They know the words but not the music: Deficits in perceiving prosodic cues to emotion by individuals with psychopathic characteristics

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Abstract

Psychopathy is a personality disorder characterized by callousness and shallow affect. It not only manifests itself as a clinical condition but also exists as a continuous personality trait in the general population. Psychopathic individuals possess a deficit in emotion-processing that interferes with their ability to perceive emotional expression in others. Participants varying in "subclinical psychopathy" (i.e., psychopathic characteristics below the cutoff for psychopathy) categorized the emotional prosody in semantically neutral words and sentences representing five emotion categories (happy, sad, angry, fear, and disgust). Word-length stimuli were predicted to be perceived with greater ambiguity than the sentence-length stimuli due to the duration difference between the two kinds of stimuli, with the difference between the stimuli predicted to be larger for participants with more psychopathic characteristics. Participants with more psychopathic characteristics and participants with fewer psychopathic characteristics were equally good at identifying the emotion in sentence-length stimuli. However, the participants with more psychopathic characteristics were less accurate at identifying emotion in word-length stimuli than participants with fewer psychopathic characteristics. This indicates that even individuals varying in levels of subclinical psychopathy can differ in emotion perception, particularly as the ambiguity of the stimuli increases.

Keywords: psychopathy, emotion, speech perception

Introduction

Emotion is a key indicator of the status of others. Information about the emotional status of others is available in various forms, including facial expressions (e.g., Darwin, 1872) and vocal affect (i.e., speech) (e.g., Scherer, 1986). The focus of the present work is the perception of emotion information that is conveyed by the prosodic cues in spoken language, and how personality characteristics can influence the accuracy of listeners' perception of this information. The specific personality characteristic investigated in the present study is psychopathy, in part because previous research has shown that psychopathic individuals have a deficit in processing emotion information in faces and spoken language. However, almost all of this research has been done with incarcerated individuals with clinical levels of psychopathy. The goals of the present study were 1) to determine if deficits in emotion perception were present in individuals with sub-clinical levels of psychopathy (i.e, relatively moderate levels of psychopathy), and 2) if so, the nature of the deficit and how it compared with those with higher levels of psychopathic characteristics.

Psychopathy

Psychopathy is a disorder of personality characterized by both emotional and behavioural features (Blair, Mitchell, & Blair, 2005). Emotionally, psychopathic individuals are callous and manipulative with shallow affect. Behaviourally, these individuals are impulsive and goal-directed, often leading them to engage in antisocial behaviour. They show a lack of concern for consequences of their actions or the welfare of others. Approximately 1% of the population can be categorized as psychopathic (Forth, Brown, Hart, & Hare, 1996). In addition to being viewed dichotomously as a personality disorder (either present or absent), psychopathy can also be considered as a trait that varies in the general population. Thus, individuals may score highly on a measure of psychopathy without meeting the criteria for true "clinical" psychopathy. Much of the literature on psychopathy has focused on psychopathy as a disorder, particularly studying incarcerated populations, in part because psychopaths are overrepresented in the correctional system compared to their prevalence in the population (Coid, Yang, Ullrich, Roberts, & Hare, 2009).

Studying the presence of psychopathic characteristics in the general population ("subclinical" psychopathy) is important because it emphasizes continuity between a clinical disorder generally associated with extreme behaviour (e.g., homicide) to less extreme but still negative behaviours (e.g., cheating) that likely are to be much more prevalent in the population. For example, research by Paulhus and associates indicates that individuals with moderate levels of psychopathic characteristics are more prone to engage in cheating on tests than individuals with low levels of psychopathic characteristics (Williams, Nathanson, & Paulhus, 2010). From a theoretical perspective, this suggests that psychopathy is not an "all or none" disorder, but rather, a personality characteristic that exists on a continuum, with individuals differing in terms of exhibiting more or less of the features, or more or less intense features, associated with the disorder. Extending the logic of this type of research to the present study, it is therefore important to determine if having features of moderate psychopathy also affect aspects of cognition, such as the perception of emotion.

Psychopathy offers an intriguing testbed for evaluating the theoretical relationship between cognition and emotion. Several models of psychopathy (e.g., Blair et al., 2005;

Newman, 1987; Newman & Kosson, 1986) make strong claims about how psychopathy affects cognitive mechanisms such as attention and perception.

Psychopathy and the Perception of Emotion Stimuli

Psychopaths show deficits in processing for various types of emotional stimuli, including faces (Pham & Philippot, 2010), visually-presented words (Blair et al., 2006), and imagery (Sutton, Vitale, & Newman, 2002). Results are mixed, but studies often show a deficit in processing fearful stimuli (Blair et al., 2005; Marsh et al., 2011). One explanation for this is that psychopathy is associated with impaired processing in the amygdala, which is responsible for the automatic response to fear (Kiehl, 2006; Blair & Mitchell, 2009). Studies have found psychopathic individuals display reduced physiological reactivity to unpleasant imagery (Patrick, Cuthbert, & Lang, 1994) and are not as responsive to fear conditioning as nonpsychopaths (Hare, Frazelle, & Cox, 1978), which would be consistent with this explanation. Several theories have been developed which account for a deficit in emotion-processing, especially the impoverished response to fearful stimuli. These accounts include the dysfunctional fear hypothesis (Newman & Kosson, 1986; Birbaumer et al., 2005; Blair et al., 2005), the amygdala dysfunction hypothesis (Blair et al., 2005; Mitchell et al., 2006) and the violence inhibition mechanism (Blair, 1995). These accounts can be grouped into a single category of theories describing deficits in perception and experience of fear that will henceforth be referred to as the dysfunctional fear hypotheses.

(The other major competing explanation for psychopathic behaviours is based on the existence of an attentional deficit. Newman's response modulation theory (e.g., Newman,1987) proposes that psychopathic individuals are unable to suspend a dominant response to a stimulus in the face of relevant feedback from the environment. However, it is not clear how it would account for the deficits in emotion perception that are the focus of the present study.)

One explanation for psychopathic individuals' ability to appear to function successfully in society (without outward indication of any psychopathology) is that they are able to learn the appropriate emotional response to social situations despite their failure to truly experience it. Johns and Quay (as cited in Blair et al., 2006) coined the term, "they know the words but not the music" to describe this paradox. That is, psychopathic individuals can learn, through social feedback, how they should respond in a situation that would evoke a normal emotional reaction in a nonpsychopathic individual. Thus, they can often respond accordingly and mask any deficit in emotional understanding they might possess.

Despite considerable research that has identified impairments in processing of emotional stimuli in psychopaths, few studies have explored this emotion processing deficit using auditory emotional stimuli (emotional speech). Blair et al. (2002) conducted a study with psychopathic inmates wherein participants listened to spoken words with neutral semantic content (word meaning) and varying emotional prosody (suprasegmental variations in frequency and amplitude) representing five emotions (happy, sad, angry, fear, and disgust). The task requirement was to accurately categorize the emotion represented in the prosody of each word. Psychopaths demonstrated a higher error rate for categorization of fearful prosody than nonpsychopaths, but no group differences were observed for the other emotion categories. This suggests that psychopathic individuals have a decreased ability to identify fear in others compared to normal individuals, a finding that is consistent with the amygdala dysfunction and dysfunctional fear hypotheses.

Several other studies have measured the response of psychopathic participants to auditory emotional stimuli and have found evidence for deficits in processing of emotional speech (Blair, Budhani, & Colledge, 2005; Bagley, Abramowitz, & Kosson, 2009). It is difficult to cohesively summarize the findings of these various studies, however, because the methodologies vary and the emotions included in each task are often different. Moreover, at the present time, minimal research has examined perception of auditory (spoken) stimuli in the context of subclinical psychopathy.

If the expression, "they know the words but not the music" holds true, it should be more difficult for psychopathic individuals to perceive emotional information conveyed by prosody in speech than for them to perceive emotion via word meaning and syntax and semantics. Emotion speech perception also has a practical application as it replicates the context of interpersonal discourse. Therefore, if psychopathic individuals struggle to accurately interpret emotion expressed by others, assessing the former's ability to perceive emotional speech should capture this impairment in a socially relevant way.

If psychopathic individuals are able to learn how to produce appropriate responses to emotion-relevant situations despite having a diminished capacity to perceive emotion, would increasing the ambiguity of the stimuli more effectively demonstrate this impoverished ability to perceive emotion? If the appropriate responses psychopathic individuals demonstrate are learned responses that are achieved through social feedback, this feedback must occur in a context with multiple social cues. The presence of multiple social cues may contribute to the acquisition of this learned response. Therefore, exposing individuals who score highly on psychopathy to somewhat ambiguous emotional stimuli would make any deficits in emotion-processing they may possess more evident. Prosody is typically thought of in the context of sentence-length stimuli: changes in prosody are likely to be more accurately perceived when they occur over the length of a sentence, where variations in pitch and tempo have a greater temporal duration. Individual words, on the other hand, provide such brief opportunities for the reliable perception of prosodic cues that it is likely more difficult to effectively convey emotion in word-length than sentence-length stimuli. For this reason it is relevant to note that Blair et al. (2002) successfully used isolated spoken words in their task requiring identification of prosody; however, the use of incarcerated individuals with very high levels of

psychopathy may have provided sufficient differences in level of psychopathy to accentuate the group differences in identification of emotional prosody.

Present Study

The current study measured the ability of individuals scored on a measure of subclinical psychopathy to correctly identify the emotional prosody present in words and in sentences. We predicted that individuals who scored higher on a measure of subclinical psychopathy would be more likely to accurately identify the emotion conveyed by prosodic information in sentences than in words. In contrast, we predicted that low scoring individuals will show equivalent levels of emotion identification performance for the two types of stimuli.

Method

Participants

Participants consisted of 159 undergraduate students enrolled in a first or second year psychology class. Participants received course credit in return for participation. The recruitment notice stipulated that participants have normal hearing. Participants were scored on the SRP-III with scores ranging from 29 to 88 (median value of 49.5). A quartile split on the SRP-III was used to distinguish between high and low scoring individuals with the high scoring group representing the top 25% of SRP-III scorers and the low scoring group representing the bottom 25% of SRP-III scores. This resulted in inclusion of 81 participants in the final analysis (40 = low scoring, 41 = high scoring).

Materials

Speech Stimuli. The stimuli used in the present study were based on words used by Blair et al. (2002). Seven bisyllabic nouns with neutral semantic content (e.g., *carpet*, *daughter*) were spoken with varying emotional prosody representing one of five emotions: happy, sad, angry, fear and disgust. All stimuli were approximately 500-600 ms in length. All words were produced for each emotion category by two different speakers (one male, one female). Since the original study by Blair et al. used British English speakers as the study was conducted in the United Kingdom, it was deemed appropriate to create a new set of stimuli spoken using "Canadian" English for the Canadian listeners participating in the study.

The same two speakers also produced the set of sentence-length stimuli. Five sentences with neutral semantic content (e.g., "*My coffee table is brown*") (the sentences were originally developed by David Kosson) were reproduced with the same five emotions (happy, sad, angry, fearful, and neutral) that were used to produce the word stimuli. Fewer sentences were included in order to make the two experiment conditions (words and sentences) more comparable in duration.

Individual Differences Measure. The SRP-III (Self-Report Psychopathy scale) (Paulhus, Neumann, & Hare, in press) was administered to participants prior to the experimental task. Individuals who scored higher on psychopathic characteristics than would be found in the subclinical population were not included in the study. The SRP-III short version is comprised of 29 questions (e.g., "I like to watch fist fights") that are scored on a 5-point Likert scale from Strongly Disagree (1) to Strongly Agree (5). It is scored on the four dimensions of Interpersonal Manipulation and Callous Affect (combined to form Factor 1), and Erratic Lifestyle and Criminal Tendencies (combined to form Factor 2), with individual factor scores given in addition to a total SRP score.

Procedure

Data were collected online using Qualtrics software (Qualtrics, 2013). Participants were provided a link to the online study which brought them to the consent form, followed by instructions for the task. A stimulus (word or sentence) was presented and participants were required to categorize the emotional prosody of the stimulus as one of five emotion categories: happy, sad, angry, fear, or disgust. These five options were displayed on the screen during the task as a set of multiple choice items and participants were instructed to click on the appropriate emotion category using the cursor. As soon as the selection was made, the next stimulus was immediately presented (approximately 1 second later). Stimuli were blocked separately by stimulus type (word vs. sentence) and also separately by speaker within stimulus type. Stimuli were randomized within blocks and presentation of stimulus type was counterbalanced. Participants were presented five practice words at the beginning of the set of word trials and five sentences for the set of sentence trials. Prior to the task, participants completed several personality questionnaires including the SRP-III.

Results

A repeated-measures ANOVA was conducted for stimulus type (word vs. sentence) × SRP group (high/low) × emotion × speaker on both accuracy and response times. Sphericity was observed for all effects discussed.

Although response times were recorded and analyzed, these results will not be discussed here as there were no significant results for response times. This is not surprising as this can be attributed to the method in which data were collected (using the cursor method rather than a keystroke response option). The prolonged time required for participants to move the cursor to the appropriate selection made the RTs too long to be practically useful.

A main effect of stimulus type (word vs. sentence) on accuracy was observed ($F(1,79) = 80.14$, $MSE = 4.63$, $p < .001$), with sentence-length stimuli producing higher accuracy than word-length stimuli. There was a significant interaction between stimulus type and SRP Group ($F(1,79) = 5.49$, $MSE = .32$, $p < .05$) (see Figure 1), with comparable accuracy for identification of sentence-length prosody between high and low scoring individuals but poorer accuracy for identification of word-length prosody by high scoring than low scoring individuals. There was a main effect of emotion identification accuracy ($F(4,316) = 80.14$, $MSE = 2.887$, $p < .001$), with happy stimuli proving the most easy to identify and disgust stimuli the least. There was a significant effect of SRP group ($F(1,79) = 7.41$, $MSE = 1.51$, $p < .01$), with high scoring individuals

displaying lower overall accuracy rates across all emotion categories. There was no significant interaction between SRP group and emotion, indicating that although high scoring individuals show discrepancies in their ability to perceive emotional prosody in general, and for word-length prosody in particular, compared to low scoring individuals, there were no differences between high and low scorers related to specific emotion categories. There was a significant interaction between stimulus type and emotion ($F(4,79) = 20.82$, $MSE = .75$, $p < .001$) (see Figure 2), with higher accuracy rates for sentence-length stimuli in all emotion categories except, surprisingly, for fear. This is counter to what was predicted as it was expected that there would be a particularly noticeable difference between high and low scoring individuals in their ability to perceive fearful stimuli given the results of Blair et al. (2002). There was no significant effect of speaker, suggesting that idiosyncratic qualities of the speakers' voices were not responsible for the observed effects.

Figure 1. Accuracy for identification of emotional prosody in word-length vs. sentence-length stimuli by SRP-III Group (High/Low). Error bars indicate standard error of the mean.

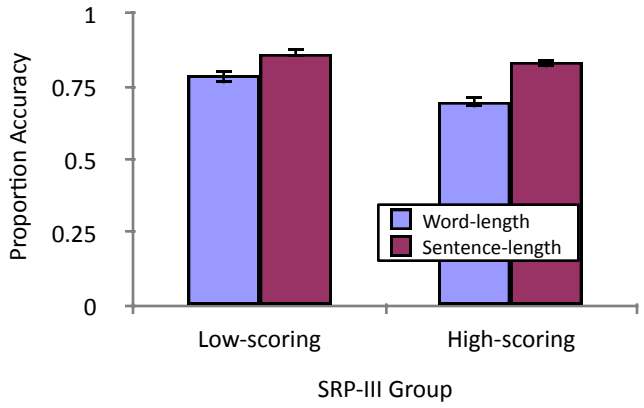
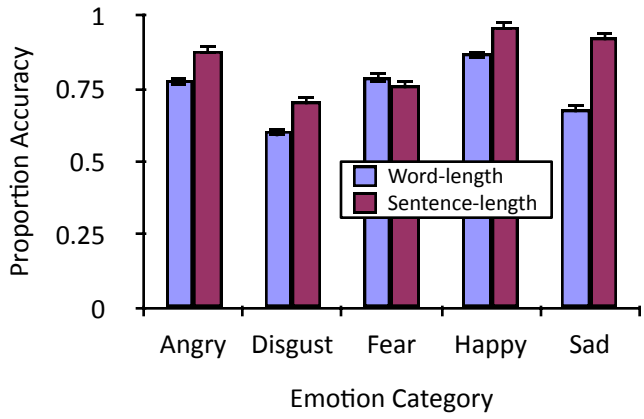


Figure 2. Accuracy for identification of emotional prosody by emotion category. Error bars indicate standard error of the mean.



Conclusion

As predicted, individuals who scored higher on the SRP-III showed greater deficits in their ability to categorize emotional prosody in words than sentences when compared with low scoring individuals. For categorization of emotional prosody in sentences, high scoring participants showed accuracy rates comparable to low scoring participants. For categorization of emotional prosody in words, however, high scoring participants were less accurate than low scoring participants. Due to the brief presentation of prosody information in word-length compared with sentence-length stimuli, words can be thought of as more ambiguous representations of emotional prosody. When presented with stimuli that provide a strong representation of emotional prosody in the form of sentences, high scoring individuals are able to perceive the prosody conveyed in the sentence as effectively as low scorers.

This pattern of results is consistent with the proposed theory that individuals high in psychopathic characteristics have a deficit in emotion-processing, an impairment that becomes evident with increasingly ambiguous emotional stimuli. While highly psychopathic individuals may be able to replicate accurate reactions to emotional stimuli and apply these appropriately in social interactions, these responses do not necessarily reflect the same extent of emotional understanding as the average person would experience. The results of the present study demonstrate that individuals vary in their ability to effectively perceive emotion information conveyed by prosodic cues in speech, and that differences in the duration of the prosodic cues appears to be the major underlying this difference. However, between the extremes of isolated words and sentence-length stimuli, it remains unclear what would constitute a sufficiently long stimulus that would provide enough unambiguous prosodic information for individuals with moderately high levels of psychopathy to accurately perceive the intended emotion. It may be challenging to devise stimuli that permit a systematic examination of this issue due to the interplay between how prosody is used in linguistic units that span the difference between isolated words and sentences.

A noteworthy finding was that higher levels of psychopathy were not associated with a problem perceiving fear, a finding not consistent with the fear dysfunction hypotheses. Rather than displaying a deficit in emotion-processing specific to fearful stimuli as identified by Blair et al. (2002) in psychopathic inmates, high scoring individuals in the present study showed poorer ability to accurately identify emotional prosody consistently across all emotion categories. This suggests that perhaps the deficit in emotion-processing experienced by individuals with subclinical psychopathy does not directly map onto the impairment as seen in individuals who meet the criteria for true psychopathy.

Further exploration of the emotional deficiency in individuals with subclinical psychopathy and how it relates to emotional impairment in those with clinical psychopathy is needed. Future analyses also will need to examine differences related to individual SRP factor scores rather

than overall SRP score to determine whether these differences in perceiving emotional prosody are more heavily reliant on the callous/unemotional component than the impulsivity/behavioural component of psychopathic traits. On the other hand, if the impulsivity component of psychopathy is implicated in the attenuated ability of those with high levels of psychopathy, then it may permit accounts of psychopathy based on an attention deficit (i.e., Newman's (1986) response modulation theory) to compete with the fear dysfunction hypothesis as a viable theory of emotion processing in this personality disorder.

References

Bagley, A.D., Abramowitz, C.S., & Kosson, D.S. (2009). Vocal affect recognition and psychopathy: Converging findings across cluster analytic approaches to assessing the construct. *Journal of Abnormal Psychology, 118*(2), 388-398.

Birbaumer, N., Veit, R., Lotze, M., Erb, M., Hermann, C., et al. (2005). Deficient fear conditioning in psychopathy: A functional magnetic resonance imaging study. *Archives of General Psychiatry, 62*(7), 799-805.

Blair, R.J.R. (1995). A cognitive developmental approach to morality: Investigating the psychopath. *Cognition, 57*, 1-29.

Blair, R.J.R, Budhani, S., & Colledge, E. (2005). Deafness to fear in boys with psychopathic tendencies. *Journal of Child Psychology and Psychiatry, 46*(3), 327-336.

Blair, R., Mitchell, D., & Blair, K. (2005). *The psychopath: Emotion and the brain*. Blackwell Publishing: MA, USA.

Blair, R.J.R., & Mitchell, D.G.V. (2009). Psychopathy, attention and emotion. *Psychological Medicine, 39,* 543-555.

Blair, R.J.R., Mitchell, D.G.V., Richell, R.A., Kelly, S., Leonard, A., Newman, C., & Scott, S. (2002). Turning a deaf ear to fear: Impaired recognition of vocal affect in psychopathic individuals. *Journal of Abnormal Psychology, 111*(4), 682-686.

Blair, K.S., Richell, R.A, Mitchell, D.G.V., Leonard, A., & Morton, J. (2006). They know the words but not the music: Affective and semantic priming in individuals with psychopathy. *Biological Psychology, 73*(2), 114-123.

Coid, M., Yang, M., Ullrich, S., Roberts, A., & Hare, R.D. (2009). Prevalence and correlates of psychopathic traits in the household population of Great Britain. *International Journal of Law and Psychiatry, 32*(2), 65-73.

Forth, A.E., Brown, S.L., Hart, S.D., & Hare, R.D. (1996). The assessment of psychopathy in male and female noncriminals: Reliability and validity. *Personality and Individual Differences, 20*(5), 531-543.

Darwin, C. (1872). *The expression of the emotions in man and animals.* London: John Murray,

Hare, R.D., Frazelle, J., & Cox, D.N. (1978) Psychopathy and physiological responses to threat of an aversive stimulus. *Psychophysiology, 15*(2), 165-172.

Kiehl, K.A. (2006). A cognitive neuroscience perspective on psychopathy: Evidence for paralimbic system dysfunction. *Psychiatry Research, 142*(2-3), 107-128.

Marsh, A., Finger, E., Schechter, J., Jurkowitz, I., Reid, M., & Blair, R.J. (2011). Adolescents with psychopathic traits report reductions in physiological responses to fear. *Journal of Child Psychology and Psychiatry, 28*(2), 834-841.

Mitchell, D.G.V., Fine, C., Richell, R.A., Newman, C., Lumsden, J., Blair, K.S., & Blair, R.J.R. (2006). Instrumental learning and relearning in individuals with psychopathy and in patients with lesions involving the amygdala or orbitofrontal cortex. *Neuropsychology, 20*(3), 280-289.

Newman, J.P. (1987). Reaction to punishment in extraverts and psychopaths: Implications for the impulsive behavior of disinhibited individuals. *Journal of Research in Personality, 21*, 464-485.

Newman, J.P., & Kosson, D.S. (1986). Passive avoidance learning in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology, 95*(3), 252-256.

Patrick, C.J., Cuthbert, B.N., & Lang, P.J. (1994). Emotion in the criminal psychopath: Fear image processing. *Journal of Abnormal Psychology, 103*(1), 523-534.

Pham, T.H., & Philippot, P. (2010). Decoding of facial expression of emotion in criminal psychopaths. *Journal of Psychiatric Disorders, 24*(4), 445-459.

Paulhus, D. L., Neumann, C., & Hare, R. D. (in press). *Manual for the self-report psychopathy scale.* Toronto: Multi-Health Systems.

Qualtrics (Version 38,972) [Software]. (2013). Provo, UT: Qualtrics Research Suite.

Scherer (1986). Vocal affect expression: A review and model for future research. *Psychological Bulletin, 99*(2), 143-165.

Sutton, S.K., Vitale, J.E., & Newman, J.P. (2002). Emotion among women with psychopathy during picture perception. *Journal of Abnormal Psychology, 111*(4), 610-619.

Williams, K. M., Nathanson, C., & Paulhus, D. L. (2010). Identifying and profiling scholastic cheaters: Their personality, cognitive ability, and motivation. *Journal of Experimental Psychology: Applied*, *16*, 293.