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**Recognition of Facial Affect in individuals
scoring high and low on Psychopathic
Personality Characteristics**

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submitted in fulfilment
of the requirements for the degree
of
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Abstract

The accuracy of perception of facial emotion expressions was studied in individuals with low and high psychopathic personality characteristics in a sample of 21 male and 39 female university students. Participants completed the Psychopathic Personality Inventory (PPI), and the Behavioural Inhibition Scale and the Behavioural Activation Scale (BIS/BAS) as measures of psychopathy. Participants completed a computerised emotion recognition task containing six emotions of facial expressions (each emotion had five different intensities). The results showed that participants scoring low on the BIS and high on the BAS scores showed significant impairments in the recognition of both sad and fearful expressions. On the other hand, group scoring high on the PPI, showed significant impairment in the recognition of angry, but not fearful or sad expressions in the total sample. Males with high psychopathic personality characteristics showed significant impairments in the recognition of sad, fearful and angry expressions compared to males with low psychopathic personality characteristics. On the other hand females with high psychopathic personality characteristics showed significant impairment in recognising the expression of disgust only compared to females with low psychopathic personality characteristics. The PPI and the BIS/BAS scales showed reasonable alpha reliabilities with some exceptions for one subscale in each measure. Correlations between the PPI and the BIS/BAS scales were weak to moderate. The current findings suggest that different dimensions of psychopathy may be associated with selective impairments in recognising unpleasant emotion expressions in others.

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Psychopathy

The clinical concept of psychopathy has existed for over a century (Hare, 1996). Indeed, psychopathy was the first personality disorder to be recognised by clinicians (Millon, Simonsen, Birket-Smith, & Davis, 1998). However, it is only recently that scientifically sound research on it has become available (Hare, 1996). In today's criminal justice system, the construct of psychopathy has important implications for sentencing, treatment options and for the assessment of risk for recidivism and violence. Therefore, understanding the underlying deficits of psychopathy is crucial for both assessment and treatment of this disorder.

Cleckley (1941) provided the first comprehensive descriptions of psychopathic personality in his book *The Mask of Sanity*. Cleckley (1941) described that one of the critical features of psychopathic personality is a poverty of emotion. He also proposed that psychopathic individuals could easily manipulate and exploit others without a trace of guilt, shame and anxiety. While psychopathic individuals may appear quite charming, their interpersonal relations are wholly insincere and superficial. In fact, Cleckley believed that the psychopathic individual was completely incapable of feeling love or compassion for another human being. Since Cleckley's (1941) initial descriptions of psychopathy, there has been much change to this concept. Many researchers argued that Cleckley's definition of psychopathy was difficult to assess accurately and called for a definition that focused exclusively on overt antisocial behaviours (Robins, 1978). In the Diagnostic and Statistical Manual of Mental Disorders-Second Edition (DSM-II), psychopathic individuals were described as unsocialised, impulsive, guiltless, selfish, and callous individuals who rationalise

their antisocial behaviour and fail to learn from experience (American Psychiatric Association, 1968). Despite this general definition, the DSM-II did not provide clinicians with diagnostic criteria for the disorder. With the publication of DSM-III, and later versions of the DSM, a set of explicit diagnostic criteria for psychopathy was introduced, which was henceforth referred to as Antisocial Personality Disorder (ASPD) (American Psychiatric Association, 1980; 1987; 1994; 2000). According to the current DSM, the diagnostic criteria for ASPD include presence of behaviours such as illegal acts, deceitfulness, impulsivity, aggressiveness, irresponsibility, and lack of remorse. These behaviours must not be a product of another mental illness. In addition, the individual given the diagnosis of ASPD must be at least 18 years of age.

Hare (1998) argued DSM criteria for ASPD consisted almost entirely of behavioural indicators of personality violations of social norms, including lying, stealing, truancy, and inconsistent work behaviour which simply did not provide adequate coverage of the construct that matched the traditional conceptions of psychopathy. This departure led Hare and others to operationalise the disorder in a manner more consistent with traditional views of psychopathy. Hare (1998) proposed that psychopathy consists of affective, interpersonal, and behavioural characteristics. Affectively, psychopathic individuals display shallow and labile emotions; they are callous and lack the normal range of emotions, such as empathy, remorse, or guilt. At an interpersonal level psychopathic individuals present as grandiose, dominant, and manipulative. They show a superficial charm, and are completely incapable of forming meaningful and lasting relations with others. The behaviour of the psychopathic individual is marked by impulsivity, sensation seeking, and general failure to accept responsibility and fulfill social,

occupational, and financial obligations. The antisocial behaviour of psychopathic individuals is diverse and may range from promiscuity, pathological lying, conning, need for stimulation, to overtly criminal acts that are oftentimes violent in nature (Lyon & Ogloff, 1998).

Although many use ASPD and psychopathy interchangeably, some argue that these two are two distinct conditions (Hare, Hart, & Harpur, 1991). The base rate for ASPD is estimated to be 80% in prison populations while the base rate for psychopathy in prison populations was reported to be 20-30% (Andrews & Bonta, 1998). Hart and Hare (1997) reported that about 90% of prison inmates classified as psychopathic also met the criteria for ASPD, while only 30% of those diagnosed with ASPD met the criteria for psychopathy. Kosson, Lorenz and Newman (2006) found that prison inmates diagnosed as ASPD with psychopathy had committed more serious and non-serious offences, and were less sensitive to emotional cues compared to those diagnosed with ASPD only. This suggests that it is likely that in some cases people with psychopathic personality will have more serious problems compared to those who only meet the diagnosis of ASPD. Because most of the psychopathic offenders are also found to be antisocial, it may be argued that psychopathy is a more deviant form of ASPD.

. The prevalence rate of ASPD in the general population is estimated to be about 3% in males and 1% in females (American Psychiatric Association, 2000). Of these, the percentage that would be considered psychopathic is not known. Although the prevalence rate of psychopathy has been estimated to be 1-2% in the general population it is not known whether they did or did not meet the criteria for ASPD (Cook, 1998). Cale and Lilienfeld (2002), based on their extensive review

of literature concluded that psychopathy and ASPD are more prevalent in males than females.

Assessment of psychopathy

Hare's conceptualisation of psychopathy led to the development of the Psychopathy Checklist- Revised (PCL-R; Hare, 1991) and its predecessor, the PCL, which is used for the assessment of psychopathy and is considered to be the measure of choice in this field (Cook, & Michie, 2001). The PCL-R gathers information based on a semi-structured interview, review of available file and collateral information including criminal records, and/or accounts provided by family members. In the absence of an interview, the PCL-R may also be scored on the basis of file reviews only. Factor analyses of the PCL-R have consistently revealed the presence of a two-factor model of psychopathy (Cook & Michie, 2001; Hare, 1991). The first factor consists of both interpersonal and affective qualities of the psychopath, and is consistent with the Cleckley's clinical descriptions of psychopathy. The second factor, by contrast, is more closely aligned with the DSM-IV criteria for ASPD, and is comprised of behavioural characteristics such as antisocial lifestyle including need for stimulation, early behavioural problems, impulsivity, criminal acts which form the social deviance factor (Cook & Michie, 2001).

Despite PCL-R being the choice of measure for diagnosing psychopathy, many have noted its limitations. Firstly, it was developed for the diagnosis of psychopathy in criminal prisoners and many empirical studies to date have been conducted in criminal populations. Secondly, its items are tailored to individuals with a criminal history (e.g., several of the criteria deal specifically with criminal

offenses and related attitudes). Thirdly, standardised administration of the PCL–R entails a lengthy structured interview and access to collateral file data (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003). Therefore, PCL–R may not be the best choice of measure for use in general populations where access to file information could be limited. A screening version of the PCL–R now exist called Psychopathy Checklist-Screening Version (PCL-SV) which is shorter and based on subtests of PCL-R to screen for presence of psychopathy in forensic and correctional settings (Hart, Cox, & Hare, 1995). PCL-SV also requires relatively lengthy interview and collateral file review for its scoring. Another screening device has also been developed for the assessment of psychopathy in children and adolescents called the Psychopathy Screening Device (PSD) (Frick & Hare, 1996). PSD is a 20-item parent/teacher rating scale and has been criticized for its poor discriminate validity from other measures of Conduct Disorder and Oppositional Defiant Disorder (Burns, 2000).

Recently researchers have begun to look at psychopathic personality characteristics in the general population, particularly in undergraduate student samples. Although there are several disadvantages associated with using a non-institutionalised sample (e.g., restriction in range of scores compared to clinical samples on measures of psychopathy where the base rate of occurrence of this disorder is generally low), using a non-institutionalised sample can be quite useful. For instance, undergraduate samples can have the advantage of being relatively free of other severe mental disorders which may distort participants' responding (Lilienfeld & Hess, 2001). Problematic response styles such as random responding or socially desired responding are also minimised in undergraduate samples compared with, for example, prison samples (Lilienfeld & Hess, 2001).

Although a variety of instruments exist to assess the psychopathic personality characteristics in the general population, most are problematic in that they index only the behavioral deviance facet of psychopathy (Hare, 1991; Harpur, Hare, & Hakstian, 1989). An instrument that has shown promise in capturing both the affective-interpersonal facet and the deviant behaviour component is the Psychopathic Personality Inventory (PPI), developed by Lilienfeld and Andrews (1996) to assess psychopathic tendencies in nonforensic samples. The PPI provides a continuum measure necessary to study psychopathy within general population (Benning et al., 2003). PPI is a self-report measure containing 187 items asking individuals to rate on a 4-Point Likert-style scale the degree to which they think a given statement is true or false as applied to them. It yields a total score which provides an index of global psychopathy and also gives scores on eight individual factor-analytically derived subscales. These include Machiavellian Egocentricity which assesses a pattern of self-centered interactions with, and willingness to manipulate others; Social Potency which assesses an individual's skill at influencing others; Fearlessness which measures someone's willingness to take risk and lack of anticipatory anxiety; Coldheartedness which measures lack of sentimentality, callousness, and absence of empathy; Impulsive Nonconformity which measures propensity towards reckless and rebellious behaviour; Blame Externalisation which assesses propensity to blame others for one's transgressions; Carefree Nonplanfulness which measures lack of both forethought and long-term goals; and Stress Immunity which measures general lack of anxiety.

Lilienfeld and Andrews (1996) reported that males scored significantly higher than females on the PPI total scores and on most of the PPI subscales in an

undergraduate sample. In contrast, some have reported that although males scored higher than females of PPI total scores in an undergraduate sample, this difference was not statistically significant (Hamburger, Lilienfeld, & Hogben, 1996).

The PPI has shown promising psychometric properties during its preliminary validation studies with four undergraduate samples (Lilienfeld & Andrews 1996). The internal consistency (as assessed by Cronbach's alpha) of the PPI total score for the four undergraduate samples ranged from .90 to .93. The internal consistencies for the eight subscales ranged from .70 to .90. The test-retest reliability was demonstrated to be very high ($r = .95$) for the total score and those of the eight subscales ranged from .82 to .94. Inter-correlations between the PPI subscales were reported to be generally positive with some negative correlations between subscales such as the Blame Externalisation and the Stress Immunity ($r = -.29$) and the Machiavellian Egocentricity and the Stress Immunity ($r = -.13$) (Lilienfeld & Andrews, 1996). The PPI exhibited convergent validity with other self-report measures of psychopathy such as the PCL-R total score, as well as discriminate validity from self-report indices of depression, schizotypy and psychosis prone ness (Berardino, Meloy, Sherman, & Jacobs, 2005; Lilienfeld & Andrews, 1996; Poythress, Edens, & Lilienfeld, 1998).

In a prison sample the PPI was still found to be internally consistent with Cronbach's alpha of .92. The internal consistencies of the eight subscales ranged from .77 to .90 (Chapman, Gremore, & Farmer, 2003). However, Chapman et al. (2003) found that many of the inter-correlations between the PPI subscales were nonsignificant or negative. For example, Machiavellian Egocentricity and Coldheartedness were nonsignificantly correlated; Carefree Nonplanfulness and

Stress Immunity were negatively and significantly correlated. Based on these findings, Chapman et al (2003) suggested that the non-positive inter-correlations between some of the PPI subscales raises questions about the validity of these subscales as a measure of psychopathic personality.

The PPI was initially developed to assess primary psychopathy, consistent with Cleckley's description of the construct. However, factor analysis of the subscales of the PPI has yielded evidence for the presence of two factors; emotional-interpersonal and socially deviant mirroring the two factors of the PCL-R (Wilson, Frick, & Clements, 1999). Wilson et al. (1999) administered a short version of the PPI to a sample of 199 undergraduate students and performed a principal components analysis on the eight subscales (a higher order analysis). The short version of the PPI contains 56 items and is reported to be highly correlated with the full version of the PPI (Lilienfeld & Hess, 2001). Wilson et al. (1999) found that each of the eight subscales loaded substantially into two factors, suggesting that a two-factor solution was optimal for the higher-order analysis of the PPI subscales. Specifically, Wilson et al. (1999) found that the Social Potency, Coldheartedness, Fearlessness, Impulsive Nonconformity, and Stress Immunity subscales loaded into Factor 1 and the Machiavellian Egocentricity, Blame Externalisation, and Carefree Nonplanfulness subscales loaded into Factor 2. Based on these findings, Lilienfeld and Hess (2001) constructed primary (PPI 1) and secondary (PPI 2) psychopathy scales from the PPI short version and subjected the two PPI factors referred to as PPI 1 and PPI 2 to further analysis and found that the two scales were internally consistent (Cronbach's alpha for PPI 1 = .86 and PPI 2 = .82). They also found that the PPI 1 and the PPI 2 exhibited a

pattern of convergent and discriminant validity with other self-report measures of primary and secondary psychopathy (Lilienfeld & Hess, 2001).

However, this factor structure has not been shown to be consistent across different studies. For example, Benning et al. (2003) found a different factor structure when they subjected the PPI subscales to higher-order factor analysis following the administration of the full-length version of the PPI to a sample of 353 male twins from the Minnesota Twin Registry. They extracted three factors whereby the Coldheartedness subscale loaded into the third factor. Benning et al. (2003) then conducted a second analysis in which they constrained the structure to two factors and found that the Coldheartedness subscale did not load on either factor. This finding is contrary to that of Wilson et al.'s (1999) Factor1 loading reported for the Coldheartedness subscale. The finding that Coldheartedness subscale did not load onto either Factor is also contrary to the prominent notion that callousness and lack of empathy, which this subscale purports to measure, and is central to the construct of primary psychopathy (Lilienfeld & Andrews, 1996). In addition, the pattern of subscale loading reported by Benning et al. (2003) also differed from that reported by Wilson et al. (1999). For example, Benning et al. (2003) found that Social Potency, Fearlessness and Stress Immunity subscales loaded on to one factor and Impulsive Nonconformity, Blame Externalisation, Machiavellian Egocentricity and Carefree Nonplanfulness loaded on to the second factor (closely related to secondary psychopathy) where as Wilson et al. (1999) found that Impulsive Nonconformity loaded onto the primary psychopathy factor.

The differences in the PPI factor structures reported by Wilson et al. (1999) and Benning et al. (2003) may have been because of the two different versions of the PPI used in these two studies. Another reason may have been because Wilson et al. (1999) used a sample of undergraduate male and female students aged between 16 to 27 years while Benning et al. (2003) used a sample of only males aged between 39 to 44 years. Taking into consideration of the different factor structures found by these two studies, measures of primary (PPI 1) and secondary (PPI 2) psychopathy were derived from the PPI scores in this study. Although, Wilson et al. (1999) used the short-form of the PPI, their factor structure was applied to the full-length PPI in the present study. This is because Wilson et al.'s (1999) sample of male and female college students was more similar to the sample used in this study. Wilson et al. (1999) also reported that the short form of the PPI correlated highly with the PPI full-length form and with other self-report measures of psychopathy suggesting that the two versions of the PPI could be used interchangeably. Thus, in the present study, the PPI 1 and the PPI 2 were based on the PPI subscales' factor structure derived by Wilson et al. (1999). However, factor analysis using the eight subscales of the PPI was also carried out in this study to compare with the factor structures reported by Wilson et al. (1999) and Benning et al. (2003).

Studies reviewed above suggest that the PPI is a promising self-report measure of psychopathic personality characteristics in the general population. However, some argue that measures of psychopathy are problematic because they do not specifically measure one of the core features of psychopathy which is the lack of anxiety (Hale, Goldstein, Abramowitz, Calamari, & Kosson, 2004). Despite PCL-R being the most commonly used measure of psychopathy in

forensic populations, it does not include items that directly measures the level of anxiety or fear. Studies have also revealed no significant relations between PCL-R and measures of anxiety (Hale et al., 2004). Although studies have shown that the PPI was significantly related to measures of negative affectivity, and anxiety, these correlations were found to weak to moderate (Lilienfeld & Hess, 2001). These findings suggest that the PPI may be limited in assessing the level of anxiety in individuals with psychopathic personality characteristics. Therefore, using validated measures of anxiety along with psychopathy measures may be beneficial in assessing the level of anxiety in people with psychopathic personality characteristics. One such measure of anxiety is the Behavioural Inhibition/Behavioural Activation scales originally developed, by Carver and White (1994). Some have also suggested that the BIS/BAS scales may be a useful self-report measure of psychopathic personality characteristics, particularly the level of anxiety and reward seeking behaviour which are based on two general motivational systems that underlie behaviour and affect called the behavioural inhibition system and the behavioural activation system (Montagne, van Honk, Kessels, Frigerio, Burt, van Zandvoort, Perrett, & de Haan, 2005). According to Gray (1987), the BIS is sensitive to signals of punishment, nonreward, and novelty. It inhibits behaviour that may lead to negative or painful outcomes. Thus BIS activation causes inhibition of movement toward goals. On the other hand the BAS system is said to be sensitive to signals of reward, nonpunishment, and escape from punishment. Activity in this system causes the person to begin movement toward goals. In terms of individual differences in personality, greater BAS sensitivity should be reflected in greater prone ness to engage in goal-directed efforts and to experience positive feelings when the person is exposed to cues impending reward. Based on the characteristics of individuals with

psychopathy such as failure to learn from experience, failure to learn to inhibit punished responses, and high impulsivity, it is proposed that psychopathic individuals may be characterised by a weak BIS and a strong BAS (Arnett, 1997; Newman, Wallace, William, Schmitt, & Arnett, 1997).

The BIS/BAS scales have 20 Likert-type items (1 = Strongly Agree, 2 = Agree, 3 = Disagree, 4 = Strongly Disagree). The BIS Scale has 7 items which attempt to measure concern over the possibility of a bad event and sensitivity to such events when they do occur. The BAS scale has 13 items which Carver and White (1994) divided into three subscales: Reward Responsiveness, Drive and Fun Seeking. The Reward Responsiveness subscale measures the tendency to respond with positive affect to and desire to seek rewarding behaviours; the Fun Seeking subscale emphasise the impulsive and pleasure-seeking behaviours; Drive subscale measures motivation to pursue goals (Carver & White, 1994).

The BIS/BAS scales have shown to be reasonably internally consistent (Cronbach's alpha of .74 for the BIS scale, .73 for the BAS Reward Responsiveness subscale, .76 for the BAS Drive, and .66 for the BAS Fun Seeking) (Carver & White, 1994). Carver and White (1994) administered the BIS/BAS items to a sample of 732 college students and subjected the 20 items to factor analysis. The analysis yielded four factors that corresponded to the BIS and the BAS subscales. Consistent with the theory that the BIS and the BAS are two independent physiological systems, the BIS scale has been found to be relatively independent of the BAS subscales. Carver and White found that the BIS scale correlated -.12 with the Drive, .28 with the Reward Responsiveness, and -.08 with the Fun Seeking subscales. On the other hand, consistent with the assumption that

BAS subscales reflect the same emotional system, it was found that the three subscales were positively correlated (Carver & White, 1994). The Drive subscale was correlated (.34) with the Reward Responsiveness subscale and (.41) with the Fun Seeking subscale. The Reward Responsiveness subscale was correlated .36 with the Fun Seeking subscale. An Australian study involving a community sample of 2725 participants, also reported reasonably good internal consistencies for BIS/BAS (Cronbach's alphas of .76 for the BIS, .83 for the BAS total, .65 for the Reward Responsiveness, .80 for the Drive, and .70 for the Fun Seeking) (Jorm, Christensen, Henderson, Jacomb, Korten, & Rodgers, 1999). Jorm et al. (1999) also reported findings which generally supported the four factor structure reported by Carver and White (1994). Jorm et al., (1999) also found that the BIS was not significantly correlated with the BAS scales. Like Carver and White (1994), Jorm et al. (1999) also found that the BAS subscales were positively correlated.

Carver and White (1994) and Jorm et al. (1999) reported that the BIS was consistently positively correlated with other measures of negative affectivity and did not correlate with measures of positive affectivity such as extraversion or positive temperament. In contrast the BAS subscales were positively correlated with other measures of positive affectivity only. The BIS/BAS scales were also found to be correlated with the PPI (Lilienfeld & Hess, 2001). The PPI total score was negatively correlated with the BIS ($r = -.47$) and was shown to be positively correlated with the BAS total score ($r = .22$). Furthermore, Lilienfeld and Hess (2001) also found that the PPI 1 was negatively correlated with BIS scale ($r = -.56$; significant) and correlated positively with BAS total ($r = .18$). In contrast it was found that the PPI 2 was weakly and nonsignificantly negatively correlated with

BIS scale ($r = -.02$) but correlated positively and significantly with BAS scale ($r = .17$). These correlations suggest that the PPI and the BIS/BAS are not highly correlated, and most likely to be measuring two different constructs

The current review of psychopathy measures suggests that although the PCL-R is considered the 'gold standard' in the assessment of psychopathy. However, use of PCL-R in nonforensic populations may be limited by its items that require detailed criminal history and access to file information. The PPI on the other hand seem more appropriate for assessing psychopathic personality traits in the general populations because it has been extensively validated in nonforensic samples (Lilienfeld & Andrews, 1996). The review of psychopathy measures here also suggest that including a measure of anxiety such as the BIS/BAS scales would be useful in this study to improve the assessment of psychopathic personality characteristics.

Psychopathy and emotion

One aspect of psychopathy is disturbed emotional processes as described by Cleckley's (1976) conceptualisation that psychopathic individuals have a lack of remorse, fear and guilt. Based on previous research findings, it is likely that poor emotion processing would be typically present in individuals diagnosed with primary psychopathy indexed by measures such as PCL-R or PPI (Kosson et al., 2006). However, it is also possible that individuals who show persistent antisocial behaviour have a disturbed emotion processing ability because these individuals do not seem to be affected by the aversive nature of victim's distress. Much of the previous research on psychopathy and emotion processing is based on criminal populations and, therefore, it is highly likely that the participants selected as high

in psychopathy are also antisocial (ASPD) (given that most psychopathic offenders were also found to meet the criteria for ASPD (Hare & Hare, 1997)). Therefore, it is not clear whether the presence of diminished emotion processing is restricted to those who are only psychopathic or to those who are psychopathic with ASPD. One way to explore this is to use a sample group from the general population who are more likely to have no history of antisocial or criminal behaviours.

The importance of disturbed affect to the construct of psychopathy has long been acknowledged. Cleckley (1941), based on case histories from his own practice, posited that a marked lack of emotions, including guilt, anxiety, or remorse was a central feature of psychopathic personality. Previous research has demonstrated this marked lack of emotional functioning including empathy, and emotional processing in psychopathic individuals as measured by the PCL-R in offender groups (Levenston, Patrick, Bradley, & Lang, 2000; Lorenz, & Newman, 2002; Newman, Widom, & Nathan, 1985; Patrick, Bradley, & Lang, 1993; Sutton, Vitale, & Newman, 2002). Much of this research is based on physiological changes in people diagnosed with psychopathy such as, heart rate, blood pressure or skin conductance that may be elicited by emotion inducing stimuli. Other indicators such as startle response or brain activation in relation to emotional information have also been measured. For instance, psychopathic individuals as indexed by PCL-R have been found to display an abnormal or delayed startle reflex in response to unpleasant scenes compared to neutral scenes. This was generally taken as evidence for a deficit in anxiety or fear (Patrick et al., 1993). Further analysis also indicated that individuals scoring high on Factor 1 (emotional detachment) as measured by PCL-R showed greater abnormality in

startle response to both pleasant and unpleasant pictures compared to groups scoring high on Factor 2 (antisocial behaviour) (Patrick et al., 1993). Similarly Patrick, Cuthbert, and Lang (1994) found that individuals with psychopathy (indexed by the PCL-R) showed smaller changes in heart rate and skin conductance during fear imagery compared to nonpsychopathic individuals in a sample of male sexual offenders. Unlike Patrick et al. (1993), Patrick et al. (1994) found both the groups scoring high on Factor 1 (emotional detachment) and groups scoring high on Factor 2 (antisocial behaviour) showed diminished physiological changes to fear imagery compared to nonpsychopathic individuals. Similarly, Verona, Patrick, Curtin, Bradley, and Lang (2004) found that male offenders who scored high on the PCL-R emotional–interpersonal factor, regardless of scores on the social deviance factor, showed diminished skin conductance responses to both pleasant and unpleasant sounds. Offenders who scored high only on the social deviance factor showed a delay in heart rate differentiation between affective and neutral sounds. Although this study provided support for general inhibited affective reactivity in psychopathic individuals this study did not investigate the type of specific emotional deficits in this group that may be moderating the abnormal affective reactivity of these individuals (Verona et al., 2004). Inhibition of startle response was also demonstrated in a study of 18 male with psychopathy when compared to nonpsychopathic males in a prison sample when they were shown aversive slides such as mutilated bodies (Levenston, Patrick, Bradley, & Lang, 2000). However, Levenston et al.'s (2000) psychopathic group also met the DSM criteria for ASPD and therefore, it is difficult to conclude that inhibited fear response is present in only people with psychopathy.

In order to explore whether deficits in emotion processing were specific to those with psychopathy only, one study compared individuals with Borderline Personality Disorder (BPD), with psychopathic individuals in a sample of male prisoners (Herpertz, Werth, Lukas, Quniabi, Schuerkens, Kunert, Freese, Flesch, Mueller-Isberner, Osterheider, Sass, 2001) Consistent with the results reported by Patrick et al. (1993), psychopathic individuals were distinguished by decreased autonomic response to both positive and negative emotional slides, and diminished a startle response when they viewed aversive slides compared to individuals with BPD (Herpertz et al., 2001).

Despite the evidence that psychopathic individuals have abnormal reactivity to others emotions, these findings are mainly based on studies using male samples. Therefore, less is known about the emotion processing characteristics of psychopathic women and the extent to which the results of these researches can be generalised to female population is unclear. Based on the similar argument as above, Sutton, Vitale and Newman (2002) examined the emotional reaction of women, using physiological measures similar to Patrick et al (1993). These authors used startle probes (short burst of noise sent through earphones) following the onset of unpleasant, neutral, and pleasant pictures presentations to 172 female prisoners who were categorised using the PCL-R (Hare, 1991) into Factor 1 (Emotional detachment) and Factor 2 (Antisocial Behaviour) and general level of anxiety by using Welsh Anxiety Scale (Welsh, 1956). Several physiological measures: acoustic startle eye blink reflex magnitude, cardiac deceleration, skin conductance response, and corrugators increase was measured. They found that women who were classified as psychopathic showed an abnormal pattern of startle response to unpleasant

pictures and this pattern was most prominent in psychopathic females with lower general levels of anxiety. On the other hand nonpsychopathic women showed the typical pattern of affect reaction of the startle response. Similarly, psychopathic women with high level of general anxiety scores exhibited a pattern of responding that was found in nonpsychopathic women. However, these group differences were not present when startle probes were presented relatively later during the picture presentation. Sutton and colleagues also found the psychopathic women having high scores on both Factors of the PCL-R exhibited lowest blink magnitudes when startle probes were presented relatively early while viewing unpleasant pictures. Based on their findings, Sutton et al. (2002) concluded that abnormality in responding to unpleasant pictures by psychopaths appears to be a delayed emotional response rather than a lack of an emotional response. Similar findings were reported earlier for males with psychopathy (Patrick et al., 1993). Although Sutton et al. (2002) found that psychopathic women showed abnormal physiological response to unpleasant stimuli, they did not investigate whether these differences were observed for specific unpleasant emotional stimuli.

In general, research has supported the notion that individuals with psychopathy exhibit an abnormal physiological response to emotional stimuli such as decreased responsivity of their autonomic nervous system (i.e., decreased heart rate, skin conductance), and inhibition of the startle reflex. While this is taken as support for a low fear model of psychopathy, some argued that this abnormal physiological response of psychopathic individuals is also related to their abnormal processing of other's emotions. The latter is based on the Violence Inhibition Model(VIM) (Blair, 1995). The VIM 1 suggests that there is a system that preferentially responds to sad and particularly fearful emotional displays

(Blair, 1995). The functional integrity of this system is thought to be crucial for moral socialization; healthy individuals learn to avoid initiating behaviors that result in sadness or fear of others because of it is aversive to them. One of the important predictions of the VIM is that psychopathic individuals should show particular difficulty when processing sad and fearful expressions. In support for the VIM or low-fear model, research has shown that psychopathic individuals showed impairments in recognising facial and vocal expressions of sadness and fear. For example, in a sample of male prisoners, those identified as psychopathic using PCL-R also showed impairments in recognising vocal affect of fear and sadness when compared to individuals identified as nonpsychopathic (Blair, Mitchell, Richell, Kelly, Leonard, Newman, & Scott, 2002). Similarly, children with psychopathic tendencies measured using the Psychopathy Screening Device (PSD) showed impairments in recognition of the expression of sadness and fear when they were presented with a series of facial expressions depicting the emotions of sadness, happiness, anger, disgust, fear, and surprise (Blair, Colledge, Murray, Mitchell, 2001). These emotions were presented in stages of increasing intensity by blending between a facial expression (i.e., 100% expression) and the corresponding individual demonstrating neutral affect (0% expression). The children with psychopathic tendencies required more stages before they could identify expressions of sadness and fear. These children were also less accurate at identifying fearful expressions, even when the emotion was presented at full intensity (fully expressed expression) (Blair et al., 2001).

Furthermore, male children with psychopathic tendencies, measured by the PSD, displayed selective impairments in the ability to recognise sad and fearful facial expressions and vocal tones (Stevens, Charman, & Blair, 2001). The 37

children were between the age of 9 and 15 years. Each child was given four subtests from the Diagnostic Analysis of Nonverbal Accuracy which contains photographs of facial expressions and auditory stimuli reflecting emotions of fear, sadness, happiness and anger. No differences were observed in the ability to recognise happy or angry facial expressions (Stevens et al., 2001).

Another study which involved children between 11 and 14 years (31 male and 24 female) from a mainstream school also found that children's ability to recognise emotions of sadness and fearfulness was inversely related to their level of behaviour problems as indexed by PSD (Blair & Coles, 2000). These children were presented with morphed images of facial expressions of sadness, fear, surprise, happiness, anger and disgust (Blair & Coles, 2000). However, they found no differences in emotion recognition between boys and girls with psychopathic tendencies. One reason why Blair and Coles (2000) did not find any gender differences in emotion recognition in the high psychopathic tendency group may have been because their sample contained only fewer girls (2 female) than boys (9 male) in their high psychopathic group, thus reducing the possibility of finding any significant differences in emotion recognition between males and females. Another reason may be because Blair and Coles (2000) used the PSD as a measure of psychopathic tendencies. PSD has been criticised for its overlap between ADHD, CD and ODD measures and because these behavioural disorders are more prevalent in boys than girls, it is possible that boys will be scoring higher in PSD than girls.

Taken together, this suggests that individuals scoring high on psychopathy measures have difficulty in processing others' fear and sadness whether they are

displayed vocally or visually. These findings may apply particularly to males with psychopathic personality characteristics.

While studies (e.g., Blair et al., 2001; Blair & Coles, 2000; Blair et al., 2002; Stevens et al., 2001) found that adults and children with psychopathic personality characteristics were less accurate in recognising emotional affect of sadness and fear, some have reported findings contrary to this. For example, in a sample of male prisoners, it was found that males with psychopathic personality characteristics (indexed by the PCL-R) exhibited a deficit in classifying facial expressions of disgust only compared to males identified as nonpsychopathic when presented with slides of six emotional facial expressions of emotion (fear, sadness, surprise, happy anger, and disgust) (Kossan, Suchy, Mayer, & Libby, 2002).. It is not clear why this study did not support previously reported findings of impaired recognition of fear and sadness in individuals with psychopathy despite the similarities between these studies. One possibility may be because the researchers presented the facial affect stimuli at full intensity which made it easier to classify sad, happy and surprised faces because of their commonality in everyday life compared to disgust (Ekman & Friesen, 1976). However, others have also reported findings that are contrary to the findings of impaired fear and sad emotion processing in individuals with psychopathy. For instance, a recent study found no differences in facial affect recognition between individuals with psychopathy and nonpsychopathic individuals as measured by PCL-R in a sample of male prisoners Glass and Newman (2006). Similar to Kosson et al. (2002), Glass and Newman (2006) also used the facial affect stimuli at full intensity and therefore subtle differences in emotion recognition between groups scoring high and low on psychopathy may have not been found. Glass and Newman (2006)

also used only four emotions (anger, fear, happy and sad) which did not include disgust. Therefore, it is not known whether there was a difference in recognition between the groups scoring high and low on psychopathy in this study.

Some researchers have also extended the study of emotion recognition and psychopathy to college students. For example, Montagne et al. (2005) administered a graded intensity task of facial affect recognition in a group of university students. The stimuli were pictures of frontal and side view of facial expressions of anger, sadness, surprise, fear, happiness and disgust which were presented as morphs starting with a neutral expression (0%) and progressing to a full-blown expression (100%) of anger, happiness, sadness, fear, surprise, and disgust of the same identity. Students scoring high on psychopathic personality characteristics, as measured by the BIS/BAS scales showed impaired recognition of fearful expressions in frontal view but not sadness. A possible explanation is that by using the BIS/BAS scales as a measure, a selection was made predominantly based on punishment insensitivity/ reward-seeking behaviour, the fearlessness component in psychopathy, and less related to the lack of empathy which is a core part of the psychopathy conceptualisation (Kring & Bachorowski, 1999). It has in fact been argued that selective impairments in the recognition of sadness are more strongly related to a lack of empathy (Blair et al., 2001).

Gordon, Baird and End (2004) examined the relation of emotion and cognition of non-clinical participants who grouped those scoring high on emotion-interpersonal and those scoring low on this dimension. Unlike Montagne et al. (2005), Gordon et al. (2004) used the full-lengthed PPI to measure psychopathy which specifically aims to measure the emotional traits (e.g., callousness, lack of

empathy) of psychopathy. Gordon et al. (2004) used a neurological test of performance on a facial recognition task that required attention given to either affect or identity of the presented stimuli. Participants were provided with a target image at the start of each block and instructed to press a response button every time the picture they were currently looking at matched the target image. Gordon et al. (2004) found no difference in accuracy on emotion recognition between high scoring and low scoring psychopathic groups. This study also presented the facial affect stimuli at full intensity which may be the reason why they did not detect any differences between the two high and low group (Gordon et al., 2004).

One important difference between the two studies done by Gordon et al. (2004) and Montagne et al. (2005) was the way the two studies measured psychopathy. Gordon et al. (2004) used the PPI while Montagne et al. (2005) used the BIS/BAS scales as a measure of psychopathic personality characteristics. Montagne et al. (2005) may be the first to use just the BIS/BAS scales as a measure of psychopathic personality characteristics. Although the PPI and the BIS/BAS scales have been found to be related (Lilienfeld & Andrews, 1996), one may not replace the other because the PPI items are designed to measure a wide range of psychopathic characteristics while the BIS/BAS items are designed to specifically measure a person's proneness to anxiety and proneness to engage in reward-seeking behaviours.

In summary, although Gordon et al. (2004) and Montagne et al. (2005) have shown inconsistent findings with college samples, it can be concluded that individuals with psychopathic personality exhibit deficits in their ability to experience and to recognise core human emotions. This was supported by number

of studies that investigated emotion processing of psychopathic individuals. However, it is unclear whether people with psychopathy have deficits in recognising all core emotions, or just fear and sadness or whether these deficits are related to the intensity of emotion. Inconsistent findings reported by Montagne et al. (2005) and Gordon et al. (2004) may be explained by their methodological differences. Firstly, Montagne et al. (2005) used an emotion recognition task with graded intensities which therefore, would be sensitive to even subtle differences between high scoring and low scoring psychopathy groups. On the other hand, Gordon et al. (2004) used an emotion recognition task which showed facial expressions at full intensity rather than at graded intensities. Thus, differences in emotion recognition between participants scoring high and low on psychopathy may not be found if individuals scoring high on psychopathy showed deficits in emotion recognition only at lower rather than high (full) intensities of emotion expressions. Secondly, Gordon et al. (2004) asked participants to match the emotion of randomly presented emotional stimuli with target images rather than identify the specific emotion presented in each image. Therefore it could be possible that even if participants did not recognise the specific emotions, they were able to match the test image with the target image just by looking at similarities in facial muscles in both images. Montagne et al. (2005) on the other hand used an emotion recognition task that required participants to name the emotions presented by selecting from a set of six possible emotion labels given.

In summary, studies of emotion recognition in individuals with psychopathy have provided substantial support for the VIM or the low fear model both in forensic and nonforensic populations (Blair et al., 2001; Blair & Coles,

2000; Blair et al., 2002; Montagne et al., 2005; Stevens et al., 2001). However, others have not found no evidence to support this (Glass & Newman, 2006; Gordon et al., 2004; Kosson et al., 2002). These differences may be due either due to disparities in methods used in presenting emotion stimuli. For instance these included graded or ungraded intensities of expressions, and different emotion sets. These differences may well be because impaired emotion recognition is not uniform among individuals with psychopathy. Therefore, additional research is needed to address these issues. Furthermore, it is also not clear whether there are differences in facial affect recognition between men and women scoring high on psychopathic personality traits because most of the research in this area was based on males with psychopathic personality characteristics.

Based on the above literature review, it is hypothesised that participants with high psychopathic personality characteristics would be less accurate in recognising the facial affect of fear and sadness compared to those with low on psychopathic personality characteristics.

Secondly, this study will look at the two measures of psychopathy (PPI and BIS/BAS scales) to investigate whether there is any relationship between the classifications of psychopathy using these measures. Finally, this study will also attempt to investigate the gender differences in the recognition of facial expression in relation to their psychopathic personality characteristics.

Method

Participants

Sixty participants from the University of Waikato took part in this study. Of the 60 participants, 39 were female and 21 were male. Out of 60 participants, 26.67% were aged between 21 to 25. Participants were equally represented between the age of 18 to 20; 26 to 30 and 31 to 35 with 18.33% in each group. Ten percent were aged between 36 to 40; 6.67% were aged between 41-45 and 1.67% were between 46 to 50 years. Twenty five of the participants were New Zealand European/Pakeha; 7 were Maori; 4 were Chinese and 24 reported their ethnicity as 'other'. Students enrolled in both graduate and undergraduate courses from any field of study were invited to participate in this study via research notices (see Appendix A) posted at various locations around the University of Waikato campus in Hamilton. In addition, a web-based notice was put on first year psychology student's course related site called the Class Forum. While students enrolled in first year introductory psychology courses received 1% course credit per hour for their participation all other participants did not receive any incentives for their participation.

Apparatus

Participants completed a computerised emotion recognition task which was developed by the researcher using facial expressions taken from the Montreal Set of Facial Displays of Emotion (Beaupre, & Hess, 2005). This series of pictures contain black and white photographs of facial expressions of six different emotions (joy, sadness, shame, disgust, fear, and anger). Each emotion also contain five images of five intensities (20, 40, 60, 80, and 100%) created by blending a full expression (i.e., 100% expression) and the neutral expression (i.e.,

0% expression) to form five intensities of the same emotion by the same individual's facial expression. The computer task was developed by using Microsoft Visual Basic to present the facial expressions via a computer. The photographic picture is displayed on the left of the computer screen with a list of vertical buttons on the right of the picture named as neutral, sadness, joy, shame, fear, disgust, anger and 'don't know' (see *Figure 1.* below for an example of the stimulus presented). Participants were asked to click one of the given buttons with the computer mouse to choose their response for the emotion displayed. As soon as the participant clicked a button, it changed to the next facial expression.

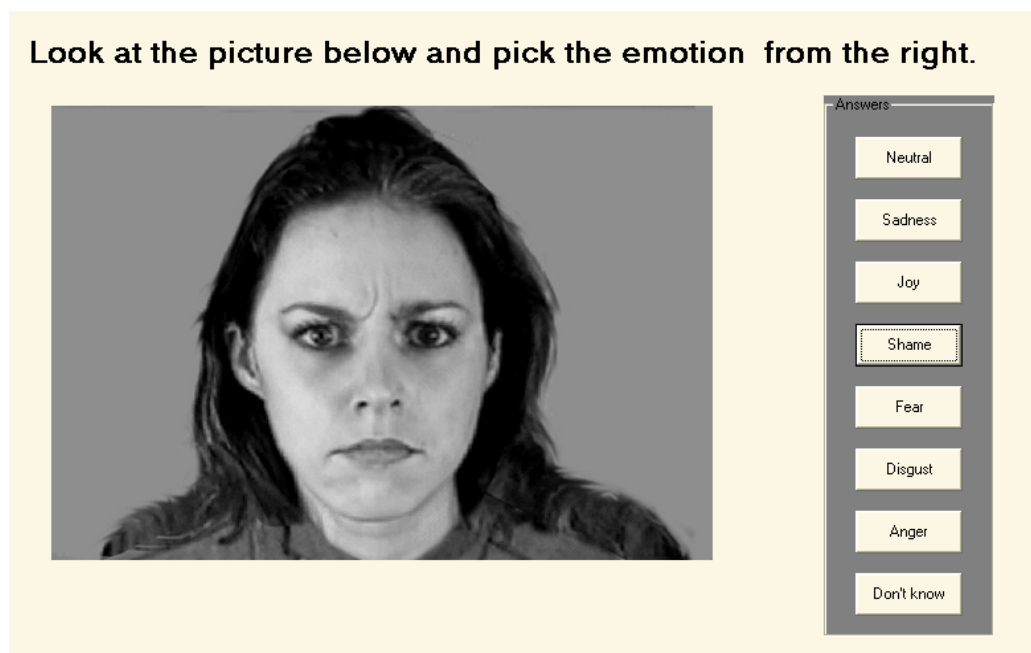


Figure 1. Stimulus example of the emotion recognition task showing the facial expression of anger at 80% intensity and button to click to identify the emotion displayed.

The emotion recognition task consisted of 4 blocks of trials consisting of facial expressions shown via a laptop computer screen. The first trial was a practice phase and the remaining 3 trials were test phases. The practice phase consisted of 6 stimuli starting with a neutral expression followed by 1 emotion

(shame) shown at 5 different intensities starting with the lowest intensity. Each test phase consisted of 36 stimuli which included the presentation of a neutral expression of the same actor at the beginning of each emotion set before changing to the next emotion set of five intensities. Thus a test trial consisted of 0% expression (neutral) followed by five stages in 20% increments into one of the six emotions. The three test trials were presented by three different actors (two females and one male). Two alternative sets of test blocks were developed whereby the order of emotions and actors were altered in each set. The order of presenting these two sets was counterbalanced to avoid any systematic practice by altering the sets given to participants. Participants were scored according to correct and incorrect responses given for each expression. That is a score of 1 was given for each correct response and a score of 0 was give for an incorrect response. After checking the responses for the three trials to see if there were differences across the trials, a total recognition score was obtained by collapsing the score for three trials of each emotion expression as participants' scores across the trials were relatively similar. Reaction time was also recorded for each response given and a mean reaction time for each expression was obtained by collapsing the reaction time for the three trials of each emotion expression. Data from the practice trial and neutral expression were not included in the results.

Participants also completed a battery of tests comprising three of self-report measures and a demographic questionnaire. These consisted of the Behavioural Inhibition Scale and the Behavioural Activation Scale (BIS/BAS) developed by Carver and White (1994) to assess the incidence of participants' self-reported psychopathic personality characteristics (See Appendix B). The BIS/BAS contains a total of 20 items measured on a 4-Point Likert-style item

requiring participants to rate the extent to which they agree or disagree with a given statement. The Psychopathic Personality Inventory (PPI) (Lilienfeld & Andrew, 1996) was used to assess the incidence of participants' self-reported psychopathic personality characteristics (See Appendix C). The PPI contains 187 items that require participants to rate on a 4-Point Likert-style scale the degree to which they think a given statement is true or false as applied to them. The demographic questionnaire (See Appendix D) included in the self-report questionnaire set asked participants to report their age group, sex, and ethnicity. Two additional items asked about current medical and mental health conditions and treatment. In addition to these, the questionnaire package also included a departmental consent form (see Appendix E) and a course credit form (See Appendix F) for those students enrolled in first year psychology papers.

Procedure

The study was initially approved by the University of Waikato's Psychology Department Ethics Committee for Human Research.. Students indicated their interest to participate by contacting the researcher via email. Students were then contacted by the researcher via email and times were arranged for their participation.

Participants were tested individually in a quiet room in the Psychology Department of the University of Waikato or in a quiet location that was mutually agreed by the participant and the researcher. Participants were not informed exactly what the questionnaires and the computerised task aimed to measure in order to avoid socially desirable responses. Instead, they were told that the questionnaires and the computerised task aimed to measure the relationship

between emotion recognition and some aspects of personality characteristics. Participants were later informed about the specific area of study once they had completed the required tasks. Before commencing testing, the researcher described the study's procedures to the participant. Participation was completely voluntary and participants were informed of their right to withdraw from the study at any time if they wished and their informed consent was then obtained in writing. Participants were also assured that their names would not be attached to their responses and that their individual responses would not be disclosed to anyone outside of the study. Participants also filled in the course credit form where appropriate. Finally, participants were asked to indicate whether they would be interested in the research findings by filling out the section in the participants' information sheet (see Appendix G) so that those registering their interest could receive a summary of the main research findings. All participants were asked to take part in the computer task before completing the questionnaires. Participants were asked to sit in front of a computer screen. At the start of the task, they were told that the expression would start as neutral but it would change to reveal one of the six emotions (each emotion at 5 different intensities) listed on the right side of the computer screen next to the stimulus. They were told that each stimulus would be shown until they identified the emotional expression by clicking on one of the buttons provided. They were asked to wait until they thought they knew that they had recognized the expression rather than to simply guess what it was. Participants were told that they would not be informed whether their responses were correct or not and that the emotional expression would change as soon as they identified the emotion. The task ended when all three test trials were presented. The responses for the test blocks for each subject were recorded by the computer. The researcher remained in the room while the

participants completed the tasks in order to answer any questions and ensure that the participants followed the instructions correctly. Once the computer task and the questionnaire set were completed, and these had been checked by the researcher to ensure that all items had been answered, participants were told that the tests measured the relation between accuracy of facial emotion recognition and self-reported psychopathic personality characteristics.

All raw data were entered into SPSS version 12.0 for Windows. This programme was used to calculate the scores on the BIS/BAS scales (see Appendix B for information on how the BIS/BAS were scored) and the PPI (see Appendix C on how the PPI was scored) according to scoring instructions provided by the test developers. Data from the demographic questionnaire were also entered into SPSS version 12.0. Missing data values were coded as blank cells in the SPSS data editor.

Results

Sixty participants completed the demographic questionnaire, the PPI, the BIS/BAS scale and the emotion task. Firstly participants' answers to the questions on current medical conditions were inspected to find out if any participants reported having any medical/or mental health condition. Since only three out of 60 reported having a medical and/or mental health condition (e.g., depression or asthma), and since these three participants were managing the conditions with medication at the time of research participation, they were included in the analyses of results. Secondly the distribution of scores on the PPI and the BIS/BAS measures in the total sample, and male and female samples were tested for normality. The Kolmogorov-Smirnov statistic was computed for each measure in the total sample and the Shapiro-Wilk statistic was computed for each measure in the male and female samples. An alpha level of 0.05 was used as the criterion for determining whether the samples were normally distributed or not. Because some sample populations were found to be non-normally distributed (i.e., males sample for the PPI total, and the PPI 2, and female sample for the PPI Carefree Nonplanfulness subscale, the BAS Reward Responsiveness subscale), non-parametric equivalents of the Pearson's correlation coefficient and independent samples *t*-test which were Spearman's rho and Mann-Whitney *U* were used in the analysis of those sample groups, the data of which were non-normally distributed. Preliminary analysis generated by parametric and non-parametric tests for the samples revealed that whether a parametric or non-parametric test was conducted made almost no difference to the result.

Psychopathic Personality Inventory (PPI)

All participants completed the PPI and the PPI total score, the eight subscales and the PPI primary and secondary scales and the PPI validity indices were calculated. Each participant's data was inspected for validity. In order to do this, each participant's scores on the three validity scales of the PPI (Deviant Responding, Unlikely Virtues, and Variable Response Inconsistency) were summed to create a total validity score. For each of the validity scales, a higher score indicated less valid responding. A histogram of the total validity scores for all participants was generated (see Appendix H), and a normal curve fitted to the data. Since none of the participants' total validity scores fell outside the high end of the normal curve, all the participant's scores were included in the analysis. Table 1 shows means and standard deviations of scores on the PPI and the BIS/BAS scales from the total sample and from the male and female samples with *t*-tests from the comparison of the male and female scores on the each measure. Internal consistency coefficients (Cronbach's alpha) for each of the PPI and its subscales are also given. As shown in Table 1, internal consistency coefficients (Cronbach's alpha) were .94 for the total PPI score, .60 for PPI 1, and .73 for PPI 2. Cronbach's alpha for the subscales of PPI ranged from .81 to .90 except for Coldheartedness subscale ($\alpha = .67$) which was somewhat lower than the other subscales.

Comparison of the means of the PPI and the BIS/BAS scales between males and females

Independent sample *t*-tests were carried out to determine if the scores of the PPI and the BIS/BAS scales of males and females were significantly different. An alpha level of 0.05 was used to determine the statistical significance. As can

been seen in Table 1, except for the Stress Immunity subscale (females, $M = 31.33$ versus Males, $M = 27.67$, $t(58) = 2.34$, $p = 0.02$), none of the other means scores on the PPI and its subscales of males and females were significantly different. On the BIS/BAS scales, females scored slightly high on the BIS total, BAS total and all the BAS subscales compared to males. However, an independent t test revealed that the differences in scores between males and females were not statistically significant

Table 1: Alpha Reliabilities, Means, and Standard Deviations in the total sample and male and female samples on PPI and, BIS/BAS scales with t-test values from the comparison of males and females scores

Measure	Cronbach's Alpha	Total Sample	Males	Females	df	t
PPI Total	0.94	352.81 (47.48)	359.48 (48.14)	347.97 (45.97)	58	0.91
Machiavellian Egocentricity	0.89	60.28 (13.58)	60.00(14.04)	60.44 (13.50)	58	-0.12
Social Potency	0.9	59.57 (12.85)	62.43 (11.65)	58.03 (13.34)	58	1.27
Fearlessness	0.83	43.67 (10.17)	45.95 (9.90)	42.44 (10.23)	58	1.28
Coldheartedness	0.67	43.07 (6.64)	45.09 (6.51)	41.83 (6.49)	58	1.86
Impulse Nonconformity	0.84	37.37 (8.90)	37.29 (8.30)	37.21 (9.07)	58	0.03
Blame Externalisation	0.89	35.53 (9.52)	34.86 (8.40)	35.90 (10.15)	58	-0.4
Carefree Nonplanfulness	0.83	37.65 (8.37)	36.62 (7.93)	38.21 (8.65)	58	-0.7
Stress Immunity	0.81	28.95 (6.11)	31.33 (5.52)	27.67 (5.94)	58	2.34*
PPI 1	0.60	212.38 (28.55)	222.10 (26.60)	207.15 (28.51)	58	1.98
PPI 2	0.73	133.47 (25.96)	131.48 (26.14)	134.54 (26.15)	58	-0.43
BIS Total	0.75	20.32 (3.52)	19.95 (2.78)	37.53 (6.05)	58	-0.59
BAS Total	0.85	38.27 (5.71)	20.51 (3.83)	38.67 (5.56)	58	-0.74
Reward Responsiveness	0.84	16.90 (2.61)	83.81 (13.12)	84.87 (13.20)	58	-0.3
Drive	0.85	10.10 (2.63)	60.42 (17.27)	64.58 (15.99)	58	-0.94
Fun Seeking	0.76	11.27 (2.31)	69.35 (13.24)	70.10 (15.21)	58	-0.42

* Significant at the 0.05 alpha level

Note. N for the total sample - 60; N for the male sample = 21, N for the female sample = 39; Standard deviations in brackets

Factor analysis of the 187 items of the PPI was conducted, using principal component analysis with varimax rotation. Factor loadings for the items were considered notable if they loaded .35 or greater on the extracted factors. This is presented in the Table 2. On the basis of standard scree plot and eigenvalue (> 1) criteria, 46 factors were extracted that accounted for 95.3 % covariance among the PPI items. Because the 187 individual items of the PPI did not yield a meaningful factor structure, a higher-order factor analysis using the 8 subscales of the PPI was carried out which was similar to that followed by Benning et al. (2003). This time three factors were extracted that accounted for 72.4 % covariance among the PPI subscales. The first factor accounted for 39.5% of the variance followed by 19.5% and 13.4% for the second and the third factor respectively. As shown in Table 2, the first factor was formed by the Machiavellian Egocentricity, the Stress Immunity, the Blame Externalisation and the Carefree Nonplanfulness subscales. The second factor was formed by the Social Potency, the Fearlessness, and the Impulsive Nonconformity subscales. The third factor was marked by only the Coldheartedness subscale. As can be seen in Table 2 some scales loaded on more than one factor (e.g., Machiavellian Egocentricity, Fearlessness, and Impulsive Nonconformity).

Due to the difference in factor structure for the PPI subscales reported by Wilson et al. (1999) and the factor structure found in this study, new PPI 1 and PPI 2 were calculated based on the factor loadings extracted in this study. The only difference between the new PPI 1 and PPI 2 and the old PPI 1 and PPI 2 was different factor loading for the Coldheartedness. Therefore, the new PPI 1 was calculated without the Coldheartedness subscale while the new PPI 2 and the old

PPI 2 contained the same subscales. The internal consistency coefficient (Cronbach's alpha) for the new PPI 1 was .62.

Table 2: Principal Component Factor Analysis of Psychopathic Personality Inventory Subscales

Subscales	1	2	3
Machiavellian Egocentricity	0.75	0.42	
Stress Immunity	-0.73	0.37	
Blame Externalisation	0.73		
Carefree Nonplanfulness	0.71		0.38
Social Potency		0.81	
Fearlessness		0.72	
Impulse Nonconformity		0.67	0.42
Coldheartedness			0.89

Note. Factor loadings below .35 are omitted, N = 60

Behavioural Inhibition and Behavioural Activation Scales (BIS/BAS)

The BIS total score and the BAS total score, the three BAS subscales (Drive, Fun Seeking and Reward Responsiveness) and the BIS-BAS difference scores (BIS-BAS) were calculated for each participant. Means and standard deviations for the total sample and for males and females are given in Table 1. Internal consistency coefficients (Cronbach's alpha) for each of the BIS and BAS total scores and BAS subscales are also given. As shown in the Table 1, internal consistency coefficients (Cronbach's alpha) were .75 for the total the BIS total score, .84 for the BAS Reward Responsiveness subscale, .85 for the BAS Drive subscale, and .76 for the BAS Fun Seeking subscale. The mean for the BIS total score for the total sample was 20.32. The minimum and maximum scores for the BIS total were 12 and 28 respectively. The mean for the BAS total score for the total sample was 38.27; 16.90 for the BAS Reward Responsiveness subscale; 10.10 for the BAS

Drive subscale; and 11.27 for the BAS Fun Seeking subscale. The minimum and maximum scores for BAS total were 27 and 51 respectively.

Table 3: Principal Component Factor Analysis of BIS/BAS Items

1	BIS	1	2	3	4	5
	If I think something unpleasant is going to happen I usually get pretty “worked up.”					0.76
	I worry about making mistakes. Criticism or scolding hurts me quite a bit.				0.62	0.88
	I feel pretty worried or upset when I think or know somebody is angry at me.				0.71	
	Even if something bad is about to happen to me, I rarely experience fear or nervousness.				0.74	
	I feel worried when I think I have done poorly at something.					0.59
	I have very few fear compared to my friends.				0.52	
2	BAS Reward Responsiveness					
	When I get something I want, I feel excited and energized.	0.67				
	When I’m doing well at something, I love to keep at it.	0.86				
	When good things happen to me, it affects me strongly.	0.84				
	It would excite me to win a contest.	0.61		0.52		
	When I see an opportunity for something I like, I get excited right away.	0.70				
3	BAS Drive					
	When I want something, I usually go all-out to get it.		0.81			
	I go out of my way to get things I want.		0.86			
	If I see a chance to get something I want, I move on it right way.		0.82			
	When I go after something I use a “no holds barred” approach.		0.71			
4	BAS Fun Seeking					
	I will often do things for no other reason than that they might be fun.			0.82		
	I crave excitement and new sensations.			0.62		
	I’m always willing to try something new if I think it will be fun.			0.73		
	I often act on the spur of the moment.			0.72		

Note. Factor Loadings below .35 are omitted; N = 60; BIS = Behavioural Inhibition System; BAS = Behavioural Activation System

Factor analysis using principal component analysis was completed for all the BIS/BAS items. The analysis yielded five factors with eigenvalues greater than 1, which together accounted for 66.55% of the overall variance. The items and factor loadings are shown in Table 3. The first factor was marked by five BAS items, second factor with four BAS items, third factor with four BAS items, fourth factor with four BIS items and fifth factor with three BIS items. The first factor corresponds to BAS Reward Responsiveness and incorporated items such as “It would excite me to win a contest”; second factor to BAS Drive which incorporated items such as “When I want something, I usually go all-out to get it”; and third factor to BAS Fun Seeking which incorporated items such as “I crave excitement and new sensations”. The BIS scale was divided into factor four and five.

Correlations between the PPI and the BIS/BAS scales

A series of Pearson’s correlations were carried out to examine the relationship between the PPI and the BIS/ BAS scales and their subscales. An alpha level of 0.05 was used to determine the significance of these correlations. These are presented in Table 4. Correlations between PPI 1 and PPI 2 showed that the PPI 1 and the PPI 2 were positively and significantly correlated ($r = .39, p < 0.01$). Inter-correlations between the PPI subscales were generally positive and significant, except for the negative correlations between Machiavellian Egocentricity and Stress Immunity ($r = -.30, p = 0.02$) and between Blame Externalisation and Stress Immunity ($r = -.30, p = 0.02$); Carefree Nonplanfulness and Stress Immunity ($r = -.38, p < 0.01$).

The correlation between the BIS total and the BAS total, was negative and nonsignificant. The BIS total was also non-significantly correlated with the BAS three subscales. In contrast, inter-correlations between the BAS subscales showed that they were positive and significant. Specifically, the Reward Responsiveness subscale correlated significantly with the Drive subscale ($r = .34, p = 0.01$) and the Fun Seeking subscale ($r = .44, p < 0.01$). The Fun Seeking subscale was correlated significantly with the Drive subscale ($r = .29, p = 0.03$).

In the total sample, the BIS total was negatively and significantly correlated with the PPI Total and the PPI 1 ($r = -.39, p = 0.01$ and $r = -.53, p < 0.01$ respectively). In contrast, the BIS total was weakly and non-significantly with the PPI 2. The BIS was also negatively correlated with seven of the eight subscales of PPI. Of these negative correlations only the Fearlessness subscale ($r = -.41, p < 0.01$), the Coldheartedness subscale ($r = -.26, p = 0.05$), the Impulsive Nonconformity ($r = -.45, p < 0.01$), and the Stress Immunity subscale ($r = -.56, p < 0.01$) showed significant correlations with the BIS total. The BIS total and the Blame Externalisation subscale showed a weak positive correlation which was not significant.

Unlike the BIS total score, the BAS total score and the three BAS subscales showed positive correlations with the PPI total, PPI 1, PPI 2 and most of the PPI subscales. The BAS total showed positive and significant correlation with the PPI total ($r = .44, p < 0.01$), the PPI 1 ($r = .43, p < 0.01$), the PPI 2 ($r = .31, p = 0.02$), and four of the eight PPI subscales; the Machiavellian Egocentricity ($r = .36, p = 0.01$), the Social Potency ($r = .41, p < 0.01$), the Fearlessness ($r = .45, p < 0.01$), and the Impulsive Nonconformity ($r = .32, p = 0.01$) subscales. The BAS

was also positively but non-significantly correlated with the Blame Externalisation, the Carefree Nonplanfulness, and the Stress Immunity. The BAS Reward Responsiveness subscales showed a significant correlation with only the Social Potency subscale ($r = .29, p = 0.02$). The BAS Drive subscale was positively and significantly correlated with the PPI total ($r = .28, p = 0.03$), the PPI 1 ($r = .31, p = 0.02$), and the Social Potency subscale ($r = .31, p = 0.02$). The BAS Fun Seeking subscale also showed positive and significant correlations with the PPI total ($r = .55, p < 0.01$), the PPI 1 ($r = .54, p < 0.01$), the Machivellian Egocentricity subscale ($r = .38, p < 0.01$), the Social Potency subscale ($r = .34, p < 0.01$), the Fearlessness subscale ($r = .64, p < 0.01$), the Impulsive Nonconformity subscale ($r = .53, p < 0.01$), and the Carefree Nonplanfulness subscale ($r = .36, p = 0.01$).

In order to assess the relation between the PPI and the BIS/BAS scales (combined) in the total sample, correlations between the BIS-BAS (difference between the scores) and the PPI total, PPI 1, PPI 2, and the PPI subscales were computed. Table 4 shows that correlations between the BIS-BAS difference and the PPI total, the PPI 1, the Machiavellian Egocentricity, the Social Potency, the Fearlessness, the Impulsive Nonconformity, and the Stress Immunity subscales were all negative and significant. Correlations between the BIS-BAS difference and the PPI 2, the Coldheartedness subscale, the Blame Externalisation subscale, Carefree Nonplanfulness subscale were also negative but non-significant.

Table 4 :Correlations between BIS/BAS scales and PPI scales

	PPI Total	MachEgo	SocPot	Fear	Cold	ImpNon	Blame	CareNon	Stress	PPI 1	PPI2	BIS	BAS	Reward	Drive	Fun Seek	BIS-BAS difference	
PPI Total		0.81*	0.54*	0.77*	0.29*	0.84*	0.56*	0.62*	-0.01	0.84*	0.83*	-	0.34*	0.44*	0.19	0.28*	0.55*	-0.54*
MachEgo			0.30*	0.45*	0.09	0.57*	0.61*	0.54*	-0.30*	0.43*	0.92*	-0.03	0.36*	0.21	0.24	0.38*	-0.26	
SocPot				0.34*	-0.02	0.31*	0.03	0.08	0.12	0.69*	0.19	-0.16	0.41*	0.29*	0.31*	0.34*	-0.39*	
Fear					0.14	0.75*	0.28*		0.09	0.79*	0.48*	-	0.41*	0.45*	0.17	0.24	0.64*	-0.59*
Cold						0.27*	-0.04	0.20	0.22	0.40*	0.10	-	0.26*	-0.07	-0.19	0.00	0.04	-0.15
ImpNon							0.39*	0.52*	0.05	0.78*	0.61*	-	0.32*	0.05	0.18	0.53*	-0.54*	
Blame								0.29*	-0.30*	0.16	0.78*	0.03	0.16	0.12	0.07	0.17	-0.08	
CareNon									-0.38*	0.33*	0.71*	-0.05	0.19	0.11	-0.02	0.36*	-0.16	
Stress										0.37*	-	-	0.00	-0.10	0.14	-0.04	-0.41*	
PPI 1											0.39*	-	0.43*	0.14	0.31*	0.54*	-0.67*	
PPI2												0.53*	0.43*	0.14	0.31*	0.54*	-0.67*	
BIS													-0.02	0.31*	0.19	0.14	0.38*	-0.22
BAS														-0.04	0.18	-0.11	-0.17	0.76*
Reward															0.79*	0.73*	0.74*	-0.68*
Drive																0.34*	0.44*	-0.38*
Fun Seek																	0.29*	-0.56*
BIS-BAS difference																		-0.60*

* Correlation is significant at the 0.05 level (2-tailed).

Note. N =60, Mach Ego = Machiavellian Egocentricity; SocPot = Social Potency; Fear = Fearlessness; Cold= Coldheartedness; ImpNon = Impulsive Nonconformity; Blame= Blame Externalisation; CareNon = Carefree NonPlanfulness; Stree = Stress Immunity; BIS= Behavioural Inhibition System; BAS = Behavioural Activation System; Reward = BAS Reward Responsiveness; Drive= BAS Drive; Fun Seek= BAS Fun Seeking; BIS-BAS difference= Difference between BIS total score and BAS total score.

Emotion Recognition Task

All participants completed the emotion recognition task which had three trials containing six emotions shown at five different intensities. Accuracy and response latency were recorded for each emotion. Percentages of accuracy and mean reaction times for each emotion across each trial were first calculated and graphed to compare the responses across the three trials. As the graphs on accuracy (See Appendix I) and reaction time (See Appendix J) appeared similar across the three trials, total recognition scores and mean reaction times for each expression was obtained by collapsing the data. Data on neutral expression were not included in the later analyses.

Figure 2 shows the percentages of correct responses by all participants for each emotion. Participants were least accurate at identifying fear at intensities of 20 and 40%, followed by shame at 60, 80 and 100%, disgust at 60%, sad at 60 and 80%, anger at 60 and 80%. Participants found joy the easiest to identify at all intensities. Participants were least accurate in recognising all facial expressions at the lowest intensity with accuracy increasing as intensity increased for all facial expressions. A ceiling effect for accuracy was observed for joy with scores ranging from 2/3 (66.67%) to the maximum score of 3 (100%) across all intensities. As a result, joy was eliminated from further analysis.

Mean accuracy scores indicated that females were better at identifying all facial expressions at all intensities compared to males in the total sample. However independent sample t-tests revealed that, the only significant

differences in the mean correct responses between males and females were observed for anger (20%) (females = 1.03 versus males = .52, $t(58) = -2.35$, $p = 0.02$); anger (40%) (females = 1.90 versus males = 1.48, $t(58) = -2.14$, $p = 0.04$); fear (20%) (females = .31 versus males = 0, $t(38) = -3.69$, $p < 0.01$); fear (40%) (females = 1.08 versus males = 0.38, $t(57.76) = -3.32$, $p < 0.01$); and fear (60%) (females = 1.87 versus males = 1.29, $t(58) = -2.15$, $p = 0.04$).

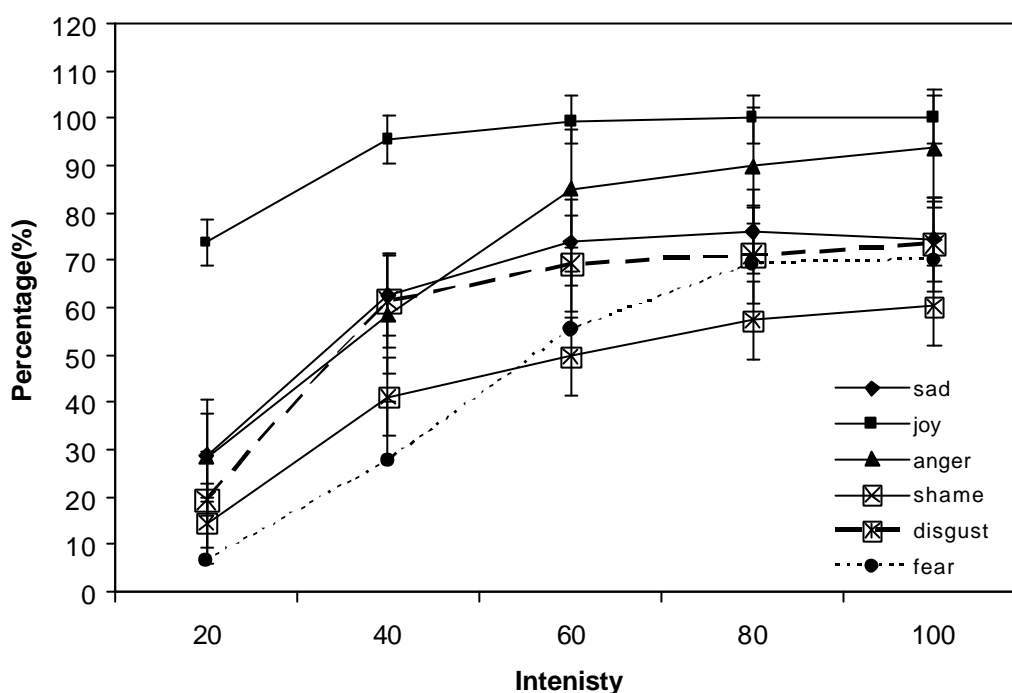


Figure 2 Overall percentage of correct response for the six emotions at the five different intensities; Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means.

Psychopathic personality characteristics and emotion recognition

To test the hypothesis that individuals scoring high on psychopathy measures would be less accurate in identifying facial expressions of fear and sadness, groups scoring high and low on the PPI total score were obtained from the total sample. This was done by splitting the total sample into three equally

sized groups based on participants' scores on the PPI total. Participants with the PPI total scores between 234-331 were groups as low scorers, participants with scores between 334-363 were grouped as medium scorers, and participants with scores between 365-488 were groups to form the high PPI scorers. Independent sample *t*-tests were carried out between low and high group only. The means, standard deviations and *t* values of the independent sample *t*-tests are presented in Table 5. Although, the group with high PPI total scores were less accurate in identifying most facial expressions at most intensities compared to the group scoring low on the PPI total score the only significant difference in mean accuracy found between high and low group was for anger at 80% intensity (low = 2.9 versus high = 2.50, $t(25.06) = 2.11$, $p = 0.04$). In addition to the comparison of the PPI total high scorers and low scorers, groups scoring high and low on the PPI 1 (emotional detachment) and the PPI 2 (antisocial behaviour) subscales were also compared. Scores on each subscale were arranged from lowest to highest for each subscale and split into three groups (low, medium and high scorers). Independent sample *t*-tests were then carried out to compare the mean accuracies of high and low groups of the PPI 1 and the PPI 2 subscales separately. Overall, the low PPI 1 scorers were better at identifying all emotions at all intensities compared to high PPI 1 scorers. However the only significant difference in the mean accuracy was for anger at 20% intensity (low = 1.05 versus high = 0.50, $t(38) = 2.11$, $p = 0.04$). On the other hand, the PPI 2 low scorers and high scorers, except for one expression were similar in their accuracy level. The only significant difference observed between the means accuracy of the two groups was observed for disgust at 80% intensity (low = 2.40 versus high = 1.85, $t(38) = 2.16$, $p = 0.03$).

The new PPI 1 was also tested by comparing the mean accuracy of emotion recognition of the high scorers with low scorers in the total sample. The aim was to explore whether there was any difference in accuracy between the old PPI 1 and the new PPI 1 high and low scoring groups. Independent sample *t*-tests between the new PPI 1 high and low scorers revealed that there were no significant differences in the means of high and low scoring groups.

As the factor analysis of this study revealed that the Coldheartedness subscale loaded into a separate factor from all other subscales, mean accuracy of emotion recognition of the high and low scorers on the Coldheartedness subscale were compared after splitting their Coldheartedness subscale scores into three groups and (low, medium and high). Independent samples *t*-tests revealed that there were no differences between the group scoring high and group scoring low on the Coldheartedness subscales.

Similar to above, groups scoring high and low based on their BIS score minus the BAS total score (BIS-BAS difference) were obtained by splitting the total sample into three equal groups with low, medium and high BIS-BAS scores (the low group's scores ranged from 6.04 to 29.12, the medium group's scores ranged between 5.49 to -6.31 and the high group's scores ranged from -48.08 to -6.59). Independent sample *t*-tests were carried out between high and low group only to compare their accuracy of emotion recognition. The means, standard deviations and results of the independent sample *t*-tests are presented in Table 6. Overall, the low BIS-BAS group was more accurate at identifying four out of five emotions at all intensities compared to high group. However, the only significant difference in these results were found for sadness at 20% (low = 1.16

versus high = 0.50, $t(37) = 2.23$, $p = 0.03$) and for fear at 60% intensity (low = 2.16 versus high 1.45, $t(37) = 2.26$, $p = 0.03$).

Table 5: Mean accuracy and standard deviations for high and low scorers on PPI Total with t-test scores

Emotion	Low	High	<i>df</i>	<i>t</i>
Sadness				
20	0.90(1.17)	0.65(0.81)	38	0.79
40	1.80(1.11)	1.65(0.99)	38	0.45
60	1.95(1.00)	2.25(0.85)	38	-1.02
80	2.05(1.05)	0.65(0.81)	38	-0.66
Anger				
20	1.00(0.79)	0.65(0.88)	38	1.32
40	1.90(0.64)	1.45(0.75)	38	2.03
60	2.70(0.47)	2.35(0.75)	32.06	1.78
80	2.90(0.31)	2.50(0.76)	25.06	2.18*
Shame				
20	0.45(0.69)	0.35(0.67)	38	0.47
40	1.25(1.07)	1.35(1.31)	38	-0.27
60	1.45(1.28)	1.60(1.14)	38	-0.39
80	1.70(1.30)	1.95(1.19)	38	-0.63
Disgust				
20	0.55(0.76)	0.60(0.99)	38	-0.18
40	2.15(0.59)	1.70(1.03)	30.15	1.7
60	2.40(0.75)	2.00(1.03)	38	1.41
80	2.35(0.75)	2.05(0.76)	38	1.26
Fear				
20	0.10(0.31)	0.20(0.52)	38	-0.74
40	0.95(0.83)	0.85(1.09)	38	0.33
60	1.60(0.88)	1.35(1.14)	38	0.78
80	1.80(0.89)	1.90(0.97)	38	-0.34

* Significant at 0.05 alpha level

Note. Low group, $N = 20$; High group, $N = 20$; Values are means and standard deviations (the latter in parentheses); *df* = degree of freedom.

Table 6 : Mean accuracy and standard deviations for high and low scorers on BIS-BAS with t-test scores

Emotion	Low	High	<i>df</i>	<i>t</i>
Sadness				
20	1.16(1.07)	0.50(0.76)	37	2.22*
40	2.10(0.88)	1.70(1.08)	37	1.28
60	2.53(0.77)	2.05(0.76)	37	1.94
80	2.52(0.77)	2.25(0.79)	37	1.11
Anger				
20	1.11(0.74)	0.65(0.67)	37	2.02
40	1.79(0.71)	1.50(0.89)	37	1.12
60	2.59(0.61)	2.50(0.69)	37	0.38
80	2.82(0.50)	2.55(0.76)	33.09	1.42
Shame				
20	0.37(0.76)	0.35(0.75)	37	0.08
40	0.89(1.05)	1.30(1.22)	37	-1.11
60	1.21(1.23)	1.75(0.97)	37	-1.53
80	1.42(1.30)	1.95(1.05)	37	-1.4
Disgust				
20	0.95(1.08)	0.40(0.75)	37	1.85
40	2.16(0.76)	1.75(1.02)	37	1.41
60	2.16(0.83)	2.05(0.89)	37	0.39
80	2.26(0.81)	2.15(0.75)	37	0.46
Fear				
20	0.32(0.48)	0.20(0.52)	37	0.72
40	1.21(0.98)	0.75(0.91)	37	1.52
60	2.16(0.96)	1.45(1.00)	37	2.26*
80	2.21(0.92)	1.90(0.97)	37	1.03

* Significant at 0.05 alpha level

Note. Low group, $N = 19$; High group, $N = 20$; Values are means and standard deviations (the latter in parentheses); *df* = degree of freedom.

To test the emotion-specific hypothesis further, participants were selected into two groups (low and high) based on their scores on both the PPI total scores and the BIS-BAS scores. As there was a negative correlation between the PPI total scores and the BIS-BAS scores, participants who scored high on the PPI total score and low on the BIS-BAS score were grouped into the high psychopathy group and participants who scored low on the PPI total score and high on the BIS-BAS score were grouped into the low psychopathy group.

Independent sample t-tests between the high and low group were carried out to compare their mean accuracy scores and these are presented in Table 7. The only significant difference between the low and high group on mean accuracy was for the fear at 80% intensity (low = 2.00 versus high = 1.13, $t(28) = 2.39$, $p = 0.02$).

Table 7 : Mean accuracy and standard deviations for high and low scorers on both PPI Total and BIS-BAS with t-test scores

Emotion	Low	High	df	t
Sadness				
20	1.00(1.13)	0.47(0.74)	28	1.52
40	2.07(1.03)	1.73(1.10)	28	0.86
60	2.27(0.96)	2.07(0.80)	28	0.62
80	2.27(0.96)	2.13(0.83)	28	0.41
Anger				
20	0.93(0.80)	0.53(0.74)	28	1.42
40	1.80(0.77)	1.33(0.82)	28	1.6
60	2.67(0.62)	2.40(0.74)	28	1.08
80	2.80(0.56)	2.47(0.83)	28	1.29
Shame				
20	0.40(0.74)	0.20(0.41)	22.04	0.92
40	1.27(1.16)	1.13(1.30)	28	0.3
60	1.40(1.24)	1.60(1.12)	28	-0.46
80	1.60(1.24)	1.93(1.10)	28	-0.78
Disgust				
20	0.73(0.96)	0.40(0.83)	28	1.02
40	2.27(0.80)	1.67(1.11)	28	1.7
60	2.40(0.91)	2.00(1.00)	28	1.15
80	2.33(0.90)	2.13(0.83)	28	0.63
Fear				
20	0.20(0.41)	0.20(0.56)	28	0
40	1.20(0.94)	0.73(1.03)	28	1.3
60	2.00(1.00)	1.13(0.99)	28	2.39*
80	2.07(0.96)	1.73(0.96)	28	0.95

* Significant at 0.05 alpha level

Note. Low group, $N = 15$; High group, $N = 15$; Values are means and standard deviations (the latter in parentheses); df = degree of freedom.

To compare the gender differences in recognition of facial expression in relation to their psychopathic personality characteristics, a median split was conducted on the PPI total scores and the BIS-BAS scores for males and females separately. Independent samples t-test revealed that females (n=19) scoring high on the PPI total score were significantly less accurate at identifying disgust at 60% intensity compared to female low scorers (n=20) (low = 2.32(*SD* = 0.95) versus high = 1.63 (*SD* = 0.99), $t(37) = 2.15, p = 0.04$). The females scoring high on the PPI 1 were significantly less accurate at identifying disgust at 40 % intensity compared to low females scoring high on the PPI 1 (low = 2.11(*SD* = 0.81) versus high = 1.33 (*SD* = 0.97), $t(35) = 2.63, p = 0.01$). The females scoring high on the PPI 2 were also significantly less accurate at identifying disgust at 60% intensity (low = 2.32 (*SD* = 0.88) versus high = 1.65 (*SD* = 1.04), $t(37) = 2.15, p = 0.04$). When male high and low scorers were compared, the low PPI total scorers (n=10) was significantly less accurate at identifying sadness at 20% intensity compared to the males scoring high on the PPI total score (n=10) (low = 1.3 (*SD* =1.06) versus high = 0.30 (*SD* = 0.47), $t(12.12) = 2.83, p= 0.02$). On the other hand compared to male low PPI 1 scorers, male high PPI 1 scorers were significantly less accurate at identifying sadness at 80% intensity (low = 2.70 (*SD* = 0.82) versus high = 1.91 (*SD* = 0.94), $t(19) = 2.38, p = 0.03$), and sadness at 100% intensity (low = 2.60 (*SD* = 0.52) versus high = 1.70 (*SD* =1.01), $t(15.19) =2.46, p = 0.02$). In contrast, males scoring high on the PPI 2 were significantly less accurate at identifying fear at 60% compared to males scoring low on the PPI 2 (low = 1.80 (*SD* = 0.92) versus high = 0.80 (*SD* = 1.03), $t(18) = 2.29, p = 0.03$)

Independent sample t-tests revealed that there were no significant differences in mean accuracies between females scoring low and high on the BIS-BAS score or between males scoring low and high on the BIS-BAS score.

Reaction time

Figure 3 shows the mean reaction times of participants' responses in the total sample for each emotion expression. It shows that overall participants took longer to respond to the facial expression of fear followed by sadness, anger, disgust, shame and joy.

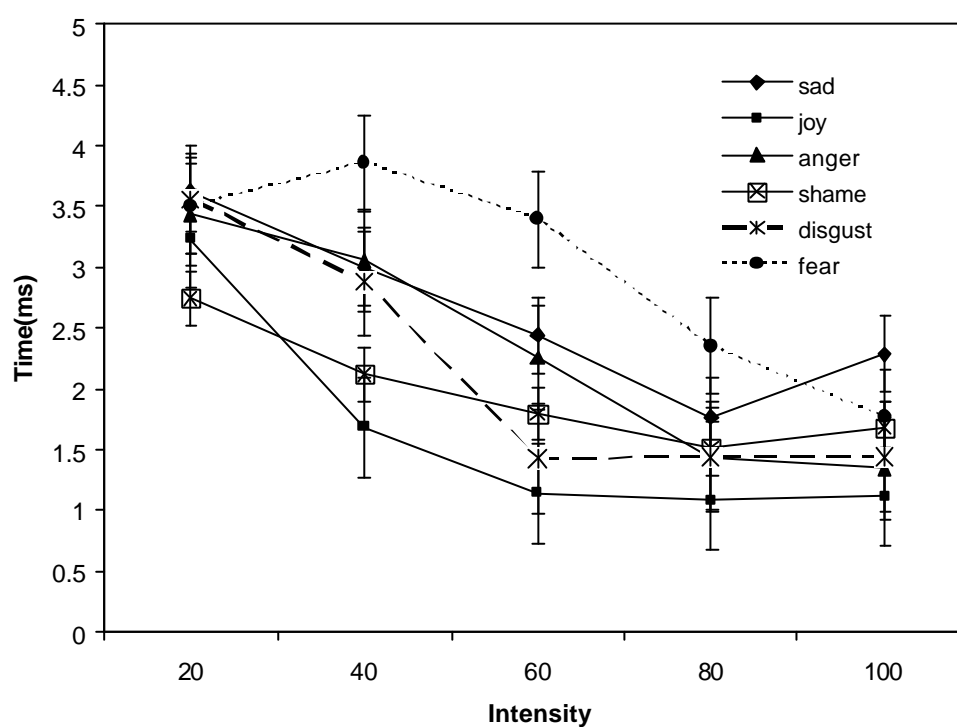


Figure 3. Average response time of participants for six emotions at five different intensities; Each points represents the overall percentages of correct responses; Vertical lines depict standard errors of the means.

Independent sample t-tests were carried out to compare the mean reaction times of the high and low PPI total, PPI 1, PPI 2 and the BIS-BAS groups.

Overall the PPI total high scorers' reaction time was shorter than the PPI total low scorers. However these differences were not found to be significant. Similarly no significant differences were between groups scoring high and low on the PPI 1. In contrast, group scoring high on the PPI 2 took less time to respond to shame (80%) and anger (20%). Similarly, the group scoring high on the BIS-BAS score took less time to respond during the emotion recognition task compared to the group scoring low on BIS-BAS. However, the only significant difference between the groups were observed for sadness at 20% intensity (high = 4.64 versus low = 3.10, $t(37) = 2.12, p = 0.04$).

When the groups selected as high and low based on their scores on both the PPI total and the BIS-BAS score, were compared, the high group's reaction time was generally shorter than the low group, but these differences were not statistically significant.

Independent sample *t*-tests revealed that the differences in reaction times between males and females in the total sample were not statistically significant. However, there were significant differences in reaction times between males and females scoring high and low on the PPI total, PPI 1, PPI 2, and the BIS-BAS scores. Specifically, compared to the low male group, males scoring high on the PPI 1 took less time to respond to the emotion of fear at 60% intensity (low = 1.50 versus high = 1.18, $t(12.51) = -2.61, p = 0.02$), shame at 20% intensity (low = 2.50 versus high = 2.02, $t(18) = 3.13, p < 0.01$), and shame at 40% intensity (low = 2.50 versus high = 1.60, $t(14.18) = 2.25, p = 0.04$). Compared to the male low BIS-BAS scorers, the male high scorers took less time to respond to sad at 60% intensity (low = 2.55 versus high = 2.00, $t(10.05) = -2.33, p = 0.04$) and

fear at 100% intensity (low = 2.00 versus high = 1.70, $t(13.30) = -2.38$, $p = 0.04$). However, there were no significant differences between the males scoring high and low on the PPI total. On the other hand, compared to the female low PPI 1 scorers, the female high PPI 1 scorers took significantly less time to respond fear at 40% intensity (low = 1.26 versus high = 0.94, $t(35) = 2.29$, $p = 0.03$). No significant differences in reaction time were found between the female high and low scorers on the PPI total, PPI 2 and the BIS-BAS scores,

In summary, the group scoring high the PPI total scores was significantly less accurate at identifying anger at 80% intensity compared to the group scoring low on the PPI total score. On the other hand when the high and low psychopathic groups were selected based on the BIS-BAS score, the high group was significantly less accurate at identifying the facial expression of sadness at 20% intensity and fear at 60% intensity. When high and low psychopathic groups were selected based on both the PPI total scores and the BIS-BAS scores, the high group was only significantly less accurate at identifying fear at 60% intensity. In the male sample, the high PPI Total scorers were significantly less accurate at identifying sadness at 20% intensity compared to the low male scorers. On the other hand in the female sample, the high PPI Total scorers were significantly less accurate at identifying disgust at 60% intensity compared to the low PPI total scorers. There were no significant differences between the high and low scorers of males and females when the groups were selected based on their BIS-BAS scores.

Several significant relations were observed between the PPI total, PPI 1, PPI 2, PPI subscales and the BIS, BAS total scores and BAS subscales. For

instance it was found that the PPI total was negatively correlated with the BIS total, the BIS-BAS scores, and positively correlated with the BAS total scores, the BAS Drive and the BAS Fun Seeking subscale. The PPI 1 was negatively correlated with the BIS and the BIS-BAS scores and positively correlated with the BAS total, the Drive subscale and the Fun Seeking subscale. Most of the PPI subscales were negatively correlated with the BIS total and the BIS-BAS scores and positively correlated with the BAS total and the BAS subscales. The only PPI subscale that showed no significant correlations with BIS/BAS scales was Blame Externalisation.

Discussion

Findings of this study partially supported the hypothesis that participants with high psychopathic personality characteristics would be significantly less accurate at identifying facial expressions of fear and sadness, compared with participants with low psychopathic personality characteristics. This prediction was supported when the participants who scored low on the BIS-BAS score (low-anxious) were compared with the participants scoring high on the BIS-BAS score (high-anxious). The significant group differences in emotion recognition found in the current study also revealed that these differences occurred at different intensities of the emotions. Significant differences between groups (high versus low) in emotion recognition at high intensities may suggest that some emotions are more difficult to identify even when the expressions are intense and obvious to identify and could not be attributed to task difficulty.

Facial affect recognition and psychopathic personality characteristics

Many research studies have found that individuals with high psychopathic personality characteristics were less accurate at identifying facial affect of sadness and fear compared with those with low psychopathic personality characteristics (Blair et al., 2001; Blair & Coles, 2000; Blair et al., 2002; Stevens et al., 2001). This finding holds true for mainly males with high psychopathic personality characteristics with a history of criminal and antisocial behaviours. Using a university student sample, the present study found that when psychopathy was measured using BIS/BAS scales, participants with high psychopathic personality characteristics were significantly less accurate at identifying sadness at 20% intensity and fear at 60% intensity compared with

participants with low psychopathic personality characteristics. This finding is consistent with previous research (Blair et al., 2001; Blair & Coles, 2000; Blair et al., 2002; Stevens et al., 2001), and provide support for the VIM model, which suggests that individuals with high psychopathic personality characteristics show diminished ability in processing sad and fearful expressions of others because they do not perceive them as aversive (Blair, 1995).

While the current findings of impaired recognition for fearful and sad expressions supports the VIM model of psychopathy, when the groups scoring high and low on the BIS-BAS score were compared, this was not supported when the PPI total score was used as a measure of psychopathic personality characteristics. Instead, the group with high PPI total score was significantly less accurate at identifying anger even at 80% intensity, but not sadness or fear, compared with the group with low PPI total score. This study also found that in the total sample, the group scoring high on the PPI factor 1 was less accurate at identifying anger at 20% compared to the low PPI 1 scorers. On the other hand, the group scoring high on the PPI factor 2 was less accurate at identifying disgust at 60, 80 and even at 100% intensity. This finding suggests that individuals scoring high on the PPI factor 1 and the PPI factor 2 may have specific impairments in emotion recognition. In contrast to these results, Gordon et al. (2004) found no difference in emotion processing between groups scoring high on the PPI factor 1 and the PPI factor 2. However, Gordon et al.'s (2004) emotion recognition task differed substantially from that used here, as their participants did not need to name the emotion stimuli. They simply had to match an emotion picture to another target picture. It is possible that this task was easier to perform than the one used in the present study.

The group of participants selected on the basis of both the BIS-BAS and the PPI total showed that compared to the low PPI and high BIS-BAS scorers, the high PPI and low BIS-BAS scorers were significantly less accurate at identifying the expression of fear at 60% intensity only and not sadness, disgust or anger. This finding is partially consistent with previous research which has found that children and adults with psychopathic personality characteristics showed impaired recognition of fear and sadness (Blair et al., 2001; Blair & Coles, 2000; Blair et al., 2002; Stevens et al., 2001) It is not clear why the current study did not find any significant group differences in the recognition of sadness in this group. One possibility is the difference in the scales use to measure psychopathy between the current study and the previous studies. For instance, Blair et al. (2001), Blair and Coles (2000), and Stevens et al. (2001) all used the PSD and Blair et al. (2002) used the PCL-R as a measure of general psychopathic personality traits. These studies did not specifically explore whether individuals with different dimensions of psychopathy present with specific impairments in emotion recognition. In contrast the current study found that impaired recognition for fearful expression was found in a selected group of participants who had high psychopathic personality characteristics and low levels of anxiety.

The differences in impaired emotion recognition found in groups scoring high on the PPI total, PPI 1, PPI 2, low on the BIS-BAS, and high on the PPI total + low on the BIS-BAS suggest that these scales are measuring different facets of the psychopathy construct. In fact the correlations carried out in this study between the BIS/BAS scales and the PPI showed moderate to low correlations, thus suggesting that these two scales measure two possibly related

but different constructs. Montagne et al. (2005) suggested that by using the BIS/BAS scales as a criterion measure, individuals are selected predominantly based on punishment insensitivity/reward-seeking behaviour which is the fearlessness or lack of anxiety component in psychopathy. On the other hand when the PPI was used as a measure of psychopathic personality characteristics, it predominantly measures personality traits related to psychopathy. In fact many of the subscales of the PPI aim at capturing internal states and personality traits that reflect Cleckley's (1976) conceptualisation of psychopathy such as guiltlessness, lack of empathy, dishonesty, and lack of forethought (Lilienfeld & Andrews, 1996).

Emotion recognition and gender differences

This study was also aimed at investigating the gender difference in emotion processing in relation to psychopathic personality characteristics. Although Sutton et al. (2002) reported that females classified as psychopathic and low in general anxiety (primary psychopathy) showed inhibited startle response while viewing unpleasant pictures compared to females classified as nonpsychopathic it is not known whether inhibited physiological response to unpleasant pictures in female participants classified as psychopathic also showed impaired emotion recognition ability. The present study found that males with high PPI total scores showed significant impairment in the recognition of sad expression at 20% compared to males with low PPI total scores. On the other hand, females scoring high on the PPI total scores were significantly less accurate at identifying the facial expression of disgust at 60%, compared to females scoring low on the PPI total scores. This finding is contrary to that found

by Blair and Coles's (2000) who reported that children with psychopathic tendencies showed impairments in the recognition of fear and sadness and they found no differences in emotion recognition between boys and girls with psychopathic tendencies. It is possible that Blair and Coles (2000) did not find any gender differences because their sample group was small and had very few girls with psychopathic tendencies. Another possibility may be because Blair and Coles (2000) compared younger sample of males and females and many gender differences only become apparent after puberty. While significant differences in impaired emotion recognition in males and females were found in the current study, no significant differences in emotion recognition were found between males and females scoring high and low on the BIS-BAS score. This may have been partly due to small sample size in each group which may have restricted the range of the BIS/BAS scores.

Further analysis on emotion recognition and psychopathy dimensions revealed that males scoring high on the PPI factor 1 were significantly less accurate at identifying sadness at 80 and 100%, and anger at 40% intensity where as males scoring high on the PPI factor 2 were less accurate at identifying fear at 60% intensity. On the other hand, females scoring high on the PPI factor 1 were significantly less accurate at identifying disgust at 40% intensity and females scoring high on the PPI factor 2 were less accurate at identifying disgust at 60% intensity. The present findings which indicate that females scoring high on the PPI were less accurate at identifying disgust compared to females scoring low on the PPI is consistent with previous findings in males who were presented with facial expressions of sadness, fear, disgust, happiness, and surprise (Kosson et al., 2002).

Taken together, current findings on emotion recognition suggest that emotion processing in individuals with high psychopathic personality characteristics is not uniform. Males with high PPI scores seem present with deficits in processing more emotions than females with high PPI scores.

Reaction time and psychopathic personality characteristics

Some argue that processing emotion of psychopathic individuals is also affected by their impulsivity (Hare 1991). This was partially supported in this study. Results on participants' reaction times during the emotion recognition task found no difference in reaction time between the groups scoring high and low on the PPI in the total sample. Analyses focusing on the emotional detachment dimension (PPI 1) and the antisocial dimension (PPI 2) showed significant differences in reaction time between groups scoring high and low on these two factors in the total sample. Specifically, current findings showed no differences between the high and low PPI 1 scorers but showed that the PPI 2 high scorers had faster reaction times while processing expressions of anger and shame compared to the female low PPI 2 scorers. These findings suggest that participants scoring high on the PPI 2 in the total sample showed an impulsive response style (faster reaction times) to specific emotion stimuli during the emotion recognition task

Correlations between the PPI and the BIS/BAS scales

One of the aims of this study was also to explore the relation between the PPI and the BIS/BAS scales. The PPI has been explicitly developed to assess the multiple components of psychopathy in the general population (Lilienfeld &

Andrews, 1996). On the other hand BIS/BAS scales aimed to measure sensitivity to signals of punishment and reward seeking behaviour of individuals (Carver & White (1994). Since its development, scores on the BIS/BAS scales and different pathologies have been linked (Johnson, Turner, & Iwata, 2003; Meyer, Johnson, & Winters, 2001). Similarly, BIS/BAS scales have been used as a measure psychopathy based on the theoretical postulation that lack of sensitivity to signals of punishment (low fear) and impulsive, sensation-seeking behaviours are central components of psychopathy (Montagne et al., 2005). Psychometric properties of the BIS/BAS scales and the PPI were evaluated in this study to assess the reliability and validity of these scales.

Internal consistencies of these two measures were found to be promising. Cronbach's alpha coefficients from the present study are consistent with those reported in the previous literature for the two measures. Specifically, the PPI total score returned a very high alpha coefficient, consistent with Lilienfeld and Andrews's (1996) finding for the PPI total. Internal consistency coefficients for the seven out of the eight PPI subscales were also high and was consistent with that reported by Lilienfeld and Andrews (1996). The subscale that did not return with an alpha coefficient within the range reported for the PPI subscales by Lilienfeld and Andrews (1996) was the Coldheartedness subscale. The Coldheartedness subscale returned with a much lower alpha coefficient. Lilienfeld and Andrews (1996) did not report which subscales showed the lowest internal consistencies. However, Woodgate (2005) and Chapmen et al. (2003) also found that the Coldheartedness subscale had the lowest internal consistency coefficient compared to other subscales. The PPI factor 1 and factor 2 returned weak to moderate internal consistency coefficients. These are lower than the

internal consistency coefficients for the PPI factors reported by Woodgate (2005) for the full-version of the PPI and Lilienfeld and Hess (2001) for the short version of the PPI. It is not clear why the current results yielded weaker internal consistency coefficients for the PPI two factors. One reason may be because the sample size of the current study was much smaller compared to the other two studies. Another possibility is that the current study used a sample of both graduate and undergraduate students while Woodgate (2005) and Lilienfeld and Hess (2001) used samples of only undergraduate students.

High-order factor analysis of the PPI subscales using principal component analysis with varimax rotation extracted three factors in this study. This factor structure shows some similarities and differences between the 3-factor structure extracted by Benning et al. (2003; using the full-version) and the 2-factor structure extracted Wilson et al. (1999; short-version). Similar to Benning et al. (2003) this study also found that the Stress Immunity, the Social Potency, and the Fearlessness subscales loaded onto factor 1; and Machiavellian Egocentricity, Blame Externalisation and Carefree Nonplanfulness subscales loaded onto Factor 2. While Benning et al. (2003) reported that the Impulsive Nonconformity subscale loaded onto Factor 2, this study found that the Impulsive Nonconformity subscale loaded onto Factor 1. Benning et al. (2003) reported that the Coldheartedness subscale loaded onto a third factor which is consistent with the present study's finding.

The pattern of factor loading of the PPI subscales in the current study was generally consistent with that reported in Wilson et al.'s (1999) study, except for the Coldheartedness subscale which did not load onto the Factor

corresponding to the emotional detachment dimension of psychopathy. The finding that the Coldheartedness subscale was defined by a separate factor raises questions about the validity of this scale especially because this subscale is designed to measure the callous and lack of empathy which is considered a central feature of psychopathy. In contrast with the other PPI subscales, the Coldheartedness subscale returned with the lowest internal consistency coefficient, and showed weak and nonsignificant correlations with other PPI subscales. In addition, items of the Coldheartedness subscale include statements such as “I often hold onto old objects or letters just for their sentimental value,” “I am so moved by certain experiences (e.g., watching a beautiful sunset, listening to a favorite piece of music) that I feel emotions that are beyond words,” and “It bothers me greatly when I see someone crying.” Thus the item content appears to reflect sentimentality and emotional reactivity rather than callousness or lack of empathy. Therefore, it appears that the Coldheartedness subscale measures factors that are separate from the other subscales of PPI and perhaps unrelated to psychopathy.

It is not clear why the Stress Immunity subscale loaded negatively onto Factor 1. The Stress Immunity subscale is aimed at measuring the general lack of anxiety which is a key component of the emotional detachment dimension of psychopathy (Hare, 1991). It is also interesting to note that the Stress Immunity subscale was not correlated with any of the Factor 1 subscales of the PPI, but showed moderately significant correlations with the subscales that made up antisocial/deviant behaviour dimension or PPI factor 2. It was also found that the Stress Immunity was significantly and negatively correlated with the BIS scale and non significantly with the BAS scale. These findings suggest that the Stress

Immunity subscale was related to anxiety and possibly the sensitivity to threat cues that may be related, perhaps more related with the antisocial behaviour dimension of psychopathy.

Cronbach's alpha coefficients for the BIS/BAS scales and the BAS subscales were slightly higher than the internal consistency coefficients for the BIS/BAS scales reported by Carver and White (1994) and Jorm et al. (1999). Consistent with Carver and White's (1994) study, a factor analysis of the BIS/BAS scales revealed four dominant factors, one marked by the BIS items and three marked by the BAS items which are henceforth referred to as BAS Reward Responsiveness, BAS Drive, and BAS Fun Seeking scales. Theoretically it has been argued that the sensitivity of the BIS and BAS physiological systems are independent (Gray, 1978). Consistent with this assumption, the BIS scale was relatively independent of the BAS subscales showing weak nonsignificant correlations. Consistent with their shared conceptual origins, the three BAS scales were positively correlated to one another, although not as strongly as might have been expected. This may suggest that the three BAS scales are perhaps measuring three separate constructs that are related in some way.

Current findings showed that the scores on BIS/BAS scales and the PPI total scores were only moderately correlated suggesting that these two scales may not be measuring the same construct. In this study, BIS was negatively and significantly correlated with the PPI total, and the PPI1, and negatively and nonsignificantly correlated with the PPI 2. On the other hand BAS was positively and significantly correlated with the PPI total, and positively and significantly

correlated with both the PPI 1 and the PPI 2. Lilienfeld and Hess (2001) also found almost similar pattern of correlations between the BIS/BAS scales and the PPI factor 1 and factor PPI 2. Although Lilienfeld and Hess (2001) did not report the correlations between the BIS/BAS scales the PPI subscales, the current study found that that the BIS scale was negatively and significantly correlated with only 4 out of the 8 subscales (i.e., Fearlessness, Coldheartedness, Impulsive Nonconformity, and Stress Immunity); BAS was positively and significantly correlated with only 4 of the 8 subscales (i.e., Machivellian Egocentricity, Social Potency, Fearlessness, and Impulsive Nonconformity). The significant correlations between the BIS/BAS scales and the PPI subscales were also weak to moderate. In addition, neither BIS nor BAS scales were correlated with the Blame Externalisation subscale and the Carefree Nonplanfulness subscale. These two subscales with the Machiavellian Egocentricity subscale make up the PPI 2 or the antisocial behaviour factor of psychopathy. Taken together, these findings may suggest that BIS/BAS scales were not adequately measuring the construct of psychopathy, but rather was measuring the anxiety, and impulsive behavioural components of psychopathy. A substantial body of research has supported the existence of high- and low-anxious psychopathic individuals who display selective performance deficits (e.g., Newman & Brinkley, 1997; Newman, Widom, & Nathan, 1985). Based on the pattern of correlations between the BIS/BAS scales and the PPI, and previous research supporting the etiological heterogeneity of psychopathy, it may be concluded that using only the BIS/BAS scales as a measure of psychopathy may not be able identify those individuals with PPC who are high-anxious. Despite the limitation of the BIS/BAS scales as a measure of psychopathy, the measure could be a useful one to use with other

psychopathy measures such as the PCL-R and the PPI to address the diverse etiological nature of psychopathy.

The limitations of this study also need to be considered. The present study addressed some of the limitations of earlier research with respect to presentation of nonverbal emotional stimuli by using a graded stimuli. However, except for one study (Gordon et al., (2004) the facial pictures (taken from MSFDE) used in this study have not been used in emotion recognition research on psychopathic individuals. Gordon et al.'s (2004) study, the emotion recognition task did not involve naming the emotions, thus findings from this study would not be comparable with their findings. However, Beaupré and Hess (2005) have provided support for the reliability of recognition of the facial expressions in the MSFDE across different cultural groups.

Secondly, the total sample size of 60 is relatively small and therefore cannot be considered to be representative of university students in general. A larger sample would have been desirable as it would have increased the robustness of the findings. Relative restriction in range was an important factor in determining the current findings. In a university sample where there is a low base rate of psychopathy compared to other populations (e.g., forensic samples), it would be difficult to produce meaningful relations between variable such as psychopathy and emotion processing, as the relative restriction in range of scores would affect the relations between psychopathological variables.

Thirdly, the use of self-report measures for the assessment of psychopathy may be problematic. One reason is because participants may not

always report the truth or may attempt to give socially desirable responses. Another reason is that the PPI takes considerably long time to complete and participants could possibly respond carelessly due to fatigue. Although the PPI had three validity scales to check such patterns of responses, these scales possibly cannot detect such invalid responses entirely. The shorter version of the PPI could have been more appropriate to use as a measure of PPC which takes less time to complete (Wilson et al., 1999). Current findings are also restricted to self-report indices of BIS and BAS functioning and, thus do not address the behavioural (e.g., passive avoidance) and physiological (electrodermal hypoactivity) indices of BIS and BAS functioning (Newman et al., 1997). Previous research using behavioural indices of BIS functioning were able to distinguish between low-anxious psychopathic individuals from low-anxious non-psychopathic individuals (Newman et al., 1997).

The results of the present study suggest numerous directions for future research. For instance, future research should aim to study psychopathy and emotion processing using female samples. This study found that males with high PPC had difficulty processing sadness, anger and fear where as women with high PPC had difficulty processing the emotion of disgust only. Further research using larger sample sizes is needed to examine the replicability of these findings. Future research should assess the role of neurological pathways in processing different emotions. This study found that the emotion processing of individuals with different dimensions of PPC was marked by selective impairments in emotion recognition among groups scoring high on different dimensions of psychopathy.

The findings of the present study have potentially important implications for the assessment of psychopathy. For instance, current findings of selective impairments in processing emotions by individuals with different dimensions of psychopathic personality characteristics suggest the importance of using multiple measures to assess psychopathy. Psychometric evaluation of the PPI and the BIS/BAS scales suggested that both scales have good reliability and thus, provide further support for using these measures in the assessment of PPC in the general populations. The findings that individuals with high PPC do exhibit deficits in nonverbal emotional processing and that these deficits do not appear to be global and pervasive, the current study adds to our understanding of emotional processes that are deficient in individuals with high PPC.

In conclusion, the present study has demonstrated individuals with high PPC as indexed by low BIS and high BAS functioning show impairments in the recognition of both sad and fearful expressions. On the other hand when PPC is measured using the PPI which is mainly based on individuals' personality traits, those with high PPC showed impairment in the recognition of angry, but not fearful or sad expressions. When PPC is measured based on scores on both the PPI and the BIS/BAS scales, individuals with high PPC showed impairment in the recognition of fearful but not sad or angry expressions. Males with high PPC showed impairments in recognising more emotions (anger, fear, sadness) compared to females with high PPC who showed impairment in recognising disgust only. Correlations between the PPI and the BIS/BAS scales tended to be weak to moderately correlated suggesting that these two measures may be measuring two separate but possibly related constructs. In addition, the PPI and the BIS/BAS scales showed good reliability, thus providing support for their

usefulness in the assessment of psychopathy in the general population. These findings should be interpreted in light of the limitations discussed earlier. Given that the present finding that the individuals with high PPC showed selective impairments in emotion recognition based on their scores on different measures, it seems that impairment of emotion recognition is not uniform across different dimensions of psychopathy.

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**Are you interested in participating
in a study of**

Personality and Emotional Processing ?

My name is Afiya Ali and I am looking for students (both graduate and undergraduate) to take part in my Masters research.

If you would be happy to complete a questionnaire and a computerized task, which together would take approximately one hour to complete, or need more information, please contact me via e-mail below:

aa43@waikato.ac.nz

If you are enrolled in Psych 102 you can earn 1% course credit for participating in the study.

If you do choose to participate and later change your mind you may withdraw at any time. All results will be kept confidential and any identifiable information will be destroyed after the completion of the research.

My supervisors are **Mary Foster** and **Nicola Starkey**



Appendix B - (BIS/BAS scales)

Behavioural Inhibition & Activation Scales

Indicate using the 4 point scale the degree to which each of the following statements describes you.

Use the number 1 if the statement is very like you and the number 4 to indicate it does not describe you accurately. Use the remaining numbers to indicate the varying degrees that the statement is like you or not like you.

Strongly Agree 1	Agree 2	Disagree 3	Strongly Disagree 4
1.	If I think something unpleasant is going to happen I usually get pretty “worked up.”		1 2 3 4
2.	I worry about making mistakes.		1 2 3 4
3.	Criticism or scolding hurts me quite a bit.		1 2 3 4
4.	I feel pretty worried or upset when I think or know somebody is angry at me.		1 2 3 4
5.	Even if something bad is about to happen to me, I rarely experience fear or nervousness.		1 2 3 4
6.	I feel worried when I think I have done poorly at something.		1 2 3 4
7.	I have very few fears compared to my friends.		1 2 3 4
8..	When I get something I want, I feel excited and energized.		1 2 3 4
9..	When I’m doing well at something, I love to keep at it.		1 2 3 4
10.	When good things happen to me, it affects me strongly.		1 2 3 4
11.	It would excite me to win a contest.		1 2 3 4
12.	When I see an opportunity for something I like, I get excited right away.		1 2 3 4
13.	When I want something, I usually go all-out to get it.		1 2 3 4
14.	I go out of my way to get things I want.		1 2 3 4
15.	If I see a chance to get something I want, I move on it right way.		1 2 3 4
16.	When I go after something I use a “no holds barred” approach.		1 2 3 4
17.	I will often do things for no other reason than that they might be fun.		1 2 3 4
18.	I crave excitement and new sensations.		1 2 3 4
19.	I’m always willing to try something new if I think it will be fun.		1 2 3 4
20.	I often act on the spur of the moment.		1 2 3 4

Items 5 and 7 are reverse-scored.

BIS: 1, 2, 3, 4, 5, 6, 7

BAS Drive: 8, 9, 11, 12

BAS Fun Seeking: 13, 14, 15, 16

BAS Reward Responsiveness: 17, 18, 19, 20

Appendix C - Psychopathic Personality Inventory (PPI)

Psychopathic Personality Inventory: Scoring Key

NOTE: Underlined items are reversed in scoring.

Total Score

(163 items): 1 + 2 + 3 + 4 + 5 + 6 + 7 + 9 + 10
 + 11 + 12 + 13 + 14 + 15 + 16 + 18
 + 19 + 20 + 21 + 22 + 23 + 24 + 25 + 26
 + 28 + 30 + 31 + 32 + 33 + 34 + 35 + 36
 + 37 + 38 + 39 + 40 + 41 + 42 + 44
 + 45 + 46 + 47 + 48 + 49 + 51 + 52 + 53
 + 54 + 55 + 56 + 57 + 58 + 59 + 60 + 62
 + 63 + 64 + 65 + 67 + 68 + 69 + 70 + 72
 + 73 + 74 + 75 + 77 + 78 + 79 + 80 + 81
 + 82 + 83 + 84 + 85 + 86 + 87 + 88 + 89
 + 90 + 91 + 92 + 93 + 95 + 96 + 97 + 98
 + 99 + 100 + 101 + 102 + 103 + 104 + 105
 + 107 + 109 + 110 + 111 + 112 + 113 + 114
 + 116 + 117 + 118 + 119 + 120 + 121
 + 122 + 123 + 124 + 126 + 128 + 129 + 130
 + 131 + 132 + 133 + 135 + 136 + 137 + 138
 + 139 + 140 + 141 + 142 + 143 + 144 + 146
 + 148 + 149 + 150 + 151 + 152 + 153 + 154
 + 155 + 157 + 158 + 159 + 160 + 161 + 162
 + 163 + 164 + 165 + 166 + 167 + 169 + 170
 + 172 + 173 + 174 + 175 + 176 + 177 + 178
 + 179 + 181 + 182 + 183 + 184 + 185 + 186
 + 187

Factor Scales¹

Machievellian Egocentricity

(30 items): 11 + 20 + 25 + 38 + 39 + 40
 + 44 + 51 + 65 + 70 + 75 + 96
 + 100 + 109 + 110 + 122 + 129
 + 133 + 137 + 140 + 143 + 150
 + 152 + 153 + 158 + 166 + 170
 + 173 + 179 + 182

¹These factors were derived from a principal axis factor analysis (Varimax rotation) of 610 students (249 males, 361 females) enrolled in Introductory Psychology classes in Minnesota. Male and female scores were standardized (into z scores) around their respective means prior to the analysis. Items were selected if they loaded .3 or above on their factor(s) (in a few cases, items slightly below .3 were also selected if it was felt that the content domain they tapped was underrepresented). Also, three items (# 123, 135, and 159) did not load highly on any factor; these items were included because their item-total correlation was > .3 in both male and female samples.

Social Potency

(24 items):
 1 + 3 + 7 + 9 + 14 + 18 + 22 + 31
 + 35 + 41 + 49 + 54 + 55 + 69
 + 72 + 90 + 102 + 114 + 131 + 139
 + 149 + 155 + 157 + 185

Fearlessness

(19 items):
 2 + 5 + 19 + 26 + 34 + 42
 + 59 + 85 + 98 + 107 + 111 + 116
 + 118 + 119 + 142 + 154 + 172
 + 174 + 181

Coldheartedness

(21 items):
13 + 21 + 24 + 28 + 32 + 45
 + 47 + 53 + 58 + 74 + 78 + 81
 + 88 + 93 + 95 + 103 + 128 + 130
 + 132 + 163 + 175

Impulsive Nonconformity

(17 items):
 12 + 16 + 37 + 46 + 52 + 57 + 79
 + 84 + 89 + 91 + 101 + 124 + 126
 + 146 + 151 + 178 + 187

Alienation

(18 items):
 23 + 3 + 33 + 36 + 67 + 80 + 82
 + 92 + 99 + 105 + 113 + 138 + 141
 + 161 + 162 + 165 + 167 + 176

Carefree Nonplaffulness

(20 items):
4 + 10 + 15 + 48 + 56
 + 62 + 64 + 68 + 77 + 87 + 97
 + 104 + 112 + 120 + 148 + 164
 + 177 + 183 + 184 + 186

Stress Immunity

(11 items):
6 + 60 + 63 + 73 + 86 + 117
 + 121 + 136 + 144 + 160 + 169

Validity Scales

? Total number of items omitted

DR (Deviant Responding)

(10 items): 17 + 29 + 50 + 66 + 76
 + 94 + 108 + 127 + 147
 + 168

MPQ Unlikely Virtues

(Tellegen, 1978/82)

(14 items): 8 + 27 + 43 + 61 + 71
 + 83 + 106 + 115 + 125
 + 134 + 145 + 156 + 171
 + 180

VRIN² (Variable
 Response Inconsistency)

(80 items; 40 pairs of
 items)

(1-3) + (2-174) + (5-42)
 + (6-160) + (11-153) + (12-46)
 + (14-102) + (15-97) + (18-114)
 + (20-158) + (22-157) + (23-80)
 + (25-133) + (26-181) + (30-82)
 + (31-149) + (33-123)
 + (34-172) + (35-72) + (39-109)
 + (40-132) + (44-179) + (48-120)
 + (54-89) + (56+-62) + (57-124)
 + (58-86) + (59-142) + (63-121)
 + (65-78) + (67-105) + (70-90)
 + (81-93) + (85-116) + (122-173)
 + (126-151) + (138-165)
 + (144-169) + (150-170)
 + (161-167)

²The VRIN scale was developed (following Tellegen, 1978/82) by selecting pairs of items with high (> .3) intercorrelations in both male and female samples. The scale is scored by taking the absolute difference between the scores on each item in the pair, and then summing these differences across pairs.

Tellegen, A. (1978/82). Brief Manual for the Multidimensional Personality Questionnaire. Unpublished manuscript, University of Minnesota.

PERSONALITY STYLES INVENTORY

This test measures differences in personality characteristics among people – that is, how people differ from each other in their personality styles. Beginning on the next page, read each item carefully, and decide to what extent it is false or true as applied to you. Then mark your answer in the space provided to the left of each item using the scale provided below.

1) False 2) Mostly False 3) Mostly True 4)
True

Even if you feel that an item is neither false nor true as applied to you, or if you are unsure about what response to make, try to make some response in every case. If you cannot make up your mind about the item, select the choice that is closest to your mind about opinion about whether it is false or true as applied to you. Here's a sample item.

I enjoy going to movies.

If it is true that you enjoy going to movies, place a 4 on the line to the left of the item, as shown below.

4 _____ I enjoy going to movies.

If it is mostly false that you enjoy going to movies, place a 2 on the line to the left of the item, and so on. Try to be as honest as you can, and be sure to give your own opinion about whether each item is false or true as applied to you.

- | | |
|-------|---|
| _____ | 1) With one smile, I can often make someone I've just met interested in getting to know me better. |
| _____ | 2) I like my life to be unpredictable, even a little surprising. Members of the opposite sex find me "sexy" and |
| _____ | 3) appealing. |
| _____ | 4) I am very careful and cautious when doing work involving detail. |
| _____ | 5) Physically dangerous activities, such as sky-diving or climbing atop high places, frighten me more than they do most other people. |
| _____ | 6) I tend to have a short temper when I am under stress. |
| _____ | 7) Even when others are upset with me, I can usually win them over with my charm. |
| _____ | 8) My table manners are not always perfect. If I'm at a dull party or social gathering, I like to stir |
| _____ | 9) things up. |
| _____ | 10) I weigh the pros and cons of major decisions carefully before making them. |
| _____ | 11) Being rich is much less important to me than enjoying |

- _____ 129) I'm good at flattering important people when it's useful to do so.
 - _____ 130) I sometimes become deeply angry when I hear about some of the injustices going on in the world.
 - _____ 131) I'm not very good at talking people into doing favors for me.
 - _____ 132) Seeing a poor or homeless person walking the streets at night could really break my heart.
 - _____ 133) When someone tells me what to do, I often feel like doing exactly the opposite just to spite them.
 - _____ 134) I always tell the entire truth.
 - _____ 135) I prefer rude, but exciting people to nice, but boring people.
 - _____ 136) I can remain calm in situations that would make many other people panic.
 - _____ 137) I usually enjoy seeing someone I don't like get into trouble.
 - _____ 138) When I'm in a group of people who do something wrong, somehow it seems that I'm usually the one who ends up getting blamed.
 - _____ 139) People are almost always impressed with me after they first meet me.
 - _____ 140) I like to (or would like to) wear expensive, "showy" clothing.
 - _____ 141) In the past, people who were supposed to be my "friends" ended up getting me in trouble.
 - _____ 142) I might enjoy flying across the Atlantic in a hot-air balloon.
 - _____ 143) I don't take advantage of other people even when it's clearly to my benefit.
 - _____ 144) I'm the kind of person who gets "stressed out" pretty easily.
 - _____ 145) Sometimes I'm a bit lazy.
 - _____ 146) I sometimes like to "thumb my nose" at established traditions.
 - _____ 147) During the day, I generally see the world in color rather than in black-and-white.
 - _____ 148) When I am doing something important (e.g., taking a test, doing my taxes) I usually check it over at least once or twice to make sure it is correct.
 - _____ 149) When I'm among a group of people, I rarely end up being the leader.
 - _____ 150) To be perfectly honest, I usually try not to help people unless I think there's some way that they can help me later.
 - _____ 151) Many people probably think of my political beliefs as "radical."
 - _____ 152) I sometimes lie just to see if I can get someone to believe me.
 - _____ 153) I have to admit that I'm a bit of a materialist.
 - _____ 154) I think that it might almost be exciting to be a passenger on a plane that appeared certain to crash, yet somehow managed to land safely.
 - _____ 155) In social situations, I sometimes act the same way everyone else does because I don't want to appear too different.
 - _____ 156) Never in my whole life have I taken advantage of anyone.
 - _____ 157) I can hold up my end of a conversation even if the topic is something I know almost nothing about.
 - _____ 158) I often tell people only the part of the truth they want to hear.
 - _____ 159) When I'm with a group of people who are having a serious conversation, I occasionally like to say something wild or outrageous just to be noticed.
 - _____ 160) I tend to get crabby and irritable when I have too many things to do.
 - _____ 161) I'm sure that some people would be pleased to see me fail in life.
 - _____ 162) I frequently find that the way that others react to my behavior is very different from what I had expected.
-

- | 1) False | 2) Mostly False | 3) Mostly True | 4) True |
|----------|-----------------|--|---------|
| _____ | 163) | Some people probably think of me as a "hopeless romantic." | |
| _____ | 164) | When a task gets too difficult, I don't mind dropping it and moving on to something else. | |
| _____ | 165) | I often get blamed for things that aren't my fault. | |
| _____ | 166) | I often lose my patience with people to whom I have to keep explaining things. | |
| _____ | 167) | Some people have made up stories about me to get me in trouble. | |
| _____ | 168) | I occasionally have periods of several days or more during which I am uncertain whether I am awake or asleep. | |
| _____ | 169) | I sometimes get myself into a state of tension and turmoil as I think of the day's events. | |
| _____ | 170) | To be honest, how much I like someone depends a lot on how useful that person is to me. | |
| _____ | 171) | I have sometimes felt slightly hesitant about helping someone who asked me to. | |
| _____ | 172) | I occasionally do something dangerous because someone has dared me to do it. | |
| _____ | 173) | I sometimes try to get others to "bend the rules" for me if I can't change them any other way. | |
| _____ | 174) | I am a "freewheeling", spontaneous person. | |
| _____ | 175) | I sometimes become so involved in my daydreams or fantasies that I momentarily forget about everything else. | |
| _____ | 176) | Some people have told me that I make too many excuses for myself. | |
| _____ | 177) | I am an ambitious person. | |
| _____ | 178) | Fitting in and having things in common with other people my age has always been important to me. | |
| _____ | 179) | I quickly become very annoyed at people who do not give me what I want. | |
| _____ | 180) | I have never felt that I was better than someone else. | |
| _____ | 181) | If I were a fire-fighter, I think that I might actually enjoy the excitement of trying to rescue someone from the top floor of a burning building. | |
| _____ | 182) | I will sometimes break a promise if it turns out to be inconvenient to keep. | |
| _____ | 183) | People who know me well regard me as reliable, dependable, and trustworthy. | |
| _____ | 184) | I watch my finances closely. | |
| _____ | 185) | I think that I would make a very good actor. | |
| _____ | 186) | I often put off doing fun things so that I can finish my work. | |
| _____ | 187) | I think that holding the same job for most of my life would be dull. | |

Appendix D- Demographic questionnaire

SECTION 1**BACKGROUND INFORMATION**

The first set of questions is about your own personal background

Age:

Please circle

[18-20]

[21-25]

[26-30]

[31-35]

[36-40]

[40-45]

[46-50]

[50+]

Gender:

Please circle

Male/Female

Ethnicity:

Please circle

NZ European	Maori	Chinese	Pacific Islander	Indian	Other
-------------	-------	---------	------------------	--------	-------

Medical Condition:

Please circle

Are you currently treated for a medical and/or mental health condition: **Yes/No**

If yes, what condition _____

Are you currently on medication for the above condition: **Yes/No**

If Yes, what medication _____

Appendix E - Consent Form

University of Waikato
Psychology Department

CONSENT FORM

PARTICIPANT'S COPY

Research Project: Emotion Processing in Adults and their Personality characteristics

Name of Researcher: AfiyaAli

Name of Supervisor (if applicable): Mary Foster and Nicola Starkey

I have received an information sheet about this research project or the researcher has explained the study to me. I have had the chance to ask any questions and discuss my participation with other people. Any questions have been answered to my satisfaction.

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Research and Ethics Committee.

Participant's _____ Signature: _____ Date: _____ Name: _____



=====

University of Waikato
Psychology Department
CONSENT FORM

RESEARCHER'S COPY

Research Project: Emotion Processing in Adults and their Personality characteristics

Name of Researcher: Afiya Ali

Name of Supervisor (if applicable): Mary Foster and Nicola Starkey

I have received an information sheet about this research project or the researcher has explained the study to me. I have had the chance to ask any questions and discuss my participation with other people. Any questions have been answered to my satisfaction.

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Research and Ethics Committee.

Participant's Name: _____ Signature: _____
Date: _____

Appendix F - course credit form

Research Participation: Course Credit Form

Students in **PSYC102** or **PSYC103** can gain up to 4% for each of these courses by participating in research run by staff members and graduate students (only). For each hour of participation students can earn 1%, with a maximum of 8 hours (4 hours for each course). The researcher will give a full explanation of what is being tested and a brief description of the research before (or after) the student takes part. If you have any objections to this scheme, please tell your tutor or course coordinator.

1. Students may earn a maximum of 4% for each of the PSYC102 **and** PSYC103 courses.
2. Students are required to allocate (using the form below) their course credits to one of these courses. This may not be changed once the form is submitted.
3. The possible 4% will be added to the student's final course mark, but the 4% cannot be used to **pass** the course. For example, it cannot be used to increase a final grade from a D to a C.

Student's copy

Student's Name: _____

ID: _____

Surname

First Name

Initial

Number of Hours Participation: _____

Credit

Points: _____

Credits to be allocated to (indicate the number of credits in the corresponding boxes):

PSYC103A ? PSYC103A TGA ? PSYC102B ? PSYC102B TGA ?

Researcher's Name: Afiya Ali

Signature:

Name of Project Supervisor (if different from above): _____

Experimenter's Copy**Student's Name :** _____**ID:** _____

Surname

First Name

Initial

Number of Hours Participation: _____**Credit****Points :** _____

Credits to be allocated to (indicate the number of credits in the corresponding boxes):

PSYC103A ? PSYC103A TGA ? PSYC102B ? PSYC102B TGA ?

Researcher's Name : Afiya Ali**Signature :**

Name of Project Supervisor (if different from above):

**EXPERIMENTERS PLEASE NOTE THAT IT IS YOUR
RESPONSIBILITY TO HAND THIS SECTION OF THIS FORM IN BY
THE DUE DATE**

Appendix G – Participant Information Sheet

INFORMATION SHEET**(Please retain this sheet for your future reference)**

My name is Afiya Ali and I would like to begin by thanking you for agreeing to take part in this study.

My thesis will attempt to understand the relation between personality and emotion processing in adults.

The following questions focus on your thoughts about personal things such as what you like in life and your feelings and emotions. After completing the questionnaires, you will be then participating in an experimental task involving recognition of emotional facial expressions. If at any time you decide you no longer wish to participate in this research please feel free to withdraw. Return this form uncompleted or destroy it if you have already written some answers.

Any identifiable data will only be seen by me as the researcher and will be used to complete my Masters thesis which will be available in due course. The information you provide will be completely confidential and data will be presented in such a manner that no individuals are recognized. If you wish to have a summary of the research findings, please fill out the tear-off slip at the bottom of this sheet and hand back to me. If you have any queries regarding this research please feel free to contact me. My contact number is:

(07) 8592991 (evenings)

Alternately you may wish to contact my supervisors Professor Mary Foster-Extn 8400 and Dr Nicola Starkey-Extn 6472 (University of Waikato- 07 838 4466)

Once again, your participation in this research is greatly appreciated.

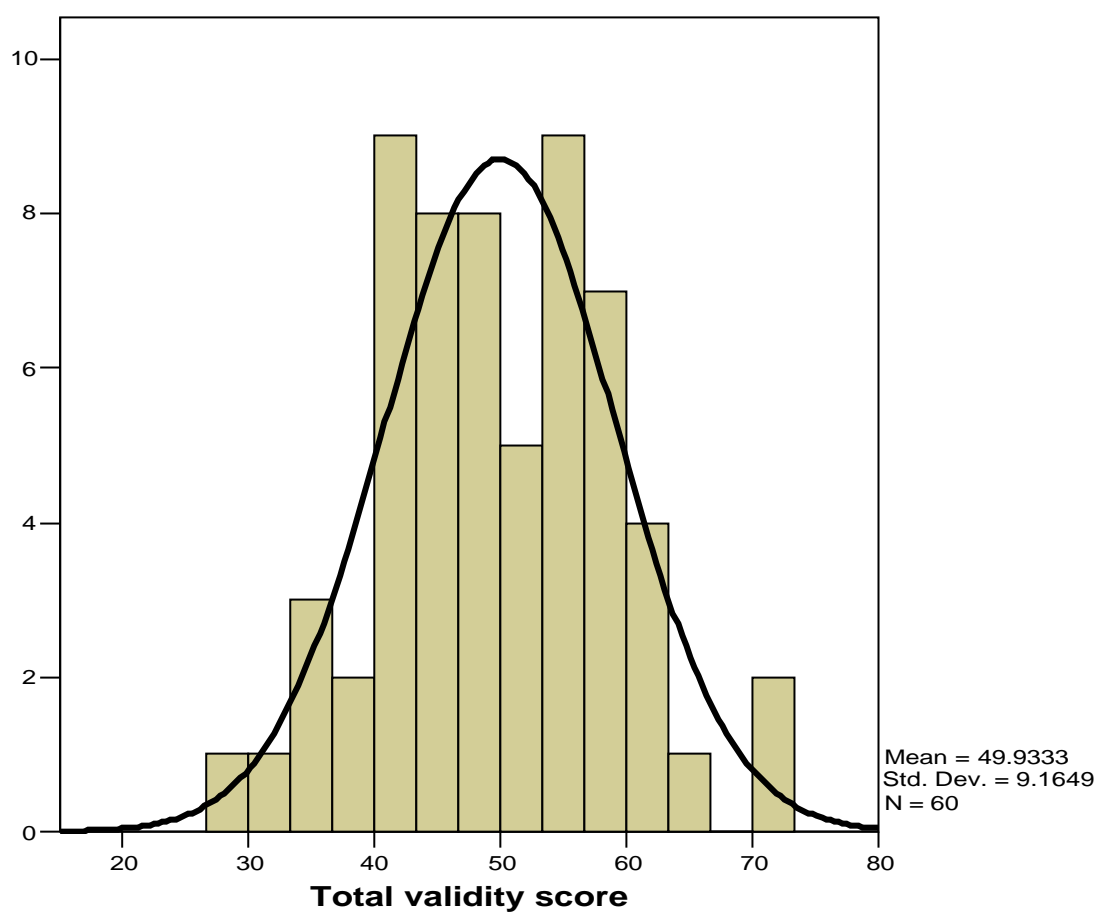
Afiya Ali
aa43@waikato.ac.nz

I would like to have a copy of the summary of the research findings when it is complete. Please email/post to the following address below.

Name _____

Address/ or Email _____

Appendix H : Validity Histogram



This histogram represents participants' total validity scores (Unlikely Virtues + Deviant Responding + Variable Response Inconsistency) on the PPI, plotted with the normal curve, for the total sample of 60 subjects. All participants' data was included in the analysis because participant's responses for the PPI generally lay within the normal curve.

Appendix I - Line graphs for correct percentages of each emotion across the three trials.

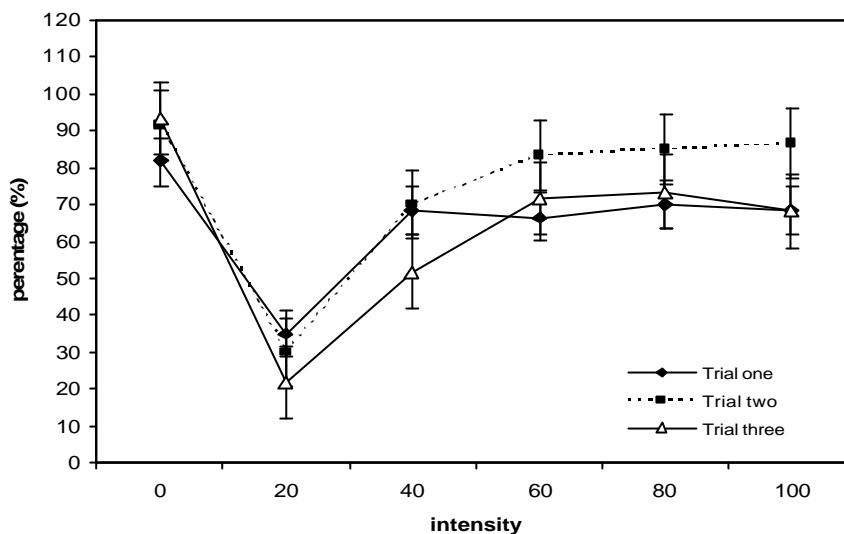


Figure H1. Overall percentage of correct response across three trials for the emotion of sadness at each intensity. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

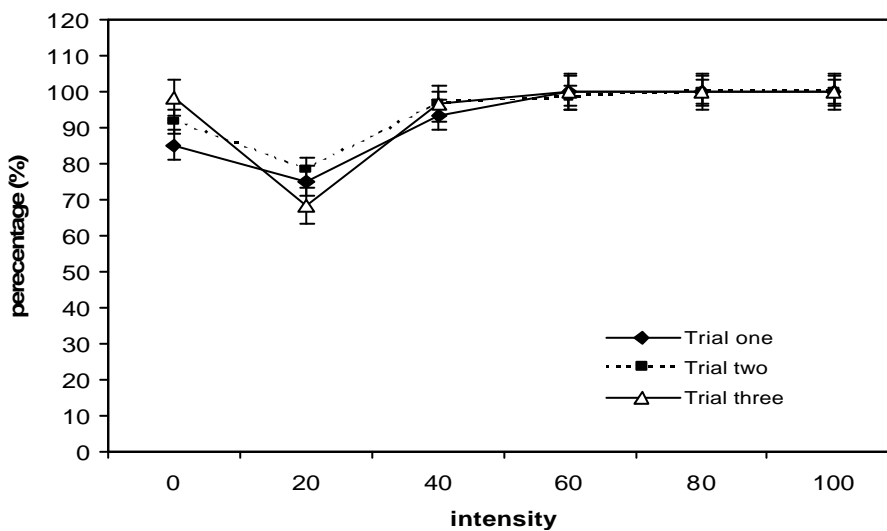


Figure H2. Overall percentage of correct response across three trials for the emotion of joy at each intensity. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

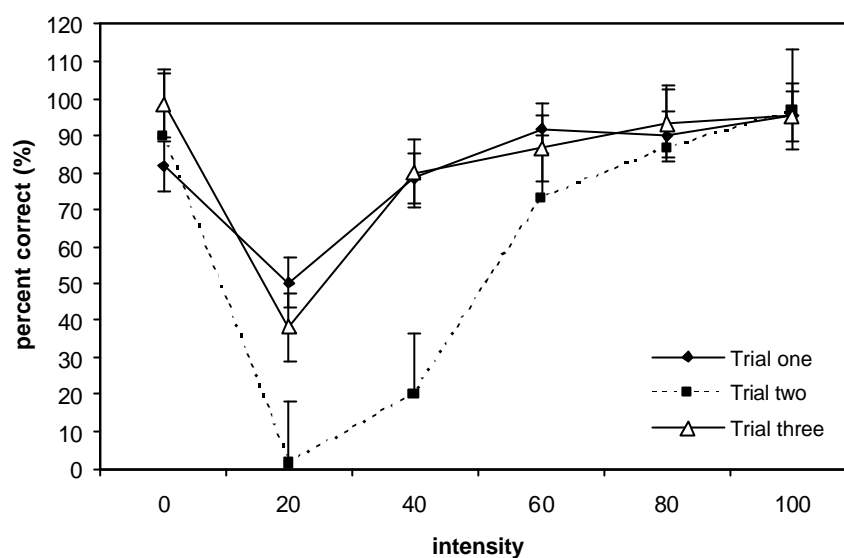


Figure H3. Overall percentage of correct response across three trials for the emotion of anger at each intensity. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

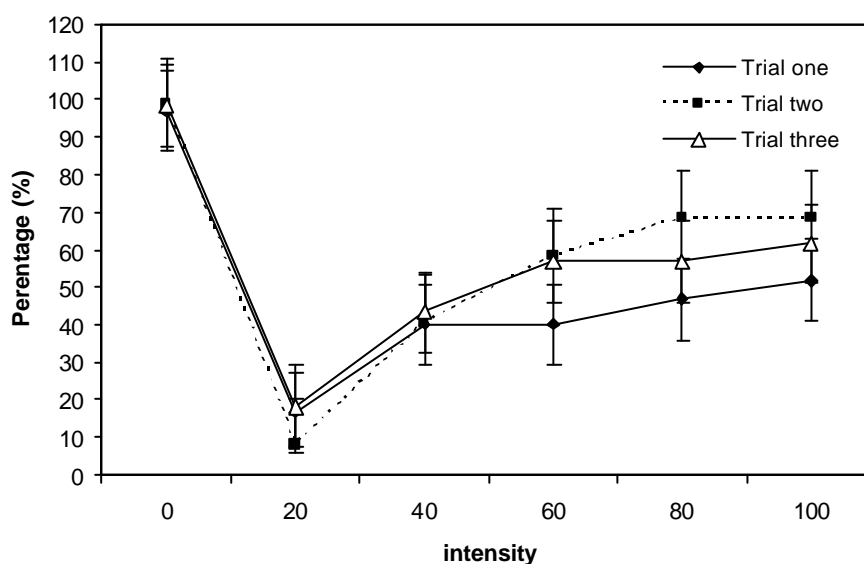


Figure H4. Overall percentage of correct response across three trials for the emotion of shame at each intensity. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

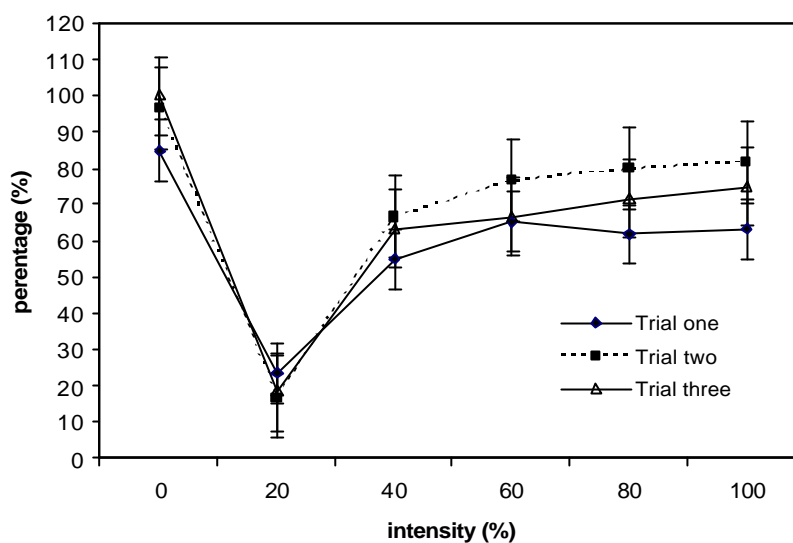


Figure H5. Overall percentage of correct response across three trials for the emotion of disgust at each intensity. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

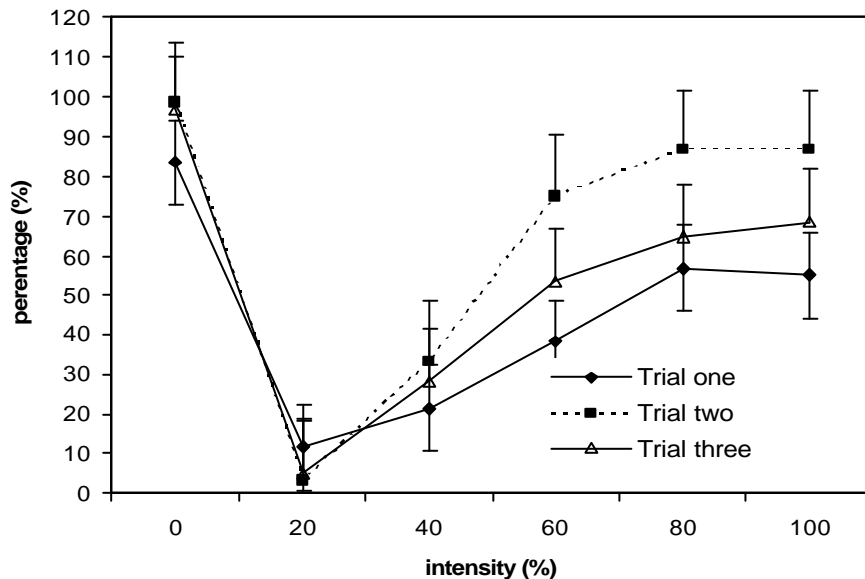


Figure H6. Overall percentage of correct response across three trials for the emotion of fear five intensities. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

Appendix J - Line graphs for mean reaction times for each emotion across the three trials.

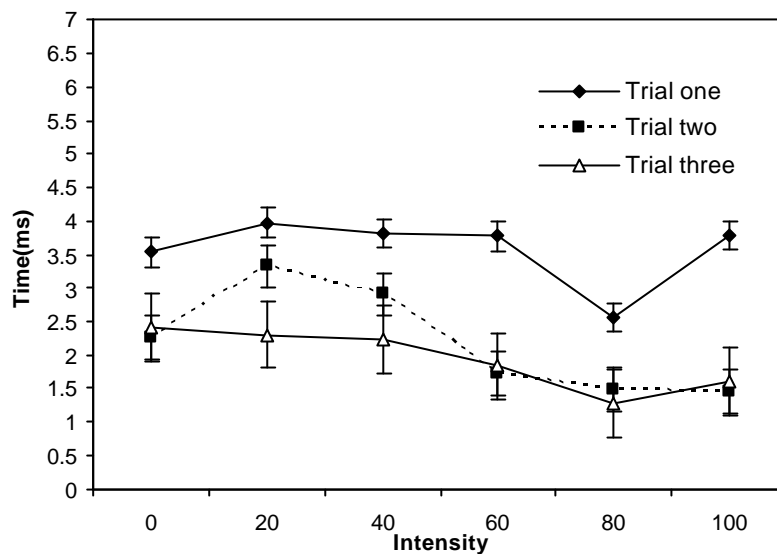


Figure 11. Mean reaction times for sadness at five intensities across three trials. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

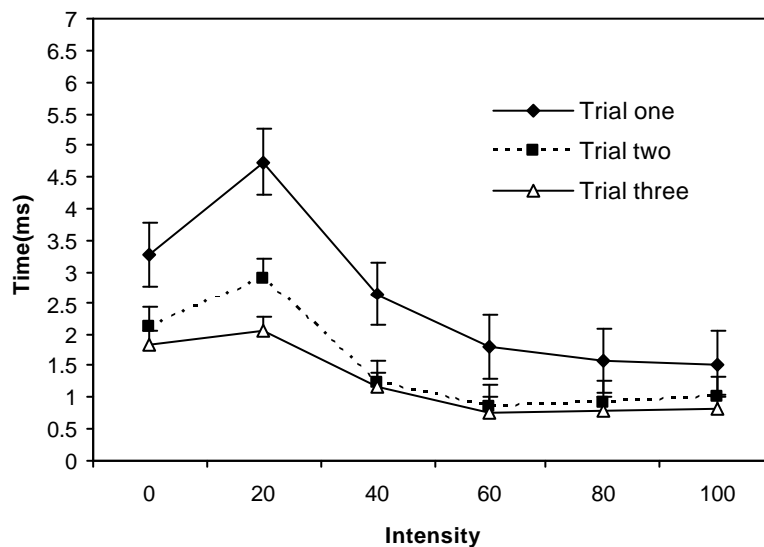


Figure 121. Mean reaction times for joy at five intensities across three trials. Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

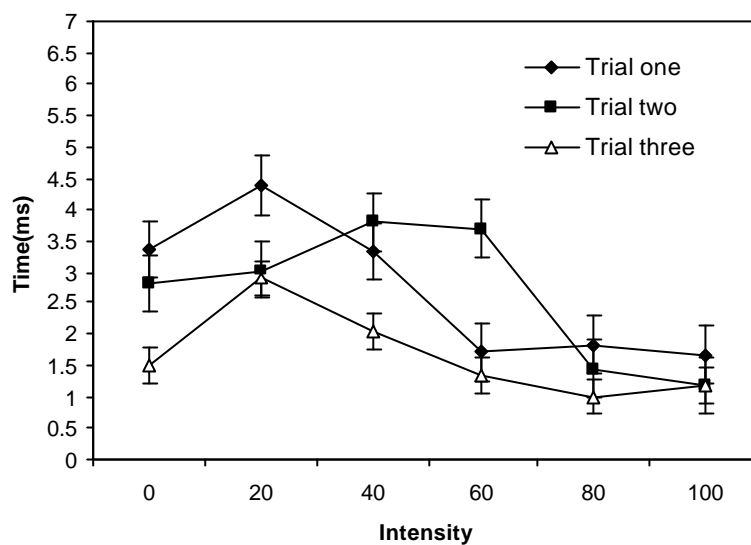


Figure I31. Mean reaction times for anger at five intensities across three trials.

Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

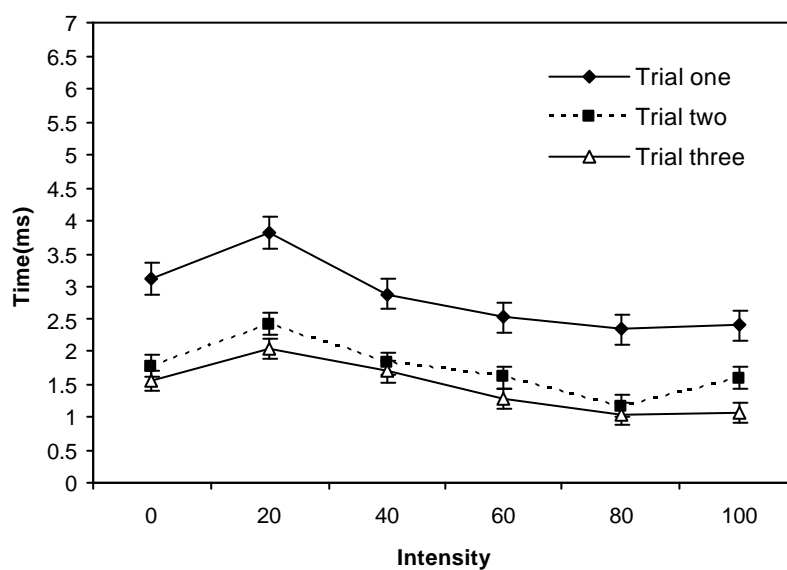


Figure I4. Mean reaction times for shame at five intensities across three trials.

Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

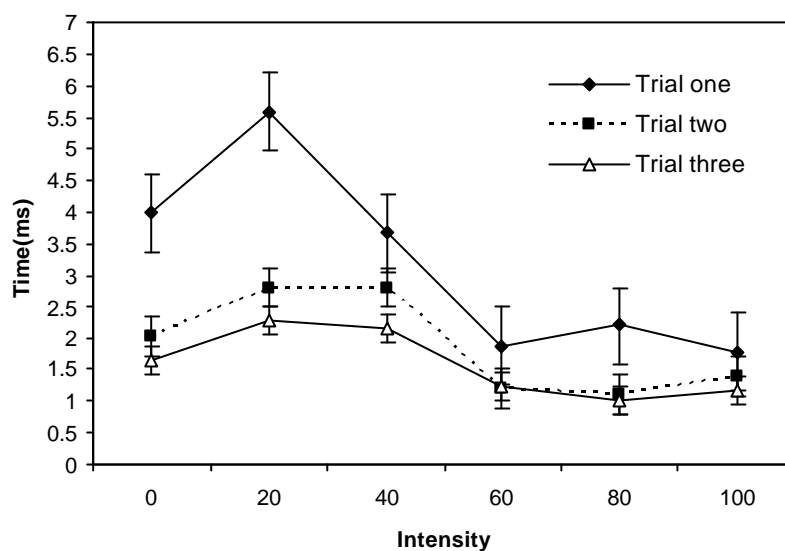


Figure 15. Mean reaction times for disgust at five intensities across three trials.

Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.

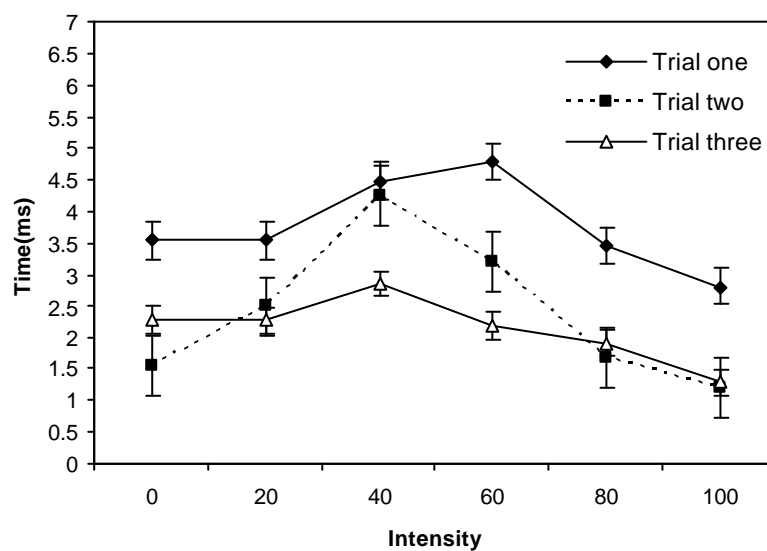


Figure 16. Mean reaction times for fear at five intensities across three trials.

Points represent the overall percentages of correct responses; Vertical lines depict standard errors of the means; 0 intensity = neutral expression.