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Deficits in emotion recognition have been associated with psychopathic and callous-unemotional (CU) behaviors among adults, adolescents, and children. However, few previous studies have examined such associations exclusively during early and middle childhood. The current study used a large, population-stratified, randomly-selected sample of 2nd grade children living in areas of high rural poverty to examine group differences in emotion recognition among children showing no conduct problems or CU behaviors (typical), conduct problems without CU behaviors (CP-only), and both CP and CU behaviors (CP+CU). Primary caregivers reported on children's conduct problems and callous-unemotional behaviors at 1st grade and children completed a computerized facial emotion recognition task at 2nd grade. Results indicated that group differences in emotion recognition accuracy were moderated by child race, with children in the typical group showing better overall accuracy and better recognition of fearful and happy faces among European American children, whereas no group differences were found among African American children. Implications for emotion socialization, etiology of CP and CU behaviors, and future directions for research and treatment are discussed.

EMOTION RECOGNITION DEFICITS AMONG CHILDREN WITH CONDUCT PROBLEMS AND CALLOUS-UNEMOTIONAL BEHAVIORS: DIFFERENCES BY CHILD RACE

by

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

CHAPTER I

INTRODUCTION

Psychopathy is a developmental personality disorder consisting of two core elements—emotional dysfunction and antisocial behavior—and is characterized by callousness, lack of empathy, impulsivity, lack of remorse, and poor behavioral control (Blair, 2008; Hare, 1991). Approximately 1% of the general population is thought to show psychopathic personality (Neumann & Hare, 2008). Despite such low prevalence, psychopathy has garnered research interest because of its implications for the development of emotion and behavioral control (Patrick, Fowles, and Krueger, 2009), as well as its association with antisocial, violent, and criminal behavior (Coid, Yang, Ullrich, Roberts, & Hare, 2009; Skeem, Polaschek, Patrick, & Lilienfeld, 2011). During the past decade, callous-unemotional (CU) behaviors, a dimension of psychopathy that can be measured in middle (Frick & Viding, 2009; Hawes et al., 2014; Willoughby, Mills-Koonce, Waschbusch, & Gottfredson, & the Family Life Project Investigators, 2015) and early childhood (Hyde et al., 2013; Kimonis et al., in press; Willoughby, Mills-Koonce, Gottfredson, & Wagner, 2014; Willoughby, Waschbusch, Moore, & Propper, 2011), has been used to account for some of the clinical heterogeneity in child conduct problems (Rowe et al., 2010) and to predict later antisocial behavior and psychopathy (Frick & Viding, 2009). Although research on this topic is increasing, there remains a dearth of etiological studies of the development of comorbid conduct problems and CU

behaviors in younger children. The current study examined emotion recognition deficits, an impairment observed in adults and adolescents with elevated psychopathy and CU behaviors, in a sample of typically developing children and children with conduct problems and CU behaviors in middle childhood.

Whereas conduct problems (CP)—which subsume both oppositional defiant and conduct disorder behaviors—refer to angry, defiant, antisocial, aggressive, and norm-violating behaviors among children and adolescents (Kimonis, Frick, & McMahon, 2014; Lorber, 2004), CU behaviors refer to the affective component of psychopathy and are characterized by callousness, a lack of empathy, a lack of guilt, and shallow and/or deficient emotions (Frick, Ray, Thornton, & Kahn, 2014). As part of their impaired emotional processing capacities, both adults and adolescence with elevated psychopathic and/or CU behaviors demonstrate deficits in recognizing negative affect in others (Bagley, Abramowitz, & Kosson, 2009; Blair et al., 2004; Jusyte, Mayer, Künzel, Hautzinger, & Schönenberg, 2015). Impaired ability to recognize others' emotions may contribute to the association between psychopathy and antisocial behavior, such that people with psychopathic behaviors may not realize, or attend to, the negative consequences of their actions for others, allowing them to hurt others for their own gain without feeling badly (Blair, 2006). Although previous studies have examined associations between CU behaviors and emotion recognition deficits among older children and adolescents, very few studies have examined such associations in middle childhood. The current study examined group differences in facial emotion recognition among typically developing 2nd-grade children and those with CP with and without

elevated CU behaviors. To provide a basis for understanding why such emotion recognition impairments may exist for children with clinical CP and CU behaviors, we first describe neurological and developmental theories for human emotion recognition functioning. Next, due to the fact that most of the extant literature on this topic is based on adult and adolescent samples, we review the scientific literature on emotion recognition among those samples with elevated psychopathy, followed by a small but growing literature on emotion recognition among younger children with elevated CP and CU behaviors.

Neurocognitive and Developmental Perspectives of Emotion Recognition

Neurocognitive perspectives suggest that certain brain structures have significant effects on emotion recognition. In particular, amygdala structure and functioning have been strongly associated with emotional functioning and are thought to contribute to emotion recognition abilities (Adolphs, 2010; Phelps & LeDoux, 2005; Wang et al., 2014). Specifically, the amygdala may play an important role in the recognition and processing of threat-related stimuli and emotions, including fear (Fitzgerald, Angstadt, Jelsone, Nathan, & Phan, 2006; Phan, Wager, Taylor, & Liberzon, 2002; Phillips, Drevets, Rauch, & Lane, 2003). However, evidence also suggests that the amygdala affects general recognition of emotions (including happy, sad, angry, and disgusted expressions), not just fear (Fitzgerald et al., 2006, Yang et al., 2002). Thus, amygdalar structural and/or functional abnormalities—such as reduced or increased amygdala volume (Bio, Soerode-Souza, Garcia Otaduy, Machado-Vieira, & Moreno, 2013), limited or disrupted connectivity to other brain structures (Holmes et al., 2012), and atypical

activation in response to social and emotional stimuli (Sebastian et al., 2014)—likely confer deficits in emotion recognition.

Alternatively, experiential processes may play an important role in emotion recognition abilities. Environmental influences—such as interactions with parents, teachers, and peers throughout childhood—appear to influence children's developing emotional functioning, including emotion recognition (Izard et al., 2011; Johnson, 1992; Warren & Stifter, 2008). Emotion socialization processes occurring within parent–child interactions during infancy and early childhood—such as parents' emotion-related beliefs, labeling and teaching of emotions, and own emotion functioning and skills—may be particularly important for emotional functioning, as children learn about emotions explicitly and implicitly through such socialization (Castro, Halberstadt, Lozada, & Craig, 2015; Dunsmore, Her, Halberstadt, & Perez-Rivera, 2009). These emotion socialization processes may also transact with various child-level and environmental factors—including but not limited to child sex (Brody, 1985; Cunningham, Kliewer, & Garner, 2009), race and ethnicity (Garrett-Peters et al., 2008; Garrett-Peters et al., 2011), family socioeconomic status (Raver, Blair, Garrett-Peters, & The Family Life Project Key Investigators, 2015), and child maltreatment (Sullivan, Bennett, Carpenter, & Lewis, 2008)—to influence children's emotional functioning and recognition. It is important to note that the neurocognitive and experiential models of emotion recognition are not mutually exclusive of one another; in fact, as discussed below, they likely interact in the development of typical and atypical emotion recognition processes.

Models of Emotion Recognition Impairments Associated with Psychopathy and Callous-Unemotional Behaviors

In addition to relations with emotional functioning, amygdala dysfunction has been associated with psychopathic and CU behaviors (DeLisi, Umphress, & Vaughn, 2009) and may underlie the association between emotion recognition deficits and psychopathic and CU behaviors (Blair, 2003). Blair's (2006) Integrated Emotion Systems (IES) model suggests that genetically-mediated amygdala dysfunction is associated with specific deficits in attending to aversive stimuli, including recognizing fear and sadness. Blair posits that when antisocial behavior results in expressions of negative emotions in others, the antisocial behavior normally becomes inhibited in the future because it was hurtful to others and seeing other people's pain or fright is typically aversive to humans. However, when amygdala deficits preclude the recognition of these emotions in others, antisocial behavior is not inhibited because the immediate feedback of hurting others is not perceived (Blair, 2006). Although the IES model focuses on the importance of aversive stimuli for psychopathy, it is likely that such neuropsychological dysfunction affects emotional systems more broadly (e.g., general emotion recognition deficits; Blair, 2006), particularly given evidence that the amygdala may play a role in recognizing all emotions.

Dadds and colleagues (2011), on the other hand, propose a developmental model in which early amygdala dysfunction results in abnormal attention to socially-relevant stimuli, particularly the eyes, which then leads to deficits in emotion recognition. They argue that certain emotional expressions are recognized by attending to the most salient

part of the face, body, or voice (e.g. the eyes for fearful expressions or the mouth for happy expressions) and that amygdala dysfunction may lead to cascading interactions characterized by reduced eye contact with caregivers as early as infancy, which in turn may lead emotion recognition deficits that foster the early emergence of CU behaviors in childhood. Similar to Blair (2006), these emotion recognition deficits are thought to lead to subsequent externalizing behaviors (and eventually antisocial behaviors), due to missed signals of negative affect from others. Although Dadds and colleagues (2011) also focus on aversive stimuli (i.e., fear and sadness), lack of attention to the most socially-relevant emotional cues may result in emotion recognition deficits across all emotion expressions, with fear recognition perhaps being the most affected. Empirical studies (reviewed below) examining psychopathic (among adults, adolescents, and older children) and CU (among children and adolescents) behaviors have demonstrated support for both specific deficits in fear and sadness recognition and in general emotion recognition deficits.

Psychopathic Behaviors and Types of Emotion Recognition Deficits

Using computerized tasks that show various emotional expressions in faces (i.e., happiness, sadness, surprise, fear, anger, and disgust), several studies have found specific deficits in fear recognition among adults (Blair et al., 2004; Del Gaizo & Falkenbach, 2008; Montagne et al., 2005) and children/adolescents (Blair & Coles, 2000; Blair, Colledge, Murray, & Mitchell, 2001; Blair, Budhani, Colledge, & Scott, 2005; Lemos Vasconcellos, Salvador-Silva, Gauer, & Gauer, 2014; Stevens, Charman, & Blair, 2001; Stanković, Nešić, Obrenović, Stojanović, & Milošević, 2015) with psychopathic

behaviors. In a sample of incarcerated, adult males, Blair and colleagues (2004) found that those high in psychopathic behaviors were less sensitive to faces that morphed gradually from neutral expressions to 100% intensity fearful expressions, such that they recognized fear later than did offenders without psychopathic behaviors. Furthermore, offenders high in psychopathic behaviors made more errors in recognizing 100% intensity fearful faces than did non-psychopathic offenders (Blair et al., 2004). In similar studies with community samples of adult college students, psychopathic behaviors have also been negatively associated with facial fear recognition (Del Gaizo & Falkenbach, 2008; Montagne et al., 2005).

Deficits have not only been found in fear recognition, but also in sadness recognition (Blair & Coles, 2000; Blair et al., 2001; Dolan & Fullam, 2006; Fairchild, Stobbe, van Goozen, Calder, & Goodyer, 2010; Stevens et al., 2001). Deficits in recognition of vocal affect have also been previously measured. For example, Stevens and colleagues (2001) found that pre-adolescent and adolescent males (9-15 years old) with psychopathic tendencies were less able than males without psychopathic tendencies to recognize fearful and sad *facial* expressions, as well as sad *vocal* expression (but not fearful vocal expression). Conversely, Blair and colleagues (2005) found that adolescent males with psychopathic tendencies were less able than males without such tendencies to recognize fearful vocal affect, but not sad vocal affect.

Multiple studies have found deficits in recognizing emotions other than fear and sadness associated with psychopathic behaviors (Bagley et al., 2009; Fairchild, van Goozen, Calder, Stollery, & Goodyer, 2009; Prado, Treeby, & Crowe, 2015). Notably,

Fairchild and colleagues (2009) found that adolescents with conduct disorder (CD) and high psychopathic behaviors showed deficits in recognition of surprised faces—in addition to fearful and sad faces—compared to children without CD and psychopathic behaviors. In a study that examined recognition of vocal affect, Bagley and colleagues (2009) found that incarcerated, adult, male offenders with psychopathic behaviors showed deficits in overall vocal emotion recognition, as well as specific deficits in recognizing happiness, sadness, and surprise; however, fear recognition was not measured. Findings across the empirical literature suggest that psychopathic behaviors may be associated with overall deficits in emotion recognition, as well as potential specific deficits in fear and sadness recognition.

Callous-Unemotional Behaviors and Types of Emotion Recognition Deficits

As compared to studies of psychopathy, considerably fewer studies have examined associations between CU behaviors and emotion recognition deficits, but there is some limited support for both specific emotion deficits. A recent study from Jusyte and colleagues (2015) found that CU behaviors among incarcerated adolescent and young adults, violent offenders were negatively associated with speed of processing of fearful faces, but not other emotional faces (Jusyte et al., 2015). Three studies conducted by Dadds and colleagues have used eye-tracking to examine looking behavior and its association with emotion recognition deficits among children with psychopathic and CU behaviors (Dadds, El Masry, Wimalaweera, & Guastella, 2008; Dadds et al., 2011; Dadds et al., 2006). In the first two studies (Dadds et al., 2008; Dadds et al., 2006), CU behaviors were negatively associated with fear recognition and with focus on the eye

region of the face among boys and adolescent males (8-17 years old). When the participants were instructed to focus on the eye region of the face, the negative association between CU and fear recognition was temporarily attenuated (Dadds et al., 2008; Dadds et al., 2006). These findings suggest that lack of attention to social-relevant stimuli (e.g. the eyes) may, at least in part, account for deficits in emotion recognition, particularly for fearful expressions. Furthermore, teaching people high in CU behaviors to focus on the eyes of others may be a potential intervention for decreasing antisocial behavior.

In a third study, Dadds and colleagues (2011) examined eye contact with attachment figures (i.e., mothers and fathers) during free-play and emotion-talk laboratory tasks among boys and adolescent males (5-16 years old) with conduct problems (CP), CD, and oppositional-defiant disorder (ODD). They found that CU behaviors were negatively associated with eye contact during laboratory free-play and emotion-talk tasks, and that eye contact with fathers was negatively associated with accurate fear recognition. Thus, boys high in CU behaviors showed less eye contact and that low eye contact (with fathers only) was associated with deficits in fear recognition (Dadds et al., 2011). Given these findings, it may be that deficits in psychopathy-related emotion recognition result, developmentally, from a lack of eye contact with parents during childhood. The cross-sectional nature of Dadds and colleagues' (2011) sample and its wide age range, however, make inferring this childhood predictor difficult. Nonetheless, the findings across these three studies by Dadds and colleagues indicate that

attention to socially-relevant stimuli—the eyes in particular—may play an important role in emotion recognition.

General deficits in emotion recognition have also been partially supported by the limited research on CU behaviors (Muñoz, 2009; Sharp, Vanwoerden, Van Baardewijk, Tackett, & Stegge, 2014; Kimonis et al, 2015). For example, two studies by Muñoz Centifanti and colleagues (Muñoz, 2009; Wolf & Muñoz Centifanti, 2014) examined emotion recognition of faces and body postures during late childhood and adolescence, finding that CU behaviors were negatively associated with recognition of fearful, angry, and painful faces; as well as fearful and angry body postures. Interestingly, though, CU behaviors were also positively associated with recognition of happy body postures and postures displaying disgust (Wolf & Muñoz Centifanti, 2014). These findings, similar to that of the psychopathy literature, suggest that emotion recognition deficits related to CU behaviors may be generalized to various emotions and that such deficits are not limited to facial expressions of emotion. In the only study, to date, that has examined associations between CU behaviors and emotion recognition exclusively among young children, Kimonis and colleagues (2015) found that preschool-aged children with high CU behaviors showed poorer recognition of angry, fearful, happy, and sad facial expressions than children with low CU behaviors. Thus, emotion recognition deficits associated with CU behaviors seem to be present early in development. However, more research is needed to replicate these findings in early childhood and to determine whether such deficits are specific or general.

Contradictory and Meta-Analytic Evidence

Some studies have found contradictory trends to the previously reviewed research. Although there are few such studies, they are worth mentioning in order to demonstrate the degree to which the underlying processes of psychopathic and CU behaviors in relation to emotion recognition are unknown. For example, in a study comparing adult, male offenders with psychopathic behaviors to non-offenders without psychopathic behaviors, Pham and Phillippot (2010) found no differences in emotion recognition between the two groups. More directly contradicting previously mentioned studies, Bowen, Morgan, Moore, and van Goozen (2014) found that adolescent, male offenders with psychopathic behaviors showed *better* recognition of fearful faces than did non-offending males. Likewise, girls and adolescent females (8-17 years old) with high CP and CU behaviors have also shown greater accuracy in recognizing fearful faces compared to girls without CP and CU behaviors (Schwenck et al., 2014). Finally, Woodworth and Willoughby (2008) found that boys and girls (7-13 years old) with high CP and CU behaviors showed a marginally significant trend toward greater accuracy in recognizing fearful faces, as compared to children with CP and low CU behaviors. Taken together, these findings suggest that people with psychopathic or CU behaviors may not show deficits in recognizing fear, but rather have a heightened ability to recognize fear. It is possible that people with psychopathic behaviors may recognize fear in other people, and in doing so, may be better able to exploit their vulnerability for their own gain. This mechanism would certainly fit the descriptions of callousness and lack of remorse typically associated with psychopathy.

Despite such null findings, a recent meta-analysis of 26 studies (many of which have been discussed in the current review) by Dawel and colleagues (2012) found that psychopathy was associated with general impairments across the six "basic" emotions (i.e., happiness, sadness, surprise, fear, anger, and disgust; Dawel et al., 2012). Interestingly, this finding remained when fear and sadness were removed from analyses, adding strength to the suggested presence of a general deficit in emotion recognition. In addition, deficits were seen in individual emotions—including fear, happiness, and surprise (for facial and vocal expressions) and sadness (for facial expressions only; Dawel et al., 2012). These meta-analytic findings largely provide support for the presence of a general deficit, as emotion recognition accuracy was lower across various emotions among people with psychopathic and CU behaviors. However, given the number of studies that have found specific fear and sadness deficits, consideration and further study of both models (i.e. models of general and specific emotion recognition deficits) remains necessary to better understand CU-related emotion recognition deficits.

Gaps and Limitations

As has been demonstrated in the preceding sections, the findings on psychopathy-related emotion recognition deficits are decidedly mixed. Although the meta-analysis by Dawel and colleagues (2012) seems to have reduced some ambiguity, the nature of the association between psychopathic and CU behaviors and emotion recognition remains unclear. This is partially due to a number of limitations within the previous studies conducted. First, a majority of studies on this topic have relied on small samples. Although a handful of studies have achieved samples of 100 or more participants (Bagley

et al., 2009; Bowen et al., 2014; Dadds et al., 2008; Del Gaizo & Falkenbach; Fairchild et al., 2009), most have relied on samples less than 100 participants and as few as 30 participants (Jones et al., 2009). Reliance on such small samples makes the detection of effects and generalizability of findings difficult. It should be noted, however, that researchers may be forced to use small samples in psychopathy and CU research because only about 1% of the general population shows psychopathic behaviors (Neumann & Hare, 2008). As such, recruiting samples that have adequate numbers of participants showing high psychopathic and/or CU behaviors to detect effects is a major methodological challenge.

From a similar sampling perspective, few previous studies have focused on psychopathy- and CU-related emotion recognition among females. To our knowledge, only two studies have focused solely on CU behaviors and emotion recognition among females (Fairchild et al., 2010; Schwenck et al., 2014). Although other studies have included females in their samples, most have focused only on males—particularly among adult offender samples (Bagley et al., 2009; Blair et al., 2004; Dolan & Fullam, 2006; Pham & Phillippot, 2010). This is likely because theories on psychopathy have traditionally focused on males and psychopathy is thought to be more prevalent among males (Skeem et al., 2011). Consequently, findings across studies on emotion recognition may not generalize well to females with psychopathic and CU behaviors.

Finally, and perhaps most importantly, previous studies have rarely focused on the early childhood etiology of psychopathy-related emotion recognition deficits and the developmental processes through which such deficits emerge. Although CU behaviors

can be observed in children as young as three years old, only three emotion recognition studies, to date, have recruited samples of young children (Dadds et al., 2011; Kimonis et al., 2015; Woodworth & Willoughby, 2008). However, these Dadds and colleagues (2011) and Woodworth and Willoughby (2008) recruited samples with wide age ranges extending into adolescence. As a result, the presence of emotion recognition deficits in early childhood could not be accurately assessed. By focusing primarily on late childhood, adolescence, and adulthood, the extant literature has not adequately addressed the developmental processes through which emotion recognition deficits occur and, thus, cannot adequately understand the mixed findings among adolescents and adults.

Current Study

The current study used a large and diverse sample of elementary-school age children to examine facial emotion recognition abilities among children characterized by high and low levels of CP and CU behaviors. Based on maternal reports collected during the 1st grade year, children were classified as either having low levels of CP (a developmentally typical group), high levels of CP and low levels of CU behaviors (a CP-only group), or high levels of CP and high levels of CU behaviors (a CP+CU group). Based on previous analyses with this sample (Willoughby et al., 2015) elevated CU behaviors were defined and analyzed based on two dimensions of CU behaviors—low empathic-prosocial behaviors and high callous behaviors (described in the Methods section below). In second grade, children were asked to complete a computerized emotion recognition task during which children identified emotions from facial expressions that progressed from neutral to prototypical across four rounds. Based on

previous studies with older children and children in this age range, it was hypothesized that typically developing children would demonstrate better overall facial emotion recognition accuracy than children with high levels of CP. Furthermore, it was hypothesized that children with both high CP and high CU behaviors would demonstrate the greatest deficits in emotion recognition. For specific emotion presentations, it was hypothesized that the children with both high levels of CP and CU behaviors would have significantly worse accuracy in the recognition of facial expressions of fear and sadness, as compared to all other children. No differential hypotheses were made for groups defined by the "low empathic-prosocial" versus "high callous" dimensions of CU behaviors. Furthermore, no specific hypotheses are made with regard to variation in group differences as a function of child sex, child race, or family income. However, interactions between child CP/CU groups and demographic factors were also examined, given that children's emotional development, emotion recognition abilities, and externalizing behavior may vary by child sex (Cunningham et al., 2009; Maxim & Nowicki, 2003), child race (Garrett-Peters et al., 2008, 2011), and family income (Raver et al., 2015; Shelleby et al., 2014).

CHAPTER II

METHODS

Participants

The Family Life Project (FLP) is a birth cohort study of children and families living in two areas of high child poverty in the United States (three counties each in Eastern North Carolina and Central Pennsylvania). The FLP used a random stratified sampling framework to recruit a representative sample of 1,292 families recruited across a 12-month period from September 2003 through August 2004. Further details on the FLP recruitment procedures and sample can be found in Willoughby and colleagues (2013) and Garrett-Peters and Mills-Koonce (2013). A subsample of 815 children (411 boys, 416 girls; 468 European American, 351 African American) with complete data for caregiver report of CP and CU behaviors and complete emotion recognition data were used for the current study. See Tables 1-3 for a cross-tabulation of child CP/CU groups across race, sex, and family income levels.[1]

Procedures

When children were in 1st grade, primary caregivers were asked to report on children's levels of conduct problems and CU behaviors during a home data collection

[1] Group formation (and subsequent analyses) are based on three methods of grouping children, as a product of using two different dimensions of CU behaviors to identify elevated CU. Because of this, some children may be classified as CU-only (and removed from analyses) or CP+CU based on one dimension, while other children are classified as CU-only or CP+CU using the other dimension. The result is slightly different distributions of group memberships across demographic variables for each method of grouping.

visit. When children were in 2nd grade, they completed a computerized emotion recognition task as part of a school-based assessment. Children were briefly pulled out of class to complete the tasks in a room designated for assessment at the schools.

Measures

Conduct Problems and Callous-Unemotional Behaviors. Levels of CP were rated by caregivers using the Disruptive Behavior Disorder Rating Scale (DBDRS; Pelham, Gnagy, Greenslade, & Milich, 1992), a DSM-IV guided rating scale that includes subscales for assessing conduct problems (including oppositional defiance and conduct disorder behaviors). The validity of the DBDRS has been previously established (Pelletier, Collett, Gimpel, & Crowley, 2006) and the internal consistency for the conduct problem composite for this sample was high (a = .92). Callous-unemotional behaviors were assessed with the Inventory of Callous-Unemotional traits (ICU; Essau, Sasagawa, & Frick, 2006), a series of 24 items on a 4-point Likert scale developed from other highly established clinical assessments (e.g., APSD, PCL-YV). Initial investigations into the factor structure of the ICU suggested a bifactor model, which included a general factor on which all items loaded and three specific subfactors (i.e., callous, uncaring, and unemotional) and demonstrated limited consistency across ages and cultures (Essau et al., 2006; Fanti, Frick, & Georgiou, 2009; Roose, Bijttebier, Claes, & Lilienfeld, 2011). However, more recent work has reported mixed results regarding the factor structure of the ICU, with researchers providing evidence for models ranging between two and five factors (Feilhauer, Cima, & Arntz, 2012; Kahn, Byrd, & Pardini, 2013; Kimonis, Branch, Hagman, Graham, & Miller, 2013). Willoughby and colleagues (2015) recently used

confirmatory factor analysis to test the factor structure of the ICU using the FLP sample and findings indicated that CU behaviors are best represented in the this data using a two-factor model that distinguishes empathic-prosocial (EP) and callous behaviors. The EP and callous factors were shown to be moderately negatively correlated and were primarily delineated by the positively and negatively worded items, which is consistent with published findings in other samples (Hawes et al., 2014; Houghton, Hunter, & Crow, 2013).

Given the factor analytic findings with FLP sample, the current study examined group differences in emotion recognition accuracy based on CP symptoms and both EP and callous behaviors. Following clinical guidelines, children were designated as having high CP if their primary caregiver reported three or more conduct disorder symptoms and/or four or more oppositional defiant disorder symptoms on the DBDRS (other children were designated as low CP). Children were designated as having low EP behaviors if they scored in the 10^{th} percentile or below based on caregivers' reports on the ICU. Children were designated as showing high callous behaviors if they scored in the 90^{th} percentile or above based on caregivers' reports on the ICU. As such, three groups were created using CP and low EP criteria (typical [low CP, high EP]; CP-only [high CP, high EP]; and CP+CU [high CP, low EP]) and three groups were created using CP and high callous criteria (typical [low CP, low callousness]; CP-only [high CP, low callousnesss]; and CP+CU [high CP, high callousness]). In addition, groups were created using both ICU dimensions in order to examine whether children qualifying as high CU according to both criteria (EP and callous) showed greater emotion recognition deficits

than children qualifying as high CU based on only one dimension. Thus, five groups were created using the combined dimensions: (1) typical, (2) CP-only, (3) CP+CU-EP, (4) CP+CU-callous, and (5) CP+CU-both. Although some children did fit into CU-only groups (low CP, high EP or low CP, high CU), this group was excluded from analyses to be consistent with DSM-V criteria for conduct disorder, which includes only a specifier for CU behaviors but not an independent diagnosis of callous-unemotionality or psychopathy in childhood (American Psychiatric Association, 2013).

Emotion Recognition Accuracy. Emotion recognition accuracy was assessed using a computerized task, the Increasingly Clear Emotions task (ICE; Halberstadt, Leary, Garrett-Peters, Lozada, & Sibley, 2011). To create the ICE task, adults' facial expressions were video recorded while they shifted from neutral expressions to prototypical emotional expressions. These recordings were then split into 7 still images, with the first image depicting a neutral expression and progressing to the seventh image depicting a fully prototypical expression. The video recordings were of 20 different adults (half female), with equal representation of African Americans and European Americans within sex. Five emotions were represented within sex and ethnicity (anger, sadness, happiness, fear, surprise). Photographs were full head shots; 13 were taken from Cohn-Kanade AU-Coded Facial Expression Database (Lucey, Cohn, Kanade, Sarigh, Ambadar, & Matthews, 2010), and were supplemented by the recruitment of 7 African American actors. All faces were judged by 20 adults (10 European Americans, 10 African Americans balanced across sex) for neutrality and prototypicality. Children were asked to choose via a forced-choice response format to determine which of the five

emotions (angry, sad, happy, afraid, surprised) was expressed by the actor and viewed all 20 faces in each round before proceeding to the next level of expressive intensity. All image sequences within a round were randomized and similar in the stage (level of prototypicality) of the emotion expressiveness. The first round in which participants viewed neutral faces was dropped because the facial expressions were, in fact, neutral, and participants were unable to distinguish among the emotions. In an effort to reduce the length of the task and maintain children's engagement and focus, the next-hardest sequence was removed for children as well, as was the final round (full prototypical expression) because of ceiling effects. Thus, children viewed four rounds (rounds 3, 4, 5, and 6) of the expressions as they became increasingly clear from neutral to prototypical. Children's overall accuracy (across all rounds and emotions) and individual emotion accuracy were examined in association with CP/CU group membership.

Additional Covariates. Child sex, child race, family income-to-needs ratio (total household income divided by the 2005 federal poverty threshold), and primary caregivers' number of years of education were reported by primary caregivers when they were recruited at the time of their child's birth (and confirmed at each FLP home visit). These variables, along with children's age when they completed the ICE task, were used as covariates in the analyses.

Analysis Plan

Differences in emotion recognition accuracy were examined as a function of child CP/CU groups using a series of univariate and multivariate ANOVAs. We first examined group differences based on groups derived from the empathic-prosocial dimension of the

ICU; we next examined group differences based on groups derived from the callous dimension of the ICU; and finally, we examined group differences based on groups derived from both dimensions of the ICU. Because of the large number of group contrasts, Benjamini-Hochberg corrections were used to reduce false discovery rates. Benjamini-Hochberg corrections uses a stepwise, adaptive procedure by controlling for the expected ratio of the number of erroneous rejections of the null hypothesis to the actual number of rejections, which allows for greater power than techniques that control the familywise Type I error rate, such as the Bonferroni procedure (Benjamini & Hochberg, 2000; Thissen, Steinber, & Kuang, 2002). Analyses proceeded in two steps. The first step examined CP/CU group differences in overall emotion recognition accuracy collapsed across all emotions and across all rounds of assessment. Within this step, models were examined first for main effects, and then examined with the inclusion of interactions between CP/CU groups and child sex, child race, and family income-to-needs ratio. Significant interactions were probed by examining CP/CU group differences separately within demographic groups. The second step examined CP/CU group differences for each emotion presentation (happiness, surprise, anger, sadness, and fear) collapsed across all rounds of the ICE task. Within this step, models were examined first for main effects, and then be examined with the inclusion of interactions between CP/CU groups and child sex, child race, and family income-to-needs ratio. Significant interactions were probed by examining CP/CU group differences separately within demographic groups. Convergent and divergent findings across these three methods of creating the CP/CU groups will be highlighted.

CHAPTER III

RESULTS

Descriptive Statistics

Table 4 presents the bivariate correlations, means, and standard deviations among focal study variables and covariates. Overall accuracy on the ICE task was positively associated with EP behaviors and negatively associated with callous behavior and conduct problems. Conduct problems were negatively associated with child EP behaviors and positively associated with callous behaviors, and the latter two were also negatively correlated. Child race was not significantly associated with overall ICE accuracy or conduct problems, but African American (AA) children were more rated as having lower EP behaviors and higher callous behaviors than European American (EA) children. Child sex was not associated with conduct problems or callous behaviors, but female children were rated as having more EP behaviors and had higher overall ICE accuracy scores than male children.

CP/CU Group Differences Based on the EP Dimension of the ICU

Overall Emotion Recognition Accuracy. Model 1 examined the main effects of demographic variables and CP/CU group membership. Significant main effects were found for CP/CU group, $F(2, 807) = 3.75$, $p = .024$, child race, $F(1, 807) = 13.84$, $p < .001$, and child sex, $F(1, 807) = 11.17$, $p = .001$. Although there was a significant main effect of CP/CU group found, no pairwise differences between groups were found when

the Benjamini-Hochberg procedure was used. African American children had better accuracy than European American children (Cohen's $d = 0.13$) and female children had better accuracy than male children (Cohen's $d = 0.10$).

Next, in Model 2, the interactions between CP/CU group and demographic variables were examined. The interaction between CP/CU group and child race was significant, $F(2, 801) = 6.04$, $p = .002$; the interactions between CP/CU group and child sex and CP/CU group and family income were not significant.[2] After trimming the non-significant interactions from the model, the CP/CU group x race interaction remained significant. Table 5 presents the adjusted CP/CU group means (indexed using the EP dimension of the ICU) for overall emotion recognition accuracy separately for EA and AA children. Among EA children, children in the typical group scored significantly higher on overall emotion recognition accuracy than children in the CP-only (Cohen's $d = 1.01$) and CP+CU groups (Cohen's $d = 0.83$), whereas the CP-only and CP+CU groups did not differ significantly from one another. Among AA children, however, there were no significant CP/CU group differences in overall emotion recognition accuracy.

Emotion Recognition Accuracy by Facial Expression. Model 3 used a multivariate ANOVA procedure to assess children's accuracy within facial emotion expressions. Significant multivariate main effects were found for child race, $F(5, 803) = 12.05$, $p < .001$, and child sex, $F(5, 803) = 3.17$, $p = .008$, but not for CP/CU group. For

[2] We also conducted analyses examining same race bias for the facial expressions and whether this was associated with differences among the CP/CU groups. We found that, for all analyses, the race of the faces presented did not significantly moderate the associations among CP/CU group, child race, and emotion recognition accuracy, suggesting that child race, rather than race of faces presented, was key in differentiating between EA and AA children.

fear recognition, no significant main effects of child race or child sex were found. For anger recognition, a significant main effect of child race was found, $F(1, 807) = 18.53$, $p < .001$, with AA children performing more accurately than EA children (Cohen's $d = 0.16$), but no significant effects of child sex were found. For happiness recognition, significant main effects of child race, $F(1, 807) = 4.10$, $p = .043$, and child sex, $F(1, 807) = 9.35$, $p = .002$, with AA children performing more accurately than EA children (Cohen's $d = 0.07$) and girls performing more accurately than boys (Cohen's $d = 0.10$). For sadness recognition, a significant main effect was found for child race, $F(1, 807) = 21.88$, $p < .001$, with AA children performing more accurately than EA children (Cohen's $d = 0.16$), but there was no effect of child sex found. For surprise recognition, significant main effects were found for child race, $F(1, 807) = 6.39$, $p = .012$, and child sex, $F(1, 807) = 8.81$, $p = .003$, with EA children performing more accurately than AA children (Cohen's $d = 0.09$) and girls performing more accurately than boys (Cohen's $d = 0.10$).

Next, in Model 4 the interactions between CP/CU group and demographic variables were examined. A significant multivariate interaction between CP/CU group and child race was found, $F(10, 1596) = 2.54$, $p = .005$, whereas the interactions between CP/CU group and child sex and CP/CU group and family income were not significant. Significant univariate interactions between CP/CU group and child race were found for fear, $F(2, 801) = 3.02$, $p = .049$ and happiness recognition, $F(2, 801) = 7.26$, $p = .001$. After trimming the non-significant interactions from the model, the CP/CU by child race interactions for fear and happiness recognition remained significant and a marginally significant interaction for surprise recognition emerged, $F(2, 805) = 2.681$, $p = .069$.

Probing the significant interactions revealed that, among EA children, children in the typical group showed greater accuracy than children in the CP-only group for fear and happiness recognition (Cohen's d = 0.90 and 1.08, respectively), whereas children in the CP+CU group did not differ significantly than children in either the typical or CP-only groups. No group differences were found among AA children. For surprise recognition, no differences between CP/CU groups emerged when probing using the Benjamini-Hochberg procedure, despite the marginally significant interaction found. No significant interactions emerged for anger or sadness recognition.

CP/CU Group Differences Based on the Callous Dimension of the ICU

Overall Emotion Recognition Accuracy. Model 5 examined the main effects of demographic variables and CP/CU group membership. Significant main effects of CP/CU group, $F(2, 807) = 4.70$, $p < .009$, child race, $F(1, 807) = 15.76$, $p < .001$, and child sex, $F(1, 807) = 13.49$, $p < .001$, were found. Children in the typical group performed more accurately than children in the CP+CU group (Cohen's d = 0.54), whereas children in the CP-only group did not differ significantly from children in either the typical or CP+CU groups. African American children performed more accurately than EA children (Cohen's d = 0.14), and female children performed more accurately than male children (Cohen's d = 0.12).

Next, in Model 6, the interactions between CP/CU group and demographic variables were examined. Significant interactions were found between CP/CU group and child race, $F(2, 801) = 7.39$, $p = .001$, and between CP/CU group and child sex, $F(2, 801) = 3.86$, $p = .022$, but not between CP/CU group and family income. After trimming the

non-significant interaction from the model, the CP/CU group x child race and CP/CU x child sex interactions remained significant. Table 6 presents the adjusted CP/CU group means (defined by the callous dimension of the ICU) for overall emotion recognition accuracy for both EA and AA children. Among EA children, children in the typical group scored significantly higher on overall emotion recognition accuracy compared to children in the CP-only (Cohen's $d = 1.27$) and CP+CU groups (Cohen's $d = 0.82$), whereas children in the CP-only and CP+CU groups did not differ significantly from one another. Among AA children there were no significant CP/CU group differences. This pattern of results in comparable to the pattern found among CP/CU groups created using the EP dimension of the ICU. Table 7 presents the adjusted CP/CU group means (defined by the callous dimension of the ICU) for overall emotion recognition accuracy for both boys and girls. Among boys, children in the typical group performed more accurately on overall emotion accuracy than children in the CP+CU group (Cohen's $d = 0.62$), whereas children in the CP-only group did not differ significantly from children in either the typical or CP+CU groups. There were no significant CP/CU group differences found among girls.

Emotion Recognition Accuracy by Facial Expression. Model 7 used a multivariate ANOVA to assess CP/CU group differences in children's emotion recognition accuracy within facial emotion expressions (happiness, surprise, anger, sadness, and fear). Significant multivariate main effects were found for child race, $F(5, 803) = 12.40$, $p < .001$, and child sex, $F(5, 803) = 3.79$, $p = .002$, but not for CP/CU group. For fear recognition, a significant main effect of child race was found, $F(1, 807) =$

4.07, $p = .044$, with AA children performing more accurately than EA children (Cohen's $d = 0.07$), whereas no significant effect was found for child sex. For anger recognition, a significant main effect of child race was found, $F(1, 807) = 17.45$, $p < .001$, with AA children performing more accurately than EA children (Cohen's $d = 0.15$), whereas no significant effect was found for child sex. For happiness recognition, a significant main effect was found for child sex, $F(1, 807) = 9.62$, $p = .002$, with girls performing more accurately than boys (Cohen's $d = 0.10$), and a marginally significant effect of child race was found, $F(1, 807) = 2.96$, $p = .086$, with AA children performing more accurately than EA children (Cohen's $d = 0.06$). For sadness recognition, a significant main effect of child race was found, $F(1, 807) = 24.64$, $p < .001$, with AA children performing more accurately than EA children (Cohen's $d = 0.17$), whereas there was no significant main effect of child sex found for sadness recognition. For surprise recognition, significant main effects were found for child race, $F(1, 807) = 6.94$, $p = .009$, and child sex, $F(1, 807) = 12.01$, $p = .001$, with EA children performing more accurately than AA children (Cohen's $d = 0.09$) and girls more accurately than boys (Cohen's $d = 0.11$).

Next, in Model 8, the interactions between CP/CU group and demographic variables were examined. A significant multivariate interaction between CP/CU group and child race was found, $F(10, 1596) = 2.36$, $p = .009$, whereas the interactions between CP/CU group and child sex and CP/CU group and family income were not significant. A significant interaction between CP/CU group and child race was found for happiness recognition, $F(2, 801) = 7.84$, $p < .001$, and a marginally significant effect was found for anger recognition, $F(2, 801) = 2.86$, $p = .058$, whereas no CP/CU x child race interactions

were found for fear, sadness, or surprise. After trimming the non-significant interactions from the model, the CP/CU group x child race interactions for happiness and anger recognition remained significant, but the previously significant effect of child race for surprise recognition was reduced to non-significance, $F(1, 805) = .005$, $p = .942$. Probing the interactions for anger and happiness recognition revealed that, among EA children, children in the typical group performed more accurately than children in the CP-only (Cohen's $d = 1.21$) and CP+CU (Cohen's $d = 0.60$) groups for happiness recognition, whereas children in the CP-only and CP+CU groups did not significantly differ from one another. No group differences were found among AA children for happiness recognition. For anger recognition, no group differences emerged for EA or AA children. This pattern of results, for happiness recognition, is comparable to the pattern found among CP/CU groups created using the EP dimension of the ICU.

CP/CU Group Differences Based on both Dimensions of the ICU

In order to examine whether children qualifying as CP+CU based on one of the ICU dimensions, versus one, would show greater emotion recognition deficits than other children, five groups were created using both dimensions simultaneously: (1) typical, (2) CP-only, (3) CP+CU-EP, (4) CP+CU-callous, and (5) CP+CU-both. However, when this grouping method was used and moderation by covariates was examined (described below), extremely small group sizes resulted for the CP+CU-EP and CP+CU-callous groups resulted (e.g., n = 2 for EA children in the CP+CU-EP group). Therefore, when reporting these results, we only discuss differences among the typical, CP-only, and

CP+CU-both groups because they have more adequate group sizes for making comparisons.

Overall Emotion Recognition. Model 9 examined the main effects of demographic variables and CP/CU group membership. Significant main effects were found for CP/CU group, $F(4, 751) = 2.72$, $p = .029$, child race, $F(1, 751) = 14.05$, $p < .001$, and child sex, $F(1, 807) = 11.60$, $p = .001$. When group differences were examined, children in the typical, CP-only, and CP+CU-both groups did not perform significantly different from one another. African American children performed more accurately than EA children (Cohen's $d = 0.11$) and female children performed more accurately than male children (Cohen's $d = 0.18$).

Next, in Model 10, the interactions between CP/CU group and demographic variables were examined. A significant interaction was found between CP/CU group and child race, $F(4, 739) = 3.46$, $p = .008$. After trimming the non-significant interactions from the model, the CP/CU group x child race interaction remained significant. Table 8 presents the adjusted CP/CU group means (defined by both dimension of the ICU) for overall emotion recognition accuracy for both EA and AA children. Among EA children, children in the typical group scored significantly higher on overall emotion recognition compared to children in CP-only (Cohen's $d = 1.17$) and CP+CU-both groups (Cohen's $d = 0.74$), whereas children in the CP-only and CP+CU-both groups did not differ significantly from one another. Among AA children there were no significant CP/CU group differences. This pattern of results for overall emotion recognition is consistent

with the pattern of results found among groups created using the EP and callous dimensions of the ICU individually.

Emotion Recognition Accuracy by Facial Expression. Model 11 used a multivariate ANOVA to assess CP/CU group differences in children's emotion recognition accuracy within facial emotion expressions. Significant multivariate main effects were found for child race, $F(5, 747) = 10.92$, $p < .001$, and child sex, $F(5, 747) = 3.43$, $p = .004$, but not for CP/CU group. For fear recognition, a marginally significant main effect was found for race, $F(1, 751) = 3.29$, $p = .07$, but no significant effect was found for child sex. When pairwise differences for race were examined, EA and AA children did not significantly differ in their fear accuracy. For anger recognition, there was a significant main effect found for child race, $F(1, 751) = 16.68$, $p < .001$, with AA children performing better than EA children (Cohen's $d = 0.12$), but no significant effect was found for child sex. For happiness recognition, a marginally significant main effect was found for child race, $F(1, 751) = 3.05$, $p = .081$, whereas a significant main effect was found for child sex, $F(1, 751) = 10.83$, $p = .001$. When pairwise differences were examined, girls performed better at happiness recognition than boys (Cohen's $d = 0.09$), but not differences were found between EA and AA children. For sadness recognition, a significant main effect for child race was found, $F(1, 751) = 20.67$, $p < .001$, with AA children performing better than EA children (Cohen's $d = 0.13$), but no significant effect was found for child sex. For surprise recognition, significant main effects were found for child race, $F(1, 751) = 6.19$, $p = .013$, and child sex, $F(1, 751) = 9.77$, $p = .002$, with EA

children performing better than AA children (Cohen's $d = 0.07$) and girls better than boys (Cohen's $d = 0.08$).

Next, in Model 12, the interactions between CP/CU group and demographic variables were examined. A significant multivariate interaction between CP/CU group and child race was found, $F(20, 2952) = 1.74$, $p = .021$, whereas the interactions between CP/CU group and child sex and CP/CU group and family income were not significant. A significant univariate interaction between CP/CU group and child race was found for happiness recognition, $F(4, 739) = 4.57$, $p = .001$, whereas no interactions were found for fear, anger, sadness, or surprise recognition. After trimming the non-significant interactions from the model, the CP/CU group x child race interaction for happiness recognition remained significant and marginally significant interaction was revealed for fear recognition, $F(4, 747) = 2.04$, $p = .087$. Table 8 presents the adjusted CP/CU group means (defined by both dimensions of the ICU) for individual emotion recognition accuracy for both EA and AA children. Probing the interactions for fear and happiness recognition revealed that, among EA children, children in the typical group performed more accurately than children in the CP-only group (Cohen's $d = 0.91$) for happiness recognition, whereas children in the CP+CU-both groups did not significantly differ from either the typical or CP-only groups. No group differences were found among AA children for happiness recognition. For fear recognition, no group differences emerged among EA or AA children. This pattern of results, for happiness recognition is comparable to the pattern found among CP/CU groups created using the EP and callous dimensions of the ICU individually.

CHAPTER IV

DISCUSSION

The current study is one of the first to examine emotion recognition accuracy among young children with CP and CU behaviors. Although it was hypothesized that CP/CU group differences in emotion recognition would be found among all children, results indicated these group differences among typical children, children with CP-only, and children with CP+CU were moderated by child race. Specifically, CP/CU group differences in overall emotion recognition accuracy were found only among EA children, but not among AA children, with children in the typical group generally showing better accuracy than children in the CP-only and CP+CU groups. In addition, CP/CU group differences were found for recognition of fearful and happy faces among EA children, but not AA children, with children in the typical group showing better accuracy than children in the CP-only (using ICU EP dimension) and CP+CU (using ICU callous dimension) groups. Partial support for moderation by child sex was also found when using the callous dimension of the ICU. Specifically, boys in the typical group performed better on overall emotion recognition accuracy than boys in the CP+CU group, whereas no group differences were found among girls. Although these results are somewhat mixed, considering the use of two separate dimensions of the ICU to create CP/CU groups, they raise important questions regarding the etiologies of CP and dimensional aspects of CU

behaviors and their associated features. In particular, they suggest that there may be important differences in socialization experiences during early- and middle-childhood between racial-ethnic groups and between boys and girls that may lead some children to develop CP, as well as the co-occurrence of CP and CU behaviors. However, interpretation of these results should be done carefully, given that the results did not strongly differentiate children in the CP-only group from those in the CP+CU group. Although one of these two groups often differed in emotion recognition from the typical group, they often did not differ from one another. Further, the effect sizes for the CP-only group often exceeded those of the CP+CU group when both differed significantly from the typical group. Thus, these results have implications for CP and CU behaviors, rather than solely CU behaviors.

Socialization Among African American Children

The biopsychosocial perspective suggests that development of the various aspects of emotional and behavioral functioning occurs through interactions and coactions at multiple levels of analysis; including genetic activity, neural and cognitive activity, behavior, and children's physical, social and cultural environments (Gottlieb, 2007). Thus, there are likely a number of complex processes that contribute to individual differences in both children's emotion recognition and their CP and CU behaviors. Among African American families, sociocontextual processes of racial/ethnic and emotional socialization may have important impacts on children's developing emotional functioning, including emotion recognition. Racial/ethnic socialization refers to verbal and nonverbal information communicated to children (especially from parents) about

what it means to be part of a given racial/ethnic group (e.g., African American; Boykin & Toms, 1985; Peters & Massey, 1983)—including messages promoting racial or ethnic pride, preparation for and coping with racial bias, and sometimes mistrust of majority groups (Dunbar, Perry, Cavanaugh, & Leerkes, 2015)—and such socialization may be an key way in which ethnic minority families buffer against the effects of discrimination for their children (García Coll et al., 1996). Previous research suggests that racial/ethnic socialization is associated with positive socioemotional outcomes, including greater anger control and less fighting among male adolescents, as well as fewer depressive symptoms among female adolescents (Hughes et al., 2006; Stevenson, Reed, Bodison, & Bishop, 1997). However, these positive socioemotional and behavioral outcomes may not only result from racial/ethnic socialization, but also through effective emotional socialization in African American families.

Dunbar and colleagues (2015) posit that emotional socialization by parents, in addition to racial/ethnic socialization, may be important for positive child outcomes, as experiences of discrimination emotionally arousing and, thus, likely require effective emotion regulation for coping. As such, there may be differences in emotion socialization processes between EA and AA families that may differentially affect emotional functioning, including emotion recognition. Although there has been limited previous research on similarities and differences among racial/ethnic groups regarding emotion socialization, similarities between EA and AA parents' emotion socialization have been found (Morelen, Jacob, Suveg, Jones, & Thomassin, 2013). For example, maternal empathy has been positively associated with emotional understanding and

negatively associated with aggression among both EA and AA children (Morelen et al., 2013; Smith & Walden, 2001). On the other hand, punitive and negative emotion parenting behaviors, such as mothers' minimizing reactions to children's negative emotions, have been found to be positively associated with adaptive coping among AA girls and negatively associated with aggression among AA boys (Smith & Walden, 2001), whereas they have been positively associated with negative outcomes among EA children (Eisenberg et al., 1999). Furthermore, findings using the current study sample suggest that AA mothers (Garrett-Peters et al., 2008) and fathers (Garrett-Peters, Mills-Koonce, Zerwas, Cox, & Vernon-Feagans, 2011) may engage in more emotion talk with their infants. Such differences in emotion socialization between EA and AA parents may partially explain the differences in emotion recognition found in the current study. Specifically, AA parents' potential use of more emotion talk during infancy and/or potential use of emotion socialization as part of racial/ethnic socialization may have contributed AA children's greater emotion recognition accuracy. Because AA children may have experienced at least partially different emotion socialization, they likely developed slightly different emotional competencies. If the majority of AA children gained competence in emotion recognition through emotion socialization, then this might explain why differences in emotion recognition were not found among CP/CU groups of AA children. Alternatively, given that AA children generally performed better than EA children in emotion recognition, it is possible that there were ceiling effects for AA children. A more difficult or complex emotion recognition task may elucidate differences in emotion recognition among CP/CU groups of AA children. Nevertheless,

these findings of differential associations with emotion recognition across race suggest that there are likely multiple etiological pathways leading children to develop CP and CU behaviors.

Emotion Socialization among Boys and Girls

A substantial extant literature examining sex differences in emotional functioning suggests that there are significant emotion socialization processes that differentially affect boys and girls. Girls and women are generally stereotyped as more emotional than boys and men and this seems to have important implications for how children are socialized by parents, other adults, and peers (Brody & Hall, 2010). For example, parents may attend to and talk about different emotions with their daughters (e.g., sadness, happiness, and anxiety) than with their sons (e.g., anger), longitudinally affecting their children's expression of such emotions (Chaplin, Cole, & Zahn-Waxler, 2005; van der Pol et al., 2015). Furthermore, parents may use more specific and greater variety of emotion words, talk more about relationships and people, and use more social context for emotions when talking with girls compared to boys (Fivush, 2007). Given that girls typically receive greater emphasis on emotions during childhood, it may be that girls, on average, do better at recognizing emotions than boys, regardless of the presence of CP and CU behaviors. As such, emotion recognition accuracy may not differentiate among CP/CU groups for girls, whereas it be useful in differentiating among CP/CU groups of boys. Similar to the findings across race, these differential findings across child sex suggest that all children with CP and CU behaviors do not necessarily show emotion recognition deficits and that multiple pathways to these problems are possible.

Implications for Associations Between Emotion Recognition and Callous-Unemotional Behaviors

The findings from the current study suggest that for some children, specifically AA children (with partial support for girls, as well), emotion recognition deficits are not associated with having CP and CU behaviors. As such, emotion recognition deficits may not be a pathway toward CU behaviors for all children, as has been conceptualized in much of the previous literature on the etiology of CU behaviors (Blair, 2006; Dadds et al., 2011). Rather, consistent with the developmental psychopathology perspective and the construct of multifinality (Cicchetti & Toth, 2009; Sroufe, 2013), these results indicate that there are likely various pathways through which children can develop CP and CU behaviors. It is possible that some children develop emotion recognition deficits through neurocognitive deficits or through environmental processes (or the combination of both) and this leads them to engage in problem behaviors and callousness, whereas other children do not develop emotion recognition deficits, but show CP and CU behaviors as a result of other developmental processes. For the latter group of children, their ability to more accurately recognize emotions in others may actually support their CP and CU behaviors by allowing them to exploit the emotions of others. Such varying pathways could help to explain some of the disparate findings from previous studies that have found comparable or greater emotion recognition accuracy among children with CU behaviors compared to other children (Bowen et al., 2014; Pham & Phillippot, 2010; Schwenck et al., 2014; Woodworth & Willoughby, 2008).

Differences Across Dimensions of Callous-Unemotional Behaviors

It should be noted that some differential associations were found when the EP dimension of the ICU was used, compared to the callous dimension. Regarding overall emotion recognition accuracy, the group differences across child race were comparable, as EA children in the typical group perform better than children in the CP-only and CP+CU groups, regardless of ICU dimension. However, when the callous dimension was used, but not the EP dimension, moderation by child sex was found, with boys in the typical group performing better than boys in the CP+CU group. For individual emotions, moderation by child race was found for fear and happiness when the EP dimension was used, with EA children in the typical group performing better than children in the CP-only group. However, a significant interaction between CP/CU group and race was only found for happiness when the callous dimension was used, with EA children in the typical group performing better than both children in the CP-only and CP+CU groups.

Although these differential findings across ICU dimension are minor, they may have important implications for operationalization and for clinical practice. Specifically, the DSM-V includes "limited prosocial emotions" as a specifier to diagnosis of conduct disorder (APA, 2013, p. 470). In order to qualify as having limited prosocial emotions, individuals with conduct disorder must show at least two of four characteristics: (1) lack of remorse, (2) callousness/lack of empathy, (3) lack of concern for performance, and (4) shallow or deficient affect (APA, 2013). As such, individuals qualifying for the specifier meant to address CU behaviors do not necessarily have to show callousness. Although the current findings are largely consistent across the EP and callous dimensions of the

ICU, the way CU behaviors are specified in the DSM-V may lead clinicians to expect different associated features (e.g., emotion recognition deficits) for children showing different symptoms of CU behaviors. The focus on limited prosocial emotions may lead clinicians to focus on the results from the EP dimension. However, the callous dimension provides important information and should be considered carefully, despite the emphasis of the DSM-V.

Is the Presence of Callous-Unemotional Behaviors Associated with Increased Emotion Recognition Deficits?

As mentioned previously, children in the CP-only and CP+CU groups often did not perform differently on emotion recognition accuracy in the current study. In addition, the effect sizes for the CP-only group sometimes were larger when both groups differed from the typical group. Thus, the current findings may represent an effect of CP on emotion recognition, rather than an effect of CU behaviors. Some previous studies have found that children and adults with psychopathic and/or CU behaviors showed emotion recognition deficits compared to those with CP-only or antisocial behavior without psychopathy (Bagley et al., 2009; Blair et al, 2005; Blair et al., 2001; Blair et al., 2004; Lemos Vasconcellos et al., 2014; Stanković et al., 2015; Stevens et al., 2001). However, it is possible that those showing the highest levels of CP or antisocial behavior demonstrate emotion recognition deficits and this coincides with psychopathic and/or CU behaviors, but is actually related to CP and antisociality. Therefore, future research should attempt to parse these emotion recognition effects to determine whether they are a consequence of CP, of CU behaviors, or of their co-occurance.

Strengths and Limitations

The strengths of the current study include the use of a large, population-stratified, randomly-selected sample; the assessment of children in middle childhood exclusively; the use of a relatively racially diverse sample; and the use of both EA and AA stimuli in the facial emotion recognition task. As was mentioned previously, many previous studies examining associations between emotion recognition and CU behaviors have used relatively small samples, whereas the current study used a large community sample, which may have allowed for better detection of effects and for better generalization of findings. However, generalization beyond families living in areas of rural poverty should be done carefully. In addition, the current study used a cohort sample of children who were all in 1st and 2nd grade at the time of the time the relevant measures were collected. Thus, this is one of only two studies, to our knowledge, that has examined emotion recognition and CU behaviors exclusively among young children. This has allowed for better examination of these associations during early- and middle-childhood, as there are no older children in the sample who are likely qualitatively different from younger children due to their developmental stages. Furthermore, the sample was comprised of approximately 57% EA children and 43% AA children, making it more racially diverse than many other previous samples. Stimuli in the emotion recognition task were also comprised of 50% EA actors and 50% AA actors. As such, we were able to examine race as a moderator of the association between CP/CU group membership and emotion recognition accuracy, and we were able to rule out same race bias as an explanation of the CP/CU group x child race interaction.

The findings from the current study should also be considered in the context of some limitations. First, it should be noted that when groups were split by child race and child sex to probe the interactions, small group sizes for the CP-only, and CP+CU groups resulted (the smallest being n = 4 for girls in the CP-only group when using the callous dimension of the ICU). Additionally, the use of a community sample could be considered a weakness, given that we examined a psychopathological phenomenon. However, clinical cutoffs were used to denote high levels of CP and a 90th percentile cutoff was used to denote CU behaviors. Thus, the children in the CP-only and CP+CU groups could certainly be considered as showing clinical levels of problem behavior.

Conclusion

Understanding the development of CP and CU behaviors in early- and middle-childhood is an important pursuit for developmental researchers, as children showing high levels of such behaviors are at risk for negative psychosocial and psychopathological outcomes. Although emotion recognition deficits have been repeatedly associated with CU behaviors, findings from the current study (along with some previous studies), indicate that such deficits may not be a core feature of CU behaviors for all children. That being said, it will be important for future research to examine the mechanisms through which emotion recognition, as well as other aspects of emotional functioning, are associated with CU behaviors and for which children these mechanisms matter. Given the apparent heterogeneity in both CP and CU behaviors, interventions aimed at preventing and/or reducing these behaviors will benefit greatly from better understanding of these developmental mechanisms.

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APPENDIX A

DATA TABLES

Table 1. Sample Sizes for CP/CU Groups Split Using the EP ICU Dimension

Variable	Typical	CP-only	CP+CU
Total	767	29	19
African Americans	323	18	6
European Americans	444	11	13
Boys	370	16	13
Girls	397	13	6
Income-to-needs ratio < 2	501	26	17
Income-to-needs ratio ≥ 2	266	3	2

Table 2. Sample Sizes for CP/CU Groups Split Using the Callous ICU Dimension

Variable	Typical	CP-only	CP+CU
Total	767	16	32
African Americans	327	10	14
European Americans	440	6	18
Boys	382	12	17
Girls	385	4	15
Income-to-needs ratio < 2	495	15	28
Income-to-needs ratio ≥ 2	272	1	4

Table 3. Sample Sizes for CP/CU Groups Split Using both ICU Dimensions

Variable	Typical	CP-only	CP+CU (EP)	CP+CU (Callous)	CP+CU
Total	713	12	4	17	15
African Americans	291	8	2	10	4
European Americans	422	4	2	7	11
Boys	347	10	2	6	8
Girls	366	2	2	11	4
Income-to-needs ratio < 2	453	11	4	15	13
Income-to-needs ratio ≥ 2	260	1	0	2	2

Table 4. Bivariate Correlations Among Central Variables and Covariates

	1	2	3	4	5	6	7	8	9
1. Overall ICE accuracy	–								
2. Child EP behaviors (ICU)	.095**	–							
3. Child callous behaviors (ICU)	-.135**	-.417**	–						
4. Child CP (DBDRS)	-.099**	-.305**	.467**	–					
5. Child race[a]	.057	-.136**	.087**	.024	–				
6. Child sex[b]	.127**	.146**	-.050	-.044	-.019	–			
7. Primary caregiver years of education	.085*	.188**	-.219**	-.136**	-.260**	-.001	–		
8. Family mean income[d]	.067*	.176**	-.166**	-.132**	-.402**	-.020	.626**	–	
9. Child age	.155**	.026	-.008	-.023	-.196**	.022	.037	.074*	–
Mean	.55560	1.9261	.3283	.72	.44	.4994	12.6865	1.8313	7.8998
Standard deviation	.085040	.54007	.39090	2.159	.497	.50028	2.03176	1.37027	.27861
N	893	893	893	893	893	893	893	893	893

***p* < .05. ***p* < .01.*

[a] 0 = European American, 1 = African American. [b] 0 = male, 1 = female. [c] 0 = North Carolina 1 = Pennsylvania. [d] Family mean income averaged across visits from the time child was 6 to 58 months old.

Table 5. Adjusted Group Means from Analyses of CP/CU Groups Defined by the EP ICU Dimension and Child Race

	European American Children (n = 468)			African American Children (n = 347)		
Accuracy	Typical (n = 444)	CP-only (n = 11)	CP+CU (n = 13)	Typical (n = 323)	CP-only (n = 18)	CP+CU (n = 6)
Overall	.557 (.004)[ab]	.474 (.023)[a]	.489 (.021)[b]	.562 (.005)	.551 (.021)	.625 (.036)
Fear	.302 (.008)[a]	.171 (.048)[a]	.261 (.044)	.310 (.010)	.348 (.042)	242. (.072)
Happiness	.810 (.006)[a]	.668 (.041)[a]	.755 (.038)	.818 (.008)	.838 (.035)	.942 (.060)

Note[1]: Covariates family income, child sex, child age at assessment, and primary caregiver education.
Note[2]: Significant group differences (using Benjamini-Hochberg corrections for false discovery rates) are identified using superscripts in each row.
Note[3]: There were no significant CP/CU group differences for anger, sadness, or surprise recognition.

Table 6. Adjusted Group Means from Analyses of CP/CU Groups Defined by the Callous ICU Dimension and Child Race

	European American Children (n = 464)			African American Children (n = 351)		
Accuracy	Typical (n = 440)	CP-only (n = 6)	CP+CU (n = 18)	Typical (n = 327)	CP-only (n = 10)	CP+CU (n = 14)
Overall	.557 (.004)[ab]	.454 (.032)[a]	.491 (.018)[b]	.564 (.005)	.601 (.027)	.548 (.022)
Happiness	.811 (.006)[ab]	.652 (.056)[a]	.733 (.032)[b]	.818 (.008)	.901 (.046)	.841 (.039)

Note[1]: Covariates include family income, child sex, child age at assessment, and primary caregiver education.
Note[2]: Significant group differences (using Benjamini-Hochberg corrections for false discovery rates) are identified using superscripts in each row.
Note[3]: There were no significant CP/CU group differences for fear, anger, sadness, or surprise recognition.

Table 7. Adjusted Group Means from Analyses of CP/CU Groups Defined by the Callous ICU Dimension and Child Sex

	Boys (n = 411)			Girls (n = 404)		
Accuracy	Typical (n = 382)	CP-only (n = 12)	CP+CU (n = 17)	Typical (n = 385)	CP-only (n = 4)	CP+CU (n = 15)
Overall	.551 (.004)[a]	.507 (.024)	.501 (.020)[a]	.569 (.004)	.625 (.040)	.530 (.021)

Note[1]: Covariates include family income, child sex, child age at assessment, and primary caregiver education.
Note[2]: Significant group differences (using Benjamini-Hochberg corrections for false discovery rates) are identified using superscripts in each row.
Note[3]: There were no significant CP/CU group differences for any individual emotions.

Table 8. Adjusted Group Means from Analyses of CP/CU Groups Defined by both ICU Dimensions and Child Race

	European American Children (n = 446)			African American Children (n = 315)		
Accuracy	Typical (n = 422)	CP-only (n = 4)	CP+CU (n = 11)	Typical (n = 291)	CP-only (n = 8)	CP+CU (n = 4)
Overall	.558 (.004)[ab]	.464 (.039)[a]	.498 (.024)[b]	.564 (.005)	.567 (.030)	.570 (.042)
Happiness	.810 (.007)[a]	.637 (.068)[a]	.766 (.041)	.816 (.009)	.890 (.052)	.945 (.073)

Note[1]: Covariates include family income, child sex, child age at assessment, and primary caregiver education.
Note[2]: Significant group differences (using Benjamini-Hochberg corrections for false discovery rates) are identified using superscripts in each row.
Note[3]: There were no significant CP/CU group differences for fear, anger, sadness, or surprise recognition.
Note[4]: The CP+CU group listed here refers to the CP+CU-both group. The CP+CU-EP and CP+CU-callous groups were excluded.