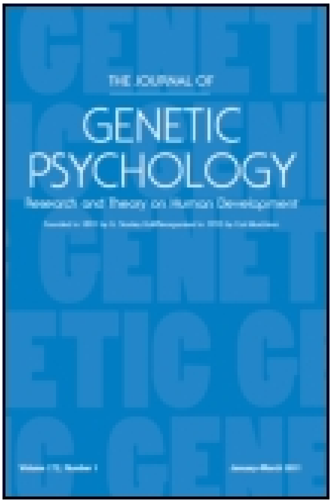


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# Recognition of Emotion in Facial Expressions and Vocal Tones in Children With Psychopathic Tendencies

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# Recognition of Emotion in Facial Expressions and Vocal Tones in Children With Psychopathic Tendencies

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ABSTRACT. The authors investigated the ability of children with emotional and behavioral difficulties, divided according to their Psychopathy Screening Device scores (P. J. Frick & R. D. Hare, in press), to recognize emotional facial expressions and vocal tones. The Psychopathy Screening Device indexes a behavioral syndrome with two dimensions: affective disturbance and impulsive and conduct problems. Nine children with psychopathic tendencies and 9 comparison children were presented with 2 facial expression and 2 vocal tone subtests from the Diagnostic Analysis of Nonverbal Accuracy (S. Nowicki & M. P. Duke, 1994). These subtests measure the ability to name sad, fearful, happy, and angry facial expressions and vocal affects. The children with psychopathic tendencies showed selective impairments in the recognition of both sad and fearful facial expressions and sad vocal tone. In contrast, the two groups did not differ in their recognition of happy or angry facial expressions or fearful, happy, and angry vocal tones. The results are interpreted with reference to the suggestion that the development of psychopathic tendencies may reflect early amygdala dysfunction (R. J. R. Blair, J. S. Morris, C. D. Frith, D. I. Perrett, & R. Dolan, 1999).

Key words: conduct disorder, emotion, empathy, expression, psychopathy

PSYCHOPATHY IS GENERALLY CONSIDERED to be a severe developmental disorder that persists across the life span. Psychopathic individuals commit more crimes, receive more convictions, and spend more time in prison before the age of 40 than nonpsychopathic individuals do (Hare, 1993). Psychopathy can be indexed behaviorally in children with the Psychopathy Screening Device (PSD;

Frick & Hare, in press) and in adults with the Psychopathy Checklist–Revised (Hare, 1991). These scales index a syndrome that is strikingly similar in the way that it presents in both children and adults. Factor analyses identify two behavioral factors (e.g., Frick, O'Brien, Wootton, & McBurnett, 1994; Harpur, Hare, & Hakstian, 1989). Factor 1 consists of items that describe a cluster of affective–interpersonal traits central to the classical, clinical descriptions of the psychopath; these include (a) callousness and (b) lack of empathy, guilt, and remorse. Factor 2 is made up of items that describe traits and behaviors associated with an unstable and antisocial lifestyle, such as impulsiveness, lack of behavioral control, and criminal activity.

Many of the affective–interpersonal traits that make up the Factor 1 items have been considered to be due to a deficit in the neurophysiological systems modulating fear behavior (e.g., Fowles, 1988; Hare, 1993; Patrick, 1994; Trasler, 1978). In support of the suggestion that there is such a deficit, research has shown psychopathic individuals to be deficient in the acquisition of anxiety responses to threatening stimuli and, when anticipating aversive shock, to show reduced electrodermal responses (e.g., Hare, Frazelle, & Cox, 1978; Lykken, 1957; Ogloff & Wong, 1990). In addition, they have been found to show reduced skin conductance responses, relative to nonpsychopathic controls, during the imagery of unpleasant and fearful experiences, and reduced potentiated startle after the presentation of visual threat primes (Patrick, Bradley, & Lang, 1993; Patrick, Cuthbert, & Lang, 1994).

An alternative way to interpret the affective–interpersonal traits that make up the Factor 1 items is to consider them to be due to a deficit in the neurophysiological systems modulating empathy (e.g., Blair, 1995; Gibbs, 1987). Of course, empathy is a rather nebulous concept that has been defined in different ways (see Eisenberg & Strayer, 1987). However, recently there has been an attempt to more precisely characterize empathy in both information processing and anatomical terms. This attempt has been termed the violence inhibition mechanism model (e.g., Blair, 1995; Blair & Frith, 2000; Blair, Morris, Frith, Perrett, & Dolan, 1999). It has been proposed that the basic emotion system is activated by sad and fearful facial expressions and vocal affects. The activation of this system is considered to result in autonomic arousal and the inhibition of ongoing behavior (Blair, 1995; Blair, Jones, Clark, & Smith, 1997). In addition, Blair and colleagues suggested that, in typically developing children, sad and fearful expressions act as



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punishments for acts that cause these expressions (e.g., hitting others). Children who are less sensitive to these expressions will be less punished by them and thus more likely to engage in acts that cause them. Such children may develop psychopathic tendencies. At the anatomical level, the neural circuit that mediates the violence inhibition mechanism is thought to include the amygdala (Blair & Frith, 2000). Indeed, recent neuroimaging studies have demonstrated that the amygdala does respond to sad and fearful facial expressions (Blair et al., 1999; Morris et al., 1996). Consequently, it has been proposed that early amygdala dysfunction may result in the development of psychopathic affective–interpersonal traits.

The suggestion that early amygdala dysfunction may result in the development of psychopathic tendencies allows the integration of the results of both the fear and empathy positions. The classical fear conditioning impairments demonstrated in psychopathic individuals also were seen in patients with amygdala lesions (e.g., Bechara et al., 1995). In addition, patients with amygdala lesions have shown reduced augmented startle reflexes (Angrilli et al., 1996). Functional imaging studies have shown that the amygdala is involved in processing sad and fearful expressions (e.g., Blair et al., 1999; Morris et al., 1996). Moreover, work with adult patients with acquired amygdala lesions indicated that these patients are typically impaired in the recognition of fearful, and frequently sad, facial expressions (e.g., Adolphs, Tranel, Damasio, & Damasio, 1994; Calder, Young, Rowland, & Perrett, 1996; for a review, see Fine & Blair, 2000). Thus, if individuals with psychopathic tendencies have amygdala dysfunction, then it can be predicted that these individuals will show difficulty processing not only sad expressions but also fearful ones. The present study tested this prediction in children with psychopathic tendencies.



## Method

### *Design*

The study consisted of two experiments, both of which involved a 2 (group) × 4 (emotional signal: happy, sad, angry, fearful) repeated measures factorial design. The groups included one with children scoring greater than 25 on the PSD ($N = 9$) and one with children scoring less than 20 on the PSD ($N = 9$) in line with previous literature (e.g., Blair, 1999; Fisher & Blair, 1998). In the first component of this study, the emotional signals were visual; that is, pictures of facial expressions. In the second component, the emotional signals were auditory; that is, the sound of an actor reading a sentence in an emotional voice. The dependent variables were the emotion attributions given to the facial and vocal stimuli.

### *Participants*

The 37 participants were male, between 9 and 15 years old ($M = 11.7$, $SD = 1.7$), and attending a school for children with emotional and behavioral difficulties. All had statements under the Education Act of 1993 as being too problematic for mainstream education because of either high levels of aggression or other significant behavioral disturbance (e.g., hyperactivity). Parental permission was obtained for all children who participated in this study. The experimental investigation was performed before the children were assigned to a particular group; thus, each child was tested blind. After testing, two teachers filled in a PSD for each child. These teachers were the individual children's form teacher and another who had extensive knowledge of that child.

*Procedure*

Each participant was interviewed individually in a quiet room adjoining the classroom. The experiment commenced after a day in which all members of the school were given the opportunity to familiarize themselves with the experimenter. The tasks were described without informing the participants of the investigation's objectives and expectations. Each child was given four subtests from the Diagnostic Analysis of Nonverbal Accuracy (DANVA; Nowicki & Duke, 1994). The order of presentation of the subtests was randomized across participants. The experiment took 15 to 20 min for each participant.

Subsequent to the administration of the DANVA, both the main class teacher and the school's head teacher filled in the PSD. Because the children were resident in this school during term time, these teachers had very good knowledge of all of the children. The PSD scores were obtained from the teachers after the testing sessions with the children, thus the experimenter was blind to the participants' PSD scores. After teacher assessment, the sample was divided on the basis of the children's PSD scores. All of the analyses reported here were conducted on children in the highest and lowest scoring quartiles (see Table 1 for group details).

*Measures*

The DANVA assesses the recognition of four facial and vocal emotions: happiness, sadness, anger, and fearfulness. The four subtests used from the DANVA were the Child Facial Expressions 2, Adult Facial Expressions 2, Child Paralanguage 2, and Adult Paralanguage 2. Both the child and adult expression subtests consist of 24 photographs of boys and girls (aged 7 to 12 years) and adults showing facial expressions (for details on task design, see Nowicki & Carton, 1993). They were presented as photographs in a photo album. Each image was shown to the participant for 2 s, then withdrawn from view. After image presentation, participants were asked to decide whether they thought the expression presented was happiness, sadness, anger, or fear.

Both the child and adult paralanguage subtests consist of 24 auditory stimuli of children's (a 10-year-old boy and girl) and adults' voices repeating the sentence "I am going out of the room now, but I'll be back later," with intonations reflect-

**TABLE 1**
**Participant Characteristics and Recognition Scores, Standard Deviations (*SD*), and Ranges for the Highest and Lowest PSD Scoring Children**

| Item | Highest PSD | Lowest PSD | $t(16)$ |
|---|---|---|---|
| Characteristic | | | |
| Age | 11.67 | 11.33 | < 1 |
| *SD* | 1.50 | 1.87 | |
| PSD score | 28.11 | 14.17 | 8.44*** |
| *SD*: Range | 2.57: 26 to 33 | 4.24: 7.5 to 18 | |
| Factor 1 | 7.61 | 3.72 | 6.86*** |
| *SD*: Range | 1.71: 4.5 to 10 | 1.03: 2 to 5.5 | |
| Factor 2 | 14.11 | 7.17 | 5.84*** |
| *SD*: Range | 1.43: 12 to 16.5 | 2.68: 2 to 10.5 | |
| Faces score (Max = 48) | 28.33 | 35.00 | 3.36** |
| *SD*: Range | 4.27: 20 to 35 | 4.15: 26 to 40 | |
| Sad (Max = 12) | 6.00 | 8.67 | 2.39* |
| *SD*: Range | 2.39: 0 to 11 | 2.35: 5 to 11 | |
| Fear (Max = 12) | 6.22 | 8.78 | 1.97† |
| *SD*: Range | 3.63: 0 to 10 | 1.39: 6 to 11 | |
| Happy (Max = 12) | 11.00 | 11.00 | < 1 |
| *SD*: Range | 1.12: 9 to 12 | 1.32: 8 to 12 | |
| Angry (Max = 12) | 5.11 | 6.56 | 1.26 |
| *SD*: Range | 2.52: 2 to 10 | 2.35: 2 to 10 | |
| Vocal affect (Max = 48) | 23.56 | 28.44 | 1.96† |
| *SD*: Range | 5.34: 15 to 33 | 5.00: 19 to 36 | |
| Sad (Max = 12) | 4.22 | 7.22 | 2.79* |
| *SD*: Range | 2.77: 0 to 8 | 1.64: 5 to 9 | |
| Fear (Max = 12) | 6.44 | 5.89 | < 1 |
| *SD*: Range | 2.19: 3 to 11 | 2.76: 1 to 11 | |
| Happy (Max = 12) | 6.67 | 8.00 | 1.19 |
| *SD*: Range | 2.50: 2 to 10 | 2.24: 5 to 11 | |
| Angry (Max = 12) | 6.22 | 7.22 | < 1 |
| *SD*: Range | 2.64: 0 to 8 | 1.48: 5 to 10 | |

*Note.* PSD = Psychopathy Screening Device. Factor 1 = Affective-interpersonal traits. Factor 2 = Impulsive and antisocial behaviors. Max = maximum.
*$p < .05$. **$p < .01$. ***$p < .001$. †$p < .05$ (one-tailed).

ing the emotions. They were presented by tape recorder placed within 1 m of the participant. The stimuli were presented 4 s after a response to the previous stimulus. The participants were given a short rest period after each subtest. The participants' responses were recorded on standard response sheets by the experimenter.

The 20-item PSD is designed to measure the characteristics of psychopathy in a way that is analogous to the Revised Psychopathy Checklist for adults (PCL-R; Hare, 1991). A study of the PSD revealed a two-factor structure similar to that identified by analysis of the PCL-R (Frick et al., 1994). For each item on the PSD, the teachers could rate the participants with a score between 0 and 2 (0 = *not true at all,* 1 = *sometimes true*, and 2 = *definitely true*). Five items were inversely scored prior to the totaling of each statement to obtain the final PSD score. A total score of up to 40 could be obtained. The participant's score for each item was the average assigned by the two teachers. Pearson's correlations of the ratings of the two teachers were .54 for total PSD score, .39 for Factor 1 (Callous/Unemotional), and .57 for Factor 2 (Impulsiveness/Conduct Problems).



## Results

Table 1 presents mean recognition scores for the groups. Initially, we conducted a 2 (group) × 2 (presentation mode: facial/vocal) × 4 (emotion type: sad, fear, happy, anger) split analysis of variance (ANOVA). This revealed a significant main effect for group, $F(1, 16) = 7.16$, $p < .05$. The high-PSD-scoring group was significantly less likely to name the facial or vocal affect correctly than the low-PSD-scoring group was (mean high-PSD recognition score = 25.945, mean low-PSD recognition score = 31.77). There also was a significant main effect for presentation mode, $F(1, 16) = 87.68$, $p < .001$. Both groups of participants were significantly more likely to name the facial expressions than the vocal affects (mean facial expression score = 31.65, mean vocal affect score = 26). There were no other significant effects or interactions.

Subsequent analyses focused on the degree of specificity of the difficulties shown by the high-PSD-scoring group in affect processing. Thus, the violence inhibition mechanism, amygdala-based account predicted that the high-PSD group would show selective difficulties with sad and fearful affect but no difficulties with angry and happy affect.

In a 2 (group) × 2 (presentation mode: facial/vocal) × 2 (emotion type: sad and fear) split ANOVA, we explored the groups' abilities to process sad and fearful affect. This revealed a significant main effect for group $F(1, 16) = 6.90$, $p < .05$. The high-PSD-scoring group was significantly less likely to name the sad and fearful facial and vocal affects than the low-PSD-scoring group was (mean high-PSD recognition = 5.72, mean low-PSD recognition = 7.64). There was also a significant main effect for presentation mode, $F(1, 16) = 13.55$, $p < .01$. Both groups of participants were significantly more likely to name the facial expressions than the vocal affects (mean facial expression score = 14.84, mean vocal affect score = 11.89). There were no other significant effects or interactions.

A 2 (group) × 2 (presentation mode: facial/vocal) × 2 (emotion type: happy and anger) split ANOVA revealed no significant main effect for group. However, there was a significant main effect for presentation mode, $F(1, 16) = 15.27$, $p < .05$. Both groups of participants were significantly more likely to name the facial expressions than the vocal affects (mean facial expression score = 16.84, mean vocal affect score = 14.06). In addition, there was a significant main effect for emotion, $F(1, 16) = 25.74$, $p < .001$. Both groups of participants were significantly more likely to name the happy expressions and vocal affects than the angry expressions and vocal affects (mean score for happy expressions and vocal affects = 9.17, mean score for angry expressions and vocal affects = 6.28). There was also a significant presentation model by emotion interaction, $F(1, 16) = 24.47, p < .01$. The happy expressions were easier to name than the happy vocal affects were, and the angry expressions were more difficult to name than the angry vocal affects were (happy: facial = 11.00, vocal = 7.34; angry: facial = 5.84, vocal = 6.72).

In addition to the ANOVAs, we conducted a series of independent samples $t$ tests to clarify the degree of specificity of the group results. These confirmed that the high-PSD-scoring group was significantly less likely to name the facial expressions and vocal affects than the low-PSD-scoring group was. However, for the individual emotions, this was significant only for the sad and fearful facial expressions and the sad vocal affect (see Table 1). The high-PSD-scoring group was able to name the happy and angry facial expressions and the fearful, happy, and angry vocal affects as well as the low-PSD-scoring group was.

## Discussion

As far as we are aware, this is the first study to investigate the ability of children with psychopathic tendencies (high-scoring individuals on the PSD) to recognize emotional facial expressions and emotion in vocal tone. The study found that children with psychopathic tendencies were significantly less able than a comparison population was to recognize sad and fearful facial expressions and sad vocal tone. In contrast, the children with psychopathic tendencies were not significantly less able to recognize happy and angry facial expressions and fearful, happy, and angry vocal tones.

Previous studies have shown that children with psychopathic tendencies and adult psychopathic individuals show reduced skin conductance responses to sad faces when compared with control groups (e.g., Aniskiewicz, 1979; Blair, 1999; Blair et al., 1997; House & Milligan, 1976). The present study was the first to show that this impairment, at least in children, extends even to the recognition of sad facial expressions and sad vocal tones. In addition, this study was the first to demonstrate that children with psychopathic tendencies also show reduced recognition of fearful facial expressions.

One study investigating the relation between performance on the DANVA and externalizing problems in girls and boys (Lancelot & Nowicki, 1997) found that total DANVA accuracy was significantly related to the number of externalizing problems shown by girls, though not by boys. Unfortunately, that study did not analyze the results by emotion category so it is not possible to conclude whether there were selective difficulties similar to those found in the present study. Moreover, we did find significant group differences in the ability to recognize sad and fearful expressions in boys. It is difficult to be certain why Lancelot and Nowicki found the association between externalizing problems and

DANVA score only in girls. The authors suggested that receptive nonverbal processing skills may be more important for social adjustment in girls than in boys. Our results suggested that difficulties in processing sad and fearful expressions are associated with behavioral disturbance in boys as well. It is possible that the girls in the Lancelot and Nowicki study represented a more extreme population, perhaps like the high-PSD-scoring population in this study. The boys may have been a more heterogeneous group. It is now widely considered that there are many developmental routes to antisocial and impulsive behavior, only one of which is associated with the lack of guilt and empathy that is the hallmark of psychopathy (e.g., Blair & Frith, 2000; Frick, 1995).

Before we consider the theoretical implications of the present study, it is necessary to consider whether the results could be explained in terms of an experimental artifact. For example, could the specificity of the results be attributable to a task difficulty effect? Fear is certainly considered to be the most difficult expression to recognize; however, sadness is one of the easier expressions to recognize (Ekman & Friesen, 1974). Thus, the group differences obtained in the present study cannot be easily attributed to task difficulty effects. Another caveat that should be mentioned is the small sample size. This was a preliminary study investigating the ability of children with psychopathic tendencies and a comparison population to name emotional expressions and vocal affects. It is possible that the lack of power due to the small sample size may have masked effects. Indeed, given the provocative nature of the specific group effects, it is in need of replication with a larger number of participants.

How can we account for our results? The results could be interpreted within the models of empathy (e.g., Feshbach, 1987; Hoffman, 1984; see Strayer & Eisenberg, 1987), which assume that the cognitive system that mediates empathy is unitary; that is, the same system mediates the empathic reaction to any emotion felt by others. Thus, for example, Feshbach considered the affective empathy reaction to be a function of three factors: (a) the ability to discriminate affective cues in others, (b) the ability to assume the perspective and role of another person, and (c) emotional responsiveness. From these accounts, the same system would mediate the empathic reaction to another's sadness as to another's anger. Such a position would not predict the selective difficulties for sad and fearful expressions shown by the high-PSD-scoring children in the present study. Alternatively, it might be possible to suggest an account based on the learning experiences of the individuals. For example, high-PSD-scoring children might be less exposed to facial expressions. However, it must be again questioned how any experience-based account would predict the specific pattern of data shown in the present study. It is unclear why high-PSD-scoring children should have selectively different experiences with sad and fearful emotional displays compared with happy and, particularly, angry emotional displays.

The results of this study were predicted on the basis of the neurocognitive violence inhibition mechanism model (Blair, 1995; Blair et al., 1999). At the neural level, this model suggests that the development of psychopathy may be a potential consequence of early amygdala dysfunction. Of course, it should be noted that we have no evidence of anatomical abnormalities in the present sample. However, it is interesting to note that comparable populations in adulthood have been found to show reduced amygdala volume, particularly in the right hemisphere (Critchley et al., 2000; Wong, Lumsden, Fenton, & Fenwick, 1997). But the model does predict that behavior dependent on the integrity of the amygdala will be impaired in individuals with psychopathic tendencies. Processing sad and fearful affect has been shown in neuroimaging and neuropsychological studies to be reliant on the amygdala (e.g., Adolphs et al., 1994; Blair et al., 1999; Calder et al., 1996; Fine & Blair, 2000). Thus, the model predicts that processing sad and fearful affect in others will be impaired in individuals with psychopathic tendencies, predictions that are borne out by this study. In contrast, the processing of other expressions that rely on neural circuits that do not include the amygdala, such as happiness and anger, will be unaffected. The present results are in line with these predictions.

One result not in line with the predictions of the violence inhibition mechanism model was the absence of a group effect for fearful vocal affect. Indeed, those in the high-PSD-scoring group were nonsignificantly more likely to name the fearful vocal affect than those in the low-PSD-scoring group were. No account can easily be given for this result. Clearly, it would be interesting to determine whether, in replications involving larger group sizes, this result would be maintained or whether, in line with the violence inhibition mechanism, a significant group difference would emerge in the predicted direction.

In conclusion, the present research demonstrated that children with psychopathic tendencies showed selective impairments in the recognition of both sad and fearful facial expressions and sad vocal affect.

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