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Somatic aphasia: Mismatch of body sensations with autonomic stress reactivity in psychopathy

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ABSTRACT

Background: Although one of the main characteristics of psychopaths is a deficit in emotion, it is unknown whether they show a fundamental impairment in appropriately recognizing their own body sensations during an emotion-inducing task.
Method: Skin conductance and heart rate were recorded in 138 males during a social stressor together with subjective reports of body sensations. Psychopathic traits were assessed using the Psychopathy Checklist-Revised (PCL-R) 2nd edition (Hare, 2003).
Results: Nonpsychopathic controls who reported higher body sensations showed higher heart rate reactivity, but this verbal-autonomic consistency was not found in psychopathic individuals. This mind–body disconnection is particularly associated with the interpersonal-affective factor of psychopathy.
Conclusions: Findings are the first to document this body sensation–autonomic mismatch in psychopaths, and suggest that somatic aphasia – the inaccurate identification and recognition of one's own somatic states – may partly underlie the interpersonal-affective features of psychopathy.

1. Introduction

Psychopathic individuals are characterized by a constellation of traits, including interpersonal-affective (e.g., superficial charm, manipulativeness, lack of affect and emotion) and antisocial features (e.g., impulsivity and aggression (Hare, 2003)). One prominent theoretical perspective of the underlying neurobiological basis of psychopathy is the somatic marker hypothesis (Damasio, 1994), which proposes that appropriate autonomic functioning is critical to experiencing emotional states that guide prosocial behavior and good decision making. It is assumed that emotions associated with previous experiences provide dispositional or visceral markers that function as alarm signals, alerting the individual to the potential negative outcome of a certain action. This somatic marker has been termed as "an unpleasant gut feeling" (Damasio, 1994, p. 173) which includes both visceral and nonvisceral sensations in response to external stimuli, and which are associated with both positive and negative emotional states. Damage to the ventromedial prefrontal cortex and other structures involved in the representation and regulation of body states (including amygdala, insula, somatosensory cortex, cingulate, basal ganglia and brainstem nuclei) has been argued to result in an inability to experience this "gut feeling" which in turn may predispose to psychopathic and antisocial behavior (Bechara et al., 1999).

There has been some support for the somatic marker hypothesis. For example, using the Iowa Gambling Task, several studies have found that while nonpsychopathic individuals learned to avoid "risky" decks, psychopaths made more risky decisions over time, indicating their inability to guide behavior based on somatic markers (Blair et al., 2001; Mitchell et al., 2002; van Honk et al., 2002). However, some have failed to find this relationship (Blair and Cipolotti, 2000), or have found that the relation is moderated by attention, anxiety, or social status (Blair and Cipolotti, 2000; Gao et al., 2009; Lösel and Schmucker, 2004; Schmitt et al., 1999). Using a different paradigm, Raine and colleagues (Ishikawa et al., 2001; Raine et al., 2000) have provided additional supporting evidence. Individuals with high antisocial personality traits and psychopathy displayed significantly reduced autonomic reactivity when giving a speech about their personal faults compared to those with low traits, and also showed reduced gray matter in the ventromedial cortex, orbitofrontal cortex, and amygdala (Yang et al., 2005, 2010). Damasio (2000) suggested that this social stressor is particularly useful for eliciting secondary emotions such as guilt and embarrassment, and that a lack of somatic markers resulted in socially abnormal behavior in psychopaths. Impairments in this cortical–subcortical network may underlie an individual's inability

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to interpret or label body sensation, which in turn may give rise to risky decision-making in psychopathic individuals (Bechara et al., 1999; Birbaumer et al., 2005; Blair, 2007; Yang et al., 2010).

Despite this body of research, no study has examined whether psychopaths are unaware of their body sensations at the somatic level. It has long been theorized that emotion experiences arise directly from the perception of body changes (e.g., James, 1884). Given that a fundamental emotion deficit is viewed by many as the core feature of psychopathy (Cleckley, 1976; Patrick, 1994), it could be hypothesized that psychopaths may be relatively less sensitive to their body changes during emotional events, and thus are unable to accurately perceive their somatic reactions, which may then contribute to their affective deficiency. What also appears entirely unexplored is the mismatch or decoupling between *objective* measures of body responses (autonomic changes), and *subjective* verbal reports of body changes in psychopaths. Psychopaths describe emotional experiences, albeit in a fashion that is stereotyped and at times wooden (Cleckley, 1976). For example, studies have shown that although compared to nonpsychopathic controls, psychopathic individuals show autonomic hyporesponsivity including reduced fear-potentiated startle and smaller skin conductance magnitudes, the two groups' subjective experience to emotional stimuli are rated similar (Benning et al., 2005; Flor et al., 2002; Patrick et al., 1993). Furthermore, these psychophysiological deficits are often attributed to the interpersonal-affective factor of psychopathy (Patrick, 2007). Given that psychopaths are characterized by emotional deficits, it is possible that they are describing emotions that they think they should feel based on exteroceptive cues, but do not consciously experience. The expectation is that normal individuals may be relatively accurate in perceiving and interpreting their body changes; if they show an objective autonomic increase to a social stressor, they should be able to verbally report corresponding body sensations. In contrast, if there is a disruption in the appropriate sensation of body reactions to a stressor in psychopaths, one would expect somatic aphasia – a mismatch between the subjective report and objective autonomic measures of their body sensations.

This study attempts to address this issue by measuring skin conductance and heart rate reactivity during a social stressor in a community sample. All participants were recruited from temporary employment agencies and psychopathic traits were assessed using the PCL-R (Hare, 2003). It is hypothesized that in a social stressor: (1) psychopathic and nonpsychopathic controls will show similar verbal reports of body sensations experienced, and (2) nonpsychopathic controls who report high body sensation will exhibit high autonomic responses, whereas this consistency would not be observed in psychopaths. Finally, we aim to explore which of the two factors of psychopathy, i.e. interpersonal-affective and antisocial behavior, will be particularly associated with the mismatch between autonomic measure and verbal reports of body sensations.

2. Methods

2.1. Participants

Participants (138 men, mean age = 35.72, *SD* = 8.61, range = 23–56 years) were recruited from temporary employment agencies in the greater Los Angeles area, and represents a different sample to that used in our prior work (Ishikawa et al., 2001; Raine et al., 2004; Yang et al., 2005). After giving written informed consent, participants were individually assessed for 2 days. The study and all its procedures were approved by the university's Institutional Review Board. An estimate of IQ scores was created by prorating four subscales of the WAIS-III (Similarities, Arithmetic, Digit Symbol and Picture Completion). Anyone who was interested in a research study was recruited and all participants were paid $100 for completing the study.

2.2. Psychopathy assessment

Psychopathy was assessed using the Psychopathy Checklist-Revised (PCL-R): 2nd edition (Hare, 2003), and supplemented by 10 sources of collateral data. The PCL-R: 2nd edition consists of 20 items and reflects two factors: interpersonal-affective characteristics (Factor 1) and antisocial behavior (Factor 2). Ratings were made by the third author (RS) who received systematic training on the administration and scoring of the PCL-R by Robert D. Hare and Adelle Forth—including the completion of a series of PCL-R assessments on standardized videotaped case histories of adult male offenders (Pearson r correlations between rater's and standardized criterion scores: Total PCL-R = .92, Factor 1 = .93, and Factor 2 = .91). Assessments were supervised by the second author who has extensive experience in the assessment of psychopathy (AR).

Expanding on our prior work on community assessment with the PCL-R (Ishikawa et al., 2001), we met the challenge of using the PCL-R in a community sample by further developing a systematic and comprehensive protocol for the collation of 10 sources of objective collateral data, including professional web-based background check services. These data not only provided new additional background information for item evaluation (e.g., irresponsibility, proneness to boredom, criminal versatility), but also allowed for assessment of inconsistencies and conflicts between the participant's oral report and objective data reports that aid assessment of pathological lying and deception. The ten collateral data sources were as follows: (a) self-reported theft, drug offenses, and violent crime as assessed by an adult extension (Raine et al., 2000) of the National Youth Survey self-report delinquency measure (Elliott et al., 1983); (b) official state-level Department of Justice criminal records for California; (c) nationwide state-level criminal and court record database searches; (d) federal criminal records database search; (e) involvement in civil action, liens, and other financial judgments; (f) personal history judgments including marriage and divorce, prior residences and relocations, relatives, and significant others; (g) data derived from, and behavioral observations made during, the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 1997b); (h) the SCID Axis II Personality Disorders (SCID-II; First et al., 1997a). The SCID-I and II diagnoses were made by the same research assistant trained on the SCID (Ventura et al., 1998); (i) the Interpersonal Measure of Psychopathy (IM-P; Kosson et al., 1997), which provides an interviewer's ratings of an individual's psychopathic interpersonal behaviors, has demonstrated construct validity with the PCL-R in a prison sample, and has been validated for use with nonincarcerated samples (i.e., college students; Kosson et al., 1997); and (j) independent IM-P ratings made by two different laboratory assistants during separate phases of testing throughout the two days. A tertile split on the PCL-R score was performed, and those falling in the top and bottom third were retained. This tertile split resulted in a cut-off point of 23, i.e., subjects with total PCL-R scores equal to or larger than 23 were grouped as psychopaths ($n = 44$, mean PCL-R score = 28.5, range 23–39). Those scored 14 or below were grouped as nonpsychopathic controls ($n = 45$, mean PCL-R score = 8.0, range 0–14). This is consistent with the cut-off point used in our prior work among a completely different community sample (Ishikawa et al., 2001; Raine et al., 2003, 2004; Yang et al., 2005). Although it is lower than the commonly used cut-off point of 30 in incarcerated population (Hare, 2003), we used this cut-off point both to be consistent with our prior research, and also because the PCL-R (which was developed on prison samples) underestimates psychopathy scores in community samples which do not have access to the rich sources of collateral information obtained in institutionalized samples. Psychopaths had significantly higher rates of self-reported violent or nonviolent crime than the nonpsychopathic controls (all $p < .001$). The two groups did not differ on age, $t(98) = 0.63$, or IQ, $t(98) = 0.52$. There were significantly more African–Americans in the psychopathy group, $\chi^2(1) = 5.97$, $p < .05$. Therefore the potential confounding effect of ethnicity was examined. See Table 1 for means and standard deviations. The total PCL-R and two factor scores, e.g. interpersonal-affective and antisocial behavior, were also used in the correlational analyses.

2.3. Psychophysiological measures

Heart rate and skin conductance measures were recorded continuously during the psychophysiological testing session. The psychophysiological protocol lasted approximately 2 h and included a total of 10 tasks. Each task lasted 3–8 min and the inter-task interval was about 2–5 min. In the current study, data from the social stressor task were used.

2.3.1. Social stressor task

Heart rate and skin conductance were measured during a social stressor designed to elicit secondary emotions such as embarrassment and guilt (Damasio, 2000). In this task, subjects were given two minutes to prepare a speech about their worst personal faults and weakness, followed by a 2-min period in which they gave their speech to the experimenter while being videotaped. If the participant had difficulty speaking continuously, the research assistant requested him to give specific examples of the reported fault(s) to enhance the stressful nature of the task (Raine et al., 2000; Ishikawa et al., 2001).

2.3.2. Apparatus and recording procedures

All psychophysiological data were collected with equipment and software from the James Long Company (1999; Caroga Lake, New York). An Isolated Bioelectric Amplifier was used and physiological data were recorded online directly into a data acquisition computer. To measure heart rate, the channel of the grounded electrocardiograph was recorded through disposable electrodes that were attached to