

Callous–Unemotional Traits, Impulsivity, and Emotional Processing in Adolescents With Antisocial Behavior Problems

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Examined the emotional reactivity of adolescents with antisocial behavior problems using a lexical decision paradigm. Evidence from adult forensic samples indicates that psychopathic traits are associated with abnormalities in the processing of emotional stimuli. In an attempt to extend these findings earlier in development, this association was tested in a sample of adolescents (mean age = 16.01; SD = 1.32) referred to a diversion program for delinquent behavior. Emotional processing was assessed by comparing recognition time for emotional words, both positive and negative, to recognition time for nonemotional words. Consistent with adult findings, the callous–unemotional (CU) dimension of psychopathy was associated with slower reaction times to negative words. In contrast, problems of impulse control were associated with faster recognition times for negative emotional words. These findings suggest that different patterns of emotional reactivity may characterize distinct subgroups of youth with antisocial behavior problems.

Psychopathy refers to a constellation of affective (e.g., poverty of emotions, lack of empathy, and guilt), interpersonal (e.g., callous use of others for one's own gain), self-referential (e.g., inflated sense of one's own importance), and behavioral (e.g., impulsive behavior and inadequately motivated violence) characteristics that have proven important in designating a severe, chronic, and difficult-to-treat group of antisocial adults (Cleckley, 1976; Hare, 1994). As the assessment of these traits and their predictive utility (e.g., predicting violent recidivism) has become more firmly established (Hare, Hart, & Harpur, 1991; Hart & Hare, 1997), there has been increasing interest in understanding the causal processes associated with psychopathy. One important focus of this research has been to investigate how individuals with psychopathic traits process emotional stimuli. Theoretical formulations positing a general lack of emotionality (Cleckley, 1976) or a more specific lack of fearful inhibitions (Lykken, 1957, 1995) have attracted impressive empirical support. For example, using several different psychophysiological paradigms, researchers have shown that psychopathic traits are associated with a diminished reactivity to aversive and other emotionally charged

stimuli (Hare, 1986, 1994; Lykken, 1957; Patrick, 1994; Patrick, Bradley, & Lang, 1993). This pattern of findings supports a theory that attributes psychopathic behavior to underactivity of a neurobiological system sensitive to cues of punishment and frustrative non-reward (Fowles, 1980; Fowles, Kochanska, & Murray, 2000; Lykken, 1995; Quay, 1993). Gray (1987a, 1987b) posited such a system, the behavioral inhibition system, composed of prefrontal cortex, hippocampal formation, and septal areas.

The potential importance of this theoretical model of psychopathic traits is that it is consistent with recent developmental theories as to how empathy, guilt, and other aspects of the affective components of conscience develop. Specifically, Blair (1999) and Kochanska (1993, 1997) have suggested multiple reasons that children characterized by a temperament involving low behavioral inhibition can be at risk for impairments in conscience development. For example, low behavioral inhibition can place a child at risk for missing some of the early precursors to empathetic concern that involve emotional arousal evoked by the misfortune and distress of others. This could lead a child to be relatively insensitive to the prohibitions and sanctions of parents and other socializing agents. It could also create an interpersonal style in which the child becomes so focused on the potential rewards and gains involved in using aggression or other antisocial means to

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solve interpersonal conflicts that he or she ignores the potentially harmful effects of this behavior on him or herself and others. There is evidence from research to support these potential mechanisms. For example, youth exhibiting problems of antisocial behavior and delinquency who also show psychopathic traits are less distressed by the negative effects of their behavior on others (Blair, Jones, Clark, & Smith, 1997; Frick, Lilienfeld, Ellis, Loney & Silverthorn, 1999), and they are more impaired in their moral reasoning and empathic concern toward others (Blair, 1999). These youth also expect more instrumental gain (e.g., obtaining goods or social goals) from their aggressive actions and are more predatory in their violence than youth with antisocial behavior problems but without these traits (Caputo, Frick, & Brodsky, 1999; Kruh, Frick, & Clements, in press).

As a result, deficits in emotional processing have been critical to many causal theories of psychopathy and to many theories of potential developmental precursors to this construct (Frick, 1998b; Frick, Barry, & Bodin, 2000). One promising paradigm for studying how individuals with psychopathic traits process emotional stimuli is a lexical decision task adapted by Williamson, Harpur, and Hare (1991) for use with adult inmates. In this task, participants are presented with letter strings and are then asked to quickly identify the strings as either words or nonwords. The words are equally divided among three emotional valences. Positive words relate to pleasurable emotions (e.g., *passion*), acts (e.g., *play*), and objects (e.g., *cake*). Negative words vary from stimuli typifying sadness (e.g., *loss*), anxiety (e.g., *tension*), and fear (e.g., *scare*) to stimuli associated with violence (e.g., *blood*) and aggression (e.g., *kill*). Emotionally neutral words include words such as *item* and *cup* that do not have strong emotional connotations. Non-words were formed by moving an interior vowel in the words from the three emotional categories (e.g., *blood-bolod*). The dependent measure in this task is the difference between participants' speed of recognition for emotional versus nonemotional words. This measure of response time facilitation can be viewed as theoretically assessing the implicit or automatic allocation of attentional resources to emotional material (Rusting, 1998). In this conceptualization, facilitation is a marker of vigilance for emotional stimuli.

Williamson et al. (1991) used this task in a sample of incarcerated adults and found that those low on psychopathic traits exhibited a normative profile of facilitated recognition for both positive and negative words relative to neutral words, whereas participants high on psychopathic traits exhibited no such facilitation. In fact, the psychopathic group exhibited their slowest reaction times to negative word stimuli. These findings support the contention that psychopathic traits are related to deficits in the processing of emotional stimuli.

Of note, when participants were asked to rate the emotionality of the words used in the lexical decision task, there was no difference between the ratings of psychopathic and nonpsychopathic participants. The distinction between performance on the lexical decision task and self-report ratings of emotional responsiveness can be explained by a distinction between automatic versus effortful appraisal processes. Automatic processing of emotional stimuli is rapid and reflexive, whereas effortful processing involves the cognitive interpretation of relevant stimuli. Most theories of psychopathy focus on the emotional deficit being in the automatic processing of emotional stimuli (Hare, 1994; Lykken, 1995; Patrick, 1994). For example, Cleckley (1976) argued that persons with psychopathy can learn to reproduce feelings and can interpret emotions in others; however, "the feeling itself does not come to pass" (p. 428). As a result, the study of emotional processing as it may relate to psychopathy needs to employ paradigms, such as the emotional lexical decision task, that tap the automatic processing of emotion.

Given these results, the lexical decision task could be a useful paradigm for studying the automatic processing of emotional stimuli in younger samples. The lexical decision paradigm allows for the study of the automatic processing of emotional stimuli in a way that is less intrusive, less expensive, and does not involve the exposure to highly aversive stimuli characteristic of many psychophysiological paradigms used to assess the emotional processing of psychopathic adults (e.g., Patrick, 1994; Patrick et al., 1993). In support of extending this line of research to youth, children and adolescents with conduct problems who show psychopathic traits have been found to exhibit deficits that could be consistent with a lack of responsiveness to emotional stimuli. Specifically, youth with these traits have shown a reward-dominant response style on a computer task designed to assess sensitivity to punishment cues after a reward-oriented response set is primed (Fisher & Blair, 1999; Frick et al., in press; O'Brien & Frick, 1996), and they have reported a preference for novel and dangerous activities (Frick et al., 1999, in press). Although these results are promising, they are not unambiguous indications of a deficit in the automatic processing of emotional stimuli for at least two reasons. First, the assessment of a preference for novel and dangerous activities is assessed through child self-report and, therefore, it is tapping secondary appraisal of potentially dangerous activities. Second, the reward-dominant response style could reflect a more general cognitive deficit in the ability to focus on relevant contextual cues once a response set is formed rather than an insensitivity to cues for punishment (Newman, 1998). That is, in past studies of reward dominance, the insensitivity to punishment cues for youth with psychopathic traits was found only after a reward-oriented response set was primed, making it

unclear whether poor performance was due to a deficit in the person's sensitivity to punishment or to an inability to change from an established response set. As a result, paradigms such as the emotional lexical decision task allow for tests of a person's automatic processing of emotional stimuli in a task that does not confound emotional processing with the ability to change a primed response set (see Blair, 1999, and Patrick, 1994, for other such paradigms).

One critical issue regarding the use of the lexical decision task, and other measures of emotional processing to study potential emotional deficits related to psychopathy, is the need to consider the multidimensional nature of psychopathy (see Frick, Bodin, & Barry, 2000; Frick, O'Brien, Wootton, & McBurnett, 1994; Hare et al., 1991). As mentioned previously, the construct of psychopathy has been defined by a cluster of affective, interpersonal, self-referential, and behavioral characteristics. However, there is great debate over how to cluster these characteristics to best represent the psychological dimensions of psychopathy. Factor analyses of these traits have found from two (Frick et al., 1994; Harpur, Hare, & Hakstian, 1989) to eight (Lilienfeld & Andrews, 1996) factors underlying these traits. Furthermore, some researchers have taken a unidimensional approach that emphasizes the intercorrelated nature of these dimensions. This approach suggests that psychopathy is best conceptualized as one higher order factor encompassing all of the secondary dimensions (e.g., Newman, 1998).

The problem with using a unidimensional approach to conceptualizing psychopathy when studying emotional processing is that most individuals with antisocial behavior problems show some aspects of psychopathy such as showing problems with impulse control and a deviant and antisocial lifestyle in adult forensic samples (Hare et al., 1991) and impulsivity, narcissism, and conduct problems in clinic-referred samples of children and adolescents (Christian, Frick, Hill, Tyler, & Frazer, 1997). The difference between individuals who are both psychopathic and antisocial and those who are antisocial but not psychopathic appears to be in the presence or absence of callous-unemotional (CU) traits (Christian et al., 1997; Hare et al., 1991). More important, the deficits in emotional processing seem to be specifically associated with these affective and interpersonal traits, again in both adult (Patrick, 1994) and child samples (Barry et al., 2000). For example, Barry et al. reported that it was only those youth who showed the combination of high CU traits, impulsivity, and conduct problems who exhibited a reward-dominant response style and a preference for thrill and adventure-seeking activities. Such characteristics were not found in youth who were high on measures of conduct problems or impulsivity without CU traits (see also Frick et al., in press). As a result, in studying emotional processing deficits in psychopathy,

it is important to have a measure that distinguishes between CU traits and other aspects of psychopathy, even if this distinction may not be important for other uses of the construct (e.g., global scores in predicting recidivism; Hare et al., 1991) and even if there may be additional divisions that may prove important for other purposes (see Lilienfeld, 1992).

In further support of the need to focus on those individuals with antisocial behavior problems who are high on CU traits, it appears that adolescents who are antisocial and impulsive and who are elevated in CU traits may show a different pattern of emotion processing than such youth who are not elevated in CU traits. Many theories of impulsivity, which is a core dimension of attention deficit hyperactivity disorder (ADHD; American Psychiatric Association, 2000), focus on problems with poorly regulated affect, motivation, and arousal (Barkley, 1997). Consistent with this theory, children and adolescents who are impulsive have been found to exhibit highly aroused responses to emotional stimuli, such as negative feedback during a concept-learning task and social communications with peers (Cole, Zahn-Waxler, & Smith, 1994; Rosenbaum & Baker, 1984). These findings indicate that some youth with conduct problems who are also impulsive could show a heightened level of reactivity to emotional stimuli, the opposite pattern of reactivity to that predicted for youth with CU traits.

Taken together, these findings lead to the theoretically important possibility that youth with antisocial behavior problems who score high on measures of impulsivity may show high levels of reactivity to emotional stimuli in the absence of CU traits and underreactivity to emotional stimuli in the presence of CU traits (Barry et al., 2000). As a result, it is important that associations between these two dimensions of psychopathy (e.g., CU traits and problems of impulse control) and measures of emotional processing are studied in a way that controls for the presence of the other dimension. Given that CU traits and impulsivity-conduct problems (I-CP) are positively correlated but one would predict correlations in opposite directions with measures of emotional reactivity, the conditions necessary for cooperative suppression effects in correlational research are met (Cohen & Cohen, 1983). Essentially, a suppressor effect occurs when the relation between a predictor and criterion variable is significantly strengthened by the inclusion of an additional predictor variable. In the previous example, the relation between CU traits and emotional reactivity theoretically should be strengthened by the inclusion of impulsivity-hyperactivity symptoms into a regression equation. The inclusion of this third variable releases criterion-irrelevant variance in CU traits that is dampening or suppressing the observed correlation with emotional reactivity (Tzelgov & Henik, 1991).

Suppressor effects, although rare in psychopathology research, have been found consistently in past research on psychopathy. For example, Patrick (1994; Patrick et al., 1993) found that the CU dimension of psychopathy was uniquely related to attenuated eye-blink startle response to acoustic probes administered during the presence of negative pictorial stimuli, whereas the impulsive–antisocial dimension was uniquely related to heightened eye-blink startle. Similar findings have been reported in child samples. Specifically, in a clinic-referred sample of youth, Frick et al. (1999) found that a negative correlation between CU traits and anxiety became stronger after controlling for I–CP in regression analyses, as did the positive correlation between I–CP and anxiety after controlling for CU traits. This finding was replicated in several other samples of adolescents and college students (see Frick, Lilienfeld, Edens, Poythress, & McBurnett, 2000).

One final important issue in studying the relations among dimensions of psychopathy and emotional processing is the potential moderating role of anxiety. Contrary to many conceptualizations of the psychopathic individual (Cleckley, 1976), research has consistently shown that a person who scores high on measures of psychopathy often also scores high on measures of anxiety (Frick et al., 1999, 2000, in press). Although these findings may seem contradictory to the hypothesized deficient fear response of psychopathic individuals described previously, trait anxiety and fearfulness are separate constructs with different cognitive and neuropsychological correlates (Frick et al., 1999; Lilienfeld, 1994). It is important to note that previous studies of the emotional processing of individuals with psychopathic traits have found that controlling for the presence of anxiety can lead to significant differences in results on certain laboratory tasks. For example, in both adults (Newman, Patterson, & Kosson, 1987) and young people (O'Brien & Frick, 1996), psychopathic traits have sometimes been associated with a reward-oriented response style only in persons who were also low on anxiety. The reason for this moderating role of anxiety is not clear. It may be that individuals with psychopathic features and anxiety are etiologically distinct from those with psychopathic features without anxiety (Blackburn, 1983; Lykken, 1995), or it may be that anxiety disrupts performance on some of these laboratory measures (Newman, 1998). For example, anxiety is associated with heightened vigilance for negative emotional stimuli in adults (Barlow, 1991; Williams, Mathews, & MacLeod, 1996) as well as children and adolescents (Taghavi, Neshat-Doost, Moradi, Yule, & Dalgleish, 1999; Vasey, Daleiden, Williams, & Brown, 1995). As a result, fluctuations in anxiety symptoms may mask unique associations between psychopathic traits and indexes of emotional processing.

Based on these considerations, we tested the association among CU traits, I–CP, and emotional reactivity

using a lexical decision task to see if findings from adult samples could be replicated in younger samples. Potential suppression effects involved in controlling for the separate dimensions of psychopathy and the potential moderating role of anxiety were tested. These associations were investigated in a diversion program for youth referred to juvenile court for first-time offenses and for mild offenses. This sample was chosen based on the need to oversample youth with high rates of antisocial behavior but still ensure that there was a sufficient range of antisocial behavior present in the sample. Both of these conditions were viewed as being important for increasing the likelihood that both of the theoretically important subgroups of adolescents with antisocial behavior problems, those high on both CU traits and impulsivity, and those high only on impulsivity would be adequately represented in the sample.

Method

Participants

Sixty-five male participants were recruited from a juvenile diversion program in the southern United States that provides day treatment for youths referred from juvenile court. The program serves adolescents who are considered to be at low to moderate risk and is designed to prevent further involvement in the juvenile court system. Students remain in the program for an average of 3 to 6 months, and the focus is on the development of academic and behavioral management skills under the close supervision of a case manager. Results of standardized educational testing indicated that participants were typically 3 to 4 years behind grade level in basic educational achievement. Five participants were excluded from our analyses due to receiving IQ scores below 70. The remaining participants ($n = 60$) had an average IQ composite score on the Kaufman Brief Intelligence Test (K–BIT; Kaufman & Kaufman, 1990) of 87.47 ($SD = 10.44$). Participants ranged in age from 12 to 18 years with an average age of 16.04 ($SD = 1.32$). The sample had an ethnic composition of 75% African American and 25% Caucasian. All of these demographic characteristics are consistent with data on the entire population of adolescents enrolled in the diversion program which, at the time of the study, had an average age of 15.3 years and an ethnic composition that was 62% African American.

Measures

Lexical decision task (Williamson et al., 1991). The lexical decision task presents participants with a series of letter strings. These letter strings include emotionally laden and neutral words, as well as nonwords. Nonwords were formed by altering one letter of each

real word contained in the task (e.g., *bomb-bemb*). Emotionality of the words was derived from Toglia and Battig's (1978) word norms. Frequency of usage data were derived from Kucera and Francis (1967). The length, number of syllables, imagery/concreteness, and frequency of usage of the words were balanced across word type. The Williamson et al. (1991) task was modified for use with adolescents by using only words composed of four letters or less that had a concreteness rating of 2.75 or greater (Toglia & Battig, 1978) such as *glad* (positive), *bomb* (negative), and *boot* (neutral). In addition, words were presented horizontally rather than vertically and were not repeated during the task. The resulting task consisted of 36 practice trials and 180 experimental trials containing an equal number of words and nonwords. Examples of the positive, negative, and neutral stimuli contained in the task are included in Table 1. Prior to participating in the task, participants completed a rating scale inventory on which they rated the emotionality of each word on a 5-point Likert-type scale. Scores of 1 represent an extreme negative rating, scores of 5 represent an extreme positive rating, and scores of 3 represent neutral emotional ratings.

Following completion of the scale, participants were seated at a computer and instructed on how to complete the task. Participants were told to depress either a "yes" ("V") key if the letters on screen spelled a real word or to depress the "no" ("N") key if the letter strings did not form a real word. The participants were instructed to make a decision "as quickly as possible, while still being accurate." The letter strings were displayed in the center of a black computer screen. The height and width of the letters were .5 cm and .2 cm, respectively. These dimensions produce lexical stimuli that are approximately .5 cm tall and 1 cm wide. Each letter string remained on the computer screen until the participant responded. After each response, participants were given a break of 2,000 msec before the appearance of the next lexical stimulus. On completion of 2 practice blocks consisting of 18 stimuli each, participants began the actual task consisting of 10 blocks of 18 stimuli separated by 20-sec break intervals. After completion of the first five blocks, participants were al-

lowed to take a longer break. The words and their companion nonwords were randomly presented within each block.

Two scores were calculated for data analyses. A positive difference score (NEU-POS) was calculated by subtracting each participant's average response time to positive words from his average response time to neutral words. A negative difference score (NEU-NEG) was calculated by subtracting each participant's average response time to negative words from his average response time to neutral words. These difference scores assess the amount of recognition time facilitation exhibited in response to affective stimuli. Response times were not included in analyses if (a) the value deviated more than 2.5 *SD* from an individual participant's overall mean response time for the task, to ensure that a few outlier data points did not have a disproportionate influence on participants' scores or (b) the response time corresponded to an incorrectly identified word stimulus. Additionally, facilitation scores (i.e., NEU-POS and NEU-NEG scores) deviating more than 2.75 *SD* from the sample mean were excluded from analyses to further minimize the influence of outlier data on response time findings. This resulted in 3 participants being removed from NEU-NEG comparisons and 1 participant being removed from NEU-POS comparisons. Finally, to ensure an acceptable level of word knowledge, data for one participant with less than a 70% accuracy rate were excluded from analyses.

Antisocial Process Screening Device (APSD; Frick & Hare, 2001). The APSD is a 20-item rating scale designed to assess traits associated with the construct of psychopathy similar to those assessed by the Psychopathy Checklist-Revised (Hare, 1991), one of the most widely used measures of psychopathy in adult forensic samples. The APSD, formerly known as the Psychopathy Screening Device, was originally designed to assess these traits based on ratings by parents and teachers in preadolescents (Frick et al., 1994). A self-report scale was used in this adolescent sample for several reasons. First, there is evidence that the reliability and validity of child report for assessing most types of child psychopathology increases in adolescence as the validity of parent and teacher report decreases (Kamphaus & Frick, 1996). This may be especially important when assessing covert behavior or affective styles that may not be evident to observers of the child's behavior. Second, the importance of self-report was particularly relevant to this sample in which the participants often came from very dysfunctional families with significant histories of previous out-of-home placements. Furthermore, the participants' short time in the diversion program did not allow for teachers to become very familiar with their personalities, and the observations occurred in a very controlled context. Finally, this self-report version of the APSD has

Table 1. Example Lexical Decision Task Word Stimuli by Category

Positive Words	Negative Words	Neutral Words
cure	mad	page
gold	pain	lift
tree	rake	mile
born	limp	fly
mild	bad	snap
glad	flea	sale
cake	gun	call

Note: Words were categorized on the basis of emotional content (i.e., positive, negative, or neutral) using Toglia and Battig's word norms (1978).

successfully been used to differentiate subgroups of juvenile offenders in other adolescent samples (Caputo et al., 1999; Kruh et al., in press; Silverthorn, Frick, & Reynolds, 2001), and other self-report measures have proven useful for assessing psychopathic traits in adolescent and young adult samples (Lilienfeld & Andrews, 1996; Lynam, Whiteside, & Jones, 1999).

Similar to the Psychopathy Checklist–Revised, it appears that psychopathic traits assessed by the APSD form multiple dimensions in youth (Frick et al., 2000), although the self-report version of the APSD has not been subjected to factor analyses to date. The two-factor structure reported by Frick et al. (1994) was used in this study because, (a) as mentioned in the introduction, it is important to separate the CU dimension of psychopathy from other dimensions of the construct when studying measures of emotional processing; (b) the two-factor structure has proven to be the most appropriate for clinic-referred or adjudicated samples (Frick et al., 2000); and (c) it is the structure that has been used in past research using the self-report version of the scale in adjudicated adolescent samples (Caputo et al., 1999; Kruh et al., in press; Silverthorn et al., 2001). The two subscales of the APSD include a six-item CU scale that assesses the affective and interpersonal dimensions of psychopathy (e.g., lacks guilt, does not show emotions, lacks empathy), whereas the 10-item I–CP scale assesses the self-referential (e.g., thinks he or she is more important than others) and behavioral dimensions (e.g., acts without thinking, gets bored easily) of psychopathy.

The internal consistency estimates for the CU (coefficient $\alpha = .49$) and I–CP scales (coefficient $\alpha = .75$) in this sample were low to moderate, respectively. However, item-total correlations did not reveal any items that, if eliminated, would have substantially increased the internal consistency of subscales. More important, there are relatively few items on the CU scale, and substantial changes in its content may have altered the construct as it has been defined in past studies of emotional processing. Because of the heterogeneity of the items on the I–CP subscale of the APSD, with only a minority of the items assessing behaviors traditionally associated with impulsivity (Burns, 2000), analyses assessing associations between impulsivity and emotional processing did not rely solely on this scale but also tested associations using items assessing the symptoms of impulsivity-hyperactivity from the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [DSM–IV], American Psychiatric Association, 1994) criteria for ADHD.

Youth Inventory–4 (YI–4; Gadow & Sprafkin, 1999). The YI–4 is an adolescent self-report checklist that assesses DSM–IV symptomatology for the most common disorders of childhood and adolescence. For this study, only the items corresponding to the ADHD

hyperactivity–impulsivity symptoms were used in analyses. Symptoms on the YI–4 are rated on a 4-point Likert-type scale with ranges of 0 (*never*), 1 (*sometimes*), 2 (*often*), and 3 (*very often*). As recommended by Gadow and Sprafkin (1999), a symptom was considered present if it was rated by the participant as being displayed *often* or *very often*. This method of obtaining self-report ratings of ADHD symptoms demonstrated good convergence with related oppositional defiant disorder and conduct disorder symptoms on the YI–4 ($r = .45$ and $.36$, respectively) and the delinquency and aggression subscales of the Youth Self Report ($r = .40$ and $.51$, respectively) in an adolescent clinic sample (Gadow & Sprafkin, 1999). In this sample, the hyperactivity–impulsivity symptoms exhibited an acceptable level of internal consistency (coefficient $\alpha = .72$).

Revised Children’s Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). The RCMAS is a 37-item self-report inventory used to assess anxiety in children and adolescents from 6 to 19 years old. It consists of a simple format in which respondents answer “yes” or “no” to a series of statements. The Total Anxiety score has proven to have acceptable levels of reliability in adolescent samples and correlates highly with other measures of trait anxiety (Reynolds & Richmond, 1985). Additionally, the RCMAS contains a nine-item Lie scale assessing children’s tendency to present themselves in a favorable light (e.g., “I am always nice to everyone”). Given this study’s reliance on self-report methodology, Lie scale scores were introduced into principal analyses to test for evidence of biased and socially desirable responding. Similar to the Total Anxiety score, the Lie scale has demonstrated adequate psychometric properties (Reynolds & Richmond, 1985). In this sample, there was evidence of strong internal consistency of the Total Anxiety score (coefficient $\alpha = .86$) but more moderate internal consistency of the briefer Lie scale (coefficient $\alpha = .65$).

K–BIT (Kaufman & Kaufman, 1990). The K–BIT is a brief intelligence measure used to assess verbal and nonverbal intellectual functioning of individuals 4 to 90 years of age. Scores for two subtests tapping verbal and nonverbal abilities can be used to form a composite IQ score that is roughly equivalent to the full-scale IQ contained on measures such as the Wechsler Intelligence Scale for Children (Wechsler, 1974). The K–BIT is a useful research measure given the minimal time demands and demonstration of adequate psychometric properties. For example, for individuals ages 13 to 19, standardization studies revealed a test–retest reliability estimate of $.93$ for the K–BIT IQ composite. Further, the composite IQ score correlated $.80$ and $.75$ with full-scale IQ scores from the Wechsler Intelligence Scale for Children–Revised (Wechsler, 1974) and Wechsler Adult Intelligence Scale–Revised (Wechsler, 1981), respectively.

Procedure

The guardian of each participant was approached for consent during routine meetings with the child's case manager. They were informed that failure to participate would in no way affect their child's status in the diversion program. All adolescents with parental consent were provided with a full description of the study and were asked to provide assent for participation. Participants were tested in two phases. In the first phase, each participant was administered the K-BIT, the self-report indexes (i.e., APSD, RCMAS, YI-4), and the pencil-and-paper measure of the emotionality of the computer task words. Participants were then given a break before being administered the lexical decision task. The length of time between assessments varied from approximately 30 min to 2 weeks. Following completion of the lexical decision task, each participant was presented with a certificate of appreciation for their participation and each participant was awarded "good behavior" points used as incentives by the diversion program that can be exchanged for merchandise (e.g., candy) and privileges (e.g., time off). The point range used as incentive for participation in the study was the same amount of points that could be obtained for excellent behavior during a similar time frame in the normal milieu of the program.

Results

Preliminary Analyses

Table 2 contains the distributions of the main study variables, all of which seemed to show an adequate range to detect the hypothesized associations. These distributions suggest that the sample was somewhat

Table 2. *Distribution of Predictor and Criterion Variables*

Variable	<i>M</i>	<i>SD</i>	Range
Age	16.04	1.32	12.66 – 18.66
RCMAS	9.12	5.70	1 – 23
K-BIT Composite IQ	87.47	10.44	71 – 112
APSD CU	5.22	2.23	1 – 12
APSD I-CP	8.23	3.81	1 – 18
APSD Total	16.55	6.95	5 – 35
ADHD	7.39	4.32	0 – 20
Neu-Pos	30.22	57.76	-74.73 – 176.53
Neu-Neg	-3.68	58.03	-177.31 – 150.52

Note: RCMAS = total anxiety score from the Revised Children's Manifest Anxiety Scale; K-BIT = Kaufman Brief Intelligence Test; APSD CU = callous and unemotional traits on the Antisocial Process Screening Device (APSD); APSD I-CP = impulsivity-conduct problems on the APSD; ADHD = attention-deficit/hyperactivity disorder hyperactivity and impulsivity symptoms on the Youth's Inventory-4; Neu-Pos = average response time to neutral word trials minus the average response time to positive word trials on the lexical decision task; Neu-Neg = average response time to neutral word trials minus the average response time to negative word trials. $N = 58$ for Neu-Pos data; $N = 56$ for Neu-Neg data.

below average in overall intelligence and somewhat higher than normative samples on anxiety and ADHD symptoms, the only scales for which normative data are available (Gadow & Sprafkin, 1999; Reynolds & Richmond, 1985). However, these characteristics were expected for a sample of adolescents who were court-referred for delinquent activity.¹ Table 3 contains zero-order correlations of the main study variables. None of the main study variables were significantly associated with age or IQ. Ethnicity was not included in the correlation matrix due to the skewed nature of the distribution; however, correlation analyses indicated minimal associations with main study variables such as the CU subscale of the APSD ($r = .14, p = ns$) and the response time facilitation indexes ($r = -.08, p = ns$ for positive facilitation index; $r = -.01, p = ns$ for negative facilitation index). Scores on the CU scale of the APSD showed a modest and nonsignificant negative correlation with the index of response time facilitation to negative emotional words ($r = -.21, p = ns$), whereas ADHD symptoms exhibited nonsignificant correlations of similar magnitude but different direction to the indexes of response time facilitation for both positive ($r = .15, p = ns$) and negative words ($r = .16, p = ns$). Although nonsignificant, these CU and ADHD correlations were in opposite directions as predicted and met the conditions for potential cooperative suppressor effects that were tested in multiple regression analyses.

Main Regression Analyses

The primary analyses for the study were multiple regression analyses conducted to test the independent associations of CU traits and the measures of impulsivity (i.e., APSD I-CP and ADHD impulsivity-hyperactivity symptoms) with the measures of response time facilitation. These analyses also tested for potential interaction effects. A two-step hierarchical procedure was used introducing CU and impulsivity main effects (Step 1) followed by the CU*Impulsivity

¹Prior to conducting bivariate and multivariate analyses, tests of normality were conducted on the response time facilitation scores. These analyses were conducted based on research suggesting that response time scores are usually skewed to such an extent as to potentially violate the assumptions of the general linear model (Andrews & Heathcote, 2001). A Kolmogorov-Smirnov one-sample test of normality indicated that the NEU-POS score exhibited a characteristic positive skew that violated the assumption of normality ($K-S d = .15, p < .01$). In contrast, the NEU-NEG score approximated the normal distribution ($K-S d = .10, p = ns$). As a result of these preliminary analyses, the NEU-POS score was subjected to a logarithmic transformation and reexamined for normality. The transformed NEU-POS score more closely approximated the normal distribution ($K-S d = .07, p = ns$). All analyses, including the NEU-POS score, were conducted separately using the actual and transformed values with no substantive differences in the results. Given the greater ease of interpreting the actual response time values, the analyses that are presented used the nontransformed values.

Table 3. Correlations Among Demographic Variables, Psychopathy, ADHD, and Indexes of Response Time Facilitation

	1	2	3	4	5	6	7	8	9
1. IQ	1.00								
2. Age	0.08	1.00							
3. RCMAS	-0.13	-0.09	1.00						
4. APSD CU	-0.01	-0.15	0.24	1.00					
5. APSD I-CP	0.06	-0.23	0.42*	0.66*	1.00				
6. APSD Total	0.04	-0.23	0.38*	0.86*	0.93*	1.00			
7. ADHD	-0.14	-0.13	0.55*	0.35*	0.48*	0.50*	1.00		
8. Neu-Pos	-0.03	-0.10	0.10	0.06	0.06	0.07	0.15	1.00	
9. Neu-Neg	0.02	0.07	-0.06	-0.21	0.03	-0.07	0.16	0.34*	1.00

Note: IQ = K-BIT Composite intelligence quotient; RCMAS = total anxiety score from the Revised Children's Manifest Anxiety Scale; APSD CU = callous and unemotional traits on the Antisocial Process Screening Device (APSD); APSD I-CP = impulsivity-conduct problems on the APSD; APSD Total = total score on the APSD; ADHD = attention-deficit/hyperactivity disorder hyperactivity and impulsivity symptoms on the Youth's Inventory-4; Neu-Pos = average response time to neutral word trials minus the average response time to positive word trials on the lexical decision task; Neu-Neg = average response time to neutral word trials minus the average response time to negative word trials. $N = 58$ for Neu-Pos comparisons; $N = 56$ for Neu-Neg comparisons.

* $p < .05$.

interaction term (Step 2). Analyses were conducted first with APSD I-CP symptoms as the measure of impulsivity and next with ADHD impulsivity-hyperactivity symptoms as the measure of impulsivity. The results from these analyses are presented in Table 4. An emphasis was placed on semipartial (sr) correlation coefficients in these regression analyses given an interest in describing the proportion of overall criterion variance uniquely predicted by each variable. In contrast to partial correlation coefficients, semipartial correlations are more directly comparable to one another and to zero-order correlations.

The top of Table 4 presents data on the independent contributions of CU and I-CP symptoms to the response time scores. As predicted, there were significant regression effects for the NEU-NEG score that supported a divergence between CU and I-CP dimensions. Specifically, there was a significant negative association between the CU subscale and the response facilitation index to negative words ($sr = -.32, p < .05$) when controlling for the I-CP dimension. In contrast, there was a nonsignificant but positive correlation between I-CP and the negative facilitation index when controlling for CU traits ($sr = .24, p = .08$). Contrary to prediction, neither of the APSD subscales exhibited strong associations with the positive response time facilitation index (CU: $sr = .02, p = ns$; I-CP: $sr = .03, p = ns$). The addition of interaction terms did not contribute to the prediction of either facilitation index. Furthermore, the inclusion of anxiety total scores as an additional main effect in Step 1 and as two separate interaction terms (CU*Anxiety and CU*I-CP) in Step 2 of the analyses did not alter the initial findings. Anxiety did not exhibit a main effect ($sr = -0.10, p = ns$), and the interaction terms did not contribute significantly to the prediction of the facilitation scores.

The bottom of Table 4 presents analogous regression analyses substituting ADHD impulsivity-hyper-

activity symptoms for the I-CP subscale scores. Similar to the previous regression analyses, significant effects were again limited to the response facilitation index for negative words. CU traits were negatively related to response facilitation ($sr = -.29, p < .05$), whereas ADHD symptoms exhibited a positive association with the negative facilitation index ($sr = .25, p = .05$). None of the interaction terms significantly enhanced the prediction of either of the response time facilitation indexes. Additionally, the inclusion of anxiety total scores did not alter the results. Anxiety did not contribute independently to the prediction of the facilitation scores as a main effect or in interaction with the CU and ADHD variables.

To further explore the suppression effects involved in the relation between dimensions of psychopathy and the emotional facilitation index, the results of the regression analyses were used to plot hypothetical facilitation scores for participants exhibiting varying levels of CU and I-CP scores. Using procedures outlined by Cohen and Cohen (1983), this was performed by first calculating CU and I-CP values that were 2 SD above and below the sample mean as indicated in Table 2. These values were subsequently introduced into a regression equation containing the unstandardized beta coefficients for the CU, I-CP, and intercept variables provided in Table 4 to obtain predicted response facilitation scores at various levels of CU traits and I-CP. The predicted response facilitation score for individuals exhibiting low levels of CU traits and low scores on the I-CP scale was 6.70 msec, indicating a slight facilitation effect for negative emotional words. In contrast, the predicted value for participants with low levels of CU traits but high I-CP scores showed a very strong facilitation effect (79.82 msec). Participants with high CU and low I-CP scores (-88.65 msec) and participants with high CU and I-CP scores (-15.81 msec) both showed predicted scores that were negative. Simi-

Table 4. Hierarchical Regression Analyses Predicting Response Time Facilitation

Psychopathy Dimensions	Neu-Pos Score			Neu-Neg Score		
	B		sr	B		sr
Step 1		($R^2 = .00$)			($R^2 = .10$)	
Intercept	21.26		—	12.20		—
APSD CU	0.78		0.02	-10.72		-0.32*
APSD I-CP	0.59		0.03	4.78		0.24
Step 2		($R^2 = .02$)			($R^2 = .14$)	
CU*I-CP	0.88		0.13	-1.38		-0.20
CU and ADHD Symptoms	Neu-Pos Score			Neu-Neg Score		
	B		sr	B		sr
Step 1		($R^2 = .02$)			($R^2 = .11^*$)	
Intercept	15.14		—	10.60		—
APSD CU	0.13		0.00	-7.76		-0.29*
ADHD	1.95		0.14	3.58		0.25+
Step 2		($R^2 = .02$)			($R^2 = .11$)	
CU*ADHD	0.22		0.03	0.04		0.01

Note: APSD CU = callous and unemotional traits on the Antisocial Process Screening Device (APSD); APSD I-CP = impulsivity-conduct problems on the APSD; ADHD = attention-deficit/hyperactivity disorder hyperactivity and impulsivity symptoms on the Youth's Inventory-4; Neu-Pos = average response time to neutral word trials minus the average response time to positive word trials; Neu-Neg = average response time to neutral word trials minus the average response time to negative word trials; *B* = unstandardized beta coefficient; *sr* = semipartial correlation coefficient indicating the independent contribution of each predictor variable to the prediction of the difference scores. Semipartial correlations for interactions used centered variables to increase the interpretability of parameter estimates; *N* = 58 for Neu-Pos comparisons; *N* = 56 for Neu-Neg comparisons.

+*p* = .05. **p* < .05.

lar results were obtained using the regression equation with ADHD symptoms.

These predicted values for the response time facilitation index based on the regression equations reported in Table 4 are consistent with study hypotheses. Impulsivity and conduct problems, in the absence of significant CU traits, were related to facilitated responding to emotional stimuli. In contrast, high scores on impulsivity and conduct problems, in conjunction with high levels of CU traits, led to reduced facilitation, similar to results found for adults with psychopathic traits. However, these results are based on the distribution and patterns of correlations among variables in the sample, and the predicted values do not represent actual scores of individual participants who differ on these dimensions. It is not clear from these analyses how many participants actually fall into these categories in the sample.

To address this issue, a person-centered cluster analysis was conducted using standardized scores (i.e., *z* scores) on the measures of CU traits, I-CP, and ADHD. These standardized scores were subjected to the FASTCLUS procedure of the Statistical Analysis System (SAS Institute Inc., 1990). This procedure places participants into disjoint clusters based on similarities in their symptom endorsement using the nearest centroid sorting method (Bernstein, 1988). A scree plot analysis of the variance explained by increasing numbers of clusters supported a four-cluster solution. These four clusters maximized the overall variance accounted for by the clusters ($R^2 = 0.64$) while maintaining the parsimony

and rationality of the cluster solution. The resulting clusters included a control cluster approaching the sample mean on all symptom categories ($n = 23$), a "normal" cluster scoring well below the sample mean on all symptom categories ($n = 22$), a cluster solely elevated on I-CP and ADHD symptoms (impulsive-only; $n = 7$), and a cluster elevated only on both APSD subscales (CU-I-CP; $n = 8$). This sample did not contain youth solely elevated in CU traits. Therefore, corresponding predicted values derived from the regression analyses should be interpreted cautiously.

Table 5 contains descriptive information on the clusters and a comparison of these clusters on the response facilitation indexes using an analysis of variance framework. Group differences on the response time variables were limited to comparisons involving the response facilitation index for negative words, $F(3, 52) = 3.16, p < .05$, with the results supporting the predicted effects for three of the four groups. As predicted, the control cluster that was around the sample mean on the APSD subscale scores and ADHD symptoms showed an expected slight facilitation effect to negative words that is typical in normative samples. Second, the CU-I-CP cluster exhibited the least facilitation to negative stimuli with a negative value suggesting slower response times to negative words. Third, the impulsive-only cluster exhibited the greatest facilitation to negative words.

The one cluster that did not fit with expectations is the cluster labeled as "normal," which scored below the sample mean on APSD scores and ADHD symp-

Table 5. Cluster Composition and Comparisons on Indices of Response Time Facilitation

Cluster Composition	Control ^a		"Normal" ^b		Impulsive-Only ^c		CU I-CP ^d		F _(3,56)	F _(3,54)
	M	SD	M	SD	M	SD	M	SD		
APSD CU	0.15 _a	0.46	-0.91 _b	0.61	0.54 _a	0.68	1.58 _c	0.67	41.55**	
APSD I-CP	0.14 _a	0.68	-0.93 _b	0.50	1.14 _c	0.37	1.15 _c	0.69	37.46**	
ADHD	0.06 _a	0.61	-0.71 _b	0.55	2.01 _c	0.65	0.02 _a	0.60	37.68**	
Facilitation Indexes										
Neu-Pos	24.66	57.51	25.71	52.55	55.67	73.82	35.08	62.08		0.57
Neu-Neg	10.74 _{ac}	53.34	-11.58 _{abc}	49.66	29.16 _c	64.95	-47.73 _{bd}	63.19		3.16*

Note: APSD CU = callous and unemotional traits on the Antisocial Process Screening Device (APSD); APSD I-CP = impulsivity-conduct problems on the APSD; ADHD = attention-deficit/hyperactivity disorder hyperactivity and impulsivity symptoms on the Youth's Inventory-4; Cluster composition means and standard deviations are based on standardized values (i.e., z scores); Neu-Pos = average response time to neutral word trials minus the average response time to positive word trials. Neu-Neg = average response time to neutral word trials minus the average response time to negative word trials. Means with different subscripts were significantly different ($p < .05$) in pairwise comparisons using independent measures t tests; $n = 22$ and 21 for the control and "normal" groups, respectively, for Neu-Pos comparisons; $n = 20$ and 21 for the control and "normal" groups, respectively, for Neu-Neg comparisons.

^a $n = 23$. ^b $n = 22$. ^c $n = 7$. ^d $n = 8$.

* $p < .05$. ** $p < .001$.

toms. This cluster showed a lack of response facilitation effect to negative words that is more like the responses of the CU-I-CP cluster and not a normative pattern of facilitation. One possible explanation for this finding is that this cluster contained a mixture of participants with some truly exhibiting low levels of relevant symptomatology and others exhibiting traits associated with psychopathy but responding in a socially desirable fashion. To examine this hypothesis, participants with Lie scale scores on the RCMAS at the upper quartile of the sample (i.e., greater than 4), which also corresponds to a recommended clinical cut-off for socially desirable responding (Reynolds & Richmond, 1985), were identified. Nine participants met this criterion, and 7 of these came from the normal cluster. When these 7 individuals were removed, the mean response time facilitation index for this group became more like an expected normative pattern of responding ($M = .98$, $SD = 46.27$), with participants showing a slight facilitation effect to negative words.

Follow-Up Analyses

A few additional analyses were conducted to clarify and expand on the main analyses. First, regression analyses were repeated entering RCMAS Lie scale scores to control for the effect of potential self-report biases on the findings. The inclusion of Lie scale scores did not alter any of the regression findings. Second, it is possible that controlling for impulsivity suppressed the variance of some items on the CU scales that were not as strongly associated with abnormalities in emotional processing.² In doing so, it allowed those items that were more strongly associated with emotional processing to account for a greater percentage of the variance in the neg-

ative facilitation index, a possibility made even more plausible by the low internal consistency of the CU scale. To test this possibility, the CU scale was regressed onto the I-CP subscale and residualized values for the CU scale (i.e., the variance in the CU scale left after controlling for I-CP scores) were calculated for each participant. These residualized scores were correlated with each item on the CU scale to determine if certain items accounted for more of the variance in the residualized variable. An examination of the zero-order correlations between each of the APSD items and the residualized CU score indicated that all six items included on the CU scale were significantly and fairly consistently associated with the residualized variable ($r = .31$ to $.50$, $p < .05$). Furthermore, the residualized variable was not significantly related to any other APSD items. As a result, the associations with the negative facilitation index does not appear to be accounted for by a few of the items on the CU scale.

Finally, analyses were conducted on participants' ratings of the emotionality of the words used in the lexical decision task. Overall, positive words were rated more positively than neutral words, which were rated more positively than negative words, $F(2, 116) = 152.39$, $p < .0001$, supporting the validity of the emotional valence attributed to the words. Additionally, CU traits did not exhibit the independent relation to negative word ratings that was found for facilitation scores on the lexical decision task. For example, CU traits exhibited a minimal relation to negative word ratings when controlling for I-CP and ADHD symptoms ($sr = .07$, $p = ns$), despite a clear association with the negative facilitation score in an analogous analysis ($sr = -.32$, $p < .05$).

Discussion

Research in adult samples has linked psychopathic traits to an underlying impairment in the processing of

²We would like to thank an anonymous reviewer for raising this possibility and providing a method for testing it.

emotional stimuli (e.g., Patrick, 1994; Williamson et al., 1991). This study suggests that this association is also found in samples of adolescents. Specifically, adolescents with antisocial behavior problems who scored high on a measure of CU traits did not process affective stimuli in the same way as other adolescents with antisocial behavior problems. Adolescents with CU traits, similar to adults with psychopathic traits, exhibited a lack of facilitation to emotional words, suggesting a diminished reactivity to emotional stimuli compared to other adolescents with antisocial behavior problems. However, unlike the study by Williamson et al., the difference was found only for negative words. This could suggest that the deficit in emotional responding characteristic of adolescents with CU traits is specific to aversive stimuli (Fowles et al., 2000; Lykken, 1995). However, given the differing finding in adults, firm conclusions as to how specific the deficit may be to different types of emotional stimuli must await further research.

There are several theoretically important implications of these findings. First, the findings are consistent with developmental theory that provides several mechanisms through which poor responsiveness to emotional stimuli may develop into a CU interpersonal style. This was summarized in the introduction. Second, the findings add to a growing body of research suggesting that the presence of CU traits is necessary to designate a group of youth who show characteristics similar to adults with psychopathy (Barry et al., 2000; Frick et al., in press). High levels of CU traits were uniquely related to emotional-processing deficits similar to the deficits found in adult psychopathic samples (Williamson et al., 1991), whereas high levels of impulsivity and conduct problems were uniquely associated with a much different response style. This divergence suggests that a combination of impulsive-hyperactive symptoms with antisocial behavior is likely not sufficient for designating a childhood analogue to the construct of psychopathy (Lynam, 1996, 1998). Instead, these findings are consistent with Barry et al., who determined that youth who are impulsive and antisocial but without high rates of CU traits are actually more sensitive to cues of punishment and more prone to emotional distress than other children and adolescents.

Third, these results support the importance of examining the independent associations of psychopathy dimensions with measures of emotional processing. That is, the divergent correlations between the two dimensions of psychopathy and emotional reactivity became stronger when they were studied controlling for the other dimension, similar to past research using different samples and different methodology (e.g., Frick et al., 1999, in press; Patrick, 1994). Such suppressor effects are rare in psychological research (Cohen & Cohen, 1983) and, therefore, not often considered in the

design of most studies. However, they appear to be fairly robust in this particular area of study, making it important for future research to consider them in the analysis and interpretation of data. One possible explanation for the suppressor effect that was tested was whether certain items on the CU scale might have been uniquely associated with deficits in emotional processing. This did not appear to be the case. In contrast, and consistent with past research (e.g., Frick et al., 1999), these findings seem to be better explained by the fact that youth with CU traits are often high on measures of impulsivity, but high rates of impulsivity symptoms are associated with different patterns of emotional responsiveness depending on the presence or absence of CU traits. As a result, the positive association between impulsivity and response time facilitation increases when the level of CU traits are statistically controlled.

Fourth, and potentially most important, the findings of this study support previous research in suggesting that different patterns of emotional reactivity may be critical for understanding the different causal pathways through which children and adolescents develop conduct problems (Frick, 1998a; Frick et al., in press). For example, it is possible that youth who are antisocial but without CU traits react strongly to perceived provocation and their aggressive and antisocial behavior is without forethought and planning due to high levels of emotional arousal (Frick et al., in press). In contrast, adolescents who are antisocial and high in CU traits may act aggressively and in an antisocial manner due to a lack of concern for the consequences of their behavior for themselves and others (Blair, 1999; Frick et al., 1999).

These findings have some practical assessment implications as well. For example, our results support those of Williamson et al. (1991) in suggesting that persons with CU traits recognize the appropriate emotions associated with the words used in the lexical decision task. This ability was apparent in the finding that the level of CU traits or impulsivity did not influence how emotional words were rated. However, CU traits and impulsivity were related to differences in the experience of word emotionality represented by the facilitation indexes. This pattern of results suggests that assessments of emotional-processing deficits must tap the automatic processing of emotional stimuli and not the secondary or effortful appraisals of such stimuli that are involved in self-report descriptions. As such, these findings indicate the need for more objective and analogue measures of emotional and behavioral functioning, and the lexical decision paradigm provides a promising method for accomplishing this assessment in a time- and cost-efficient manner (Frick & Loney, 2000). Clearly, before this promise can be realized, these results would need to be replicated in other samples. However, an intriguing possibility that can be tested in future research is whether this lexical decision

task or other measures of implicit emotional processing enhance the predictive validity (e.g., predicting future violence) of measures of psychopathy that rely on rating scale and interview assessments of emotional functioning (Hare et al., 1991). The use of very short, concrete words and the relatively unobtrusive nature of the task makes it a potentially fruitful paradigm for use in even younger samples.

It is important to place these interpretations in the context of a number of limitations in the study. First, the traits associated with psychopathy were assessed solely through adolescent self-report, which is susceptible to reporter biases. We have tried to justify the use of self-report in the Method section as being a valid assessment method given the age and context of this sample. Also, self-reports of psychopathy have recently been used to detect theoretically important criteria in other studies of adolescents and young adults, supporting the appropriateness of self-reports of psychopathy for some purposes (Caputo et al., 1999; Kruh et al., in press; Lilienfeld & Andrews, 1996; Lynam et al., 1999; Silverthorn et al., 2001). However, it is important to replicate these findings using other methods of assessing psychopathic traits.

Second, the scales from the self-report measure of psychopathy, particularly the CU subscale, had moderate to low internal consistency. Although low reliability does not increase the likelihood of Type I error, this could have weakened the results in this study. It was important to separate the CU dimension of psychopathy from other dimensions based on past research. Substantial changes to the content of the CU subscale could have altered this construct in important ways and hurt the ability to compare these results to past studies. Furthermore, we conducted analyses to test for the potential effects of scale heterogeneity, such as using a second measure of impulsivity in analyses and testing the items on the CU scale to determine if certain items could have accounted for the associations with the emotional-processing task. However, the low internal consistency of the measure of psychopathy used in this study indicates that much more work is needed to understand the dimensionality of self-report, particularly self-report on the APSD, and how this dimensionality may differ across age, measure, and other important variables.

Third, the study relied on response time to lexical stimuli as the only measure of emotional reactivity. This is contrasted with Fowles and Kochanska (2000), who examined emotional reactivity in young children using behavioral observation, maternal ratings, and electrodermal measures. These researchers indicate that future work in this area must attempt to explore the incremental validity of multimethod assessments of emotional reactivity and other dimensions of behavioral inhibition. One example of this type of research was a study conducted by Kiehl, Smith, Forster, and

Hare (1995), which assessed electrocortical activity exhibited by adult psychopathic individuals while completing the lexical decision task. These researchers found that psychopathic individuals do not show a characteristic increase in brain activity (i.e., event-related brain potential) to affective words that is exhibited by nonpsychopathic individuals. Additionally, Kiehl, Hare, McDonald, and Brink (1999) found that adult psychopathic participants exhibit a unique and large centrofrontal negative-going wave during task performance, further supporting the presence of distinct psychophysiological correlates to the adult psychopathy construct. It remains to be seen if similar psychophysiological correlates would be found in younger samples during this task.

Fourth, the lexical decision task is an indirect measure of emotionality. As such, it is difficult to discern how various temperamental (e.g., differences in autonomic reactivity), cognitive (e.g., attentional biases), and background factors (e.g., differential experiences with the words and their associated meanings) may interact in producing differential performance among children and adolescents. One important type of control that was integrated into our use of the task was a control for individual differences in word recognition times. Relative difference scores were calculated assessing each participant's speed of responding to emotional versus neutral words rather than simply comparing group averages for the different word categories (Williamson et al., 1991). This control provides a more precise estimate of response time facilitation by accounting for individual differences in recognition speed. However, the complexity of measuring emotional processing and determining the critical cognitive, physiological, and contextual determinants of a specific style of emotional processing requires that this potential emotional deficit be studied using other paradigms as well.

Fifth, this study was conducted on a sample of court-referred adolescents without the inclusion of a normal comparison group. As a result, although the results indicated different patterns of emotional responsiveness among groups of adolescents with antisocial behavior problems, statements concerning which of these, if any, are "abnormal" as compared to normative adolescents cannot be made. Another implication of studying an antisocial sample is that it does not indicate whether the association between CU traits and a certain pattern of emotional responding is due to the CU traits or to the combination of CU traits and antisocial behavior. As a result of these issues, it is important to replicate these results in other samples with different characteristics. These results have been partially replicated in a recent study using a community sample of children and adolescents (Frick et al., in press).

Sixth, and also related to characteristics of the sample, participants were primarily African Americans.

As a result, interpretations should be tempered with respect to their application to other ethnic groups. However, it is intriguing that this study essentially replicated a finding obtained in a predominately Caucasian adult sample, thereby providing replication across both age and ethnicity.

Finally, although we have explicitly tried to tie our results to the literature on adults with psychopathy, it is important to acknowledge that the term *psychopath* has a very pejorative connotation. It implies a very stable, difficult-to-change, and biologically based personality pattern (Hare, 1994; Lykken, 1995). There is insufficient evidence to make any of these conclusions about children or adolescents with CU traits. Instead, we view this and other similar studies (e.g., Barry et al., 2000; Frick et al., 1994, in press) as trying to extend the *construct* of psychopathy earlier in development to determine whether the predictive utility (e.g., predicting future violence) and the theoretical importance (e.g., designating a group of individuals with antisocial behavior problems with distinct causal factors underlying their behavior) can be extended to youth who are antisocial. The purpose is not to develop a system to diagnose psychopathy in youth (Frick & Hare, 2001).

Within the context of these limitations, these results add to a growing body of research focused on developing a better understanding of the processes that may lead to a very serious and costly personality pattern in adulthood. This type of research has the potential of informing intervention efforts focused on changing the developmental trajectory toward this outcome. However, even as we await longitudinal research documenting the predictive link between the youth and adults with CU traits, the use of CU traits in samples of youth with antisocial behavior problems seems important in helping to disentangle different developmental pathways, each potentially involving a unique constellation of causal factors through which children and adolescents develop severe antisocial and aggressive behavior (Frick, 1998b; Frick et al., 2000, in press). The results of this and similar studies suggest that youth who are antisocial and who show CU traits differ from those who do not on many important characteristics, especially in the regulation of emotion. Eventually, this research could provide an empirical basis for designing prevention and treatment programs that are specific to the unique processes involved in these and other pathways to antisocial behavior. Already, such individualized approaches to treatment have proven to be the most effective alternatives for changing the life course of the children and adolescents who are most severely antisocial (see Frick, 1998a, 2001, for a more extended discussion and examples). As research clarifies the processes involved in these developmental pathways even further, we would expect further improvements in the available methods of prevention and treatment.

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