

Adolescents with psychopathic traits report reductions in physiological responses to fear

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Background: Psychopathy is characterized by profound affective deficits, including shallow affect and reduced empathy. Recent research suggests that these deficits may apply particularly to negative emotions, or to certain negative emotions such as fear. Despite increased focus on the cognitive and neural underpinnings of psychopathy, little is known about how psychopathy is associated with emotional deficits across a range of emotions. In addition, the relationship between psychopathy and the subjective experience of emotion has not yet been assessed. **Methods:** Eighteen 10–17-year-olds with psychopathic traits and 24 comparison children and adolescents reported on their subjective experiences of emotion during five recent emotionally evocative life events, following a paradigm developed by Scherer and colleagues (Scherer & Wallbott, 1994). Group comparisons were then performed to assess variations in subjective experiences across emotions. **Results:** As predicted, psychopathy was associated with reductions in the subjective experience of fear relative to other emotions. Children and adolescents with psychopathic traits reported fewer symptoms associated with sympathetic nervous system arousal during fear-evoking experiences. **Conclusions:** Rather than being related to uniformly impoverished emotional experience, psychopathic traits appear to be associated with greater deficits in subjective experiences of fear. This pattern of responding supports and extends previous observations that psychopathy engenders deficits in fear learning, physiological responses to threats, and the recognition of fear in others. **Keywords:** Psychopathy, emotion, fear, antisocial behavior, autonomic, adolescence, conduct disorder.

Psychopathy is a developmental disorder characterized by impoverished emotional responding, reduced empathy and remorse, and persistent antisocial and irresponsible behavior (Hare, 1995). Impoverished affect has long been considered a critical facet of psychopathy. Hervey Cleckley's original criteria that defined psychopathy included 'general poverty in major affective reactions,' a criterion that has carried over to modern assessments of psychopathy. However, it remains unclear whether psychopathy entails equivalently impaired responding across emotions or whether deficits are more pronounced for particular emotions. Moreover, little is known about subjective emotional experiences in psychopathy. In the present study, following a paradigm developed by Scherer and colleagues (Scherer & Wallbott, 1994), adolescents with psychopathic traits and healthy controls reported their subjective emotional and physiological experiences during recent life events that evoked anger, disgust, fear, happiness, and sadness.

Both early and modern clinical descriptions of psychopathy have focused on impoverished emotional responding. Cleckley (1988) considered the primary clinical feature of psychopathy to be impoverished emotional reactions to life experiences.

In *The Mask of Sanity*, he specified that this impairment pertained to love as well as to a variety of other emotions, including anger, grief, pride, and joy. He also noted deficits in anxiety, but did not specifically mention impairments in fear, disgust, or other emotions. Shallow affective responding remains a central feature of modern assessments of psychopathy in both adults and juveniles. For example, in juveniles, the Psychopathy Checklist: Youth Version (PCL:YV; Forth, Kosson, & Hare, 2003), like the Psychopathy Checklist: Revised (PCL:R; Hare, 1995), includes 'shallow affect' as a criterion.

Few studies of psychopathy have assessed responses across a variety of emotions. Most laboratory investigations of psychopathy have focused on deficits in emotional responses to negative stimuli, particularly stimuli that evoke fear. Empirical studies reveal reduced autonomic activity in psychopathic individuals during fear-relevant paradigms such as aversive conditioning (Flor, Birbaumer, Hermann, Ziegler, & Patrick, 2002), the anticipation of shock (Hare, 1982) and viewing others' distress cues (Aniskiewicz, 1979; Blair, 1999). Other studies have also shown reductions in the extent to which threat cues enhance the startle reflex in psychopaths (Levenston, Patrick, Bradley, & Lang, 2000; Patrick, 1994). The results of recent neuroimaging research suggest that these emotional difficulties may relate to dysfunction within the amygdala and orbitofrontal

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cortex and perhaps other neural structures (Birbaumer et al., 2005; Dolan & Fullam, 2009; Finger et al., 2008; Jones, Laurens, Herba, Barker, & Viding, 2009; Kiehl et al., 2001; Marsh et al., 2008).

Some studies have compared responses to broadly positive and negative stimuli in psychopaths. Several have shown reduced physiological responses (Herpertz et al., 2001) and emotional attention (Mitchell, Richell, Leonard, & Blair, 2006) to both reward and punishment among psychopathic individuals. However, other results suggest that psychopathy is associated with greater deficits in responding to punishment than to reward (Blair et al., 2004; Blair, Morton, Leonard, & Blair, 2006). Studies of emotion attribution also suggest that psychopaths' impairments vary across emotions. Psychopaths are impaired in attributing guilt but not happiness, sadness, or embarrassment to others (Blair et al., 1995), and are more impaired in identifying others' fearful emotional facial expressions than other expressions (Marsh & Blair, 2008). Only one study has assessed the relationship between psychopathy and physiological responding across a variety of specific emotions (Pham et al., 2000). This study found no group differences in either measured or reported physiological responses to emotionally evocative film clips. However, across both psychopaths and controls, participants reported that the clips that were selected to evoke fear and anger actually evoked sadness and disgust more strongly than the target emotions. This suggests that the film clips may not have differentiated sufficiently among emotions. Thus, despite a frequent emphasis on fear impairments in psychopathy, few studies have been designed to assess fear responses relative to other emotional responses in individuals with psychopathic traits.

Scherer and Wallbot developed a means for assessing subjective emotional experiences across emotions (Scherer & Wallbott, 1994). This measure instructs participants to recall the details of real-life events that generated each of several basic emotions and to report on the physiological and subjective states that accompanied each event. It was created to assess patterns of emotional responding across cultures, and has demonstrated impressive consistency in emotion-specific patterns of reported physiological symptoms, feeling states, and expressive behaviors across more than 2,000 young adult participants from 37 cultures. Assessments of physiological arousal include reported symptoms of both sympathetic arousal (e.g., increased heart rate) and parasympathetic arousal (e.g., stomach upset). The results have shown stable patterns in line with predictions. Across cultures, fear is associated with greater increases in reported sympathetic activation than sadness, happiness, disgust, or anger, whereas sadness is associated with increases in parasympathetic activation that are greater than for other emotions.

The present study was designed to assess patterns of reported subjective emotional responses in adolescents with psychopathic traits. Following Scherer and Wallbott, adolescents recalled recent instances in which they experienced anger, disgust, fear, happiness, and sadness and reported the physiological and feeling state experiences that accompanied each event. In line with theories that psychopathy results from deficits in fear responding (Lykken, 1995; Patrick, 1994) Blair, 2005a; Lykken, 1995; Patrick, 1994), we predicted that psychopaths would differ most from controls in their reported emotional experiences in response to fearful events.

Methods

Participants

Participants included 42 male and female adolescents between the ages of 10 and 17. They were recruited from the local community using fliers, newspaper advertisements, and recruitment tables at community events. Of these participants, 18 were classified as having psychopathic traits and 24 were healthy controls. The two groups of participants did not significantly differ in terms of age, gender distribution, or average IQ (Table 1). All children were assessed by a trained clinician using the Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997). Children with psychosis, pervasive developmental disorders, Tourette's syndrome, mood or anxiety disorders, neurological disorders, IQ <75, or medical illness severe enough to require treatment were excluded from both groups. Adolescents classified as psychopathic were required to score ≥ 20 on the Antisocial Process Screening Device (Frick & Hare, 2001) and the Psychopathy Checklist—Youth Version (Forth et al., 2003). Participants in the comparison group could not have scores ≥ 20 on the Antisocial Process Screening Device. We also administered the Youth Psychopathy Inventory (Poythress, Dembo, Wareham, & Greenbaum, 2006) to all participants to assess severity of psychopathic symptoms.

This study was approved by the institutional review board at the National Institute of Mental Health. The parent or legal guardian of each participant provided written informed consent before the study began; participants provided informed assent.

Materials

Clinical measures. The Antisocial Process Screening Device (Frick & Hare, 2001) is a 20-item parent-completed scale indexing antisocial processes, including psychopathic traits and conduct and impulsivity problems, in children and adolescents. This instrument was completed by a parent or legal guardian for each participant. There is no established threshold score on the Antisocial Process Screening Device for classification of adolescents with psychopathic traits (Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999). However, following

Table 1 Participant characteristics

	Healthy controls	Psychopathic traits	<i>p</i> -value
<i>N</i>	24	18	
Gender (M/F)	13/11	11/7	<i>p</i> > 0.05
Age (SD, range)	14.1 (1.4, 11.7–16.9)	13.8 (2.0, 10.4–16.7)	<i>p</i> > 0.05
IQ (SD, range)	106.2 (13.3, 80–127)	99.3 (10.5, 78–118)	<i>p</i> > 0.05
Diagnoses			
ADHD	0	11	–
ODD	0	11	–
CD	0	6	–
Screening measures*			
APSD (SD, range)	6.5 (4.1, 2–16)	28.6 (4.2, 20–35)	<i>p</i> < .001
YPI (SD, range)	97.1 (18.0, 73–131)	118.9 (24.1, 94–181)	<i>p</i> < .005
PCL:YV (SD, range)	–	24.0 (3.3, 20–32)	–

*Note: IQ scores were unavailable for one healthy participant. YPI scores were unavailable for one participant with psychopathic traits, and PCL:YV scores were unavailable for a separate participant with psychopathic traits.

previous work (Finger et al., 2008; Marsh et al., 2008), we selected a cutoff score of 20, one-half the maximum possible score of 40 points.

The Psychopathy Checklist–Youth Version (Forth et al., 2003) is a 20-item scale assessing interpersonal, affective, and behavioral features related to callous-unemotional traits in youths 12–18 years of age. Scores are based on semi-structured interviews and collateral information. This instrument was completed by two trained experimenters whose scores showed good reliability ($R = 0.91$). Inter-rater reliability was assessed prior to any discussion of adolescents' scores between raters. Afterward, disagreements in scoring were resolved through discussion in order to determine adolescents' final scores. The Psychopathy Checklist–Youth Version was completed for participants with psychopathic traits. Again, following previous work (Finger et al., 2008; Marsh et al., 2008), a cutoff score of 20 or greater (one-half the maximum possible score) was used to classify adolescents with psychopathic traits.

The Youth Psychopathy Inventory (Poythress et al., 2006) was used to measure symptom severity on core interpersonal and affective callous-unemotional traits in all participants. This instrument is a 50-item self-report measure assessing personality domains including callousness, unemotionality, and remorselessness.

Experimental measures. Participants completed a measure adapted from the cross-culturally validated instrument developed by Scherer and Wallbott (1994). This measure assesses physiological symptoms, subjective feeling states, and expressive behaviors associated with basic emotions. Scherer and Wallbott administered the measure to 2,921 individuals from 37 countries and found cross-culturally stable differences among emotions in terms of all three aspects of emotionality.

We asked participants to recall situations in which they experienced anger, disgust, fear, happiness, and sadness. Following Scherer and Wallbott, the measure contained a two-page section of questions for each emotion. The order in which the sections relevant to each of the five emotions were presented was randomized across participants. On the first page of each section, participants were first asked to recall a situation in which they recently experienced a strong emotion of the kind specified on that page. Participants were asked to

recall a situation for which they vividly remembered the circumstances and their own responses. Participants were then asked a series of open-ended questions to prompt them to recall the details of the situation and their experience. These questions were, 'Where were you?' 'What were you doing?' 'What was happening around you?' and 'Why exactly were you feeling (that emotion)?'

The second page asked participants to provide specific information about each situation, including when it happened, how long it lasted, how well they recalled it, and to what degree various physiological sensations and expressive behaviors occurred. Appraisal-related questions were also asked. These items were selected and classified based on the items used by Scherer and Wallbott. Checklists were provided for physiological sensations (13 items) which included items indicative of sympathetic (ergotrophic) nervous system activation (5 items: breathing changes, heart beating faster, feeling tense, shaking or shivering, sweating), parasympathetic (trophotropic) nervous system activation (3 items: lump in throat, stomach upset, crying), and energy and temperature changes (5 items: feeling cold, feeling warm, feeling hot, feeling relaxed, energy), as well as for expressive behaviors and appraisals of the emotional state (11 items: smiling, crying, laughing, yelling, frowning, feeling good, feeling bad, trying to hide the emotion, feeling the emotion to the greatest degree possible, attempts to lessen the emotional state, and beliefs about whether the emotion should have been felt more strongly).

On the final page of the measure, participants were asked to assess how easy or difficult it was to recall instances of each emotion, how often they generally feel each emotion compared to other people, and how strongly they generally feel each emotion compared to other people. For simplicity, given the age range of our participants, questions were not answered on the variable scales used by Scherer and Wallbott, but instead were all answered using 7-point scales anchored by 'No, not at all' and 'Yes, definitely.'

Procedure

Participants completed the questionnaire in a single testing session in a private testing room at the National Institute of Mental Health. While they completed the

measure, participants were monitored by a researcher who provided participants with clarification as needed. For most children, the measure was administered as part of a larger battery of behavioral testing that included questionnaires and computer tasks assessing learning, reasoning, and reaction times.

Results

We first assessed whether the emotional situations described by participants varied in evocativeness across groups. Five independent raters read participants' responses to the open-ended questions ['Where were you?' 'What were you doing? What was happening around you?' and 'Why exactly were you feeling (that emotion)?']. They then rated how emotionally evocative the situations as described were for the relevant emotions (e.g., how much anger would this situation evoke in a typical adolescent?). The raters achieved an acceptably high level of reliability (intraclass correlation coefficient = 0.83) and so their responses were averaged.

A 2 (group) \times 5 (emotion) repeated-measures ANOVA was then performed on the average ratings of the 5 raters to determine whether they detected any group differences in the emotionality of the situations the participants experienced. A main effect of group was detected, $F(1, 37) = 6.19, p < 0.05$, such that the raters tended to score the situations provided by adolescents with psychopathic traits to be more emotionally evocative. No group \times emotion interaction emerged, $F(4, 148) = 0.83, ns$.

To compare responses across emotions and response domains, we first, following Scherer and Wallbott, normalized each participant's scores by converting each variable rating to a z-score that was calculated from the mean and standard deviation for each participant across the emotions for which the participant generated scenarios. This permitted the assessment of emotion-specific response profiles across participants. In addition, this conversion controls for the observed main effect of group in the evocativeness of emotional events, which is particularly salient given that no neutral-state information is provided for comparison using this measure. Following normalization, each participant's arousal rating scores represented a difference from the mean score across all emotions for that participant. Reported physiological symptoms were then combined according to Scherer and Wallbott to form indices of reported sympathetic and parasympathetic arousal.

Sympathetic and parasympathetic responses

Reported sympathetic and parasympathetic responses were analyzed using 2 (group) \times 5 (emotion) repeated-measures ANOVAs to assess group differences in patterns of physiological symptoms across the five emotions. For reported sympathetic

responses, the results showed the predicted group \times emotion interaction, $F(4, 132) = 3.15, p < 0.05, \eta^2 = 0.09$. This was accounted for by a significant group difference in reported sympathetic responses during fear-evoking situations such that healthy adolescents reported significantly greater increases in sympathetic activation than did adolescents with psychopathic traits when fearful, $t(36) = 2.49, p < 0.05$. This group difference in responses to fear remained even after controlling for independent raters' assessments of the fear-evoking situations, as assessed by conducting a follow-up 2 (group) \times 1 ANOVA including average rater assessments of each situation as a covariate, $F(1, 35) = 5.64, p < 0.05$. No significant differences in reported sympathetic activation emerged for any of the other four emotions (Table 2).

Among healthy adolescents, reported sympathetic activation to fear-evoking situations followed the pattern observed cross-culturally by Scherer and Wallbott. Fear elicited significantly greater reports of increased sympathetic activation than did any other emotion: anger, $t(23) = 4.91, p < 0.001$; disgust, $t(22) = 6.69, p < 0.001$; happiness, $t(22) = 4.11, p < 0.001$; and sadness, $t(22) = 5.39, p < 0.001$. By contrast, adolescents with psychopathic traits did not report significantly different levels of sympathetic activation for fear versus anger, disgust, or sadness ($ps > 0.30$). These children only reported significantly more sympathetic activation for fear than for happiness, $t(14) = 3.84, p < 0.005$.

For individual items composing the index of sympathetic activation, significant differences were found in the reports of healthy adolescents and those with psychopathic traits for reported changes in breathing, $t(36) = 2.79, p < 0.01$, and marginally significant differences were found for tension, $t(37) = 1.84, p < 0.10$, and shaking, $t(36) = 1.91, p < 0.10$ (two-tailed). No significant differences emerged for reported changes in heart rate or sweating.

A significant main effect of emotion was also observed, $F(4, 132) = 8.18, p < 0.001, \eta^2 = 0.20$. Across groups, participants reported the largest sympathetic responses to fear-evoking situations

Table 2 Reported physiological responses to emotionally evocative events

	Healthy M (SD)	Psychopathic M (SD)	t value _—
Sympathetic			
Anger	-0.04 (0.37)	0.19 (0.57)	1.50 _—
Disgust	-0.23 (0.47)	0.04 (0.60)	1.51 _—
Fear	0.62 (0.46)	0.24 (0.45)	2.49*
Happiness	-0.19 (0.64)	-0.54 (0.55)	1.85 _—
Sadness	-0.15 (0.32)	0.15 (0.66)	1.95 _—
Parasympathetic			
Anger	-0.29 (0.38)	-0.20 (0.46)	0.72 _—
Disgust	0.12 (0.43)	0.16 (0.40)	0.28 _—
Fear	0.14 (0.56)	0.08 (0.51)	0.30 _—
Happiness	-0.47 (0.32)	-0.51 (0.32)	0.45 _—
Sadness	0.48 (0.52)	0.51 (0.57)	0.22 _—

and the lowest responses to happiness-evoking situations, replicating the pattern observed by Scherer and Wallbott (1994).

For reported parasympathetic symptoms, no group \times emotion effect was observed, $F(4, 132) = 0.21$, *ns*. However, a main effect of emotion was found, $F(4, 132) = 18.95$, $p < 0.001$, $\eta^2 = 0.37$. Across groups, participants reported the largest parasympathetic response to sadness-evoking situations and the lowest responses to happiness-evoking situations, again replicating the pattern observed by Scherer and Wallbott (1994) (Table 2).

The fear-relevant analyses described above exclude the data from one 12-year-old and one 16-year-old participant with psychopathic traits. The 12-year old reported having never felt afraid and the 16-year-old reported not remembering any situation in which he had felt afraid and so neither participant provided a sample situation or any responses for this emotion (both children reported situations that evoked other emotions, and their data were included in the group ANOVAs). No healthy child reported having never felt afraid or not remembering ever feeling afraid.

Other appraisals of emotional states

Contrast tests were conducted to assess group differences in the remaining appraisals of fear-evoking situations. No significant group differences were found in how well the details of the situation described were remembered, reported changes in temperature or expressive behavior, appraisals of the emotional state as feeling good or bad, the desire to hide the emotional state, or belief that the emotional state should have been felt more strongly ($ps > 0.10$). The one exception was that adolescents with psychopathic traits reported yelling more than healthy adolescents during fear-evoking situations, $t(35) = 2.17$, $p < 0.05$. However, this result did not survive correction for multiple comparisons.

Strength and frequency of emotional experience

Subjects were asked at the end of the questionnaire how easy it had been to recall an instance of each emotion, how frequently they felt each emotion, and how strongly they usually felt each emotion (7-point scales). Responses to these three questions were positively correlated for each emotion (effective reliability across the three ratings ranged from $R = 0.67$ for sadness to $R = 0.87$ for happiness) and so were averaged for each emotion and analyzed using a 2 (group) \times 5 (emotion) repeated-measures ANOVA. The results indicated a significant group \times emotion interaction, $F(4, 152) = 2.58$, $p < 0.05$, $\eta^2 = 0.06$. This interaction was generated by group differences in experiences of fear, $t(38) = 2.29$, $p < 0.05$, whereby psychopathic adolescents reported experiencing fear less often and less strongly than healthy ado-

lescents (Figure 1). There were no group differences in experiences of the remaining four emotions ($ps > 0.05$). There was no main effect of group. The results of a main effect of emotion, $F(4, 152) = 20.46$, $p < 0.001$, $\eta^2 = 0.35$, indicated that participants reported experiencing happiness most and disgust least. Last, we analyzed whether psychopathic adolescents' reported strength and frequency of feeling fear or self-reported physiological correlates of feeling fear correlated with the severity of psychopathic traits (as assessed by Youth Psychopathy Inventory total scores and subscale scores). These analyses did not reveal any statistically significant relationships.

Discussion

Prior research has established universal consistencies in reported patterns of sympathetic and parasympathetic arousal during experiences that evoke emotions like fear, sadness, anger, disgust, and happiness. For example, across multiple cultures adults report more sympathetic arousal during fear-evoking situations than during situations that evoke any of several other emotions. The results of the present study show that healthy adolescents report patterns of sympathetic and parasympathetic arousal very similar to those previously observed cross-culturally in adults. For instance, in these adolescents fear evokes more reported sympathetic arousal than any other emotion. Adolescents with psychopathic traits failed to show this pattern, reporting no greater increase in sympathetic arousal during situations that evoke fear than during situations that evoke anger, disgust, or sadness. These data indicate that the reduced sympathetic arousal shown by psychopathic individuals to fear-evoking stimuli in the laboratory are consistent with reductions in their subjectively experienced arousal in fear-evoking situations in daily life.

The results we report are consistent with theories that emphasize disruptions in fear processing in individuals with psychopathic traits. Early theories linking fear dysfunction to the persistent antisocial behavior observed in psychopathy emphasized how fear deficits prevented psychopathic individuals from responding appropriately to punishment

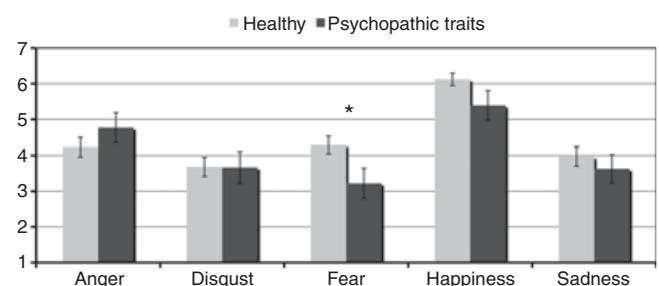


Figure 1 Group differences in reported experience of emotions

(Eysenck, 1964; Eysenck & Gudjonsson, 1989; Trasler, 1973). These theories proposed that healthy children avoid engaging in previously punished behaviors because the behavior becomes associated with the punishment via instrumental conditioning. Dysfunctions in fear responding may lead psychopathic individuals to experience less aversive arousal to punishments and thus to form weaker associations between the punishment and the behavior that elicited it. Thus, individuals with psychopathy are hypothesized to be more likely to repeat previously punished actions than are healthy individuals. In keeping with these theories, Kochanska and others have found, using a variety of measures, that more fearful children show higher levels of moral development and conscientiousness (Asendorpf & Nunner-Winkler, 1992; Kochanska, Murray, & Coy, 1997).

More recent theories emphasize that deficits in fear may help to explain the empathy deficits characteristic of psychopaths. Empathy is typically defined as an emotional response to another person's emotional state and is associated with sympathetic concern or compassion (Blair, 2005b; Decety & Meyer, 2008; de Waal, 2008; Hoffman, 1987). Effective elicitors of concerned or compassionate empathic responses are cues that signal distress, pain, or fear (Batson, Duncan, Ackerman, Buckley, & Birch, 1981; Marsh & Ambady, 2007). Individuals who are particularly skilled in recognizing distress cues in others, such as fearful facial expressions, are more likely to report feeling sympathy for others (Marsh & Ambady, 2007), to behave altruistically toward strangers in a laboratory setting (Marsh, Kozak, & Ambady, 2007), and to show enhanced Theory of Mind abilities (Corden, Critchley, Skuse, & Dolan, 2006). Skill in recognizing fearful facial expressions is also linked to enhanced amygdala function (Corden et al., 2006). By contrast, highly antisocial individuals, including adult psychopaths, show severe and specific deficits in recognizing fearful facial expressions relative to other expressions (Marsh & Blair, 2008). Psychopaths' deficits in recognizing and responding appropriately to this emotion in others may be related to their impoverished experience of fear, which may impair their ability to empathize with this emotion in others.

The group differences observed in this study may be associated with different functioning in the neural structures that generate fear responses. A number of neurocognitive models of psychopathy stress amygdala dysfunction in this population (Blair, 2005a; Patrick, 1994). Activation in the amygdala has been shown to be more closely associated with fear processing than with other basic emotions (Murphy, Nimmo-Smith, & Lawrence, 2003). And neuroimaging studies have revealed aberrant amygdala responses in individuals with psychopathic traits when processing fear-relevant stimuli (Birbaumer

et al., 2005; Dolan & Fullam, 2009; Jones et al., 2009; Marsh et al., 2008). Recent studies have also reported structural anatomical abnormalities in the amygdala in psychopaths (Yang, Raine, Narr, Colletti, & Toga, 2009). Further study may help to determine how functional and structural abnormalities like these relate to the cognitive and behavioral impairments that have been observed.

Further studies may also help to clarify the implications of the present study. This study should be replicated using a larger sample of participants. The difficulty of recruiting and screening children with conduct problems for laboratory research precluded a larger sample from being obtained for the present study. But other strategies for data collection (e.g., web research, data collection in schools or institutions) might provide access to a larger sample. In addition to assessing the reliability of the present findings, testing a larger sample would enable a more detailed analysis of the relationship of the present findings to demographic variables like gender or age, and might enable the detection of relationships between reported emotions and the severity of psychopathic traits. In addition, gathering within-subject data on the correspondence between experienced emotion and antisocial behavior, empathy, and emotion recognition would strengthen hypotheses regarding the developmental trajectory of the disordered behavior observed in adolescents with psychopathic traits.

It would also be helpful to collect objective physiological measurements during emotional events in a paradigm similar to that conducted by Pham and colleagues (Pham, Philippot, & Rime, 2000). This would help to determine the correspondence between subjectively experienced emotion and physiological indices of emotion. This would also help to strengthen our interpretation of the paradigm used in this study, particularly given that the task was originally developed for use in college-age adults. Although the healthy adolescents we tested demonstrated patterns of responding extremely similar to that of the young adults tested previously, obtaining external sources of information to confirm the validity of this paradigm for use with adolescents would be helpful.

Finally, replications may help to validate the use of this paradigm in individuals with psychopathic traits. Given the affective deficits traditionally associated with psychopathy, one could argue that the disorder might leave individuals generally out of touch with their feelings (anonymous reviewer's suggestion). However, the patterns that emerged in the current data do not support this possibility. We observed an interaction between group and emotion for reported sympathetic responses. This suggests that adolescents with psychopathic traits do not report their feelings (or at least their physiological responses) any differently than healthy adolescents for emotional states other than fear. An alternate

explanation is that perhaps adolescents with psychopathic traits confabulated their responses. Importantly, though, if adolescents with psychopathic tendencies did confabulate their physiological experiences, they did so in a way that was not statistically significant from healthy adolescents *unless the experience was fearful in nature*. Thus the current data do not suggest that adolescents with psychopathic traits fail to experience all emotions, but rather that their deficits are specific to fear.

Conclusion

Psychopathy is a developmental disorder characterized by impoverished emotional responding. From some of the earliest conceptions of psychopathy to modern measures of the construct, psychopaths' emotional experiences are described as impoverished. However, very few studies have compared psychopaths' responses across a range of basic emotions, including happiness, disgust, and fear.

Moreover, no prior study has assessed the relationship between subjective experiences of emotion and psychopathy in adolescents. The present study suggests that psychopathic traits in adolescents are associated with deficits in subjective experiences of fear but not other emotions, a finding that may help to shed light on the persistent antisocial behavior and empathy deficits observed in this population.

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Key points

- Psychopathy is characterized by profound emotional deficits. Prior research suggests that these deficits may apply particularly to negative emotions, such as fear.
- The present results indicate that, unlike healthy adults and adolescents, adolescents with psychopathic traits report no greater increase in sympathetic arousal during situations that evoke fear than during situations that evoke anger, disgust, or sadness.
- Psychopathic adolescents also reported experiencing fear less frequently and less strongly than their peers.
- Impaired fearfulness in adolescents with psychopathic traits is consistent with atypical patterns of neural activity in the amygdala and orbitofrontal cortex observed in this population.
- The present findings may also help to explain the antisocial behavior and impaired empathy that characterize these adolescents.

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