. First, they suggest that it might be inappropriate to use a wide range of ages in a single study as there are significant changes in emotion processing that occur between pre-adolescence and adolescence. Second, they suggest that studies investigating pre-school and early elementary school-aged children are warranted. Lastly, they suggest that studies investigating the longitudinal relationship between fear processing and psychopathy across childhood are warranted.

Finally, the findings from this study suggest that future research should include diverse samples and use ethnicity as an independent variable, and not simply a covariate. With regards to fear processing deficits in children with psychopathy, much of the research to date has been in primarily Caucasian samples. To the author's knowledge, this was the first of these studies to take ethnicity, specifically membership in African American ethnicity, into account during the analyses. Future studies should include ethnic differences with particular emphasis on ethnic minority groups, such as Asian and Latino children, as they are vastly underrepresented in this literature and there is a growing literature suggesting fear recognition deficits across ethnicities (e.g., Chiao et al., 2008).

Summary Statement

This study tested the fearlessness hypothesis of psychopathy by investigating the relationship between fear processing, aggression, and psychopathy in pre-adolescent children. Results indicated that psychopathy scores predicted explicit recognition and implicit processing deficits of fearful but not other faces with the exception of disgust faces. Psychopathy factor scores interacted with aggression in predicting implicit processing and explicit recognition deficits. Ethnicity, membership in Caucasian versus African American ethnic groups, predicted the importance of ICP traits in these findings, whereby these traits predicted emotion processing deficits in Caucasian but not African American children. Taken together, the results from this study suggest that a nuanced approach to investigating the fearlessness hypothesis in children with psychopathic features is warranted, including investigating the relationship in different childhood age groups, different ethnic groups, and by psychopathy factor.

References

Achenbach T. M. (1991). *Manual for the child behavior checklist/4-18, YSR, and TRF profiles*. University of Vermont Department of Psychiatry, Burlington, VT.

American Psychiatric Association. (2000). *The Diagnostic and Statistical Manual for Mental Disorders, 4th Edition.* Washington, D.C.: American Psychiatric Publishing, Inc.

Alais, D. & Blake, R. (2005). *Binocular Rivalry*. Boston: MIT Press.

Ashwin, C., Baron-Cohen, S., Wheelwright S.,O`Riordan, M., & Bullmore, E. T. (2007). Differential activation of the amygdala and the social brain during fearful face-processing in Asperger's syndrome. *Neuropsychologia, 45*, 2 - 14.

Author. (1996). NIMH Diagnostic Interview Schedule for Children version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry 39*, 28-38.

Barry, C. T., Frick, P. J., DeShazo, T. M., McCoy, M. G., Ellis, M. L. & Loney, B. R. (2000). The importance of callous-unemotional traits for extending the concept of psychopathy to children. *Journal of Abnormal Psychology, 109*, 335–340.

Batty, M. & Taylor, M. J. (2003). Early processing of the six basic facial emotional expressions. *Cognitive Brain Research, 17,* 613 - 620.

Batty, M. & Taylor, M. J. (2006). The development of emotional face processing during childhood. *Developmental Science, 9,* 207 - 220.

Beauchaine, T. P. (2001). Vagal tone, development, and Gray's motivational theory: Toward an integrated model of autonomic nervous system functioning in psychopathology. *Development and Psychopathology, 13,* 183 – 214.

Beaupre, M. G. & Hess, U. (2006). An ingroup advantage for confidence in emotion recognition judgments: The moderating effect of familiarity with the expressions of outgroup members. *Personality and Social Psychology Bulletin, 32,* 16 – 26.

Blair, R. J. R. (2003). A neuro-cognitive model of the psychopathic individual. In M.A. Ron & T.W. Robbins (Eds.), *Disorders of brain and mind 2* (pp. 400–420). Cambridge: Cambridge University Press.

Blair, R. J. R., & Coles, M. (2000). Expression recognition and behavioural problems in early adolescence. *Cognitive Development, 15*, 421–434.

Blair, R. J. R., Colledge, E. & Mitchell, D. (2001) Somatic markers and response reversal: is there orbitofrontal cortex dysfunction in boys with psychopathic tendencies? *Journal of Abnormal Child Psychology, 29*, 499 -511.

Blair, R. J. R., Colledge, E., Murray, L., & Mitchell, D. G. V. (2001). A selective impairment in the processing of sad and fearful expressions in children with psychopathic features. *Journal of Abnormal Child Psychology, 29,* 491-498.

Blair, R. J. R., Mitchell, D. G., Peschardt, K. S… Perrett, D. I. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences, 37,* 1111 – 1122.

Blair, R. J. R., Mitchell, D. G. V., Richell, R. A., Kelly, S., Leonard, A., Newman, C., & Scott, S. K. (2002). Turning a deaf ear to fear: Impaired recognition of vocal affect in psychopathic individuals. *Journal of Abnormal Psychology, 111*, 682-686.

Brandt, J. R., Kennedy, W. A., Patrick, C. J., & Curtin, J. J. (1997). Assessment of psychopathy in a population of incarcerated adolescent offenders. *Psychological Assessment, 9*, 429-435.

Caldwell, M., Skeem, J., Salekin, R., & van Rybroek, G. (2006). Treatment Response of Adolescent Offenders With Psychopathy Features. *Criminal Justice and Behavior, 33,* 571 - 596.

Carr, M. B. & Lutjemeier, J. A. (2005). The relation of facial affect recognition and empathy to delinquency in youth offenders. *Adolescence, 40,* 601–619.

Chiao, J.Y., Iidaka, T., Gordon, H…. Ambady, N. (2008). Cultural specificity in amygdala response to fear faces. *Journal of Cognitive Neuroscience, 20,* 2167 – 2174.

Christian, R. E., Frick, P. J., Hill, N. L., Tyler, L., & Frazer, D. (1997). Psychopathy and conduct problems in children: II. Implications for subtyping children with conduct problems. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*, 233-241.

Cima, M. & Raine, A. (2009). Distinct characteristics of psychopathy relate to different subtypes of aggression. *Personality and Individual Differences, 47,* 835-840.

Cleckley, H. M. (1988). *The Mask of Sanity, 5th Ed.* St. Louis, MO: C.V. Mosby Co.

Cooke, D. J., Michie, C., & Hart, S. (2006). Facets of clinical psychopathy: Toward clearer measurement. In C.J. Patrick (Ed.), *The Handbook of Psychopathy* (pp. 91-106). New York: Guilford Press.

Coyne, S. M., Nelson, D. A., Graham-Kevan, N., Keister, E., & Grant, D. M. (2010). Mean on the screen: psychopathy, relationship aggression, and aggression in the media. *Personality and Individual Differences, 48,* 288 - 293.

Dadds, M. R., El Masry, Y., Wimalaweera, S., & Guastella, A. J. (2008). Reduced Eye Gaze Explains "Fear Blindness" in Childhood Psychopathic Traits. *Journal of the American Academy of Child & Adolescent Psychiatry, 47,* 455-463

Dadds, M. R., Maujean, A., & Frasier, J. A. (2003). Parenting and Conduct Problems in Children: Australian Data and Psychometric Properties of the Alabama Parenting Questionnaire. *Australian Psychologist, 38,* 238 - 241.

Dadds, M. R., Yael, P., Hawes, D. J., …. Abeygunawardane, A. I. (2006). Attention to the eyes and fear-recognition deficits in child psychopathy. *British Journal of Psychiatry, 189,* 280-281.

Das, J., de Ruiter, C., Lodewijks, H., & Doreleijers, T. (2007). Predictive validity of the Dutch PCL:YV for institutional disruptive behavior: Findings from two samples of male adolescents in a juvenile justice treatment institution. *Behavioral Sciences & the Law, 25,* 739-755.

Dawson M. E., Schell A. M., & Filion, D. L. (2007). The electrodermal system. In: John T. Cacioppo, Tassinary L. G., & Berntson, G. G. (Eds.), *Handbook of Psychophysiology*. 3rd edition. New York: Cambridge University Press, pp. 159–181.

Deur, J. L. & Park, R. D. (1970). Effects of inconsistent punishment on aggression in children. *Developmental Psychology, 2,* 403 - 411.

Edens, J. F., Campbell, J. S., & Weir, J. M. (2007). Youth psychopathy and criminal recidivism: A meta-analysis of the psychopathy checklist measures. *Law and Human Behavior, 31,* 53-75.

Edens, J. F., Marcus, D. K., Lilienfeld, S. O., & Poythress, N. G. (2006). Psychopathic, Not psychopath: Taxometric evidence for the dimensional structure of psychopathy. *Journal of Abnormal Psychology, 115,* 131-144.

Edens, J. F., Skopp, N. A., & Cahill, M. A. (2008). Psychopathic features moderate the relationship between harsh and inconsistent parental discipline and adolescent antisocial behavior. *Journal of Clinical Child & Adolescent Psychology*, *37*, 472-476.

Ekman, P. & Friesen, W. V. (1971). Constants across culture in the face and emotion. *Journal of Personality and Social Psychology*, *17,* 124 – 129.

Ekman, P. & Friesen, W. V. (1976). *Pictures of Facial Affect*. Palo Alto: Consulting Psychologists.

Escobar-Chavez, S. L., Tortolero, S. R., Markham, C., Kelder, S. H., & Kapadia, A. (2002). Violent Behavior Among Urban Youth Attending Alternative Schools. *Journal of School Health, 72,* 357 - 362.

Essau, C. A., Sasagawa, S., & Frick, P. J. (2006). Callous-unemotional traits in a community sample of adolescents. *Assessment, 13*, 454-469.

Fairchild, G., Van Goozen, S. H. M., Calder, A. J., Stollery, S. J., & Goodyer, I. M. (2009). Deficits in facial expression recognition in male adolescents with early-onset or adolescence-onset conduct disorder. *Journal of Child Psychology and Psychiatry*, *50*, 627-636.

Fite, P. J., Greening, L., Stoppelbein, L., & Fabiano, G. A. (2009). Confirmatory factor analysis of the antisocial screening device with a clinical inpatient populations. *Assessment, 16,* 103 - 114.

Fowles, D. C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity, and psychopathy. *Psychophysiology, 17*, 87 - 104

Fowles, D. C. & Kochanska, G. (2000). Temperament as a moderator of pathways to conscience in children: The contribution of electrodermal activity. *Psychophysiology, 37,* 788-795.

Frick, P.J. (1991). *The Alabama Parenting Questionnaire*. The University of Alabama.

Frick, P. J. (2004). *The Inventory of Callous-unemotional Traits*. Unpublished rating scale: University of New Orleans.

Frick, P. J. (2009). Extending the construct of psychopathy to youth: Implications for understanding, diagnosing, and treating antisocial children and adolescents. *The Canadian Psychiatric Association Journal, 54,* 803-812.

Frick, P. J., Bodin, S. D., & Barry, C. T. (2000). Psychopathic traits and conduct problems in community and clinic-referred samples of children: Further development of the Psychopathy Screening Device. *Psychological Assessment, 12*, 382–393.

Frick, P. J., Cornell, A. H., Barry, C. T., Bodin, S. D., & Dane, H. E. (2003). Callous-unemotional traits and conduct problems in the prediction of conduct problem severity, aggression, and self-report of delinquency. *Journal of Abnormal Child Psychology, 31,* 457-470.

Frick, P.J., Cornell, A.H., Bodin, S.D., Dane, H.E., Barry, C.T., & Loney, B.R. (2003). Callous-unemotional traits and developmental pathways to severe conduct problems. *Developmental Psychology, 39*, 246–260.

Frick, P. J. & Hare, R. D. (2001). *The Antisocial Processes Screening Device: Technical Manual*. Toronto, ON: Multi-Health Systems.

Frick, P. J., Kimonis, E. R., Dandreaux, D. M., & Farell, J. M. (2003). The 4 year stability of psychopathic traits in non-referred youth. *Behavioral Sciences & the Law, 21,* 713-736.

Frick, P. J., & Loney, B. R. (1999). Outcomes of children and adolescents with conduct disorder and oppositional defiant disorder. In H. C. Quay & A. Hogan (Eds.), *Handbook of disruptive behavior disorders* (pp. 507–524). New York: Plenum.

Frick, P. J., Stickle, T. R., Dandreaux, D. M., Farrell, J. M., & Kimonis, E. R. (2005). Callous-unemotional traits in predicting the severity and stability of conduct problems and delinquency, *Journal of Abnormal Child Psychology, 33,* 471-487.

Fung, M., Raine, A., Lynam, D., Venables, P., Loeber R., Steinhauer, S. R., & Stouthamer-Loeber, M. (2005) Reduced electrodermal activity in psychopathy-prone adolescents. *Journal of Abnormal Psychology, 114*, 187–96.

Glenn, A. L., Raine, A., Venables, P. H., & Mednick, S. A. (2009). Early temperamental and psychophysiological precursors of adult psychopathic personality. *Personality Disorders: Theory, Research, and Treatment, S(1),* 46-60.

Gray, J. (1987). *The Psychology of Fear and Stress.* New York: Cambridge University Press.

Hare, R. D. (1965). Temporal gradient of fear arousal in psychopaths. *Journal of Abnormal Psychology, 70,* 442 - 445.

Hare, R. D. (1982). Psychopathy and physiological activity during anticipation of an aversive stimulus in a distraction paradigm. *Psychophysiology*, *19*, 266 - 271.

Hare, R. D. (1991). *The Hare Psychopathy Checklist-Revised (PCL-R)*. Toronto, Ontario: Multi-Health Systems.

Hare, R. D. (1999). *Without conscience: the disturbing world of psychopaths among us.* New York, NY: The Guilford Press.

Hare, R. D., Frazelle, H., Cox, D. C. (1978). Psychopathy and Physiological Responses to Threat of an Aversive Stimulus. *Psychophysiology, 15*, 165–172.

Hare, R. D. & McPherson, L. (1983). Violent and aggressive behavior by criminal psychopaths. *International Journal of Law and Psychiatry, 7,* 35 – 50.

Harpur, T. J., Hakstian, A., & Hare, R. D. (1988). Factor structure of the Psychopathy Checklist. *Journal of Consulting and Clinical Psychology*, *56*, 741 – 747.

Hawes, D. J. & Dadds, M. R. (2005). The treatment of conduct problems in children with callous-unemotional traits. *Journal of Consulting and Clinical Psychology, 73,* 737-741.

Hinshaw, S. P., Owens, E. B., Wells, K. C., … Wigal, T. (2000). Family processes and treatment outcome in the MTA: Negative/ineffective parenting practices in relation to multimodal treatment. *Journal of Abnormal Child Psychology, 28,* 555 - 568.

Iacono, W. G. (1998). Identifying psychophysiological risk for psychopathology: Examples from substance abuse and schizophrenia research. *Psychophysiology, 35*, 621–637.

Jack, R. E., Blais, C., Scheepers, C., Schyns, P. G., & Caldara, R. (2009). Cultural confusions show that facial expressions are not universal. *Current Biology, 19,* 1543 – 1548.

Kiehl, K. A., Smith, A. M., Hare, R. D., … Liddle, P. F. (2001). Limbic abnormalities in affective processing by criminal psychopaths as revealed by functional magnetic resonance imaging. *Biological Psychiatry, 50*, 677 – 684.

Kimonis, E. R., Frick, P. J., Fazekas, H. & Loney, B. R. (2006). Psychopathy, aggression, and the processing of emotional stimuli in non-referred boys and girls. *Behavioral Sciences and the Law, 24*, 21–37.

Kimonis, E. R., Frick, P. J., Munoz, L. C., & Aucoin, K. J. (2007). Can a laboratory measure of emotional processing enhance the statistical prediction of aggression and delinquency in detained adolescents with callous-unemotional traits? *Journal of Abnormal Child Psychology, 35,* 773 - 785.

Kimonis, E. R., Frick, P. J., Skeem, J…. Morris, A. S. (2008). Assessing callous-unemotional traits in adolescent offenders: Validation of the Inventory of Callous-Unemotional Traits. *Journal of the International Association of Psychiatry and Law, 31*, 241-251.

Kreibig, S. D., Wilhelm, F. H., Gross, J. J., & Roth, W. T. (2007 October). The psychophysiology of fear and sadness: Cardiovascular, electrodermal, and respiratory responses during film viewing. Psychophysiology, 44 (S1), S20. Talk presented at the Society for Psychophysiological Research, 47th Annual Meeting, Savannah, GA, USA.

Krueger, R. F. (1999). Personality traits in late adolescence predict mental disorders in early adulthood: A prospective-epidemiological study. *Journal of Personality, 67,* 39-65.

Lee, Z., Vincent, G. M., Hart, S. D., & Corrado, R. R. (2003). The validity of the Antisocial Process Screening Device as a self-report measure of psychopathy in adolescent offenders. *Behavioral Sciences and the Law, 21*, 771–786.

Lefkowitz, M. M., Eron, L. D., Walder, L. O., & Huesmann, L. R. (1977). *Growing up to be violent: A longitudinal study of the development of aggression.* New York: Pergamon.

Lilienfeld S. O. & Andrews B. P. (1996). Development and preliminary validation of a self report measure of psychopathic personality traits in noncriminal populations. *Journal of Personality Assessment, 66*, 488-524.

Lobaugh, N. J., Gibson, E., Taylor, M. J. (2006). Children recruit distinct neural systems for implicit emotional face processing. *Neuroreport, 17,* 215 – 219.

Loeber, R., Farrington, D. P., Stouthamer-Loeber, M., & van Kammen, W. B. (1998). *Antisocial behavior and mental health problems*. Mahwah, NJ: Erlbaum.

Loney, B. R., Taylor, J., Butler, M. A., Iacono, W. G. (2007). Adolescent psychopathy features: 6-year temporal stability and the prediction of externalizing symptoms during the transition to adulthood. *Aggressive Behavior, 33,* 242 – 252.

Lorber, M. F. (2004). The psychophysiology of aggression, psychopathy, and conduct problems: A meta-analysis. *Psychological Bulletin, 130*, 531-552.

Lykken, D. T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology*, *55,* 6 – 10.

Lykken, D. T. (1957). *The antisocial personalities.* Hillsdale, NJ: Lawrence Erlbaum & Associates.

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,* 155–165.

Marsh, A. A. & Ambady, N. (2007). The influence of the fear facial expression on prosocial responding. *Cognition and Emotion*, *21*, 225 – 247.

Marsh, A. A. & Blair, R. J. R. (2008). Deficits in facial affect recognition among antisocial populations: a meta-analysis. *Neuroscience and Biobehavioral Review, 32,* 454 – 465.

Marsh, A. A., Kozak, M. N., & Ambady, N. (2007). Accurate identification of fear facial expressions predicts prosocial behavior. *Emotion*, *7,* 239-251.

McVeigh, J., Grinberg, V. S., & Siegel, M. W. (1995). A double buffering technique for binocular imaging in a window. Proceedings of the 1995 SPIE/IS+T Conference, pp. 168-175.

Montagne, B., van Honk, J., Kessels, R. P. C., Frigerio, E., Burt, M., van Zandvoort, M. J. E., Perrett, D. I., & de Haan, E. H. F. (2004). Reduced efficiency in recognizing fear in subjects scoring high on psychopathic personality characteristics. *Personality and Individual Differences, 38,* 5-11.

Munoz, L. C. (2009). Callous-unemotional traits are related to combined deficits in recognizing afraid faces and body poses. *Journal of the American Academy of Child and Adolescent Psychiatry, 48,* 554 - 562.

Murrie, D. C., Marcus, D. K., Douglas, K. S., Lee, Z., Salekin, R. T., & Vincent, G. (2007). Youth with psychopathy features are not a discrete class: a taxometric analysis. *Journal of Child Psychology and Psychiatry*, *48,* 714 – 723.

Nowicki, S. Jr. & Duke, M. (1994). Individual differences in the nonverbal communication of affect: The Diagnostic Analysis of Nonverbal Accuracy Scale. *Journal of Nonverbal Behavior, 18,* 9-35.

Nowicki, S. Jr. & Duke, M. (2002). *Will I Ever Fit In?: The Breakthrough Program for Conquering Adult Dyssemia*. New York: The Free Press.

O'Brien, B. S. & Frick, P. J. (1996). Reward dominance: Associations with anxiety, conduct problems, and psychopathy in children. *Journal of Abnormal Child Psychology, 24,* 223 – 240.

Obradovic, J., Pardini, D. A., Long, J. D., & Loeber, R. (2007). Measuring Interpersonal Callousness in Boys From Childhood to Adolescence: An Examination of Longitudinal Invariance and Temporal Stability. *Journal of Clinical Child & Adolescent Psychology, 36,* 276 - 292

Orpinas, P. & Frankowski, K. (2001). The aggression scale: A self-report measure of aggressive behavior for young adolescents. *Journal of Early Adolescence, 21,* 50 - 67.

Oxford, M., Cavell, T. A., & Hughes, J. N. (2003). Callous/unemotional traits moderate the relation between ineffective parenting and child externalizing problems: A partial replication and extension. *Journal of Clinical Child & Adolescent Psychology, 32,* 577 - 585.

Pardini, D. A., Lochman, J. E., & Frick, P. J. (2003). Callous/Unemotional traits and social-cognitive processes in adjudicated youths. *Journal of the American Academy of Child and Adolescent Psychiatry, 42,* 364-371.

Pardini, D. A., Lochman, J. E., & Powell, N. (2007). The Development of Callous-Unemotional Traits and Antisocial Behavior in Children: Are There Shared and/or Unique Predictors? *Journal of Clinical Child & Adolescent Psychology, 36,* 319 – 333.

Pelham, W. E., Gnagy, E. M., Greenslade, K. E., & Milich, R. (1992). Teacher ratings of DSM–III–R symptoms for the disruptive behavior disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *31*, 210–218.

Phillips, M. L. Williams, L. M., Heining, M…. Gray, J. A. (2004). Differential neural responses to overt and covert presentations of facial expressions of fear and disgust. *Neuroimage*, *24*, 1484 – 1496.

Phillips, M. L., Young, A. W., Scott, S. K…. Gray, J. A. (1998). Neural responses to facial and vocal expressions of fear and disgust. *Proceedings of the Royal Society of Biological Sciences, 265, 1809 – 1817.*

Piacentini, J. C., Cohen, P., & Cohen, J. (1992). Combining discrepant diagnostic information from multiple sources: Are complex algorithms better than simple ones? *Journal of Abnormal Child Psychology, 20*, 51–63.

Rilling, J. K., Glenn, A. L., Jairam, M. R., Pagnoni, G., Goldsmith, D. R., Elfenbein, H. A., & Lilienfeld, S. O. (2006). Neural correlates of social cooperation and non-cooperation as a function of psychopathy. *Biological Psychiatry, 61,* 1260-1271.

Russell, J. A. (1994). Is there universal recognition of emotion from facial expression? A review of cross-cultural studies. *Psychological Bulletin, 115*, 102 – 141.

Sagvolden, T., Johansen, E. B., Aase, H., & Russell, V. A. (2005). A dynamic developmental theory of attention-deficit/hyperactivity disorder (ADHD) predominantly hyperactive/impulsive and combined subtypes. *Behavioral Brain Sciences, 28*, 397 - 419.

Salekin, R. T., Brannen, D. N., Zalot, A. A., Leistico, A. M., & Neumann, C. S. (2006) Factor structure of psychopathy in youth: testing the applicability of the new four-factor model. *Criminal Justice and Behavior, 33*,135 -157.

Schachter, S., & Latane, B. (1964). Crime, cognition, and the autonomic nervous system. In D. Levine (Ed.), *Nebraska Symposium on Motivation* (Vol., 12, pp. 221–273). Lincoln: University of Nebraska Press.

Schmidt, K., Solant, M. V., & Bridger, W. H. (1985). Electrodermal activity of undersocialized aggressive children: A pilot study. *Journal of Child Psychology and Psychiatry, 26*, 653 – 660.

Schmitt, N. (1996). Uses and Abuses of Coefficient Alpha. *Psychological Assessment, 8,* 350 - 353.

Schwab-Stone, M., Shaffer, D., Dulcan, M…. Rae, D.S. (1996). Criterion validity of the NIMH diagnostic interview schedule for children, Version 2.3 (DISC 2.3).

Journal of the American Academy of Child and Adolescent Psychiatry, 35, 878-888.

Shaffer, D., Fisher, P., Dulcan, M. K…. Regier, D. A. (1996). The NIMH Diagnostic Interview Schedule for Children version 2.3 (DISC-2.3): Description, acceptability, prevalence rates, and performance in the MECA study. *Journal of the American Academy of Child and Adolescent Psychiatry, 35*, 865–866.

Shelton, K. K., Frick, P. J., & Wooten, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology*, *25*, 317-329.

Sherwood, A., Allen, M. T., Fahrenberg, J., Kelsey, R. M., Lovallo, W. R., & Doornen, L. J. P. van. (1990). Methodological guidelines for impedance, cardiography. *Psychophysiology, 27*, 1–23.

Skilling, T. A., Quinsey, V. L., & Craig, W. M. (2001). Evidence of a taxon underlying serious antisocial behavior in boys. *Criminal Justice and Behavior, 28*, 450–470.

Stevens, D., Charman, T., Blair, R. J. (2001). Recognition of emotion in facial expressions and vocal tones in children with psychopathic tendencies. *Journal of Genetic Psychology, 162*, 201–211.

Sullivan, E. A. & Kosson, D. S. (2006). Ethnic and cultural variations in psychopathy. In C. Patrick (ed.), *Handbook of Psychopathy*. New York: Guilford.

Swogger, M. T., Walsh, Z., Houston, R. J., Cashman-Brown, S., & Connor, K. R. (2010). Psychopathy and Axis I psychiatric disorders among criminal offenders: relationships to impulsive and proactive aggression. *Aggressive Behavior, 36,* 45-53.

Taylor, J., Carlson, S. R., Iacono, W. G., Lykken, D. T., & McGue, M. (1999). Individual differences in electrodermal responsivity to predictable aversive stimuli and substance abuse. *Psychophysiology, 36,* 193-198.

Thomas, L. A., DeBellis, M. D., Graham, R., & LaBar, K. S. (2007). Development of emotional facial recognition in late childhood and adolescence. *Developmental Science, 10*, 547-558.

Toupin, J., Mercier, H., Dery, M., Cote, G., & Hodgins, S. (1995). Validity of the PCL-R for adolescents. *Issues in Criminological and Legal Psychology, 24*, 143-145.

Tremblay, C., Kirouac, G., & Dore, F. Y. (2001). The recognition of adults' and children's facial expressions of emotions. *The Journal of Psychology, 121,* 341-350.

Tsuchiya, N., and Koch, C. (2004). *Continuous flash suppression*. Vision Sciences Society, 4th annual meeting, Sarasota, FL.

Van Baardewijk, Y., Stegge, H., Andershed, H., Thomaes, S., Sholte, E., & Vermeiren, R. (2008). Measuring psychopathic traits in children through self-report. The development of the Youth Psychopathic traits Inventory – Child Version. *International Journal of Law and Psychiatry, 31,* 199 – 209.

Vasey, M. W., Kotov, R., Frick, P. J., & Loney, B. R. (2005). The latent structure of psychopathy in youth: A taxometric investigation. *Journal of Abnormal Child Psychology*, *33*, 411–429.

Vitacco, M. J., Caldwell, M. F., Van Rybroek, G. J., & Gabel, J. (2007). Psychopathy and behavioral correlates of victim injury in serious juvenile offenders. *Aggressive Behavior, 33,* 537-744.

Vitacco, M. J., Neumann, C. S., & Jackson, R. L. (2007). Testing a four-factor model of psychopathy and its association with ethnicity, gender, intelligence, and violence. *Journal of Consulting and Clinical Psychology, 73,* 466 - 476.

Wagner, H. L. (1993). On measuring performance in category judgment studies of nonverbal behavior. *Journal of Nonverbal Behavior, 17*, 1- 28.

Walters, G. D., Gray, N. S., Jackson, R. L., Sewell, K. S…. Snowden, R. J. (2007). A taxometric analysis of the Psychopathy Checklist: Screening Version (PCL: SV): Further evidence of dimensionality. *Psychological Assessment, 19*, 330-339.

Walters, G. D., Duncan, S. A., & Mitchell-Perez, K. (in press). The latent structure of psychopathy: A taxometric investigation of the Psychopathy Checklist—Revised in a heterogeneous sample of male prison inmates. *Assessment, 14*, 270 – 278,

Wechsler, D. (1991). *Wechsler Intelligence Scale for children (3rd ed.)*. San Antonio, TX: The Psychological Corporation.

Weinberger, N. M., Gold, P. E., Sternberg, D. B. (1984). Epinephrine enables Pavlovian fear conditioning under anesthesia. *Science, 223,* 605 - 607.

Widom, C. S. (1977). A methodology for studying noninstitutionalized psychopaths. *Journal of Consulting and Clinical Psychology*, *45,* 674 – 683.

Woodworth, M. & Waschbusch, D. (2007). Emotional processing in children with conduct problems and callous/unemotional traits. *Child: Health, Care, & Development, 34,* 234 - 244.

Wootton J. M., Frick P. J., Shelton K. K., & Silverthorn P. (1997). Ineffective parenting and childhood conduct problems: the moderating role of callous-unemotional traits. *Journal of Consulting and Clinical Psychology, 65,* 301- 308.

Yang, E., Zald, D. H., & Blake, R. (2007). Fearful expressions gain preferential access to awareness during continuous flash suppression. *Emotion, 7,* 882 - 886.

Ziegler, E., Taussig, C. & Black, K. (1992). Early childhood intervention: a promising preventative for juvenile delinquency. *American Psychologist, 47*, 997- 1006.

Table 1.

Studies of Explicit Facial Emotion Processing Deficits in Children and Adolescents with Psychopathic Features.

			Stimulus	Facial Emotion Recognition				
Study	N (*M* Age, *SD*)	Measure	Time	Anger	Fear	Happy	Sad	Disgust
Blair & Coles, 2000	55 (12.4,0.9)	PSD	2s	/	-	/	-	/
Blair et al., 2001	51 (12.9, 2.0)	PSD	*3s	/	-	/	-	/
Carr et al., 2005	29 (15.3)	ICEA	2s	/	-	/	/	
Dadds et al., 2008	100 (12.4, 2.2)	APSD	2s	/	-	/		-
Dadds et al., 2006	98 (12.8, 1.8)	APSD	2s	/	-	/	/	/
Fairchild et al., 2009	81 (15.8, .8)	YPI	5s	/	-	/	-	/
Munoz, 2009	55 (11.8, 1.9)	ICU	2s	-	-	/	/	/
Stevens et al., 2001	18 (11.6)	APSD	2s	/	-	/	-	
Woodworth et al., 2007	73 (9.8, 1.7)	APSD	2s	/	+	/	-	/

Note. + = enhanced performance; - = deficient performance; / = no difference; blank cells indicate that the emotion was not assessed. * each stage of the Emotional Expression Multimorph Task was presented for 3s; APSD = Antisocial Process Screening Device; PSD = Psychopathy Screening Device; ICEA = Index of Empathy for Children and Adolescents; ICU = Inventory of Callous and Unemotional Traits; YPI = Youth Psychopathy Inventory.

Table 2.

Calculation of H_u in the DANVA-II

	Judgment				
Stimulus	Fearful	Sad	Happy	Angry	Total
Fearful	a	b	c	d	a + b + c + d
Sad	e	f	g	h	e + f + g + h
Happy	i	j	k	l	i + j + k + l
Angry	m	n	o	p	m + n + o + p
Total	a+e+i+m	b+f+j+n	c+g+k+o	d+h+l+p	N

Note. Modified from Wagner (1993).

Table 3.

Descriptive Statistics for Questionnaire and Interview Measures

Measure	*M (SD)*	*Min - Max*
APQ - Deficient Monitoring	10.95 (3.12)	8.0 - 21.0
APQ - Negative/Ineffective Parenting	24.84 (5.75)	15 .0 - 45.0
APQ - Positive Involvement	62.72 (6.32)	42.0 - 74.0
APSD Combined Total Score	20.00 (5.60)	7.0 - 32.0
Callous Unemotional	5.47 (2.07)	0.0 - 10.0
Impulsivity/Conduct Problems	7.31 (1.83)	0.0 - 10.0
Narcissism	7.23 (3.11)	1.0 - 14.0
CBCL Aggression Score	12.31 (7.71)	0 .0 - 33.0
DISC - ADHD Symptoms	9.67 (5.21)	1.0 - 22.0
DISC - CD Symptoms	2.73 (3.37)	0.0 - 18.0

Note. APQ = Alabama Parenting Questionnaire; APSD-C = Antisocial Process Screening Device, Child Self-report; APSD-M = Antisocial Process Screening Device, Mother-report; CBCL = Child Behavior Checklist; DISC = Diagnostic Interview Schedule for Children for the DSM-IV.

Table 4.

Descriptive Statistics for Laboratory Tasks and Physiological Measures

Measure		*M (SD)*
Laboratory Task		
mCFS	fear faces RT (ms)	3544 (1378)
	happy faces RT (ms)	4542 (1395)
	disgust faces RT (ms)	4291 (1255)
	neutral faces RT (ms)	4316 (1286)
DANVA-II	fear faces correct	3.93 (1.71)
	happy faces correct	5.36 (0.76)
	sad faces correct	4.33 (1.26)
	angry faces correct	3.64 (1.17)
Physiological Measures		
Countdown	PEP	96.05 (16.81)
	HR	81.10 (13.49)
	EDA	4.93 (03.40)
Lottery	PEP	96.36 (17.27)
	HR	83.17 (12.84)
	EDA	6.56 (03.84)

Note. mCFS = modified continuous flash suppression; DANVA-II = diagnostic analysis of nonverbal accuracy, version 2; PEP = pre-ejection period; EDA = electrodermal activity.

Table 5.

Zero-Order Correlations among Questionnaire and Interview Measures

Measure	1	2	3	4	5	6	7	8	9
1. Aggression Scale	-								
2. APQ - Deficient Monitoring	-.06	-							
3. APQ - Negative/Ineffective	.11	**.43**	-						
4. APQ - Positive Involvement	-.01	**-.26**	-.19	-					
5. APSD Combined Total Score	**.24**	**.33**	**.39**	-.11	-				
6. Callous Unemotional	.12	.15	**.38**	-.13	**.76**	-			
7. Impulsivity/Conduct Problems	.15	**.26**	.14	-.08	**.69**	**.32**	-		
8. Narcissism	**.26**	**.34**	**.36**	-.08	**.89**	**.51**	.45	-	
9. CBCL - Aggression Score	-.04	.22	**.47**	-.02	**.59**	**.38**	.48	**.55**	-
10. C-DISC CD Symptoms	**.40**	.01	.08	-.07	.19	.05	-.02	**.32**	.11

Note. Bolded correlations = $p < .05$; APQ = Alabama Parenting Questionnaire; APSD = Antisocial Process Screening Device; CBCL = Child Behavior Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children for the DSM-IV.

Table 6.

Interview and Questionnaire Measure Scores Regressed on Continuous Flash Suppression Reaction Times.

	Continuous Flash Suppression Reaction Times								
	Fear			Disgust			Happy		
Measure	ΔF (1,79)	β	ΔR^2	ΔF (1,79)	β	ΔR^2	ΔF (1,79)	β	ΔR^2
APSD Total Scores	2.22	.17	.03	†2.99	.19	.03	.71	.09	.01
Callous Unemotional	**8.98	.32	.10	*5.15	.25	.06	.58	-.09	.01
Impulsivity/Conduct Problems	.07	-.03	.00	.60	.09	.01	1.33	.13	.02
Narcissism	1.01	.11	.02	1.18	.12	.01	1.66	.14	.02
Aggression Scale	*3.94	.22	.05	.78	.10	.01	.05	.03	.00
CBCL Aggression	.16	.05	.00	.01	.01	.00	.14	.04	.00
DISC CD Symptoms	1.49	.14	.02	1.12	.12	.01	*6.11	.07	.27

Note. †$p < .10$; *$p < .05$; **$p < .01$; All analyses were controlling for age; APSD = Antisocial Process Screening Device - Combined Informant Scores; CBCL = Child Behavioral Checklist; DISC = Diagnostic Interview Schedule for Children, DSM-IV.

Table 7.

Interview and Questionnaire Measure Scores Regressed on Diagnostic Assessment of Nonverbal Accuracy Hit Rates.

	Diagnostic Assessment of Nonverbal Accuracy Hit Rates											
	Fear			Anger			Sadness			Happy		
Measure	ΔF (1,65)	β	R^2	ΔF (1,65)	β	R^2	ΔF (1,65)	β	R^2	ΔF (1,65)	β	R^2
APSD Total Score	†2.90	-.21	.04	.07	.03	.03	.30	-.07	.00	.23	-.06	.00
Callous Unemotional	.83	-.11	.01	.01	.01	.00	.01	.01	.00	.07	-.03	.00
Impulsivity/Conduct Problems	†3.27	-.22	.05	.23	.06	.00	.56	-.09	.01	.01	.01	.00
Narcissism	2.15	-.18	.03	.02	.01	.00	.39	-.08	.01	.51	-.09	.01
Aggression Scale	.37	-.08	.01	1.30	-.14	.02	.02	.02	.00	.01	-.01	.00
CBCL Aggression	.29	.07	.00	.53	.09	.01	.02	.02	.00	.08	-.04	.00
C-DISC CD Symptoms	1.28	.14	.02	1.71	-.16	.03	.00	.00	.00	.01	-.01	.00

Note. †$p < .10$; *$p < .05$; All analyses were controlling for age; APSD = Antisocial Process Screening Device – Combined Informant Scores; CBCL = Child Behavioral Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV.

Table 8.

Interview and Questionnaire Measure Scores Regressed on Physiological Measures during the Countdown Task.

	Physiological Measures								
	EDA			HR			PEP		
Measure	ΔF (1,38)	β	ΔR^2	ΔF (1,47)	β	ΔR^2	ΔF (1,47)	β	ΔR^2
APSD Total Scores	.08	.01	-.05	.30	-.08	.01	†3.98	-.27	.07
Callous Unemotional	.79	-.14	.02	.42	.09	.01	**7.36	-.37	.13
Impulsivity/Conduct Problems	.02	-.02	.00	.01	-.02	.00	.99	-.14	.02
Narcissism	.01	.02	.00	1.74	-.19	.04	1.14	-.15	.02
Aggression Scale	1.15	-.17	.03	1.53	-.18	.03	.77	.13	.02
CBCL Aggression	.01	.02	.00	.00	.01	.00	.39	-.09	.01
C-DISC CD Symptoms	.01	.02	.00	.82	-.13	.02	.24	.07	.01

Note. †$p < .10$; *$p < .05$; **$p < .01$. All analyses were controlling for age; APSD = Antisocial Process Screening Device - Combined Scores; CBCL = Child Behavioral Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV; EDA = Electrodermal Activity; HR = Heart Rate; PEP = Pre-ejection Period.

Table 9.

Moderated Multiple Regression Analyses:

Psychopathy and Conduct Disorder Measure X CBCL

Aggression Interaction Terms Predicting Performance on

Fear Recognition Tasks.

	Fear Recognition Tasks					
	DANVA-II			mCFS		
Measure	ΔF (1,60)	β	ΔR^2	ΔF (1,73)	β	ΔR^2
APSD Combined Total Scores	1.66	.16	.02	†3.62	.22	.04
Callous Unemotional	†3.16	.23	.05	2.59	.18	.03
Impulsivity/Conduct Problems	.04	.02	.00	*5.78	.27	.07
Narcissism	1.42	.15	.02	1.27	.13	.02
C-DISC CD Symptoms	.15	.05	.00	.01	.01	.00

Note. †$p < .10$; *$p < .05$; All analyses were controlling for age; APSD = Antisocial Process Screening Device; CBCL = Child Behavioral Checklist; DANVA-II = Diagnostic Accuracy in NonVerbal Awareness; mCFS = modified Continuous Flash Suppression; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV.

Table 10.

Moderated Multiple Regression Analyses: Psychopathy and Conduct Disorder Measure X CBCL Aggression Interaction Terms Predicting Reactivity to Fear Conditioning.

	Physiological Measures								
	EDA			HR			PEP		
Measure	ΔF (1,37)	β	ΔR^2	ΔF (1,46)	β	ΔR^2	ΔF (1,46)	β	ΔR^2
APSD Combined Total Scores	.07	-.04	.00	.00	.01	.00	1.89	-.22	.04
Callous Unemotional	.51	-.12	.48	2.46	.25	.05	1.28	.17	.02
Impulsivity/Conduct Problems	1.93	-.28	.05	.97	-.15	.02	1.18	-.16	.02
Narcissism	.28	.09	.01	.01	-.02	.00	2.30	-.23	.05
C-DISC CD Symptoms	.44	.11	,01	.85.	-.14	.02	.78	-.13	.02

Note. All analyses were controlling for age APSD = Antisocial Process Screening Device; CBCL = Child Behavioral Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV; EDA = Electrodermal Activity; HR = Heart Rate; PEP = Pre-ejection Period.

Table 11.

Multiple Regression Analyses: APQ Parenting Scales

Predicting Child Aggression Scores.

	Child Aggression Scores					
	CBCL Aggression			Aggression Scale		
Measure	ΔF (1,70)	β	ΔR^2	ΔF (1,73)	β	ΔR^2
APQ - Deficient Monitoring	†3.66	.22	.05	.28	-.06	.00
APQ - Negative/Ineffective	**22.05	.48	.23	.95	.11	.01
APQ - Positive Involvement	.01	-.01	.00	.01	-.01	.00

Note. †$p < .10$; **$p < .001$; All analyses were controlling for age; APQ = Alabama Parenting Questionnaire.

Table 12.

Interview and Questionnaire Scores Regressed on Physiological Measures during the Lottery Task.

	Physiological Measures								
	EDA			HR			PEP		
Measure	ΔF (1,38)	β	ΔR^2	ΔF (1,47)	β	ΔR^2	ΔF (1,47)	β	ΔR^2
APSD Total Scores	.02	.02	.00	.08	.04	.00	†2.67	.24	.06
Callous Unemotional	.01	-.02	.00	.27	-.08	.01	.05	.03	.00
Impulsivity/Conduct Problems	.34	.09	.01	.13	-.06	.00	**8.78	.42	.17
Narcissism	.00	.01	.00	1.16	.16	.03	.89	.14	.02
Aggression Scale	2.75	-.26	.07	.04	.03	.00	*5.14	.33	.11
CBCL Aggression	2.54	-.24	.06	.10	.05	.00	.05	-.03	.00
C-DISC CD Symptoms	*4.72	-.33	.11	.03	.03	.00	.17	-.06	.00

Note. †$p < .10$; *$p < .05$; ** $p < .01$. All analyses were controlling for age; APSD = Antisocial Process Screening Device; CBCL = Child Behavioral Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV; EDA = Electrodermal Activity; HR = Heart Rate; PEP = Pre-ejection Period.

Table 13.

Moderated Multiple Regression Analyses: Psychopathy and Conduct Disorder Measure X Ethnicity Interaction Terms Predicting Performance on Fear Recognition Tasks.

	Fear Recognition Tasks					
	DANVA-II			mCFS		
Measure	ΔF (1,60)	β	ΔR^2	ΔF (1,73)	β	ΔR^2
APSD Combined Total Scores	.14	.05	.00	.04	.02	.00
Callous Unemotional	1.01	-.13	.02	.96	.11	.01
Impulsivity/Conduct Problems	†2.58	.22	.04	1.56	.15	.02
Narcissism	.24	.07	.00	1.07	-.12	.02
Aggression Scale	.77	-.12	.01	.00	.01	.00
CBCL Aggression	.41	.09	.01	.08	-.04	.00
C-DISC CD Symptoms	.08	.04	.00	.55	.09	.01

Note. †p < .10; All analyses were controlling for age, ethnicity, and C-DISC ADHD symptoms; APSD = Antisocial Process Screening Device; CBCL = Child Behavioral Checklist; DANVA-II = Diagnostic Accuracy in NonVerbal Awareness; mCFS = modified Continuous Flash Suppression; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV.

Table 14.

Moderated Multiple Regression Analyses: Psychopathy and Conduct Disorder Measure X Ethnicity Interaction Terms Predicting Reactivity to Fear Conditioning.

	Physiological Measures								
	EDA			HR			PEP		
Measure	ΔF (1,37)	β	ΔR^2	ΔF (1,46)	β	ΔR^2	ΔF (1,46)	β	ΔR^2
APSD Combined Total Scores	.07	.04	.00	.63	-.12	.01	.93	-.14	.02
Callous Unemotional	.11	-.05	.00	.34	-.09	.01	*4.23	-.29	.08
Impulsivity/Conduct Problems	1.38	.21	.04	1.31	.19	.03	.26	-.08	.01
Narcissism	.00	.01	.00	2.37	-.23	.05	.39	-.09	.01
Aggression Scale	.01	-.02	.00	2.61	-.24	.06	.01	-.02	.00
CBCL Aggression	.60	.13	.02	.84	-.14	.02	.19	-.07	.00
C-DISC CD Symptoms	.01	.02	.00	2.00	-.23	.05	.56	-.12	.01

Note. *$p < .05$; All analyses were controlling for age; APSD = Antisocial Process Screening Device; CBCL = Child Behavioral Checklist; C-DISC = Computerized Diagnostic Interview Schedule for Children, DSM-IV; EDA = Electrodermal Activity; HR = Heart Rate; PEP = Pre-ejection Period.

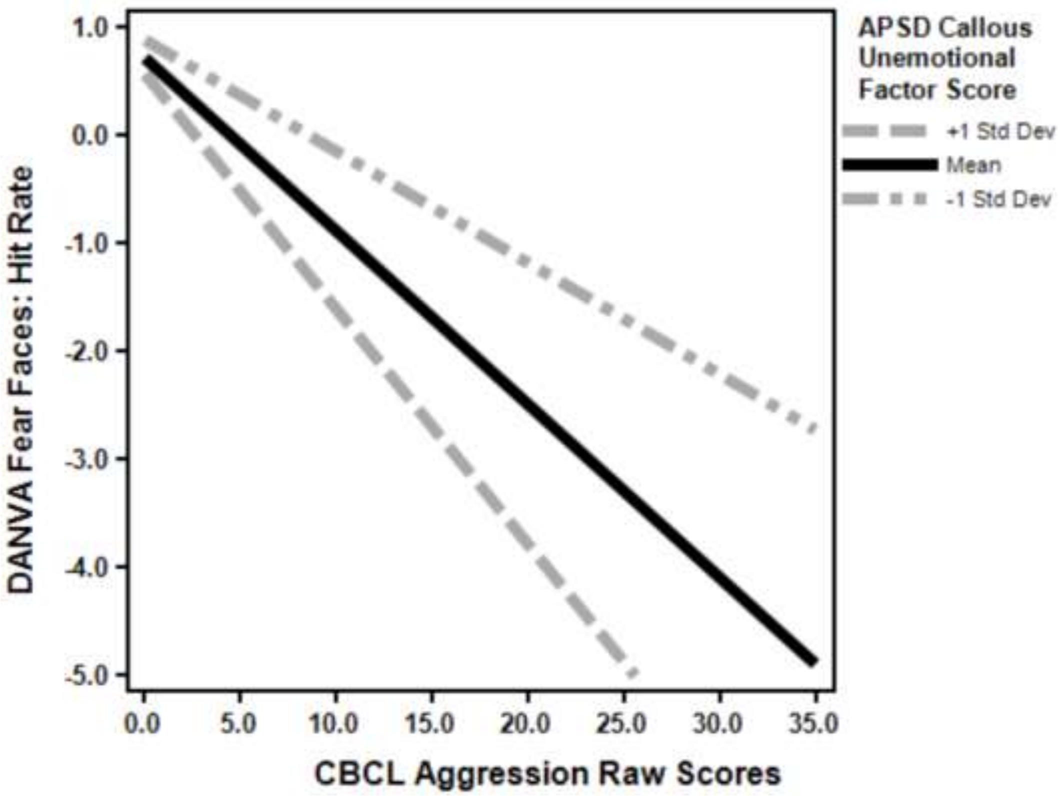

Figure 1. DANVA-II fear faces - unbiased hit rates regressed on CBCL aggression raw scores by APSD Combined Callous Unemotional factor scores controlling for age.

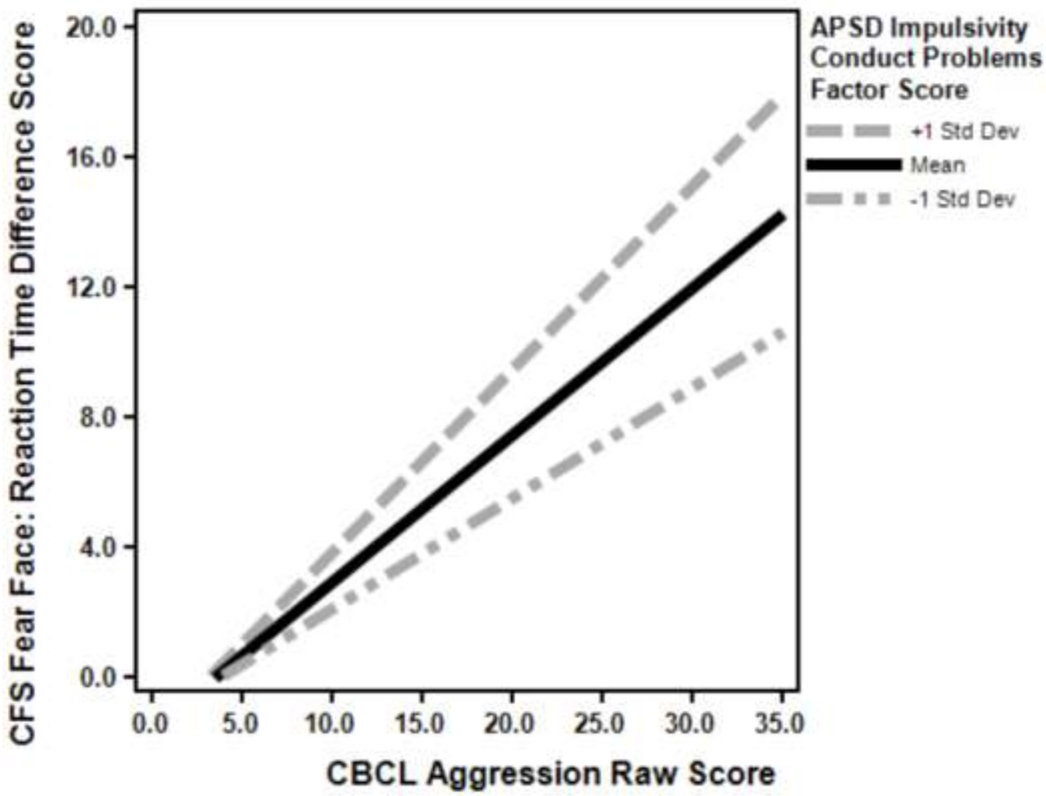

Figure 2. Modified continuous flash suppression - fearful faces reaction times regressed on CBCL aggression raw scores by APSD Combined Impulsivity/Conduct Problems factor scores controlling for age.

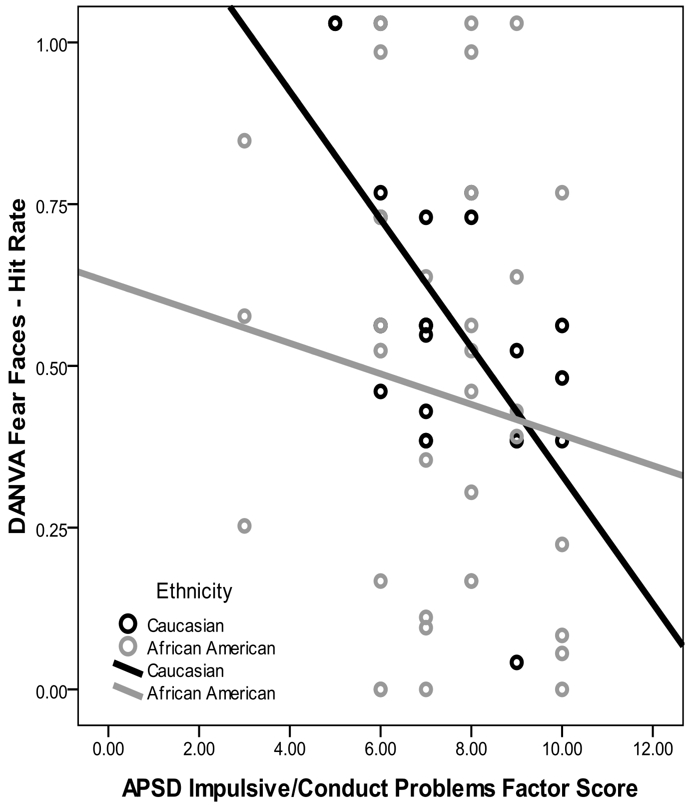

Figure 3. DANVA-II fearful faces - unbiased hit rates regressed on APSD Combined Impulsivity/Conduct Problems traits by ethnicity controlling for age.

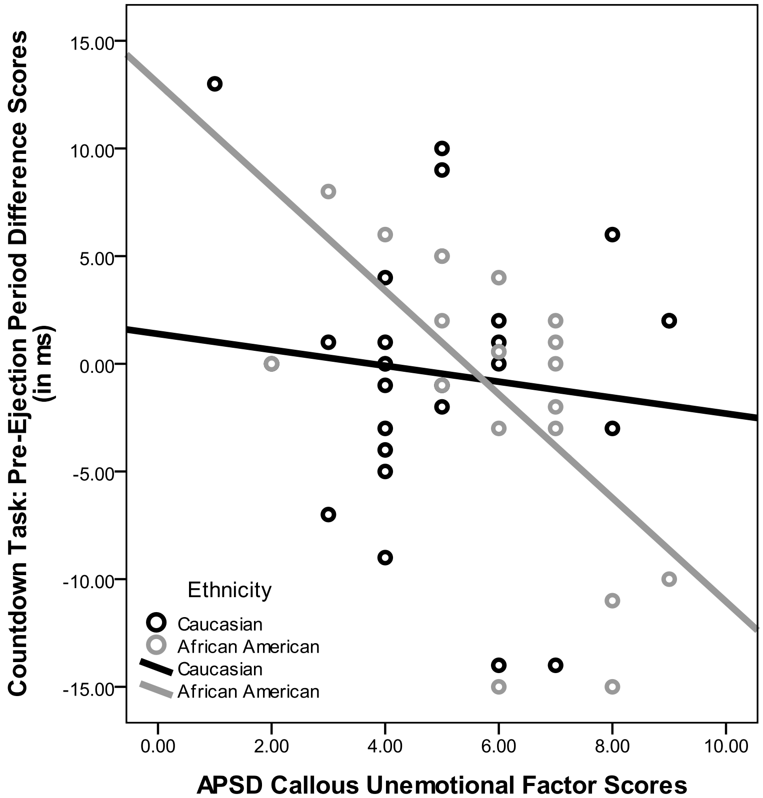

Figure 4. Pre-Ejection Period difference scores during the Countdown Task regressed on APSD Callous Unemotional traits by ethnicity controlling for age.