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Turning a Deaf Ear to Fear: Impaired Recognition of Vocal Affect in Psychopathic Individuals

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The processing of emotional expressions is fundamental for normal socialization and interaction. Reduced responsiveness to the expressions of sadness and fear has been implicated in the development of psychopathy (R. J. R. Blair, 1995). The current study investigates the ability of adult psychopathic individuals to process vocal affect. Psychopathic and nonpsychopathic adults, defined by the Hare Psychopathy Checklist—Revised (PCL–R; R. D. Hare, 1991), were presented with neutral words spoken with intonations conveying happiness, disgust, anger, sadness, and fear and were asked to identify the emotion of the speaker on the basis of prosody. The results indicated that psychopathic inmates were particularly impaired in the recognition of fearful vocal affect. These results are interpreted with reference to the low-fear and violence inhibition mechanism models of psychopathy.

Psychopathy is a disorder characterized in part by emotional traits such as callousness, a diminished capacity for remorse, and superficial charm as well as impulsivity and poor behavioral controls (Hare, 1991). Psychopathy is indexed in adults by the Hare Psychopathy Checklist—Revised (PCL–R; Hare, 1991). Recent data suggest that the emotional difficulties associated with psychopathy interfere with moral socialization and put the individual at risk for developing high levels of antisocial behavior (Wootton, Frick, Shelton, & Silverthorn, 1997).

Currently, there are two main models that attempt to explain why psychopathic individuals show emotional dysfunction and poor socialization. These are the low-fear model (e.g., Patrick, 1994) and the empathy dysfunction, violence inhibition mechanism (VIM) model (e.g., Blair, 1995, 2001). The low-fear explanation suggests that failed socialization in psychopathic individuals is the result of an attenuated ability to experience fear and, subsequently, a reduced ability to adjust their behavior in response to the negative consequences their behavior has led to in the past. Empirical support for this position is drawn from experiments suggesting that psychopathic individuals show impaired fear conditioning (Lykken, 1957) and impaired startle reflex potentiation (Levenston, Patrick, Bradley, & Lang, 2000).

The VIM model suggests that there is a system that preferentially responds to sad and particularly fearful emotional displays (Blair, 1995, 2001). The functional integrity of this system is thought to be crucial for moral socialization; the healthy individual learns to avoid initiating behaviors that result in the sadness or fear of others because this is aversive to the observer. One of the important predictions of the VIM model is that psychopathic individuals should show particular difficulty when processing sad and fearful expressions. Responding to other facial expressions (e.g., anger and disgust) has been shown, through neuroimaging studies, to involve dissociable systems from those that process sad and fearful expressions. These other systems are not thought to be impaired in psychopathic individuals (for a review, see Blair, 2001). In line with this position, both children with psychopathic tendencies and psychopathic adults show reduced autonomic arousal to sad but not angry facial expressions. In addition, children with psychopathic tendencies show impaired recognition of sad and fearful facial expressions (although the naming impairment for adult psychopathic individuals is only seen for fearful expressions; for a review of this literature, see Blair, 2001).

Although previous studies have investigated the ability of psychopathic individuals to process emotional facial expressions, to our knowledge none have investigated the ability of psychopathic individuals to process emotional information from vocal intona-

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tion. In the current study, the participants were presented with neutral words spoken with intonations conveying happiness, disgust, anger, sadness, and fear and were asked to identify the emotion of the speaker on the basis of prosody. The goal of the study was to explore the ability of psychopathic individuals to recognize emotional vocal intonations.

Method

Participants

The participants were 39 men selected from a pool of 140 individuals residing in Category B (second highest security level) penal institutions in the London area. Participants with a PCL–R score of 30 or above were included in the psychopathic group ($n = 19$); the nonpsychopathic group was composed of individuals scoring less than 20 ($n = 20$) in accordance with established criteria in the literature and the guidelines of the PCL–R (e.g., Hare, 1991). Those individuals whose PCL–R score was 20–29 were excluded from the study. There were no significant group differences in either age, $F(1, 37) = 1.24$, *ns*, or Raven's advanced progressive matrix score (Raven, 1965), $F(1, 37) = 1.63$, *ns* (see Table 1 for full details on participants). The sample was made up of 32 Caucasian and 7 Afro-Caribbean participants. In addition to satisfying PCL–R criteria for high and low levels of psychopathy, psychiatric files were screened for evidence of psychosis or neurological disorder; individuals who had received diagnoses for psychosis or organic brain damage were excluded from testing ($n = 5$). Written consent was obtained from all of the inmates who participated in this study. Each participant understood that participation was voluntary and would not result in financial or other gain and that consent could be withdrawn at any stage of the study.

Design

This experiment involved a 2 (Group: psychopathic and comparison individuals) × 5 (Emotional Vocal Intonations: happy, disgust, anger, sadness, and fear) mixed-model factorial design. The groups were made up of incarcerated adults separated into two groups on the basis of their PCL–R scores. The dependent variable was the number of errors made for each emotional vocal intonation. Each participant's age and score on the Raven's advanced progressive matrix (Set I; Raven, 1965), an estimate of intelligence, were also recorded.

Measures

PCL–R. The PCL–R consists of 20 behavioral items that are scored on the basis of a file review and a semistructured interview. Participants were scored by two raters on the basis of file information and an interview where possible; 6 inmates were unavailable for interview, so these individuals were scored on the basis of file notes only (4 psychopathic and 2 nonpsychopathic individuals). Although the PCL–R scores are most often obtained through interview and file review, inmates can be scored reliably from file notes alone (Hare, 1991; Wong, 1988). Interrater reliability was established by means of a Spearman rank correlation conducted on inmates ($N = 39$) that was scored independently by two raters. The correlation, $r_{ranks} = .92$ ($p < .001$), is similar to that reported in the literature (e.g., Hare, 1991).

Vocal Affect Recognition Test. The Vocal Affect Recognition Test consisted of 60 stimuli. Each stimulus consisted of one of six bisyllabic concrete nouns of neutral denotation (e.g., carpet), digitalized at 22 kHz and presented in random order on a Macintosh G3 laptop computer. One male and one female voice provided an emotional vocal tone for each word. The emotions conveyed were happiness, disgust, anger, sadness, and fear, chosen because they have unique prosodic characteristics (Scott et al., 1997). Thus, in the task, the participant heard each of the six words 10 times (twice with happy intonation, twice with disgusted intonation, etc.). Before the 60 test stimuli, there were an additional 5 practice stimuli (an additional word spoken in each of the basic emotional intonations).

The participants were asked to listen to the voice speaking the words and to determine what emotion the speaker was feeling when the word was spoken. Each participant was reminded that the meaning of the words would not convey any emotion. Instead, the participants were instructed to rely purely on the way in which the word was spoken to determine what emotion the speaker was feeling. The participants could take as much time as they required before proceeding to the next stimulus. Participants were told to choose 1 of 5 response options (happiness, disgust, anger, sadness,

Table 1
Participant Characteristics and Mean Vocal Emotion Recognition Errors for the Psychopathic and Nonpsychopathic Groups

	Psychopathic individuals			Comparison group		
Measure	*M*	*SD*	Range	*M*	*SD*	Range
Participant characteristic						
Raven's matrix score	7.84	2.32	4–11	8.75	2.12	5–12
Age (years)	34.47	9.07	21–52	31.45	7.90	21–45
PCL–R Factor 1 score	12.82	1.76	10–16	2.78	2.30	0–7
PCL–R Factor 2 score	15.03	1.22	13–17	5.42	3.37	0–12
PCL–R total score	32.28	2.19	30–37.5	9.78	5.27	1–18
Vocal affect mean recognition errors[a]						
Happiness	4.42	2.67	0–10	3.95	3.20	0–11
Disgust	4.32	2.50	0–10	2.70	2.03	0–9
Anger	3.47	1.87	0–7	3.10	1.97	0–7
Sadness	3.47***	1.90	0–8	2.00	1.81	0–8
Fear	5.26**	3.21	1–12	2.45	1.28	0–5
Total	4.19*	1.32	1.2–5.8	2.84	1.09	1.6–5.8

Note. Raven's matrix score = Raven's Advanced Progressive Matrix—Set I; PCL–R = Hare Psychopathy Checklist—Revised.
[a] Maximum errors = 12.
* $p < .05$. ** $p < .005$ (Bonferroni corrected). *** $p < .05$ (uncorrected).

or fear) for each stimulus presented. These options were written in front of the participant and were available at all times.

Procedure

Each participant was tested individually in a quiet interview room within the institution. The task was described without informing the participant of the investigation's specific objectives and expectations. Following written consent, each participant was presented with the emotional prosody recognition task presented within a larger neurocognitive test battery. The duration of the experiment was approximately 12 min for each participant.

Results

Initially, correlational analyses were carried out to explore the effect of age and Raven's score on task performance. This identified significant correlations only for Raven's matrix score and recognition errors for disgusted ($r = -.50$, $p < .005$) and fearful ($r = -.61$, $p < .001$) vocal expressions. There were no significant correlations with age.

An initial 2 (Group: psychopathic and comparison individuals) × 5 (Emotion: mean errors for happy, disgusted, angry, sad, and fearful vocal affect) multivariate analysis of covariance (MANCOVA) was conducted, with IQ acting as a covariate. This revealed a significant main effect for group, $F(5, 32) = 3.17$; $p < .05$; the psychopathic individuals made significantly more recognition errors than the comparison group (see Table 1). In addition, the effect of the covariate, IQ, was also significant, $F(5, 32) = 6.24$, $p < .001$. The higher the individual's IQ, the fewer errors were made. Follow-up univariate analyses of variance (ANOVAs) revealed a significant group effect for fearful vocal affect, $F(1, 36) = 11.92$, $p < .005$ (Bonferroni corrected). As can be seen in Table 1, the psychopathic individuals were markedly impaired in their recognition of fearful vocal affect. There were no other significant group effects following Bonferroni corrections (although there was a significant effect for sad vocal affect uncorrected), $F(1, 36) = 4.97$, $p < .05$. In line with the correlational analysis, the covariate IQ had significant effects on the recognition of fearful and disgusted vocal affects, Fs(1, 36) = 20.11 and 10.21, ps < .01, for fearful and disgusted vocal affect, respectively.

It is important to note that the significant main effect for group was primarily due to the data for fearful vocal affect. A second MANCOVA in which the fear vocal affect data were not included revealed no significant group differences, $F(4, 33) = 1.76$, *ns*.

A correlational analysis examined the interrelationships between ability to recognize vocal affect and scores on the PCL–R and its constituent factors. As a significant correlation was found between IQ as measured by the Raven's matrix and Factor 2 scores ($r = -.33$, $p < .05$), and given the relationship of IQ with performance for some of the vocal affects, the impact of IQ was partialed out of the correlational analysis. These revealed that the ability to recognize sad and fearful vocal affect were significantly associated with PCL–R factor and total scores: rs = .41, .40, and .36, $p < .05$, for the correlations of sad vocal affect errors with total PCL–R scores and with Factor 1 and Factor 2 scores; rs = .51, .50, and .49, $p < .01$, for the correlations of fearful vocal affect errors with PCL–R scores and with Factor 1 and Factor 2 scores. In contrast, the ability to recognize happy, disgusted, or angry vocal affects was not associated with either total PCL–R scores or its component factors.

Finally, the error pattern of the psychopathic and comparison individuals was examined. Table 2 presents the percentage of total errors of each erroneous response by correct response and group. As can be seen, both groups made similar types of errors in response to the audio emotion stimuli (i.e., both groups tended to answer happiness for disgust, sadness for happiness, disgust for anger, and sadness for fear).

Discussion

This study investigated the ability of adult psychopathic individuals to identify vocal affect. This study observed that the psychopathic individuals were severely impaired in the recognition of fearful vocal affect relative to comparison individuals. In addition, there was an association between impaired recognition of sad vocal affect and higher scores on the PCL–R. There were no significant group effects for any other vocal emotion.

A series of studies has examined the ability of children with psychopathic tendencies to identify facial emotional expressions (e.g., Blair, Colledge, Murray, & Mitchell, 2001; for a review, see Blair, 2001). In all of these studies, group differences have been found for sad and fearful but not happy, disgusted, angry, or surprised expressions. In addition, studies have shown reduced autonomic activity in children with psychopathic tendencies and in psychopathic adults to sad facial expressions (see Blair, 2001). The current study extends this work by showing that the impairment of adult psychopathic individuals in processing the emotional signals of other humans extends to the auditory domain. Not only do these individuals present with difficulties recognizing and generating autonomic responses to facial expressions of sadness and fear but they also show difficulty with sad and fearful vocal affect.

The low-fear explanation suggests that psychopathic individuals are poorly socialized as a result of a failure to adequately process impending threat or punishment (Lykken, 1957; Patrick, 1994). Such an explanation might generate the prediction that psycho-

Table 2
Type of Misidentification Made for Each Emotion by Group

	Answer given				
Correct answer	Happiness	Disgust	Anger	Sadness	Fear
Happiness					
Psychopathic	—	17.8	5.5	68.5	8.2
Comparison	—	25.0	1.3	55.3	18.4
Disgust					
Psychopathic	40.8	—	9.9	39.4	9.9
Comparison	42.9	—	19.0	21.4	16.7
Anger					
Psychopathic	27.9	41.0	—	11.5	19.7
Comparison	24.6	63.9	—	3.3	8.2
Sadness					
Psychopathic	13.2	43.4	3.8	—	39.6
Comparison	8.3	33.3	8.3	—	50.0
Fear					
Psychopathic	15.0	31.3	6.3	47.5	
Comparison	20.0	20.0	0.0	60.0	

Note. All values are expressed as percentages.

pathic individuals should show impaired processing of expressions such as anger and fear, as both of these expressions have been considered to act as threat cues (Whalen, 1998). Although the current finding of impaired fearful vocal affect would be in line with the low-fear account, the absence of impaired recognition of angry vocal affect would not be. However, it is interesting to note that empirical work has assigned differential communication roles for angry and fearful facial expressions (Blair & Cipolotti, 2000; Mineka & Cook, 1993). Angry expressions are thought to act as social cues to initiate response reversal, causing the observer to either suppress the current response or to select an alternative response (Blair & Cipolotti, 2000). Fearful facial expressions, in contrast, act as socially aversive unconditioned stimuli (US) and serve to teach other individuals to avoid particular objects (Mineka & Cook, 1993). The low-fear model has long stressed the importance of difficulties in aversive conditioning rather than in response reversal (Lykken, 1957, 1995; Patrick, 1994). It is interesting that in this study, psychopathic individuals present with difficulty for the expression, fearfulness, which is thought to act as an aversive US. Thus, the current results are not incompatible with a more tightly specified low-fear account.

Moreover, the VIM model can be considered a form of this low-fear account. The VIM model also considers moral socialization to involve aversive conditioning but considers the important aversive US for this conditioning to be the sad and fearful expressions of others (Blair, 1995). The current study supports the suggestion that psychopathic individuals have difficulty in processing displays of sadness and fear whether these are in the visual or auditory modality. However, the current data, also in line with the facial expression literature (Blair, 2001), indicate that the difficulty psychopathic individuals have with fearful vocal affect is far more significant than their difficulty with sad vocal affect.

Recent theoretical work has integrated the low-fear and VIM accounts at the neural level (Blair, 2001). This revised model suggests that amygdala dysfunction may be crucially involved in the development of psychopathy (although other brain regions may also be implicated; e.g., Raine, Lencz, Bihrle, LaCasse, & Colletti, 2000). In line with this theory, psychopathic individuals have been found to present with reduced amygdaloid volume relative to comparison individuals (Tiihonen et al., 2000). In addition, they showed reduced amygdala activation, relative to comparison individuals, during an emotional memory task (Kiehl et al., 2001). Moreover, functionally, psychopathic individuals, like individuals with amygdala lesions, show impairments in aversive conditioning and reduced startle reflex potentiation (for a review, see Blair, 2001). As regards the current study, the two neuroimaging studies that have investigated the neural response to vocal affect have both identified an amygdala response to fearful vocal affect (Morris, Scott, & Dolan, 1999; Phillips et al., 1998). Moreover, a case study has reported impaired recognition of fearful vocal affect in a patient with lesions including the amygdala (Scott et al., 1997), although other patients with amygdala lesions have not necessarily shown this impairment (Adolphs, Tranel, & Damasio, 2001). Thus, psychopathic individuals present with impairment for the vocal affect most linked to the functioning of the amygdala.

The results of this study also strengthen claims that psychopathy is a neurocognitive disorder that is apparent across the life span, as children with psychopathic tendencies also present with impairment for the recognition of fearful vocal affect (Blair et al., 2002). Thus, not only does the behavioral profile of psychopathic adults show similarities to that of children with psychopathic tendencies (Frick, O'Brien, Wootton, & McBurnett, 1994; Hare, 1991) but also the neurocognitive impairments may present in a comparable way across the life span.

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Call for Nominations

The Publications and Communications (P&C) Board has opened nominations for the editorships of ***Contemporary Psychology: APA Review of Books***, ***Developmental Psychology***, and ***Psychological Review*** for the years 2005–2010. Robert J. Sternberg, PhD, James L. Dannemiller, PhD, and Walter Mischel, PhD, respectively, are the incumbent editors.

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