Startle reflex modulation and psychopathic traits in a university student sample

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Abstract

Psychopathy is a personality disorder with potentially serious consequences for the individual, and for society. Laboratory research on incarcerated psychopaths has provided strong support for an underlying affective deficit, resulting in a failure to respond appropriately to fearful or otherwise unpleasant emotional stimuli. One promising technique for examining this abnormal response to punishing or fearful stimuli is the emotionally primed, auditory probed, startle-blink. This study attempted to replicate laboratory findings using this paradigm with incarcerated psychopathic offenders, in a university student sample. Participants were pre-screened for Machiavellianism, measured using the MACHIV (Christie & Geis, 1970), and later assessed for Psychopathy using the Psychopathy Checklist: Screening Version (PCL:SV; Hart, Cox & Hare, 1995). Forty-three participants were initially included in this study (22 males, 21 females), 11 were excluded from analysis of blink amplitudes based on unscorable electromyographic (EMG) data recordings, or an aborted testing session (8 females, 3 males), one additional female's EMG data was excluded because the International Affective Picture System (IAPS; CSEA-NIMH, 1999) picture set used did not match that of the other participants. Of the 31 remaining subjects, 6 were placed in the Higher psychopathy group, with PCL:SV scores 1.5 Standard Deviations above the mean, all other subjects were included in the Lower psychopathy group. Emotional stimuli consisted of a subset of the International Affective Picture system, parsed on valence (pleasant, neutral, unpleasant), and content (erotic, action, neutral, victim, threat). Startle probes were administered at 3, 4, or 5s into picture viewing. Dependent variables

included standardized startle-blink magnitudes ($n = 31$) and self-ratings of pictures ($n = 40$) (arousal, valence, interest). Personality and behavioural measures also included trait anxiety, as measure through the Welsh Anxiety Scale (WAS; Welsh, 1956), and a self-report measure of antisocial behaviour (measured through the Antisocial Behaviour Scale). Findings indicated no significant group interactions for any of the dependent variables. However, overall trends, based on findings with incarcerated psychopaths, were in the expected direction. In addition, analyses of the effect of startle-probe time yielded a slight improvement in differentiating the Higher and Lower Psychopathy groups with startle probe onsets earlier than 5 seconds. A major reason for the lack of significant effects may have been the inability on behalf of the experimenter to isolate more students scoring higher on psychopathy. Other explanations for the lack of significant results are discussed.

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Startle reflex modulation and psychopathic traits in a university student sample

Psychopaths, though often charming and superficially agreeable, are associated with serious societal costs. Many of these individuals engage in violent, criminal, and generally irresponsible behaviours (Hare, 1993; Hemphill, Hare, & Wong, 1998; Serin & Amos, 1995). Fundamentally, psychopaths may be viewed as societal "free-riders", individuals, who, when faced with rules and regulations, do not appear to feel the same sense of obligation to behave in an appropriate manner.

No matter how superficially charming, psychopathic individuals, upon closer examination, reveal themselves to be cold, selfish, petulant, and immune to punishment and remorse (Babiak, 1995; Hare 1993; Lykken, 1995; Martens, 2002; Millon, 1981). Historically (Millon, Simonsen, & Birket-Smith, 1995) psychopathic individuals have drawn the attention of scholars from a variety of disciplines such as criminology (e.g., Rafter, 1997), psychology (e.g., Cleckley, 1976; Hare, 1993) and philosophy (e.g., Kinberg, 1946; Ramsay, 2000). With that interest came the development of varied and numerous nomenclature to explain the phenomenon (Millon et al., 1995).

The central characteristic of the psychopath, appearing to one extent or another throughout these numerous conceptualizations, and which dominates current definitions is an "emotional deficit" (e.g., Hare, 1998; Mitchell & Blair, 2000; Patrick, 1994; Steuerwald & Kosson, 2000). While researchers continue to debate the underlying nature of this deficit, it is clear that there is a commonly held belief that psychopaths process emotions differently from nonpsychopaths (e.g., Levenston, Patrick, Bradley, & Lang, 2000; Lykken, 1995, Newman & Lorenz, 2002; Steuerwald & Kosson, 2000).

Researchers also attempt to disentangle possible mechanisms involved in this abnormal processing including such elements as the impulse to approach or withdraw from emotional scenarios, the ability to associate fearful or punishing stimuli with behaviour, and the capacity to suspend attention from one punishing behaviour, to another, more rewarding one (e.g., Levenston et al., 2000; Newman & Lorenz, 2002; Patrick, Bradley & Lang, 1993). Methods used in these various efforts range from studying participant reflexive startle reactions while observing frightening or pleasant pictures, to observing participants while they learn tasks, or play games (e.g., Hare & Quinn, 1971; Levenston et al., 2000; Lykken, 1957; Patrick, et al., 1993; Newman & Kosson, 1986).

The remainder of the introduction is organized so as to begin with a definition, and description, of psychopathy as a clinical entity, and how the diagnostic criteria for this clinical entity have been operationalized for laboratory work. Following that, some of the laboratory findings to date, mainly with incarcerated psychopaths, will be recounted, both in terms of the ability for psychopathic individuals to learn to associate negative emotions such as loss or fear with behaviour, and also how psychopaths appear to reflexively respond while being exposed to emotional scenarios. The introduction will close with a discussion of recent efforts to measure psychopathy, study the relationship between psychopathy and emotional processing in non-offender samples, and provide the rationale and hypotheses of the current study.

Definitions of Psychopathy

Beginning in the nineteenth century, the French psychiatrist Philippe Pinel (1801/1962) coined the term “*manie sans delire*” (insanity without delirium) (Millon et

al., 1995). Pinel applied this term to individuals who appeared rational and coherent yet at the same time behaved irrationally and often maliciously (Millon et al., 1995).

Extending the work of Pinel, Prichard (1835, cited in Henderson, 1939) used the phrase "moral insanity" to describe those individuals whose framework of moral beliefs and activities were so malformed that they could not effectively navigate themselves in society. Following Prichard, J. L. Kock, in 1888, at least partially in response to negative reactions to the term "moral insanity", coined the term "psychopathic inferiority" to describe those who were neither ill nor in full possession of psychic normality and behavioural control (Millon et al., 1995).

In 1932 the American Psychiatric Association (APA) employed the term psychopathic personality. Although generally applied to a hodgepodge of personality disorders, the asocial, amoral, subtype is that which most closely resembles the contemporary concept of psychopathy. In the first edition of the Diagnostic and Statistical Manual (APA, 1952), the term Sociopathic Personality Disturbance (antisocial reaction or sociopath) was used. The second edition of DSM (APA, 1968) changed the name to antisocial personality disorder (APD) which has remained intact through DSM-III (1980), DSM-III-R (1987), and DSM-IV (1994), though the current abbreviation for the disorder is ASPD, not APD.

ASPD is a condition characterized by a chronic history of irresponsible and illegal behaviour (e.g., stealing, vandalism, assault). ASPD and psychopathy exhibit overlapping symptoms (Hare, 1991; Hare, Hart, & Harpur, 1991). However, ASPD is primarily operationalized in terms of antisocial behaviour, whereas psychopathy is typically

discussed in terms of personality traits such as callousness, a lack of guilt, and a propensity to be manipulative towards others (Cleckley, 1976; Hare, 1991).

The Mask of Sanity

The current conceptualisation of psychopathy as a clinical entity has been greatly influenced by the work of Hervey Cleckley. Cleckley, an American clinician, wrote the book "The Mask of Sanity", based on his experiences with psychopaths in his clinical practice (1976). Cleckley provided a case by case sketch of the prototypical psychopath. Case studies and clinical descriptions in his book describe individuals from varying backgrounds and occupations (Cleckley, 1976). Consistent with historical descriptions, the picture he develops of the prototypical psychopath is an individual who may behave perfectly rational one moment, and then get caught performing the most idiotic of crimes at a whim, seemingly unaffected by fear of consequences (Cleckley, 1976). Cleckley's descriptions (Cleckley, 1976) also included a number of key interpersonal, affective and behavioural characteristics including: a tendency to be manipulative, superficial charm, above-average intelligence, absence of psychotic symptoms, an absence of anxiety, lack of remorse, failure to learn from experience, egocentricity, and an almost total lack of emotional depth. Cleckley also listed more concrete behavioural characteristics including: a trivial sex life, a tendency to be unreliable, an inability to follow a life plan, dishonesty, suicide attempts that were rarely genuine, impulsiveness, and all around antisocial behaviour (Cleckley, 1976).

Assessment of Psychopathy

The clinical existence, and relevance, of psychopathy has made tremendous progress over the last 20 years. A key contribution to this progress has been the work of

Robert Hare at the University of British Columbia. Hare's contributions to understanding psychopathy are many and varied (Hare, 2003). The arguably greatest contribution Hare has made is the operationalisation of the aforementioned clinical descriptions of psychopathy (in particular that of Cleckley). Hare, with the help of numerous colleagues, students, and collaborators, has developed a family of instruments to assess psychopathy including the Psychopathy Checklist Revised (PCL-R; Hare, 1991, 2003), the Psychopathy Checklist: Screening Version (PCL:SV; Hart, Cox, & Hare, 1995), and the Psychopathy Checklist : Youth Version (PCL:YV; Forth, Kosson, & Hare, 2003). While it is true that current applications of these instruments to assist forensic decision-making include assessing the risk of violent recidivism (Quinsey, Harris, Rice, & Cormier, 1998), assessing dangerousness (Serin & Amos, 1995), early release decisions (New Zealand Department of Corrections, 1996), treatment planning (Loving, 2002), and profiling (Homant & Kennedy, 1998), these applications are secondary to the goal initially expressed by Hare in developing the PCL, that is, to provide a reliable and valid measure useful for studying the underlying physiological causes of psychopathy (Hare, 1991).

Of the PCL instruments, the Psychopathy Checklist-Revised is the most commonly used diagnostic tool for the construct of psychopathy (Hare, 1991). The PCL-R is a 20 item clinical rating scale scored from detailed file information and a semi-structured interview. The items are scored on a 3-point scale (0 = "item does not apply", 1 = "item applies somewhat", 2 = "item definitely applies") and are summed to obtain a total score that ranges from 0 to 40. Items include a number of behavioural and interpersonal characteristics such as glibness and superficial charm, criminal versatility, and grandiose sense of self-worth (see Table 1 for a listing).

Research on the factor structure of the PCL-R initially identified two factors (Harpur, Hakstian, & Hare, 1988; Windle & Dumenci, 1999). Factor 1 describes a constellation of interpersonal and affective traits. Factor 2 describes a chronic antisocial, unstable lifestyle. Items that did not load on either factor include promiscuous sexual behaviour, many short-term marital relationships, and criminal versatility (Harpur et al., 1988).

Recent research has emerged that challenges the two-factor model, and instead asserts the appropriateness of a three-factor hierarchical model to explain psychopathy (Cooke & Michie, 2001). See Table 1 for a description of items. Cooke and Michie (2001) conducted a series of studies to first determine whether or not the two-factor model was adequate understand the construct of psychopathy, and later to isolate and validate a three-factor model. In the first experiment, both Exploratory and Confirmatory Factor Analysis (EFA; CFA) was conducted on the PCL-R development sample (N = 1389). Results did not support the two-factor model of psychopathy. In the second experiment, the authors, using a larger sample (N = 2067) performed EFA and Item Response Theory (IRT). The EFA analysis, referred to the researchers as the “top-down approach”, initially yielded five factors. Later analysis, drawn from IRT, isolated three factors: arrogant and deceitful interpersonal style, deficient affective experience, and impulsive and irresponsible behavioural style (see Table 1). Seven of the items did not load on these three factors, and instead were placed under one unitary construct referred to as “antisocial behaviour”, seen as manifestations of the three core factors (Cooke & Michie, 2001). The remainder of the experiments involved promising efforts to validate the three-factor model. Overall, the findings supported a three-factor model that supports

psychopathy as a coherent construct, with more emphasis on personality than behaviour (Cooke & Michie, 2001).

Most recently, the second edition of the PCL-R Technical Manual cites a study (Parker, Sitarenios, & Hare, in progress) suggesting an 18 item, two factor, four facet model (Hare, 2003). See Table 1 for a list of these factors, and corresponding items. These factors were derived from exploratory and confirmatory factor analysis conducted on a large sample comprising male offenders, female offenders, file reviews, and male forensic psychiatric patients (combined $N = 9,016$).

Initially, principal components analyses were conducted on half of the largest of the subsamples, the male offenders, and several models were suggested for later testing using confirmatory factor analysis. In all of the principal components analyses, Item 11 – Promiscuous Sexual Behaviour, and Item 17 – Many Short Term Marital Relationships, did not load on a specific factor. The several identified models were tested, but the most relevant were: A model suggesting one overarching psychopathy factor, a two factor deviant lifestyle and interpersonal affective factor model, and a model stipulating an interpersonal, an affective, a lifestyle, and an antisocial facet.

These models were first tested using CFA with the second half of the male offender sample and the remaining three samples. Results of model comparisons using goodness-of-fit chi squares demonstrated that the four facet model provided a significantly better fit than the other models, and replicated across the four sub-samples (Hare, 2003). Following these analyses, a second order confirmatory factor analysis was conducted to determine whether the subscales (facets) loaded better on a single psychopathy factor, or that Affective and Interpersonal facets loaded on one factor, while

Lifestyle and Antisocial Facets loaded on a second factor. Goodness of fit chi-squared revealed the two factor, four facet model to be superior. Hare (2003) stresses in the manual that the two factor, four facet model maximizes the usage of items, and also envelopes the above described model found by Cooke and Michie (2001), without losing any important information. Hare (2003) also concludes with a statement to the effect that while no model will be perfect, and different studies will yield disparate findings, most of the available research on the factor structure of the PCL-R are consistent with clinical experience and theory and research on psychopathy, equating to strong evidence for the internal validity of the PCL-R (Hare, 2003).

Administration of the PCL-R requires access to detailed interview and case history information, including official criminal record (Hare, 1991; 2003). As such, while reliable and valid, the standard form of the PCL-R is costly and time consuming. In addition, the information required to properly score the PCL-R calls into question the appropriateness for using this measure in a non-forensic setting. The developers of the PCL-R, taking this into consideration, have also created the Psychopathy Checklist: Screening Version (PCL:SV; Hart et al., 1995), which, though it also involves a semi-structured interview and collateral information, is less resource and time intensive to administer than the PCL-R.

The PCL:SV is a 12-item rating scale based directly on the PCL-R. Items are scored in a similar fashion to the PCL-R, ranging from 0-2, summing to a total score of up to 24. Most items on the PCL:SV (see Table 2 for a list of items organized by factor) were taken directly from the PCL-R, only shortened and made more simple, but maintaining true to the traits underlying the original PCL-R item. Other PCL:SV items

were created by collapsing, and shortening, two PCL-R items similar in content. For example, item 5 of the PCL:SV - Lacks Empathy, was derived from collapsing the two PCL-R items 7 (Shallow Affect), and 8 (Callous/Lack of Empathy).

Research supports this instrument as a reliable and valid alternative for assessing psychopathy in a variety of samples, including forensic/nonpsychiatric, forensic/psychiatric, civil/psychiatric, civil/nonpsychiatric, (Hart et al., 1995) and students (Forth et al., 1996). Item response theory analysis of the PCL:SV has found similarities, and subtle differences between the PCL:SV and PCL-R (Cooke, Michie, Hart, & Hare, 1999) In addition, factor analyses of the PCL:SV have supported the existence of a two-factor model (Hart, Cox, & Hare, 1995) and a three-factor model (Skeem, Mulvey, & Grisso, 2003), describing the structure of the PCL:SV.

Cooke et al. (1999), conducted item response theory analyses on the PCL:SV using the original development sample ($N = 586$), in order to determine whether or not the PCL:SV was measuring the same construct as the PCL-R. Comparisons of the PCL:SV and the PCL:R indicated that eight of the 12 items in the PCL:SV strongly paralleled the equivalent PCL-R items. Of the four items that differed, they were all found to be equal or superior to equivalent PCL-R items in terms of discrimination. Also, it was found that Factor 1 items – Interpersonal and affective features of psychopathy, had higher thresholds than the Factor 2 – Antisocial behavioural features. Higher thresholds in this case means that individuals had to be at a higher level of psychopathy before interpersonal and affective features, such as “lacks empathy”, became evident. Nevertheless, both factors were equally discriminating.

Hart et al. (1995) found, using confirmatory factor analysis on the development sample ($N = 586$), that the two factor model was a significantly better fit to their data than a unidimensional model. A later study conducted by Skeem et al. (2003), conducted exploratory and confirmatory factor analyses of PCL:SV scores in a sample of civil psychiatric patients ($N = 870$). While initial exploratory factor analyses of the data yielded support for the two factor model, the researchers, after testing a number of models with confirmatory factor analysis, found that Cooke and Michie's (2001) three factor model of psychopathy was more plausible than the traditional two factor model. According to the researchers the three factor model better described the structure of the PCL:SV and also better assessed personality deviation, meaning that it better reflected the underlying personality traits associated with psychopathy, de-emphasizing the behaviour that could be caused by factors other than personality pathology (Skeem et al., 2003).

Further research will be required in order to establish which of these, or some other, factor structures most effectively accounts for laboratory evidence. However, at the present time, the consistent use, and findings, associated with the two-factor model speak to continuing its application.

Emotional Deficit

Initial clinical descriptions of the disorder of psychopathy revolved around an underlying emotional, or affective deficit. In the words of Cleckley (1976):

My concept of a psychopath's functioning postulates a selective defect or eliminator which prevents important components of normal experience from being integrated into the whole human reaction, particularly an elimination or

attenuation of those strong affective components that ordinarily arise in major personal or social issues(p. 374).

Laboratory research has, with the aid of an operationalized definition of psychopathy, sought to test the notion that psychopathy is integrally linked to some form of affective deficit (e.g., Hare, 1998; Lykken, 1995; Cleckley, 1976; Newman, Patterson, & Kosson, 1987; Patrick et al., 1993). This affective deficit has been examined through various theoretical and paradigmatic lenses, employing a wide variety of methodological tools (Hare, 2003). As this study is focussed on the construct of psychopathy as identified by Cleckley (1976) and operationalized by Hare (1991;1993), all of the studies reported in this document, unless otherwise stated, classify psychopathic and nonpsychopathic groups using the PCL-R (Hare, 1991) or PCL:SV (Hart et al., 1995). The following review will focus on two main streams of research: avoidance learning and fear conditioning, and emotionally primed reflexive responses to startling stimuli.

Avoidance Learning and Conditioned Fear

Many of the earlier laboratory studies of psychopathy focused on a putative learning deficit. Specifically, researchers attempted to establish fear or avoidance conditioning in psychopaths in a laboratory setting (for reviews see Lykken, 1995; Hare, 1998; Newman, 1998; Newman & Wallace, 1993). Cleckley (1976) noted that most of the characteristic behaviours of the prototypical psychopath seem to be better controlled in the general population by way of interpersonal rewards and costs. The psychopath, then, appeared to be in some way defunct in terms of emotional experience guiding the normal learning process. He described the mechanism underlying this inability to process emotional cues and experiences as "semantic aphasia" (Cleckley, 1976). However, as

noted by Lykken (1995), the psychopath does not appear to display a ubiquitous lack of emotional engagement. It appears, rather, to be limited to feelings of anxiety or fear (Lykken, 1995).

This observation led Lykken to postulate the "Low Fear-Quotient" theory of psychopathy (Lykken, 1995). This theory rests on the assumption that all humans are inherently pre-wired to fear particular objects and situations, and also to associate these fearful stimuli with situations and environments in which they occur (Lykken, 1995). The Low Fear-Quotient is hypothesized to be a continuum, based on the degree to which an individual is biologically predisposed to exhibit these direct, and associated, fearful responses (Lykken, 1995). If we accept Lykken's (1995) notion that behavioural costs lie in the affective system, (i.e. in terms of fear or anxiety) then individuals who are less anxious should be at greater risk to develop psychopathy.

Many of the early studies on instrumental and classical conditioning sought to condition psychopaths to associate a punishing or unpleasant stimulus or consequence with a behaviour. Palmar skin conductance, widely used as a measure of autonomic arousal, was measured as an index of the extent to which psychopaths would experience fear or anxiety when presented with impending, unpleasant, consequences (see reviews by Hare, 1978, 1998, Lykken, 1995; Newman & Wallace, 1993). For example, Lykken (1957) conducted a study in which incarcerated psychopaths and nonpsychopaths (classified using Cleckley's criteria) were instructed to learn a sequence of lever presses that would navigate them through a "mental maze" task while recording palmar skin conductance. Offenders also had to learn a "latent" task to inhibit pressing specific levels, since these would result in receiving electrical shocks. Psychopaths displayed the poorest

passive avoidance learning, or ability to inhibit punished responses, indicating that they were less concerned about the shocks and instead focused their attention on learning the correct levers (Lykken, 1957). A later study by Schmauk (1970) also examined passive avoidance learning in psychopaths and nonpsychopathic offenders using three different types of punishment. These punishments included: saying "wrong", administering electric shocks, and subtracting 25 cents from an eight dollar initial stake. Schmauk (1970) found that psychopaths performed more poorly than nonpsychopaths in the electric shock and verbal reprimand conditions. The groups did not differ when the loss incurred was monetary, indicating that only salient punishment (i.e., loss of monetary reward) was sufficiently salient to the psychopathic group to inhibit behavioural responses (Schmauk, 1970).

Hare and Quinn (1971) examined classical conditioning in a sample of psychopathic and nonpsychopathic offenders (as defined by an earlier 7-point clinical rating scale). Participants in this study were presented with a series of 10 second long tones either paired or not paired with an aversive stimulus (Hare & Quinn, 1971). Psychopaths showed much lower anticipatory skin conductance to tones followed by an aversive stimulus than nonpsychopathic controls. Both groups did display a deceleration in heart rate, indicating an increase in attention, in anticipation of aversive stimuli.

A number of studies involving skin conductance and heart rate conducted by Hare and colleagues isolated a differential orienting response, or tendency for the psychopathic and nonpsychopathic offenders in their physiological processes in anticipation of an event (Hare, 1978; Lacey & Lacey, 1970). The experimental paradigm often used in these studies was the "countdown" paradigm, where participants would await an aversive

stimulus. In psychopaths, heart rate would decelerate, but skin conductance would only increase slightly, whereas in nonpsychopaths, skin conductance would greatly increase with slight increases in heart rate. The orienting response in this case was interpreted as indicating an increase in fear of nonpsychopaths and a capacity for the psychopaths to ignore the impending aversive event (Hare, 1978). This ability to "tune out" cues associated with impending fear or punishment seemed to operate equally well in situations in which the psychopath would administer aversive shocks to others (Hare & Craigen, 1974) and has been replicated more recently by other researchers (Larbig, Veit, Rau, Schlottke, & Birbaumer, 1992; Ogloff & Wong, 1990).

Flor, Birbaumer, Hermann, Ziegler, and Patrick (2002) compared 9 noncriminal psychopaths (classified using the PCL:SV and additionally interviewed using PCL-R) including chronic traffic violators and three "adventurous types", and 12 healthy controls in an aversive Pavlovian conditioning experiment involving pairing a foul odour (conditioned stimulus) with neutral faces (unconditioned stimulus). Dependent variables in this study included skin conductance, event-related brain potentials, heart rate, corrugator (frown) electromyographic recordings, auditory startle response potentiation (measured through startle-blink), and subjective measures of arousal and valence. Psychopaths in this study exhibited similar electrodermal and heart rate activity as that reported by Hare and Quinn (1971). The psychopathic group also displayed "an emotional associative deficit" (Flor et al., 2002, p.514) evidenced by smaller skin conductance, startle, and corrugator muscle responses than nonpsychopaths. The authors noted the potential, based on electroencephalographic recordings, that this effect was

independent of attention as psychopaths did attend to signals but failed to associated emotional significance relating to impending pain or discomfort.

While many of the above mentioned conditioning studies have mainly focussed on some form of "tuning out", or inability to make associations between consequences and behaviour, there is another large body of research that posits a different mechanism to integrate the research findings. Newman and colleagues, in a variety of different experimental settings, have developed a hypothesised mechanism by which psychopaths fail to make appropriate associations (see reviews by Gorenstein & Newman, 1980; Kosson & Harpur, 1997; Newman, 1997, 1998; Newman & Lorenz, 2002). This mechanism is referred to by the researchers as the "response modulation hypothesis" and refers to the inability of psychopaths to incorporate, and properly attend to, important contextual cues while engaged in goal-directed behaviour. For example, Newman and colleagues (1987) tested this hypothesis by using a single deck of 100 playing cards presented via a computer monitor and five cent rewards and punishments. The odds of receiving a reward was high initially to establish a dominant response set for reward. The odds steadily declined with each block of 10 cards until likelihood of reward decreased to zero. The authors used three conditions: one involving immediate feedback only; another provided subjects with immediate feedback plus a cumulative display of all cards played; finally, the third condition involved an enforced 5-second delay after each response, during which the immediate and cumulative feedback remained on the display.

As expected by the authors, psychopaths played more cards and lost more money than nonpsychopaths in the condition involving immediate feedback only. In addition, psychopaths tended to play more cards than controls even when they were provided with

a cumulative display illustrating the declining probability of reward and increasing probability of punishment. Psychopaths and controls terminated the game at an equally appropriate time when subjects were prevented from responding immediately after receiving feedback.

Many studies have examined this hypothesis in regards to passive avoidance learning (Arnett, Smith, & Newman, 1997; Howland, Kosson, Patterson, & Newman, 1993; Newman & Kosson, 1986; Newman et al., 1987; Newman & Schmitt, 1998; Newman, Schmitt, & Voss, 1997).

A study by Arnett and colleagues (1997) empirically examined whether or not observed learning deficits were associated with hypersensitivity to reward or an inability to suppress behaviour in light of punishment. The study involved a continuous motor task in which one of five peripheral green lights was lit each time a participant pressed the centre button. Participants in the experiment were asked to press the button corresponding to the peripheral green light as quickly as possible and then to press the centre button again. There were two conditions in this experiment. In the first, the participants earned 5 cents each time they completed five presses within the allotted time. In the second condition, rapid responding enabled participants to avoid losing 5 cents. After performing the task for 1 minute, a central red light was activated to indicate that the peripheral green lights could change from green to red between the time participants released the centre button and pressed the peripheral button. If participants pressed the peripheral button in the presence of a peripheral red light, they lost 50 cents. This phase also lasted 1 minute, and the two phases were repeated four times. In both conditions, the centre red light indicated that the system of reward and punishment was changing and that

now participants would have to stop engaging in certain behaviours in order to avoid losing relatively large amounts of money (i.e., punishment).

The researchers found that psychopaths, at this point of change in task contingencies failed to exhibit the expected change in skin conductance, signalling a physiological response to impending punishment when the change followed the reward condition, rather than the punishment avoidance condition. This finding supported the notion that the driving factor is hypersensitivity to reward paired with a failure to suspend the dominant behaviour (receiving rewards) to engage in another relevant behaviour (avoiding punishment).

Schmitt and Newman (1999) have also found evidence that psychopathy, as defined by the PCL-R (Hare, 1991), is independent of anxiety. Experimental research conducted by Newman and colleagues, also includes studies that control for levels of trait-anxiety in participants based on scores on the Welsh Anxiety Scale (WAS; Welsh, 1956) adapted from the MMPI (Brinkley et al., 1999; Lorenz & Newman, 2002a, 2002b). The WAS is a 39-item questionnaire used as a measure of an individual's disposition to experience negative affect and anxiety (Welsh, 1956). For most studies, Newman and colleagues divide participant groups into high- and low- anxious psychopaths. Findings in these studies follow the general trend that psychopaths behave in ways consistent with existing theoretical conceptions of psychopaths, but with slightly larger effects for low-anxious psychopaths. However, aside from Newman and colleagues, few if any other studies involving the PCL-R or PCL:SV have controlled for anxiety using the WAS (Welsh, 1956).

Studies to date on fear conditioning and avoidance learning in psychopaths have isolated three major research questions. First, is there an associative deficit, or tuning-out, of affective information regarding punishment and relevant stimuli? Second, is the desire or attention dedicated to a goal difficult for psychopaths to suspend or redirect in the face of new information, even if it signals punishment? Third, is there an inherent physiological deficit in fear or anxiety making punishment ineffectual? Some evidence has been found for the validity of each of these potential explanations. The following section will discuss research conducted specifically on reflexive responding to fearful or unpleasant stimuli.

Reflexive Responses to Emotional Stimuli

Fear and anxiety are often used interchangeably to describe an unpleasant state of tense apprehension. This tense apprehension has been associated with changes in physiological state (Bradley, 2000). These changes include: changes in heart rate, pulse, respiration and perspiration. Speaking from a behaviourist perspective, this unpleasant state elicits an effort to withdraw, commensurate to the level of apprehension experienced by the organism (Bradley, 2000).

Based on research on the startle reflex in animals and humans, Lang, Bradley, and Cuthbert (1990) proposed that emotional state might be seen as operating under two motivational systems. These systems may be seen as states of readiness for action, one appetitive, one aversive (Lang et al., 1990). An appetitive state is associated with "a behavioural set favouring approach, attachment, and consummatory behaviour" (Lang et al., 1990, p.377). Aversive readiness disposes the organism to "avoidance, escape, and defence"(Lang et al., 1990, p. 377). The efferent system as a whole is modulated

according to the biological preparedness of the organism, as defined by these systems (Lang et al., 1990). Under these theoretically defined boundaries, then, a reflexive behaviour belonging to an appetitive set (such as sexual arousal) would be enhanced if "activated when a subject was already engaged in positive emotional response" (Lang et al., 1990, p.377). The same would be true for reflexive responses while already involved in a negative emotional response (Lang et al., 1990). What this amounts to is an amplification of reflexive responses in the presence of a matching emotional state (Lang et al., 1990). Take for example the startle reflex. Should the organism be primed for approach behaviour, the capacity for being halted in its behaviour by a startling stimulus should be decreased, whereas in the presence of fearful or other stimuli prompting withdrawal, the organism should exhibit a much larger startle response. The term "affective valence" will be used consistently in this document to refer to the direction of the emotional preparedness of the organism (i.e., appetitive-aversive). From this theoretical viewpoint, valence may be seen as operating independently of arousal (Lang et al., 1990). When arousal and valence are examined in tandem, one may locate emotional responses in this space according to both arousal and the intensity of the emotional experience (Lang et al., 1990) and valence, or the directional motivation of an organism. Thus, a distinction between anger, fear, sadness, and pleasure, may be made. Fear, for example, may be characterized by low valence (preparedness for withdrawal) and high arousal. In addition, measures typically used to detect changes in affect may be bound to arousal, whereas valence, under this paradigm, is not (Lang et al., 1990).

Patrick, and colleagues, has made efforts to apply this dimensional view to the exploration of affective experience in psychopaths (Patrick et al., 1993; Patrick, 1994;

Patrick, Cuthbert, & Lang, 1994; Levenston, et al., 2000). These efforts, for the most part, have involved the use of the probe-startle response, measured through eye-blinks and other physiological measures. The startle-blink response is not a direct study of emotion, but rather a measure of motivational priming (Lang, Bradley, & Cuthbert, 1990; 1997). That is, priming with an event with substantive emotional content modulates response to an unrelated stimulus (the startle probe). Generally speaking, the blink response occurs 30-40 msec after probe presentation, at a latency that implies “preattentive processing” and does not support modulation by intentional mechanisms (Lang et al., 1997). The neurophysiological model referred to in the study of startle-response in humans is thoroughly grounded in experimental research on animals. The concept that blink magnitude is modulated by affective valence has been tested and confirmed (Vrana, Spence, & Lang, 1988).

In one of these seminal research contributions by Patrick and colleagues (1993), affective slides were presented to incarcerated sex offenders divided into psychopathic, nonpsychopathic, and mixed groups. Subjects within these groups were then presented with pleasant, neutral, and unpleasant emotional stimuli. Reactions to these emotional stimuli were measured using electromyographic activity (EMG) (in the form of startle-blink and facial muscle response), heart rate, skin conductance, affective reports, and stimulus-viewing time. The materials used and procedure followed paralleled those used in previous studies conducted by other researchers in a college student population (Lang et al., 1990). The first question the researchers attempted to answer was whether or not criminals differed from normal controls in their responses to affective stimuli (Patrick et al., 1993). Second, the authors wished to compare differences in responding in a subset of

the criminal population (i.e., psychopathic, nonpsychopathic, and mixed groups) (Patrick et al., 1993).

Measures of skin conductance (SCR) and heart rate (HR) yielded no significant main effects for group using either raw SCR or 6 second HR change scores (Patrick et al., 1993). The overall slide valence effect, however, was significant for each variable (Patrick et al., 1993). Heart rate too, displayed a linear trend across slide valence (Patrick et al., 1993). Greater deceleration was observed for unpleasant than pleasant slides, with neutral slides falling between (Patrick et al., 1993). Heart rate deceleration may best be interpreted in light of the notion that a slowing heart indicates a sensitization of the central processing of stimulus input (Lacey & Lacey, 1970). By contrast, SCRs were larger for pleasant and unpleasant slides than for neutral, reflected in a quadratic trend effect (Patrick et al., 1993). In addition, Patrick and colleagues (1993) also found SCRs to pleasant slides were greater than for unpleasant slides. The authors interpreted these results as indicating that affective slides, pleasant or unpleasant, were more arousing for subjects than were neutral slides (Patrick et al., 1993).

In regards to measures of reflexive responses to auditory startles, as evidenced by electromyographic blink amplitudes, Patrick and colleagues (1993) found a significant slide valence effect (with standardized blink magnitude scores), with a significant linear trend effect (with pleasant smallest, then neutral, and unpleasant with the highest raw startle magnitude). This overall effect mirrored that of the research conducted with college students (Lang et al., 1990).

Patrick et al. (1993) found that while the measures of arousal did not significantly differentiate the groups, once a correction was made to control for antisocial behaviour

(PCL-R Factor 2 scores), a significant group by interaction effect was found. For a subgroup of offenders, those scoring high and low on PCL-R Factor 1, there were significant differences in startle modulation. Low scoring Factor 1 offenders exhibited larger startle responses to noise probes while watching unpleasant slides and smaller startle responses while viewing pleasant slides relative to neutral slides. This linear trend was not displayed by the high scoring Factor 1 group. These findings in conjunction indicated that while traditional measures of affect as evidenced by arousal did not point to the difference in emotional valence in psychopaths, measuring startle-blink proved more promising (Patrick et al., 1993).

Another study, utilizing the measures of heart rate, skin conductance, and electromyographic responses, but with the corrugator (frown) muscle, rather than the obicularis oculi (blink) muscle as the site of EMG recording, and a different set of contextual stimuli, yielded similar findings (Patrick et al., 1994). In this study, the research team separated incarcerated offender groups according to PCL-R (Hare, 1991) scores into nonpsychopathic, moderately psychopathic, and psychopaths. The stimuli set consisted of six neutral and six fearful sentences developed by Vrana, Cuthbert, and Lang (1989). Neutral sentences took the form of mildly pleasant, relaxing situations. The authors provided the following sample of the form of these sentences: "I am relaxing on my living room couch looking out the window on a sunny autumn day"(Patrick et al., 1994, p.525). Fearful sentences in this case were thought to be threatening and arousing (e.g. "Taking a shower alone in the house, I hear the sound of someone forcing the door, and I panic"(Patrick et al., 1994, p.525). Other fearful sentences depicted injections, painful dental exams, witnessing an accident, and spiders (Patrick et al., 1994). General

findings of the study indicated that the psychopathic group, relative to low-psychopathy subjects, showed smaller physiological response changes, both heart rate and startle modulation, during fear imagery relative to neutral imagery. Psychopathic subjects also displayed smaller differentiation in frown response (though non significant). What Patrick et al. (1994) suggested these findings might indicate is a deficit in the normal links between language cues and the action mobilization that is the standard in emotional research (Fridja, 1986; Lang, 1979). In short, emotional imagery plays a substantial role in the mediation of behaviour in terms of perceived or potential consequences for one's actions (Patrick et al., 1994).

Herpertz et al. (2001) studied startle-blink reactions to slides in a group of German psychopathic offenders defined by the PCL:SV, a group of patients with borderline personality disorder, and a noncriminal control group. These researchers found that only the group of psychopaths did not display valence effects in reaction to emotional slides. Psychopath's physiological measures such as facial electromyographic (corrugator – or “frown” muscle) responses, and skin conductance responses were smaller than controls. Herpertz et al. (2001), concluded psychopaths were characterized by a pronounced lack of fear in response to aversive events.

Researchers have also attempted to parse pleasant and aversive pictures into sub-categories in an effort to examine what effect, if any, different scenes may have on startle inhibition or potentiation (Levenston et al., 2000). Levenston et al. (2000) examined the differential startle, corrugator (“frown”) and zygomatic (“smile”), skin conductance, and heart rate responses in incarcerated psychopaths and nonpsychopaths to pictures

depicting erotic, thrilling, neutral, victim, or direct threat scenes. Self-report ratings of pictures in terms of pleasantness, arousal, dominance and interest were also collected.

The authors also examined the effect that the onset time of the startle probe (brief startling tone) had on the above measures. Probes were administered at early (300ms, 800ms), and later (1,800, 3,000, and 4,500ms) times during the six second picture viewing period.

Levenston et al. (2000) found that nonpsychopaths exhibited normal startle modulation patterns at later onset times, normal meaning moderate and strong reflex potentiation while viewing victim (mutilation or assault) or threat scenes, respectively. Psychopaths, on the other hand, exhibited inhibited startle responses during victim scenes, and only weakly potentiated startle responses to threat scenes. Psychopaths also displayed more consistent blink inhibition in response to pleasant slides (i.e., erotic and thrilling), and a greater level of heart rate deceleration (orienting response) to emotional pictures overall. Interestingly, the nonpsychopaths exhibited startle potentiation to thrilling pictures.

In terms of probe onset times, nonpsychopaths displayed startle inhibition for emotional pictures relative to neutral pictures during the early portion of the picture interval. Psychopaths did not show this difference until later times. The authors interpreted this finding as indicating a delay in the recognition of the motivational significance of those stimuli.

The authors interpreted the findings of this study as indicating that the observed inhibition to victim scenes in psychopaths reflected “a predominance of attentional engagement”(Levenston et al., 2000, p. 381), suggesting that psychopaths are exhibiting

an orientation, or approach response to these pictures, rather than aversion or withdrawal. However, psychopaths also displayed some potentiation (though not as pronounced as that of controls) to pictures displaying threatening scenes, which are characterized by being more obviously directed towards the viewer. The authors interpreted this finding as indicating that as the intensity of the aversive stimulus reaches a certain level of intensity, the dynamic interplay between the appetitive approach and defensive withdrawal is reconciled in favour of withdrawal. This would indicate not that psychopaths are devoid of a capacity to respond to aversive stimuli, but instead that they may be characterized by a higher threshold for withdrawal, as indicated by startle potentiation. This argument was also tentatively applied to the predilection for nonpsychopaths to display startle potentiation during slides depicting thrilling content. Thrill scenes contain some element of danger and excitement (e.g., mountain climbing, hang-gliding), which may initiate a withdrawal, at higher intensities, rather than approach response in nonpsychopathic individuals.

No group differences were found in self-report picture ratings or in frown or smile muscle electromyographic recordings, suggesting that facial expressions and reported emotional reactions are not consistent with startle responses, suggesting to the authors that the startle response is dissociated from overt expression. Skin conductance responses were higher for threat than victim slides in both groups, indicating that the overall arousal level was higher when picture scenes involved direct threat. A stronger deceleration in heart rate was also observed in psychopaths relative to nonpsychopaths for both pleasant and unpleasant slides, findings consistent with the attentional-orienting interpretation.

A recent study employed an innovative stimulus set examined physiological reactions to film segments in psychopathic and nonpsychopathic inmates in a Belgian prison (Pham, Phillippot, & Rimé, 2000). The researchers recorded blood pressure, skin temperature, muscle tension, and skin conductance while subjects viewed movie clips designed to convey particular emotions (i.e., anger, sadness, joy, fear, and disgust). Participants were also asked to respond to a brief questionnaire regarding their perceived physiological and emotional reactions. No difference was found between psychopaths and controls on self-report emotional experience. Psychopaths did, however, tend to report weaker bodily sensations when regarding emotional movie clips. Also, psychopaths displayed weaker blood pressure prior to and during emotional scenes, and exhibited an increase in skin conductance when viewing film segments depicting anger. al or bodily sensations. possibly indicating an overall physiological reactivity. Psychopaths also reported less intense bodily sensations during film segments.

Most recently, Sutton, Vitale, and Newman (2002), examined affective startle modulation in a sample of incarcerated female psychopaths and nonpsychopaths. In addition to replicating the procedures and findings of Patrick et al. (1993), the authors also subdivided the groups according to anxiety level (using the WAS). The low-anxious psychopaths displayed attenuated blink-reflex magnitude when viewing unpleasant pictures as compared to both nonpsychopaths and high-anxious psychopaths. Additional correlational analysis also indicated that decreased startle-blink responses to aversive slides were only found in female offenders scoring highly on both Factor 1 and Factor 2 of the PCL-R (adhering to the above described two-factor model), rather than highly on only one of the two factors. Also of note was the adoption on behalf of the researchers of

two startle-probe delivery times (2.0s and 4.5s). Sutton et al. (2002) conducted their analyses separately for each probe delivery time and found group interaction effects only in the 2.0s condition, indicating that with later probe onset, observed group differences were not detectable. This was interpreted on behalf of the researchers, in a similar vein as Leventson et al. (2000), to reflect a delay in the processing of unpleasant cues in psychopaths.

These studies, by presenting subjects with emotional stimuli, without requiring subjects to participate in a specific task, provide an index of emotional arousal and valence independent of experimental task demand. In addition, by recording physiological reactivity in such a way as to indicate an approach or avoidance response, researchers may further separate valence from overall arousal. Findings also support the notion that heart rate and skin conductance measures of emotional reactivity are not consistently effective in differentiating emotional reactivity between psychopaths and nonpsychopaths (Patrick et al., 1993). Most importantly, based on the above findings, the use of startle-blink methodology provides “a potential solution to the problem of fear measurement in psychophysiological research”(Patrick et al., 1993, p. 83).

In a recent review, Newman and Lorenz (2002) discuss these above findings as suggesting that it is psychopaths’ “deficient response modulation” that gives rise to emotional and self-regulation deficits. From this perspective, it is the inability on behalf of the psychopath to shift attention from foreground stimuli, to attend to relevant cues in the environment, that may underlie recent findings regarding startle modulation in psychopaths. Indeed, the authors suggest that psychopaths are deficient in their ability to process emotional information when they are in positions of automatic responding (e.g.,

viewing pictures), but perform adequately when intentionally attending to emotional cues (e.g., actively seeking reward) (Newman & Lorenz, 2002).

Psychopathy and non-offender samples

The majority of existing research on psychopathic traits and affective valence has been conducted on incarcerated offenders. Relatively little research has been directed to the nature of this construct in non-institutional populations.

While work has been done in industrial-organizational environments (Babiak, 1995; Gustafson & Ritzer, 1995), until fairly recently, relatively little attention has been directed towards the non-criminal, clinical, assessment of psychopathy (Forth et al., 1996; Levenson, Kiehl, & Fitzpatrick, 1995; Widom, 1977). The study of noncriminal psychopaths may serve a number of purposes, the most promising of which being to potentially uncover protective factors precluding criminal activity (Lilienfeld, 1994). Alternatively, it may reveal the mechanisms by which a psychopath may indeed lead a criminal lifestyle yet successfully evade detection by policing agencies (Forth et al., 1996).

Widom (1977), conducted the first study examining psychopathy using clinical criteria in a non-institutionalized population. Widom (1997) used Robins' (1966) criteria for sociopathy. Widom's (1977) participants consisted of 23 males and five females. Robins' (1966) criteria for sociopathy consisted of respondents meeting 5 of the 19 antisocial behaviour symptoms. She found that the majority of individuals (78.6%) met the criteria for sociopathy. Since the criteria for this study focused mainly on antisocial behaviour, it may only reflect the behavioural manifestations of psychopathy, and not the proposed underlying cognitive/affective deficit under examination in this study.

Levenson and colleagues (1995) studied psychopathy in university students. The authors modelled self-report measures of psychopathy to a certain extent after the PCL items. These measures included primary psychopathy, secondary psychopathy, and antisocial action scales. The primary and secondary psychopathy scales were designed to produce two factors similar to that produced by the PCL-R (Harpur et al., 1989). Primary psychopathy items were created to assess a selfish, uncaring, and manipulative posture towards others. The secondary psychopathy items were created to assess impulsivity and a self-defeating lifestyle. The antisocial action scale consisted of items assessing the frequency of antisocial behaviours that are typical of students, and included prosocial activities (reverse coded). In addition, the authors also used a measure of sensation seeking, stress reaction, and harm avoidance. Stress reaction is held to be a measure of trait anxiety, and harm avoidance a measure of fearfulness of physical danger. Amongst other important findings, Levenson et al. (1995) reported the lack of a negative association between psychopathy and stress reaction (which is a measure of trait anxiety). The psychopathy measure used also had a weak negative correlation with harm avoidance.

Forth et al. (1996) assessed the reliability and validity of the PCL:SV in a male and female non-prison population. The screening version was found to have high internal consistency and interrater reliability. While the two factor structure inherent in the PCL-R in institutionalized populations was not supported in this sample, PCL:SV scores did significantly correlate with ASPD symptoms, substance use, self-reported criminal activity, and observer ratings of interpersonal behaviour. Female students scored lower on all PCL:SV items than did males (Forth et al., 1996). One potential explanation for

these findings put forward by the authors, was that all of the PCL:SV ratings of female participants was performed by female interviewers. Investigations into the potential for gender-bias in scoring of the PCL:SV has not yet been conducted.

In summary, recent evidence suggests some success in examining psychopathic traits and their correlates in community samples, both male and female (Cooke et al., 1999; Forth et al., 1996; Hart et al., 1995; Levenson et al., 1995; Skeem et al., 2003; Widom, 1977). However, some issues exist regarding the extent to which a) antisocial behaviour is central, or peripheral to the study of psychopathic traits in community samples, b) to what extent consistent laboratory findings with regards to the two factor model of psychopathy will generalize to community samples, and c) what impact item response theory findings (Cooke et al., 1999) with the PCL:SV regarding the higher threshold for Factor 1 items (i.e., harder to reach a level where manifestations are evident), may have on laboratory research with community psychopaths.

Startle-Blink and Psychopathic Traits in Community samples

Since the initial undertaking of this study, there have been two substantial contributions to the understanding of the effect of psychopathy on affective priming of the startle reflex in non-offender, or community, samples.

The first is a study conducted by Vanman, Mejia, Dawson, Schell, and Raine (in press). The sample in this study consisted of adult males and females recruited (initially as part of another study) from temporary employment agencies in the greater Los Angeles area. Participants were assessed for psychopathy using the PCL-R (Hare, 1991), supplemented by a battery of collateral data including a self-report measure of criminal offending used in the National Youth Survey (Elliott, Ageton, Huizinga, Knowles, &

Canter, 1983; Raine et al., 2000). This measure consisted of 44 items covering acts ranging from minor acts (e.g., unruly in public place, minor thefts) to more serious offending involving directly harming others. While much of the study of the effects of psychopathy closely mirrored that of the original work of Patrick et al. (1993), in that psychopathy was largely tested as a dual-facet construct (antisocial behaviour, and emotional detachment), there were interesting procedure differences. For example, Vanman and colleagues used inter-trial startles as a point of comparison, matched to corresponding picture valence (pleasant and unpleasant), rather than startles to neutral slides. Auditory startle probes occurred at either 300, 800, or 4500ms.

Participants scoring high on Factor 2 of the PCL-R (Antisocial Behaviour), displayed no affective modification of startle if they also scored highly on Factor 1 (Emotional Detachment). When the factor scores were examined together as continuous variable in a regression analysis, affective modification of startle was negatively related to Factor 1, but positively related to Factor 2. The authors interpreted these results as providing support for a two-factor model of psychopathy.

Another recent study examined a younger sample, consisting of 355 young males (Benning, Patrick, Malone, Bernat, & Iacono, 2003). The experimenters divided groups into high and low scorers on psychopathy based on Minnesota Personality Questionnaire (MPQ; Tellegen, 1982) item scores, selected so as to effectively overlap with the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996), a self-report measure of psychopathy (for more details regarding their sampling procedure, see Benning, Patrick, Blonigen, Hicks, & Iacono, 2003). The MPQ items, selected in this way, have been found capable of separating into two factors that correspond with the

current factor structure identified for the PPI (Wilson, Frick, & Clements, 1999). Factor analyses of the PPI have yielded two factors: Factor 1 – which denotes cold-heartedness, social potency, fearlessness, impulsive nonconformity, and stress immunity, and Factor 2 – which denotes Machiavellian egocentricity, blame externalization, and carefree nonplanfulness.

Of the overall sample, the topmost 5% and bottommost 5% scores on the MPQ items were selected for comparisons ($n = 30$). The psychophysiological measures included skin conductance and startle modulation in reaction to pleasant (high-intensity erotic), unpleasant (high-intensity threat), and neutral pictures. The authors found that prior research on psychopathic offenders and startle modulation replicated in the community sample. It is also noteworthy that in this sample, the group scoring lower on MPQ items associated with PPI Factor 1, exhibited a pronounced reaction to unpleasant slide stimuli, as compared to prior research on incarcerated samples.

These recent studies provide some indication as to how two different but related aspects of psychopathy affect emotional modulation of the startle reflex (Benning et al., 2003; Vanman et al., in press). However, neither of these studies has used the PCL:SV in an effort to examine this relationship, nor have they specifically addressed the interrelationship between antisocial behaviour and psychopathy in community samples.

Current Study

Much of the research published to date has focused on the institutional psychopath, and not those psychopathic individuals who have not come to the attention of the criminal justice system (Forth et al., 1996; Levenson et al., 1995; Widom, 1977). As such, this study complements recent attempts to replicate research on the effect of

psychopathy on startle modulation in offender, and other community samples (Benning, et al., 2003; Flor et al., 2002; Herpertz, 2001; Patrick et al., 1994; Patrick et al., 1993) in a sample of university students. Psychopathy was measured using the PCL:SV for two reasons. First, it has proven reliable and valid in university student samples (Forth et al., 1996). Second, the PCL:SV has the added advantage of requiring less time to score (approximately 1 and one half hour to 2 hours) than the PCL-R (generally no less than 3 hours), the gold standard for assessing psychopathy in incarcerated offenders.

First, a hypothesis of affective processing deficits associated with psychopathic traits was tested. It was expected that students lower in psychopathic traits would show a linear effect in blink responses according to slide content (pleasant, neutral, and unpleasant). Students higher in psychopathic traits would display a quadratic effect in blink responses (i.e., lower response to pleasant and unpleasant slides relative to neutral). Second, based on the findings of Vanman et al. (in press), it was predicted that multiple regression equation predicting startle modulation from PCL:SV Factor 1 and Factor 2 scores would yield significant standardized regression coefficients for both factors, but in opposite directions, with Factor 1 correlating negatively, and Factor 2 correlating positively. Third, no group or sex difference in self-report ratings of valence, arousal, or interest were expected. This expectation is consistent with both prior findings by Patrick and colleagues (Patrick et al., 1993; Patrick et al., 1994), and that psychopaths' reports of affective experience and physiological responses often differ (e.g., Williamson, 1991). Instead, the overall self-reported effects should be consistent with other studies on startle-blink in college students (e.g., Lang et al., 1990) in that there should be a linear effect for valence, and quadratic for both arousal and interest. Fourth, based on the findings of

Sutton et al. (2002), analyses were conducted to test for an interaction between Group, Valence, and Probe Onset time. The expectation was that for probe onsets of four seconds and earlier (i.e., 3s and 4s), the expected Group by Valence interaction would be significant, but that after four seconds the 5s probe time would "wash-out" any significant Valence by Group interactions. Finally, using the WAS as a covariate would yield a larger interaction effect between Level of Psychopathy and Valence. This hypothesis is consistent with the findings of Sutton et al. (2002) and other studies relevant to the relationship between anxiety and psychopathy (e.g., Newman & Schmitt, 1998). In addition, a study conducted by Miller and Patrick (2000) found evidence that under conditions of shock anticipation individuals (college students) high in trait anxiety exhibited greater startle potentiation when viewing threatening words than when viewing pleasant words. The relationship between antisocial behaviour, picture content, and picture intensity were to be examined on an exploratory basis.

Method

Participants

Participants in this study were undergraduate university students enrolled at Carleton University. Participants were initially "screened-in" through either two consecutive years of the mass testing subject pool at Carleton University or from soliciting participation from a second year introduction to forensic psychology course. The mass testing program allows researchers to include screening measures in a set of questionnaires to be presented to students enrolled in the first year introductory psychology course at Carleton University. The mass testing questionnaire included the

MACH-IV (Christie & Geis, 1970) (see Appendix A). Any additional students were drawn from a second year forensic psychology course based on their MACHIV scores.

Machiavellianism has been found to correlate positively with, and bear similarities to, psychopathy (McHoskey, Worzel, & Szyarto, 1998). This scale was administered to approximately 1600 undergraduate students enrolled in first-year psychology, and 39 students in a second year forensic psychology class. All students scoring two standard deviations above the mean were contacted ($n = 57$), of these, 18 arrived at the laboratory to participate in the study. The remaining participants in this study were randomly drawn from students scoring below the mean MACHIV scores in the mass testing group ($M = 94.92$, $SD = 12.27$) and the forensic psychology class ($M = 92.36$, $SD = 11.34$). Participants selected for participation ranged in age between 18 and 37 ($M = 20.61$, $SD = 3.15$).

Forty-three participants (21 male, and 22 females) in total participated in this study. Twelve participants were excluded from analysis of blink amplitudes based on unscorable EMG data, or an aborted testing session (7 females, 5 males). One such female participant was excluded from EMG analysis because the IAPS picture set used did not match that of the other participants.

Affective and Interest self-report ratings were also discarded for two of these 12 excluded participants, based on an aborted testing sessions.

One female participant was not assessed using the complete set of behavioural measures, including self-report antisocial behaviour, and anxiety. As a result, calculations using the overall sample of participants includes 42, rather than 43 participants.

Measures

Machiavellianism. Machiavellianism was measured using the MACHIV (Christie & Geis, 1970)(see Appendix A). The MACH-IV is a 20-item self-report questionnaire that aims to measure the use of manipulation and deceit in interpersonal relationships (Christie & Geis, 1970). On the questionnaire, respondents are asked to indicate the extent to which they agree or disagree with each statement using a 7-point scale which ranges from 1 "agree strongly" to 7 "disagree strongly" (Christie & Geis, 1970). Of these items, 10 are reverse-scored.

Psychopathy. Psychopathy was assessed using the Psychopathy Checklist: Screening Version (Hart et al., 1995; see Appendix B for a list of questions asked). The PCL:SV is a 12-item clinical rating scale designed to measure interpersonal, affective, and behavioural characteristics of psychopathy. Items 1-6 which comprise Factor 1, measure the interpersonal and affective symptoms of psychopathy, whereas items 7-12 measure the social deviance symptoms of psychopathy. Each item is rated on a 3-point scale with 2 indicating the item definitely applies, 1 that it may or may not apply, and 0 that it definitely does not apply to the participant. The items are then summed to yield a total score that ranges from 0-24 with a diagnostic cutoff of 18 for psychopathy. The PCL:SV is scored on the basis of information from the interview and collateral information. In this study, collateral information was collected from an individual, identified by the participant as knowing him or her well (see Appendix B for collateral interview questions). PCL:SV interviews were video-taped in order to obtain a measure of inter-rater reliability. Interclass correlations were calculated based on the scores

obtained from 10 participants assessed by another graduate student from the same laboratory.

Anxiety. Anxiety was assessed using the Welsh Anxiety Scale (WAS; Welsh, 1956) (see Appendix D). The WAS, adapted from the MMPI, is a 39-item questionnaire used as a measure of an individual's disposition to experience negative affect and anxiety (Welsh, 1956). Items are in a true-false form. All true responses, except for item 20 – “I very seldom have spells of the blues” are summed to produce the scale total.

Self-Report Antisocial Behaviour. The Antisocial Behaviour Scale (ABS; Forth & Brown, 1993; see Appendix E), is a 56-item self-report questionnaire that asks students to record how often and at what age they participated in antisocial behaviours such as shoplifting, school-related offences, driving offences, vandalism, drug and/or alcohol related offences, theft, verbal, physical, and sexual assaultive acts. Antisocial Behaviour Scale scores were calculated two ways for later analyses. First, an overall measure of self-report antisocial behaviour was used, calculated by summing each self-reported behaviour, regardless of severity or frequency. For the purpose of this study, this subscale will be referred to as ABS Versatility. The ABS was also scored to reflect a total number of behaviours the individual reported having engaged in that involved directly harming others (e.g., robbery, assault, sexual offences), as opposed to offences that would not necessarily directly harm others (e.g., drug offences, library fines, minor theft). For the purpose of the present study, this subscale will be referred to as ABS Harm.

Physiological Measure. In this experiment physiological measurement consisted of electromyographic (EMG) recordings of blink magnitudes. Electrodes were placed and adhered just below participants' left eye, one electrode directly below the pupil with the

top of the electrode touching the bottom crease of the lower lid, and the second placed laterally at approximately 12mm (Van Boxtel, Boelhouwer, & Bos, 1998). This recording site was selected in order to optimize recording of the action potentials of the inferior part of the left orbicularis oculi muscle (Van Boxtel, et al., 1998). One additional ground electrode was placed on the student's forehead.

A Coulbourn Instruments High Gain Bioamplifier with Bandpass Filter (S75-01) was used to collect and filter online (8-1000Hz) the surface EMG signal collected through Tronomed 4mm Na/NaCl electrodes, the cups of which filled with standard electrolyte gel. Electrodes were adhered to the recording sites using double sided adhesive collars, trimmed on the top and sides to reduce inter-electrode distance and to avoid obstructing the vision of participants. A Grass electrode impedance meter (EZM-5A) was used to ensure that electrode impedance was kept below 5kohms.

The analog EMG signal collected through the Coulbourn Bioamplifier was converted to a digital signal through a DataQ A/D conversion board (DI-200). Digital waveforms converted by the DI-200 board were stored on a Packard Bell IBM PC clone 486DX2-66 with a 260MB hard drive. Data was collected at 2000 samples per second. Event markers to track stimuli presentation periods were remotely triggered using a TTL signal sent through the parallel port of another PC and attached to a modified DataQ DI-705 circuit board connected to both the Coulbourn Bioamplifier and the Packard Bell PC.

Self-Report Affective and Interest Ratings. Subjective ratings of arousal and valence were collected via the SAM ("Self Assessment Mannikin") (See Appendix F), an affective rating system designed by Lang (1980). The numbers 1 through 9 represented how participants felt along the two dimensions of arousal and valence, a value of "1"

meaning more excited, and more pleasant respectively. In addition, participants were presented with an "interest" rating scale ranging from uninteresting to very interesting (See Appendix G). Participants, again, entered 1 through 9 at the appropriate point on the scale.

Stimulus Materials

Affective Pictures. Emotional slide stimuli presented during this experiment was drawn from the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, National Institute of Mental Health [CSEA-NIMH], 1999). The IAPS, according to the developers, is designed to serve as a "set of normative emotional stimuli for experimental investigations of emotion and attention"(Lang, Bradley, & Cuthbert, 1999, p. 1). The three main reasons stated for the development of these normative stimuli are a) to establish an effective tool to allow for better experimental control, b) facilitate comparison between experiments, and c) allow for exact replication of affective experiments (Lang et al., 1999). Currently, there are over 700 stimuli in the IAPS set, all of which have an accompanying normative rating on arousal and valence, both universally and gender-specific, derived through repeated experiments with children and college students (Lang et al., 1999). These pictures present a unique opportunity to share a standard stimulus set between laboratories interested in studying emotion and attention. The IAPS has been used extensively in research studies involving college student populations in North America and abroad (e.g., Cuthbert, Schupp, Bradley, McManis, & Lang, 1998; Patrick & Lavoro, 1997; Schupp, Cuthbert, Bradley, Cacioppo, Ito, & Lang, 2000; Verschuere, Crombez, & Koster, 2001).

Participants viewed a series of 72 pictures drawn from the IAPS (CSEA-NIMH, 1999), presented in five counterbalanced slide orders (2 for females, 3 for males). Buffer pictures did not involve the presentation of a startle probe, and EMG reactions were not scored for habituation pictures (3 per session). The 54 pictures that were startled depicted various scenes varying in pleasantness including 24 neutral, 24 pleasant (12 erotic, and 12 action), and 24 unpleasant (12 threatening, and 12 depicting scenes of victimization). Erotic, action, victim, and threatening pictures were further sub-classified into high and low intensity stimuli, based on their combined arousal and valence scores. (See Appendix H for a listing of IAPS slide numbers used, organized by content, gender, and intensity). Figure 1 displays a chart of the slide set, collapsed across content, and intensity, and plotted on arousal and valence. Ratings for this slide set were closely matched between males and females (did not significantly differ on valence or arousal). Prior to each slide presentation, a fixation stimulus was presented (a small cross shape situated in the centre of the viewing field). It should be noted that as a result of experimenter error in preparing the counterbalanced slide orders, slide orders were not equally balanced for probe onset time. Also, again due to error, in this case in administering slide orders, some slides were substantially under-represented (5% or less) in terms of startle across all participants (by gender). These slides were excluded from analyses. The excluded slides for females were: 2110, 2130, 6250, 1101, 7010, 7040, 9584, 9700, 8050, 8180, 8250, for females, and 5740, 9700, 7180, and 9630 for males. What this amounted to was a smaller number of unpleasant (19 out of 24), pleasant (20 out of 24) and neutral (21 out of 24) pictures being used in analyses for females, and neutral (21 out of 24), and unpleasant (23 out of 24) pictures for males. All other slides were startled an equal number of times. However,

as startle responses to slides are averaged across Valence, and Content, this error was not expected to have any serious effect on the majority of comparisons and analyses in this study. Where necessary, caveats are included with analyses to indicate where the potential for bias was anticipated to reach a level that may detract from the integrity of the findings.

Auditory Startle Probe. While viewing the slides the subject, during the majority of the slides, hear a short (50ms) white-noise burst at 105dB (startle probe) with immediate rise time. The startle probe was presented through Audio-technica iCool stereo headphones (ATC-H5). Slides were presented for 6 seconds, and the startle probe occurred at 3, 4, or 5 seconds during slide viewing. Inter-trial interval startle probes were also delivered in order to reduce predictability. Decibel levels of the startle stimuli were tested using a Radio Shack Sound Level Meter (Catalogue Number: 33-2055).

Presentation Software. Stimuli presentation, subjective rating responses, and remote triggering of data acquisition was accomplished using the E-Prime software package Version 1.0 (Psychology Software Tools Incorporated, 2002). The stimuli presentation program was adapted from a program designed by Dr. Edward Bernat at the University of Minnesota.

Viewing Environment. Slide stimuli and affective ratings were presented using a Sony Data projector (VPL - CX5) on a sheet of white 22-inch by 28-inch poster board. Subjects viewed the projected emotional stimuli from a very comfortable chair situated 1.5 meters from the viewing area. The testing environment was a dimly lit laboratory (windows shuttered, small incandescent desk lamp) located on the campus of Carleton University.

Procedure

Most of the students were initially contacted by telephone, a small proportion were contacted by e-mail, as they had changed phone numbers over the course of this study. A brief overview of the study was provided (see telephone recruitment script, Appendix I), and interested students were scheduled for an appointment.

On arrival, the study was described to participants in detail. Participants were given the opportunity to ask any questions and asked to read and sign a consent form describing the study components in detail (see Appendix J). The consent form also contains a section where the participants were asked if the interview could be videotaped and to provide the name of an individual (e.g., friend, relative) whom the researcher could contact to provide collateral information regarding aspects of the participant's personality and behaviour. The purpose of this collateral interview was to validate the statements made by the participant during the interview. The participant was given the opportunity to view the questions regarding the collateral interview. The collateral interview covered such areas as the student's school, work, and family history as well as affective and interpersonal characteristics.

Prior to commencing the study participants were asked to fill out a participant information sheet (see Appendix K), which asked questions regarding their hearing, eyesight, and other health-related issues. Participants were also told they may stop participating at any time, they did not have to answer any questions they do not wish to, and that all information collected would be kept strictly confidential. The PCL:SV interview generally took between one and two hours to complete. At the end of the interview, participants were asked to complete the WAS and the ABS.

After the interview, participants were seated in a dimly lit room in a comfortable chair. A scripted instruction was then read or recited to the participant (see Appendix L).

Remaining mindful of any potential discomfort on behalf of the participants resulting from nude opposite sex slides, same-sex experimenters conducted the slide presentation and electrode placement portion of the experiment. At the end of the session participants received either class credit, or \$20.00 for their participation. The students were also provided with a debriefing of the experiment (see Appendix M).

Signal Reduction and Analysis

Digital signal processing (specifically offline rectification and filtering) was carried out using LabView Version 5.1. The digitized signal was smoothed by passing it through a 20Hz low-pass digital Butterworth IIR filter, full-wave rectified, and then high-pass filtered through another Butterworth IIR filter set at 50Hz. Blink amplitude in this experiment was defined as peak values corresponding with each startle probe. Peak blink amplitudes were z-score transformed to control for individual differences in amplitude distribution. Any signals falling outside of three standard deviations were altered so as to fall just within 3 standard deviations. Any recording where it was too difficult to discern baseline from peaks was discarded, which, in some cases, led to discarding participants from analysis altogether. This applied also to cases in which the participant over-responded, consistently hitting their maximum level of response. In most cases this was due to a failure to calibrate auditory stimuli presentation, or to place electrodes in an optimal recording position in relation to the surface area most conducive to recording orbicularis oculi activity. Within each subject, both startle responses, and self-ratings to like-stimuli were averaged across trials.

Results

Twenty-two female participants ranging in age from 18-28 ($M = 20.56$, $SD = .50$), and 21 male participants ranging in age from 19-37 ($M = 21.14$, $SD = .85$) participated in this study. Of these, 10 males and 8 females fell above 2 standard deviations in their MACH-IV scores (i.e., over 118). Of these “screened-in” individuals, 6 participants, all males, fell above 1.5 standard deviations in their psychopathy scores. As psychopathy, and not Machiavellianism, was the focus of this study, it was decided that gender comparisons would not be pursued for examinations of group differences in startle amplitude.

All other comparisons were carried out using SPSS's General Linear Model, Repeated Measures program. Groups were defined using the PCL:SV. Following prior research (e.g., Patrick et al., 1993), picture valence category was treated as a within-subjects factor, with three levels (Pleasant, Neutral, and Unpleasant). The predicted linear relationship between picture valence, self-report ratings, and the blink response (i.e., pleasant less than neutral, neutral less than unpleasant) was tested using a univariate analysis of trend.

Measures

Intraclass correlation coefficients (ICCs; Bartko, 1976) were calculated for 10 of the 43 PCL:SV assessments conducted in this experiment (6 males, 4 females). The ICC for PCL:SV Total, single measure, was .89. For PCL:SV Factor 1, the ICC values were higher, $ICC = .97$. ICC measures of inter-rater reliability were much lower, however, for PCL:SV Factor 2, $ICC = .64$.

Table 3 displays means, standard deviations, and ranges for the measures used in this study. Significant differences in one-way analyses of variance were found between the two groups on PCL:SV Total, $t(1,41) = 7.55, p < .001$, Factor 1, $t(1, 41) = 5.03, p < .001$, and Factor 2 scores, $t(1,41) = 5.54, p < .001$. In addition, group differences were also found on MACHIV, $t(1,41) = 2.83, p < .01$, and ABS Versatility, $t(1,40) = 4.64, p < .001$. No significant differences were found for anxiety, as measured by the WAS, $t(1,41) = .58$, and ABS Harm, $t(1,40) = 1.69, p = .15$, scores.

While not the purpose of this study, there were also modest differences found between males and females on ABS Harm, $t(1,40) = 2.03, p < .01$, ABS Versatility, $t(1,40) = 3.76, p < .05$, PCL:SV Total, $t(1,41) = 2.66, p < .05$, and PCL:SV Factor 1, $t(1,41) = 2.64, p < .05$, with males scoring higher on each measure (see Table 4).

Picture Valence and the Startle Response

There was a significant picture valence effect, with blink magnitudes differing significantly across pleasant, neutral, and unpleasant picture categories (z -score M s = -.16, .08, .08), multivariate $F(2, 28) = 10.77, p < .001$. Overall standardized blink magnitude values were largest for neutral (by .002), smallest for pleasant pictures, with negative pictures eliciting mean standardized startle magnitudes slightly lower than neutral, producing a significant linear, and quadratic trend effects, $F(1,29) = 13.10, p < .01$; $F(1,29) = 8.54, p < .01$. The significant linear trend effect for the sample modestly replicated the pattern observed in prior studies. However, blink magnitude for unpleasant pictures closely approximated magnitudes for neutral stimuli.

Overall Group (Higher and Lower Psychopathy) X Picture Valence (Pleasant, Neutral, and Unpleasant) interaction was not significant, multivariate $F(2, 28) = 1.37, p =$

.27. Nevertheless, based on prior assumptions, *a priori* trend tests performed on each group separately yielded a significant linear effect for the lower psychopathy group only, $F(1, 5) = 21.82, p < .001$. The pattern, again, was significant with the expected trend with startle magnitudes highest for unpleasant pictures and lowest for pleasant pictures (see Figure 2). Conversely, trend tests of standardized startle-magnitude for the higher psychopathy group did not yield a significant linear Valence Trend $F(1,5) = 3.10, p = .139$. The quadratic Valence Trend effect for this group was significant $F(1, 5) = 7.165, p < .05$. The highest mean standardized blink scores were for neutral stimuli, with both pleasant and unpleasant eliciting smaller startle magnitudes.

Startle Modulation as a Correlate of Psychopathy Related Traits

A measure of startle modulation was also calculated by subtracting standardized blink magnitudes in response to pleasant pictures from standardized blink magnitudes to unpleasant pictures. Thus, greater startle modulation scores indicated larger blinks to negative pictures in comparison to positive pictures. Modulation scores were then correlated (bivariate) with PCL:SV, MACHIV and ABS scores.

Table 4 displays the correlation matrix for these variables. Modulation did not significantly correlate with any of these personality or behavioural measures. However, for PCL:SV Total, PCL:SV Factor 2, and MACH IV scores, zero-order correlations with Modulation were in the expected negative direction, with r 's of -.06, -.26, and -.05, respectively, indicating that as these measures increased, the difference between an individual's startle to negative pictures and positive pictures decreased.

A standard multiple regression was also calculated, predicting Modulation from Factor 1 and Factor 2 scores. R for regression approached significance, $F(2,28) = 3.27, p$

= .053. The standardized regression coefficient for Factor 1 was marginally significant, $\beta = .06$, $t(29) = 2.05$, $p = .05$, as was the one for Factor 2, $\beta = -.07$, $t(29) = 2.34$, $p < .05$.

Therefore, both Factor 1 and Factor 2 scores significantly predicted Modulation, but in opposite directions. High scores on Factor 1 were associated with an increase in startle modulation, whereas Factor 2 scores were associated with a decrease.

Affective Self-Report and Interest Ratings

Participants in this experiment indicated on a series of three ratings scales their affective state, and level of interest, in relation to the affective pictures. These ratings were subjected to two-way (Group X Picture Valence) repeated measures analyses of variance. The Picture Valence effect was significant for each of arousal, $F(2,37) = 21.93$, $p < .001$; valence, $F(2,37) = 13.85$, $p < .001$; and interest, $F(2,37) = 81.33$, $p < .001$. For arousal and interest ratings there was a significant quadratic trend effect for picture category, with pleasant and unpleasant pictures being rated as more arousing, $F(1,38) = 44.44$, $p < .001$ and interesting, $F(1,38) = 161.26$, $p < .001$, than neutral pictures. There was no significant linear trend effect for arousal $F(1,38) = 2.1$, $p = .16$, or interest $F(1,38) = .02$, $p = .90$, and this effect did not interact with Group, for arousal, $F(1,38) = .58$, $p = .45$, or interest, $F(1,38) = 1.69$, $p = .20$. For valence ratings, there was a significant linear trend effect for picture valence $F(1,38) = 27.87$, $p < .001$. There was no significant quadratic effect for self-reported picture valence, $F(1,38) = 2.24$, $p = .14$. The linear self-report picture valence ratings did not interact with Group, $F(1,38) = .39$, $p = .53$. Figure 3 displays the trends for the three ratings scales by Group.

Probe Onset Time and the Startle Response

The multivariate $F(2, 57) = 1.87, p = .16$ for the interaction between Valence and Picture Time was not significant. Figure 4 provides two graphs illustrating differences between Low and High Psychopathy groups by Time of Probe Onset (i.e., up to 4s and at 5s).

Anxiety and the Startle Response

In this sample WAS scores were not related to Modulation of startle, $r(31) = .003, p = .986$. WAS scores were also not significantly correlated with total PCL:SV ($r = .11$), PCL:SV sub-factors one ($r = -.05$) or two ($r = .28$) or MACHIV scores ($r = -.10$).

Modelled after previous research findings by Newman and colleagues (e.g., Sutton et al., 2002), that used the WAS to further separate psychopathic groups into high and low anxiety subgroups, but working with a much smaller sample size, the WAS was used as a covariate for group comparisons of picture valence effects.

The overall Group X Picture Valence interaction was not significant, multivariate $F(2, 27) = 1.47, p = .25$. Nor was the interaction between WAS scores and Picture Valence, $F(2,27) = .33, p = .72$.

Self-Report Antisocial Behaviour and the Startle Response

The relationship between psychopathy, startle modification, and self-report antisocial behaviour was also examined. Antisocial Behaviour Scale scores were calculated two ways for these analyses. First, an overall measure of self-report antisocial behaviour was used, calculated by summing each self-reported behaviour, regardless of severity or frequency. This was found to correlate negatively with startle modification r

(31) = $-.17$, $p = .38$ indicating a slight reduction in modification, in tandem with an increase in overall self-report antisocial behaviour.

ABS Versatility significantly correlated with PCL:SV Total scores $r(31) = .61$, $p < .01$. Factor 1 of the PCL:SV, did not significantly correlate with this ABS Versatility measure, $r(31) = .19$, $p = .30$, whereas PCL:SV Factor 2 was strongly associated, $r(31) = .76$, $p < .01$.

As can be seen in Table 4, the correlation between ABS Harm, and Modulation of the startle reflex approached significance, $r(31) = -.33$, $p = .07$. Correlations with Factor 1, Factor 2, and Total PCL:SV scores were $r(31) = .04$, $p = .84$, $r(31) = .54$, $p < .01$, and $r(31) = .39$, $p < .05$ respectively.

Both of these measures were entered into Psychopathy by Valence repeated measures analysis as a covariate. The interaction between Level of Psychopathy and Valence did not reach significance, Multivariate $F(2, 27) = 1.94$, $p = .16$, however, the F value was larger using the ABS Versatility measure as a covariate. The interaction between Valence and ABS Versatility was also non-significant, Multivariate $F < 1$.

Entering ABS Harm as a covariate in the repeated measures analysis yielded a smaller multivariate $F(2, 26) = 1.27$, $p = .30$, than that using the ABS Versatility, and smaller still than the original analysis of the interaction between Level of Psychopathy and Startle Magnitudes by Valence. The interaction between Valence and ABS Harm was larger, though still non-significant, than the interaction between the original analysis of the interaction between Level of Psychopathy and Startle Magnitude by Valence, Multivariate $F(2, 26) = 1.69$, $p = .20$.

The correlation between these two measures of self-report antisocial behaviour (ABS Versatility and ABS Harm) and anxiety were both positive and significant, r 's (31) = .39, $p < .05$, and .48, $p < .01$.

Effects of Picture Content and Intensity

Content. While exploratory, this set of pictures was developed so as to be able to parse pleasant, neutral, and unpleasant pictures into five distinct categories (see Figure 1), i.e., Erotic, Action, Neutral, Victim, and Threat. See Figure 5 for a chart depicting overall startle magnitudes by content.

Table 5 displays the means for startle magnitude and self-report ratings for each level of content. There was a significant overall multivariate $F(4, 26)$ (repeated measures, with content as the Independent Variable) for Startle Magnitude of 12.03, $p < .01$. The interaction between Picture Content and Level of Psychopathy was not significant, Multivariate $F(4, 26) = 1.45$, $p = .25$. Bonferonni Pairwise Comparisons of Content yielded significant differences between Erotic and all other levels, with mean differences of Action = -.41, Neutral = -.49, Victim = -.33, Threat = -.53. The largest mean difference in Startle Magnitudes by Content was between Erotic and Threatening pictures. The next largest, but non-significant, mean difference was between victim and threat, with a mean difference of -.19. Mean difference scores for startle magnitude did not significantly differ between neutral and victim, neutral and threat, or neutral and action.

Consistent with previous findings, self-ratings of Arousal and Interest closely approximated each other in terms of being higher for both the positive (erotic, action) and negative (victim, threat) pictures, than neutral. The Valence ratings display a downward trend, with erotic and action eliciting higher mean ratings than victim or threat. Post-Hoc

Bonferroni pairwise comparisons yielded significant mean differences for all levels of content (Neutral, .79; Victim, 2.0; Threat, 1.51, p 's < .01), except action (mean difference = .4, p = .18) with Erotic Pictures. Mean difference scores between Victim and Threat were also significant, -.48, p < .05. Mean Valence ratings for Neutral Pictures differed significantly with both Erotic and Victim (mean difference = 1.2, p < .01), and approach significance for threat pictures (mean difference .72, p = .053).

High Psychopathy and Low Psychopathy group differences for these three sets of ratings (i.e., Arousal, Valence, and Interest) did not yield significant multivariate F s (4, 35), 2.40, p = .07, 1.55, p = .21, and 2.03, p = .11, respectively.

Based on these findings, it would appear that within the Pleasant picture set, Erotic pictures inhibited the startle response for both groups, whereas pictures depicting Action scenes did not. Instead, Action somewhat potentiated startle, at least in relation to Erotic. An inverse trend becomes apparent in regards to Unpleasant content where Victim content appears to inhibit startle, relative to Threat. To explore this relationship further, groups were compared on their startle magnitudes in response to Erotic, Neutral, and Threat Stimuli.

Figure 6 demonstrate the overall trends for Startle Magnitudes by Picture Valence, restricted to Erotic, Neutral, and Threat Pictures. The overall multivariate effect of Valence was significant $F(2, 28) = 22.98$, p < .001. The multivariate F for the interaction between level of Psychopathy and Picture Valence was not significant, with an $F(2, 28)$ of .57, p = .57.

Intensity. This picture set is also balanced to allow for comparisons between high and low intensity. Based on the above findings in terms of Content, the following

analyses were intended to parse the effect of Picture Valence (Erotic, Threat) into high and low intensity.

Figure 7 illustrates the overall effect of Low Intensity, and High Intensity, Erotic, Neutral, and Threat pictures on blink magnitudes, by Level of Psychopathy. The multivariate effect of High Intensity Erotic and Threat Pictures vs Neutral was significant $F(2, 28) = 11.49, p < .01$. The multivariate interaction of Level of Psychopathy and High Intensity Pictures was not significant, $F < 1$. The overall effect of Low Intensity Picture Content on Startle Magnitudes was significant with a Multivariate $F(2, 28) = 8.03, p < .01$. The interaction of Low Intensity Pictures with Level of Psychopathy approached significance, Multivariate $F(2, 28) = 2.55, p = .10$.

Discussion

The present study examined the relation between affective modulation of the startle blink reflex and psychopathy in a sample of university students. Original hypotheses of this study were: 1) Psychopathic students lower in psychopathic traits would exhibit a significant linear Valence trend, whereas students higher in psychopathy would display a quadratic Valence trend, 2) a multiple regression equation predicting startle modulation from PCL:SV Factor 1 and Factor 2 scores would yield significant standardized regression coefficients for both factors, in opposite directions, 3) no significant differences would exist between groups on self-report affective and interest ratings, 4) Probe onset times at later than four seconds, Group X Valence interactions would no longer be significant, and 5) using the WAS as a covariate would yield a larger interaction effect between Level of Psychopathy and Valence.

As expected, mean PCL:SV scores in this sample were considerably lower than in forensic samples. While male and female students were not compared on either startle modulation or self-report affective or interest ratings, there were significant differences between these groups on personality and behavioural measures. Female students scored significantly lower on ABS Harm, ABS Versatility, PCL:SV Total and Factor 1 scores. Males and females did not differ on PCL:SV Factor 2, WAS, or MACHIV scores. PCL:SV findings are consistent with prior research assessing university students, in that prior research has found significant differences between males and females on PCL:SV Total, and Factor 1 scores (Forth et al., 1996). However, prior research also found gender differences in students for Factor 2 scores (Forth et al., 1996), with females scoring lower. Also, in this sample, as opposed to the findings of Forth et al. (1996), the males scored lower on Total, Factor 1 and Factor 2 scores of the PCL:SV, but female participants scored higher on Factor 1 than in previous research with university students (Forth et al., 1996).

Mean PCL:SV scores were significantly higher in the Higher Psychopathy group, as opposed to the Lower Psychopathy group (see Table 5). In addition, the two groups also significantly differed on ABS Versatility, PCL:SV Factor 1, PCL:SV Factor 2, and MACHIV, with the higher scores for the Higher Psychopathy group. ABS Harm and WAS scores, conversely did not significantly differ between groups. This finding supports the notion that a) the two groups may be considered to appropriately differ on psychopathy, and psychopathy related traits, and b) that higher and lower levels of anxiety and/or the capacity to self-report having harmed others, co-occurred with either a higher or lower level of psychopathy.

Correlations in this sample (see Table 6) between PCL:SV Total scores and Factors 1 and 2 revealed that the two Factors were highly correlated with the total score, and also significantly correlated with each other. Of the two factors, the PCL:SV Factor 2 correlated most highly with Total scores. As expected from prior research examining the relationship between Machiavellianism and psychopathy, MACHIV scores were significantly correlated with PCL:SV Total, Factor 1, and Factor 2 scores (Hare, 2003; McHoskey et al., 1998). Self-report antisocial behaviour was also significantly related to PCL:SV Total, and Factor 2 scores, with ABS Harm showing the strongest relationship (see Table 6). PCL:SV Factor 1 scores were not significantly related to either ABS Versatility or ABS Harm, though it correlated more highly with ABS Versatility than Harm, with r 's of .19, and .04, respectively. Findings regarding the relationship between PCL:SV Total scores and antisocial behaviour are consistent with prior findings with university students (Forth et al., 1996). That self-reported ABS Harm and ABS Versatility scores relate strongly to Factor 2 makes sense considering that the items in Factor 2 include adult and adolescent antisocial behaviour.

Consistent with prior research on incarcerated psychopaths (Levenston et al., 2000; Patrick, 1994; Patrick et al., 1993; Sutton et al., 2002), the Higher Psychopathy group in this sample exhibited abnormal potentiation of startle-blink reflex when presented with aversive pictures. While it is the case that this effect was only found significant based on *a priori* testing of the two groups separately, to find any effect at all in such a small community sample is striking.

Findings from the linear regression of PCL:SV Factor 1 and 2 scores on Modulation were the opposite of what was expected. Whereas Vanman et al. (in press)

found that Factor 1 correlated negatively with startle modulation, and Factor 2 correlated positively with Factor 2, in this study the effects were reversed, with Factor 1 correlating positively and Factor 2 correlating negatively with startle modulation. Reasons for this difference are not clear, however Vanman et al. (in press)'s procedure did differ from the present study in that: a) the PCL-R, rather than the PCL:SV as their measure, b) they had an older sample, c) their measure of blink amplitude differed, in that they compared blink responses to affective pictures to corresponding inter-trial interval blink responses, rather than to neutral pictures, and d) these individuals were not pre-screened using the MACHIV, all of which may have had implications on manifestations of psychopathy, and representations of startle modulation. Another factor that may have had contributed to the lack of variance accounted for in modulation by Factor 1, is the high threshold for Factor 1 found in Cooke et al. (1999). Based on the findings of Cooke et al. (1999), it may be that the level of psychopathy in this sample were not sufficient to make meaningful statements regarding the relationship between Factor 1 and modulation.

Self-reports of affective and interest reactions to emotional pictures were as expected, consistent with previous work by Patrick and colleagues (Patrick, 1993; Levenston et al., 2000), and also previous work with college students (Lang et al., 1999). Valence yielded the expected linear trend, and both arousal and interest were quadratic, with unpleasant and pleasant pictures yielding comparable levels of arousal and interest, with Neutral stimuli being rated as least arousing and least interesting. No significant group differences were found in terms of self-report arousal, valence, or interest ratings.

In attempting to interpret findings for time of probe onset during picture viewing, it would initially appear that at 5 seconds, while not statistically significant, the capacity

to differentiate group differences based on startle modification declines. This finding has been associated with differences in emotional information processing in psychopaths as compared to nonpsychopathic controls (Newman & Lorenz, 2002; i.e., psychopaths process affective information at a slower rate). However, these findings should be interpreted with caution. While it is the case that the proposed linear and quadratic trends for lower and higher psychopathy groups appears at the 3-4 second mark, and not the fifth, it is also true that the three counterbalanced picture orders used for this experiment were not deliberately balanced according to picture time. As such, these findings should be viewed as preliminary at best, and at worst, un-interpretable, in the larger context of determining the ideal probe onset time for testing the emotionally primed startle-blink.

Findings relating to trait anxiety, as measured through the Welsh Anxiety Scale (Welsh, 1956), also followed an expected trend, though a small sample in the Higher Psychopathy group prevented further group separation according to the approach taken by Newman and colleagues (Newman & Lorenz, 2002) into high and low anxious students. As a covariate in the Group by Valence analysis, WAS scores did raise the F value, though not significantly.

Although initially counter-intuitive to those who view psychopathy as a central emotional deficit, integrally linked to a lack of fear, the lack of consistent negative correlations between anxiety, psychopathy, and self-report antisocial behaviour make sense. Other studies with incarcerated individuals, both males and females, have found that trait measures of anxiety are positively correlated with psychopathy (Schmitt & Newman, 1999; Sutton et al., 2002). What may be underlying this anxiety is not necessarily trait anxiety, *per se*, but instead a by-product of an antisocial lifestyle

(Fowles, 1987; Frick, 1998; Lilienfeld, 1992, 1994). Not only were WAS scores significantly correlated with self-reported antisocial behaviour, but anxiety was also found to correlate moderately with Factor 2 of the PCL:SV, and correlate inversely with Factor 1 of the PCL:SV. This would support the premise that lifestyle factors, which are generally reflected more clearly through items associated with Factor 2 of the PCL:SV, may co-occur with anxiety, whereas the more enduring characteristics associated with Factor 1 may actually predispose the individual to be exhibit less trait anxiety.

Though one recent study examining startle-blink and psychopathy in a community sample included self-report antisocial behaviour (Vanman et al., in press), the authors did not focus specifically on self-reported antisocial behaviour in their analyses, but rather used self-report antisocial behaviours to supplement their PCL-R scoring. Controlling for ABS versatility in conducting Group by Valence mixed measures MANOVA, the interaction effect was slightly increased. ABS Harm scores, when used in the same manner were also found to slightly increase the original interaction effect. This may indicate, that as Newman and colleagues (e.g., Sutton et al., 2002) approach the issue of anxiety and psychopathy, a similar situation may hold true regarding antisocial behaviour in that there may be high and low antisocial psychopaths, even those scoring high on Factor 2.

Skeem et al. (2003) in their study examining the three-factor structure of the PCL:SV, called into question the use of antisocial behaviour related items when assessing community samples. Of all the measures included in this study, ABS Harm scores were found to have the highest negative zero-order correlations with Modulation (see Table 6). Taken in conjunction, these findings would suggest that further study is needed to

understand the inter-relationships between psychopathy, antisocial behaviour, and startle modulation in community samples. It is clear that, at least in the present study, the propensity to self-report having directly harmed others is inversely related to a behavioural response equated with fear and withdrawal.

Although exploratory in this study, another particularly striking finding is that the Higher Psychopathy group, in addition to showing startle inhibition for both pleasant and unpleasant pictures in relation to neutral, showed a noticeable trend towards startle inhibition to victim scenes (mutilated figures or attacks on others) in relation to controls. This is consistent with the findings of Levenston and colleagues (2000). Also, the psychopathic group showed a higher level of potentiation, though still lower than that exhibited by controls, to threatening stimuli.

Levenston et al. (2000) interpreted these seemingly contradictory finding as indicating that defensive withdrawal in psychopaths may not easily overcome their attentional engagement, (i.e., to shift from an orienting to a defensive response). Particularly when aversive pictures do not portray scenes suggesting imminent threat. Relative to neutral, both pleasant and unpleasant pictures, which are affectively arousing, engage more attention than the neutral pictures, explaining inhibition. However, once the scene becomes more clearly salient to the viewer, i.e., portrays imminent threat (e.g., gun aimed at viewer), psychopaths display more similar withdrawal patterns to controls, though to a lesser degree.

However, unlike Levenston et al. (2000), in this sample both the Higher Psychopathy group and controls, though to a much smaller degree, displayed inhibited startle response to pictures depicting victims. One potential explanation for this finding is

that the control group is not necessarily free from psychopathy related deficits, in, for example, empathy. A substantial proportion of the Lower Psychopathy group ($n = 12$), did in fact score two standard deviations above the mean on the MACHIV. The MACHIV, it may be recalled, seeks to identify those individuals exhibiting a particular type of callous and manipulative interpersonal style. It may be that the PCL:SV interview, and limited collateral information, did not allow for the classification of some individuals lacking a particular emotional response set into the Higher Psychopathy group, (i.e., lacking in empathy). While Levenston et al. (2000) preferred an explanation of the psychopathic group's inhibition to pictures depicting victims, over a deficit in empathy, the question still remains as to whether or not there maybe a moderating variable involved that may correspond with Machiavellianism as defined by Christie and Geis (1970).

For purely pleasurable erotic scenes, both groups displayed the expected startle inhibition. In response to pictures depicting action, such as hang-gliding, or mountaineering, the Lower Psychopathy group exhibited startle potentiation to activity scenes, whereas the Higher Psychopathy group demonstrated inhibition, though not as pronounced as to erotic scenes. One possible reason for this may be that as the pleasant activity scenes increase in intensity they actually become somewhat aversive, rather than pleasant. Thus, the thrill scenes which involve danger and excitement should motivate the Lower Psychopathy group for withdrawal, whereas the Higher Psychopathy group will not be motivated to withdraw, but instead display an orienting response.

Intensity, as a means of further separating Picture Content provided an initially counterintuitive finding. When analyses were restricted to High Intensity Erotic and

Threat stimuli, the overall trend was for the Higher and Lower psychopathy group to display a very similar trend, a result that runs contrary to the previous analyses in this study. One possible explanation for this finding is that once the pictures become highly personally relevant the Higher groups ability to "gate out" the startle probe is overcome. The recent study conducted by Benning et al. (2003), however, found that when analyses were limited to high intensity Erotic and Threat stimuli, the more psychopathic group displayed an attenuated response to high intensity threat stimuli. However, the study by Benning et al., (2003), a) selected extreme groups for comparison, and b) used a different set of measures to pre-screen for, and assess, psychopathy.

The design of the Benning et al., (2003) raises an important limitation inherent in this study. In the present sample, students were pre-screened for high levels of Machiavellianism, and then later assessed for psychopathy. All of the students classified in this study as scoring higher on the PCL:SV were drawn from the high MACHIV group. However, the comparison group was drawn a) randomly from students scoring lower on MACHIV, and b) from those students found to score high on the MACHIV, but not higher on the PCL:SV. It may be the case that at least some of the differences between the groups were suppressed by having higher MACHIV students in the comparison group.

Another obvious limitation of this study is the small size of the high psychopathy group. This poses problems relating to power, and also precludes performing some interesting subgroup comparisons. Initially, a comparison between male and female higher and lower scoring students was planned, but based on the small sample size, was later discarded.

Another design limitation was the failure to effectively ensure that probe onset times were counterbalanced. In future studies it would be interesting to see if the findings in this study can be replicated with properly controlled picture stimuli presentations.

In future studies it would also be helpful to enlarge the existing sample size considerably, compare males and females, and also to use a different screening measure. The MACHIV may be tapping into a sample group that, while very similar to the psychopath, displays some important differences, such as thrill seeking, and a lack of behavioural inhibition, less so than fearlessness, or emotionally detached, as has proven to be the greatest predictor thus far of a lack of startle-modulation in psychopaths.

Measures of autonomic arousal, such as skin conductance, may have assisted in the interpretation of these findings. Skin conductance has proven useful in the past in differentiating arousal from attention. Heart rate might be useful as well in further parsing the effects of attention from arousal. This might prove useful in clarifying the true effects of emotional reactivity to emotional pictures, and, as a result move closer towards a substantial understanding of the construct of psychopathy in a community sample.

The utility of these findings should not be underestimated based on their lack of significance. This study adds to the emerging literature examining emotional processing abnormalities and psychopathy in a non-offender sample. Contrary to other findings emerging in the field, in this sample, Factor 2 of the PCL:SV, and antisocial behaviour served as better predictors of a lack of startle potentiation when faced with threatening pictures than the PCL:SV Factor 1, which one would expect to do far better as a predictor, based on prior research.

As mentioned in the introduction of this document, the expanding body of knowledge regarding fear conditioning, avoidance learning, and affective response in psychopaths has led to three major research questions. First, is there an associative deficit, or tuning-out, of affective information regarding punishment and relevant stimuli? Second, is the desire or attention dedicated to a goal difficult for psychopaths to suspend or redirect in the face of new information, even if it signals punishment? Third, is there an inherent physiological deficit in fear or anxiety making punishment ineffectual?

This study, while not definitively answering these questions, provides additional experimental evidence towards their eventual solution. First, the tuning-out of emotional stimuli may indeed play a role not only in learning connections between behaviour and negative consequences, but may also play a role in reflexive response to frightening stimuli. Certainly in this study it was found that only at high levels of intensity did students higher in psychopathy exhibit startle potentiation when viewing unpleasant pictures. This finding may indicate that individuals higher in psychopathy are more effective at tuning out environmental changes not related to the foreground stimulus they are attending to, in this case affective pictures. Their attention effectively blocks out the relevant stimulus signalling a withdrawal response, in this case the startle probe. This notion has been addressed in a recent review by Newman and Lorenz (2002), where the authors suggest that perhaps psychopaths are more adept at ignoring changes in the environment when engaged in goal director behaviour, a propensity that might be seen as adaptive in normal levels, but like many traits, are pathological in cases of extreme manifestation (i.e., psychopathy). This perspective also serves to simultaneously answer the second question and qualify the first. Perhaps it is the case that for individuals higher

in psychopathy, they are not so much not responsive to punishment, as relatively unaware of it, when focused on goal directed behaviour. That is, until the intended punishment becomes sufficiently salient as to be attended to by the psychopath. This would explain both the group higher in psychopathy's reactions to the different affective pictures in this study, and may also explain why self-report antisocial behaviour correlates negatively with startle modulation. Perhaps the awareness of causing harm to others, indicating that the behaviour in question should cease, comes only too late to those individuals higher in psychopathy.

Finally, while by no means the final answer, this study adds additional evidence to a growing body of research suggesting a deficit in emotional responding associated with psychopathy. However, it remains to be seen whether or not the mechanism underlying this emotional deficit is fear, as defined by Lang and colleagues and adopted by Patrick et al. (e.g., Lang et al., 1997; Patrick et al., 1993), or primarily dysfunctional processing of affective information. What the findings of this study, interpreted from the perspectives of both Newman and Lorenz (2002), and Levenston et al. (2000), clearly suggest, is the possible moderating effect attention has on emotional responding in individuals with psychopathic traits.

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Table 1

PCL-R Factor Structure and Items for 2-Factor, 3-Factor, and 4-Facet Models

Two Factor Model	Three Factor Model	Four Facet Model
<i>Factor 1: Selfish, Callous, and Remorseless Use of Others</i> 1.Glibness/Superficial Charm 2.Grandiose Sense of Self Worth 4.Pathological Lying 5.Conning/Manipulative 6.Lack of Remorse or Guilt 7.Shallow Affect 8.Callous / lack of empathy 16.Failure to Accept Responsibility <i>Factor 2: Chronically Unstable, Antisocial, and Socially Deviant Lifestyle</i> 3.Need for Stimulation / Proneness to Boredom 9.Parasitic Lifestyle 10.Poor Behavioural Controls 12.Early Behaviour Problems 13.Lack of Realistic Long-Term Goals 14.Impulsivity 15.Irresponsibility 18.Juvenile delinquency 19.Revocation of conditional release	<i>Factor 1: Arrogant and Deceitful Interpersonal Style</i> 1.Glibness/Superficial Charm 2.Grandiose Sense of Self Worth 4.Pathological Lying 5.Conning/Manipulative <i>Factor 2: Deficient Affective Experience</i> 6.Lacks Guilt 7.Shallow Affect 8.Callous 16.Failure to Accept Responsibility <i>Factor 3: Impulsive and Irresponsibly Behavioural Style</i> 3.Need for Stimulation / Proneness to Boredom 9.Parasitic Lifestyle 13.Lack of Realistic Long-Term Goals 14.Impulsivity 15.Irresponsibility	<i>Facet 1: Interpersonal</i> 1.Glibness/Superficial Charm 2.Grandiose Sense of Self Worth 4.Pathological Lying 5.Conning/Manipulative <i>Facet 2: Affective</i> 6.Lack of Remorse or Guilt 7.Shallow Affect 8.Callous/Lack of Empathy 16.Failure to Accept Responsibility for Own Actions <i>Facet 3: Lifestyle</i> 3.Need for Stimulation/Proneness to Boredom 9.Parasitic Lifestyle 13.Lack of Realistic Long-Term Goals 14.Impulsivity 15.Irresponsibility <i>Facet 4: Antisocial</i> 10.Poor Behavioural Controls 12.Early Behavioural Problems 18.Juvenile Delinquency 19.Revocation of Conditional Release

Table 2

PCL:SV Factors and Items for 2-Factor and 3-Factor Models

Two Factor Model	Three Factor Model
<i>Factor 1: Interpersonal and Affective</i>	<i>Factor 1: Arrogant Deceitful Style</i>
1. Superficial	1. Superficial
2. Grandiose	2. Grandiose
3. Deceitful	3. Deceitful
4. Lacks Remorse	<i>Factor 2: Deficient Affective Experience</i>
5. Lacks Empathy	4. Lacks Remorse
6. Doesn't Accept Responsibility	5. Lacks Empathy
<i>Factor 2: Antisocial Behaviour Factors</i>	6. Doesn't Accept Responsibility
7. Impulsive	<i>Factor 3: Irresponsible, Impulsive Lifestyle</i>
8. Poor Behavioural Controls	7. Impulsive
9. Lacks Goals	9. Lacks Goals
10. Irresponsible	10. Irresponsible
11. Adolescent Antisocial Behaviour	
12. Adult Antisocial Behaviour	

Table 3

Descriptive Statistics for All Students

Measure	N	Range	<i>M</i>	<i>SD</i>
ABS Versatility	42	28	11.90	3.12
ABS Harm	42	13	2.0	6.47
PCL:SV	43	10	3.35	2.66
PCLSVF1	43	7	1.84	1.65
PCLSVF2	43	6	1.49	1.56
MACHIV	43	68	107.23	18.08
WAS	43	29	11.95	6.19

Note. ABS Versatility = Antisocial Behaviour Scale, Versatility subscale; ABS Harm = Antisocial Behaviour Scale, Harm subscale; PCL:SV = Psychopathy Checklist: Screening Version; PCL:SVF1 = Psychopathy Checklist: Screening Version, Factor 1; PCL:SVF2 = Psychopathy Checklist: Screening Version, Factor 2; MACHIV = Machiavellianism scale version 4; WAS = Welsh Anxiety Scale.

Table 4

Means and Standard Deviations (in Brackets) Across Males and Females

Measure	Male (<i>n</i> = 21)	Female (<i>n</i> = 22)	<i>t</i>
ABS Versatility	13.86 (8.05)	9.95 (3.60)	2.03**
ABS Harm	3.57 (3.64)	.43 (1.21)	3.76*
PCL:SV	4.38 (2.91)	2.36 (2.01)	2.66*
Factor 1	2.48 (1.83)	1.22 (1.19)	2.64*
Factor 2	1.86 (1.90)	1.14 (1.08)	1.54
MACHIV	112.48 (17.62)	102.23 (17.45)	1.92
WAS	12.43 (6.71)	11.50 (5.77)	.49

Note. *n* = 21 for male and *n* = 21 for female ABS scores. Where needed, *t* scores were calculated based on the assumption that variances were not equal. ABS Versatility = Antisocial Behaviour Scale, Versatility subscale; ABS Harm = Antisocial Behaviour Scale, Harm subscale; PCL:SV = Psychopathy Checklist: Screening Version; Factor 1 = Psychopathy Checklist: Screening Version, Factor 1; Factor 2 = Psychopathy Checklist: Screening Version, Factor 2; MACHIV = Machiavellianism scale version 4; WAS = Welsh Anxiety Scale.

* $p < .05$; ** $p < .01$.

Table 5

Means and Standard (Deviations) Across Higher and Lower Psychopathy Groups

Measure	Higher (<i>n</i> = 6)	Lower (<i>n</i> = 37)	<i>t</i>
ABS Versatility	21.17 (6.49)	10.36 (5.08)	4.46***
ABS Harm	5.00 (4.98)	2.46 (.41)	1.69
PCL:SV	8.33 (1.03)	2.54 (1.82)	7.55***
Factor 1	4.33 (2.07)	1.43 (1.17)	5.03***
Factor 2	4.00 (1.55)	1.08 (1.14)	5.54***
MACHIV	125.17 (8.18)	104.32 (17.61)	4.72***
WAS	13.33 (6.62)	11.72 (6.19)	.58

Note. Where needed, *t* scores were calculated based on the assumption that variances were not equal.

ABS Versatility = Antisocial Behaviour Scale, Versatility subscale; ABS Harm = Antisocial Behaviour Scale, Harm subscale; PCL:SV = Psychopathy Checklist: Screening Version; Factor 1 = Psychopathy Checklist: Screening Version, Factor 1; Factor 2 = Psychopathy Checklist: Screening Version, Factor 2; MACHIV = Machiavellianism scale version 4; WAS = Welsh Anxiety Scale.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6

Intercorrelations Between Bivariate Personality and Behavioural Measures and Startle Modulation

	1	2	3	4	5	6	7	8	9	10
1.MACHIV	-	.69**	.67**	.48**	-.10	.19	.13	-.05	.33	.50**
2.PCL:SV Total		-	.83**	.87**	.11	.61**	.39*	-.06	.30	.69**
3.PCL:SVF1			-	.49**	-.05	.19	.04	.18	.34	.52**
4.PCL:SVF2				-	.28	.76**	.54**	-.26	.07	.64**
5.WAS					-	.39*	.48**	.00	.18	.12
6.ABS Versatility						-	.79**	-.17	.18	.58**
7.ABS Harm							-	-.33	.58**	.31
8.Startle Modulation								-	.01	-.10
9.Gender									-	-.39*
10.Group										-

Note. $n = 31$. For Nonparametric data, Spearman Correlation Coefficients were calculated; ABS Versatility = Antisocial

Behaviour Scale, Versatility subscale; ABS Harm = Antisocial Behaviour Scale, Harm subscale; PCL:SV = Psychopathy

Checklist: Screening Version; PCL:SVF1 = Psychopathy Checklist: Screening Version, Factor 1; PCL:SVF2 = Psychopathy

Checklist: Screening Version, Factor 2; MACHIV = Machiavellianism scale version 4; WAS = Welsh Anxiety Scale; Gender

= Females (1) vs Males (2); Group = Lower (1) vs Higher (2) in Psychopathy.

* $p < .05$; ** $p < .01$.

Table 7

*Mean (Standard Deviation) Self Ratings, and Standardized Startle Magnitudes, By
Content By Group*

Overall	Erotic	Action	Neutral	Victim	Threat
Startle ($n = 31$)	-.38 (.22)	.10 (.26)	.08 (.20)	-.01 (.30)	.18 (.29)
Arousal ($n = 40$)	4.57 (1.64)	4.21 (1.67)	2.81 (1.36)	4.55 (1.71)	4.60 (1.81)
Valence ($n = 40$)	6.39 (1.12)	6.26 (1.02)	5.69 (1.10)	4.46 (1.47)	4.90 (1.47)
Interest ($n = 40$)	5.43 (1.56)	5.09 (1.65)	2.68 (1.01)	5.09 (1.61)	4.98 (1.62)
Higher					
Startle ($n = 6$)	-.31 (.24)	-.03 (.25)	.21 (.18)	-.08 (.33)	.15 (.40)
Arousal ($n = 6$)	5.53 (2.02)	4.61 (1.63)	3.27 (1.26)	5.53 (1.90)	5.85 (1.82)
Valence ($n = 6$)	6.76 (1.22)	5.99 (.87)	5.83 (1.30)	4.69 (1.69)	5.22 (1.74)
Interest ($n = 6$)	5.85 (1.34)	4.71 (1.75)	2.90 (1.25)	6.06 (1.50)	6.00 (1.26)
Lower					
Startle ($n = 25$)	-.40 (.21)	.13 (.26)	.05 (.19)	.04 (.23)	.19 (.27)
Arousal ($n = 34$)	4.40 (1.54)	4.14 (1.69)	2.73 (1.38)	4.38 (1.64)	4.37 (1.75)
Valence ($n = 34$)	6.32 (1.10)	6.31 (1.05)	5.67 (1.08)	4.42 (1.45)	4.84 (1.44)
Interest ($n = 34$)	5.36 (1.61)	5.15 (1.65)	2.65 (.98)	4.92 (1.58)	4.80 (1.62)

Figure 1. Slide Content on Arousal and Valence By Intensity.

Figure 2. Startle Blink Magnitude for High and Low Scoring Psychopathy Groups as a Function of Valence.

Figure 3. Means for Self-Ratings by Psychopathy Groups Across Slide Conditions.

Figure 4. Probe Onset Times by Group, by Valence.

Figure 5. Standardized Blink Magnitudes to Pictures by Content Category

Figure 6. Startle Responses for Erotic, Neutral, and Threat Picture Contents across Psychopathy Groups

Figure 7. Startle Responses for High and Low Intensity Erotic, Neutral, and Threat Pictures

Figure 8. Scatterplot of PCL:SV Total scores, Factor 2 "Antisocial" on Factor 1

"Emotionally Detached" Scores.

Appendix A

Mach IV

Surname	Given name	Telephone Number

Listed below are a number of statements. Each represents a commonly held opinion and there are not right or wrong answers. You will probably disagree with some items and agree with others. We are interested in the extent to which you agree or disagree with such matters of opinion.

Indicate the extent to which you agree or disagree by marking the appropriate number according to the scoring key below. Write this number on the line, to the left of each statement.

1	2	3	4	5	6	7
AGREE STRONGLY	AGREE SOMEWHAT	AGREE SLIGHTLY	NO OPINION	DISAGREE SLIGHTLY	DISAGREE SOMEWHAT	DISAGREE STRONGLY

- _____ 1. Never tell anyone the real reason you did something unless it is useful to do so.
- _____ 2. The best way to handle people is to tell them what they want to hear.
- _____ 3. One should take action only when sure it is morally right.
- _____ 4. Most people are basically good and kind.
- _____ 5. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.
- _____ 6. Honesty is the best policy in all cases.
- _____ 7. There is no excuse for lying to someone else.
- _____ 8. Generally speaking, people won't work hard unless they're forced to do so.
- _____ 9. All in all, it is better to be humble and honest than to be important and dishonest.
- _____ 10. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which carry more weight.
- _____ 11. Most people who get ahead in the world lead clean, moral lives.
- _____ 12. Anyone who completely trusts anyone else is asking for trouble.
- _____ 13. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.
- _____ 14. Most people are brave.
- _____ 15. It is wise to flatter important people.
- _____ 16. It is possible to be good in all respects.
- _____ 17. Barnum was wrong when he said that there's a sucker born every minute.
- _____ 18. It is hard to get ahead without cutting corners here and there.
- _____ 19. People suffering from incurable diseases should have the choice of being put painlessly to death.
- _____ 20. Most people forget more easily the death of their father than the loss of their property.

Appendix B

PCL:SV Interview Questions

A. SUBJECT INFORMATION

1. ID#: _____

2. Race: _____

3. Age: _____

4. Gender: _____

5. Date of Birth: _____

B. INTERVIEW INFORMATION

1. Interviewer: _____

2. Date of Interview: _____

C. RATER INFORMATION

1. Rater: _____
2. Date of Rating: _____
3. Interview Type: _____ Live
 _____ Audiotape
 _____ Videotape

D. CURRENT STATUS

1. Tell me a bit about yourself.
 - ** How long have you been going to university?
 - ** What are you taking? Why did you decide to come to university?
 - ** How has university been going so far? How do you find the courses
 (interesting, time-consuming, boring, etc.)
 - ** When do you hope to finish?

E. WORK HISTORY

1. What kind of work have you done in the past? Was this permanent or summer employment? Were these part-time jobs? Are you working while you are in school?
 - ** How many different jobs have you had? Why have you changed jobs?
 - ** When you work at something for a long time, do you get bored easily?
2. How would you boss have described your work performance?

3. How often would you come in late for work?
4. Have you ever intentionally missed work when you were not sick?
5. Did you ever get in trouble for not obeying the rules and regulations at work?
6. Have you ever stolen anything from your employer?
7. Have you ever been fired? Why? Have you ever left a job because you knew you were going to be fired?
8. Have you ever been unemployed?
 - ** How did you support yourself?
 - ** Were you looking for work? How seriously?
9. Have you ever collected UI, welfare, or some other form of social assistance?
10. Have you ever had to rely on somebody else to support you?
 - ** Did this support come from you parents to get you through university?
11. Have you ever committed crime to obtain money?

F. GOALS

1. Is there any occupation you would like to have?
 - ** How long have you wanted to do this? Have you planned or prepared for this occupation in any way? What training do you require?
2. Is having an occupation important to you?
3. What are your plans after you leave school?
 - ** Where are you going to live? How will you support yourself?
4. Do you have any long-term goals?
 - ** What problems might you have in achieving those goals?
5. Are you worried about the future?

** Why/why not?

G. HEALTH

1. Have you ever been seen by a psychologist, a counselor or a psychiatrist before?

** What for? At what age(s)? In university or elsewhere? What did the professional identify as the problem(s)? What treatment(s) or advice did they offer? Did you follow it?

2. Have you ever felt really depressed?

** How many times? Why? At what age(s)?

H. FAMILY/HOME

1. How old were you when you left home?

** Why did you leave then? What did you do?

2. What is your relationship with your family like now?

** How often do you have contact with them?

4. Are any of them having personal or financial difficulties?

IF YES: Have you tried to help them in some way?

5. Have you ever "hit the road" and traveled without real plans?

** At what age(s)? What was the longest time you were gone? Where did you go?

What did you do? Did you tell anyone you were going?

I. FRIENDS/RELATIONSHIPS

1. Do you have any close friends right now?

2. Who are you closest to?

** How would you feel if you could never see this person again? How long would you be upset for?

3. Do you get tired hanging out with the same people?

4. What attracts you to a partner?

5. Have you ever been married or lived common-law? If so, how many times?

IF NEVER, ASK: Have you had any other kind of important or long-term relationship? How many?

6. What have your relationships been like?

** How long do they usually last? What was the longest one? What was the shortest? Why do they usually end? Who usually ends them? How long does it take you to get over them?

** What do you like best about your partners? Are you usually in love with your partners, or are the relationships just physical?

** Are your relationships usually stable, or are things up-and-down? Do you argue much? Have you ever had physical fights?

7. Have you ever been unfaithful to any of your partners?

IF YES: How often?

** How did your partner(s) feel about it?

** How did you feel about it?

8. Have you ever broken up with someone who was in love with you?

IF YES: How many times?

** Was it really difficult? How did it affect him/her/them?

J. ADOLESCENT BEHAVIOR PROBLEMS

1. When you were an adolescent, did you do anything like vandalize a school or someone else's property, set fires, hurt animals for fun, or steal from your parents?

** Did you ever get caught? How were you punished? How did it affect you?
2. How was your behavior at school?

** Did you get into trouble for things like skipping classes, fighting, disturbing the class, being drunk or stoned at school, cheating, stealing, and so forth?

** Were you ever suspended or expelled? How many times? What for?
3. Were you ever arrested as a juvenile?

** What for? Were you convicted?

** How old were you when you first started doing crime?

** Did you ever commit crimes and not get caught? What

K. ADULT BEHAVIOR PROBLEMS

1. Did you ever have a problem with alcohol or drug abuse?

** Did you drinking or using drugs ever cause you problems (such as driving while impaired, getting into fights, getting arrested)?
2. Have you ever done dangerous or "wild and crazy" things?
3. Do you have a bad temper?

** IF NO: Has anyone ever said you have a bad-temper?

** What types of things get you really angry?

** What do you do when you are angry?

** Do you get into physical fights?

** What was the worst injury you ever caused someone? Why?

4. Some people don't let themselves become too concerned about how others feel.

Are you like that?

IF YES: Tell me more about it.

5. Have you ever done anything that really hurt somebody's feelings?

** Describe it. Why did you do that? Was it intentional?

6. Do you lie a lot?

** How often? Are you good at it?

7. Do you think that people are easy to "con" or manipulate?

** Do you ever do it? What are some examples?

8. Have you ever deceived or taken advantage of a partner in some other way?

IF YES: Tell me about it.

9. Did you ever get in trouble for not paying your bills, defaulting on a loan (this can include a student loan), or not paying child support?

L. ADULT CRIMINAL RECORD

1. Have you ever been arrested as an adult?

** What for? Describe what happened. Were you convicted? How long was your sentence? Do you feel it was a fair one? What kind of a job did your lawyer do?

** If you have been arrested, do you think your criminal record will have any effect on your life?

** What type of effect? Good or bad?

IF THE PERSON HAS NOT BEEN ARRESTED AS AN ADULT ASK:

Have you ever done something that others might consider to be criminal (such as driving while over .08, selling or using street drugs, etc.)? What about questionable activities, such as cheating on exams, plagiarism, or vandalizing property? Describe what happened.

IF THE PERSON ADMITS EITHER BEING ARRESTED OR HAVING ENGAGED IN OTHER WRONGFUL BEHAVIORS ASK:

Why do you engage in these kinds of questionable activities?

** Do you think these things are serious? What effect have they had on other people? How do you feel about that?

** What could you have done to avoid committing crime/engaging in these activities? Have you ever tried to stop? How?

** What kinds of things would help to keep you out of trouble?

** Do you regret having committed these acts? Why/why not?

** Are your illegal or questionable activities usually planned, or are they "spur-of-the-moment?"

2.If you had to pick one thing in your life that you could take back, something that you wish you had not done, what would it be?

** Why do you regret having done it?

M. OTHER QUESTIONS

1. What do you do during your leisure time?
2. Some people are skillful at using others or taking advantage of them to get what they want, are you able to do this?
4. Do you sometimes pretend you are upset or sad because other people expect you to?
5. When was the last time you cried? What made you upset?
6. How do you feel about people who take advantage of others?
7. Have you ever tried to control others by being physically or verbally threatening?
8. How do you feel when you see dead or injured animals on the highway?
9. How do you feel about yourself? Rate how you feel about yourself on a scale of 1 to 10, with 1 being really bad and 10 being really good.
10. Are there things that we didn't talk about today, that you think it is important for people to know about you?

N. INTERVIEW NOTES

1. Rate clarity and coherence of subject's responses during interview:
____ a) Subject's responses were clear and coherent
____ b) Some mild problems understanding subject's responses
____ c) Some moderate problems understanding subject's responses
____ d) Subject's responses were almost totally unclear or incoherent

2. Rate consistency of subject's responses during interview:

- ___ a) Subject's responses were consistent
- ___ b) Some mild inconsistencies were apparent in interview
- ___ c) Some moderate inconsistencies were apparent in interview
- ___ d) Subject's responses were almost totally inconsistent

3. Rate the overall validity of the interview:

- ___ a) Valid and problem free
- ___ b) Valid, but with mild problems
- ___ c) Valid, but with moderate problems
- ___ d) Invalid; most items should be scored totally on the basis of
collateral information.

4. Describe any aspects of the subject's demeanor and behavior during the interview that seem important or that may not be apparent in audio- or video-tapes. Such comments may focus on the subject's style of speech, nonverbal behaviors, interpersonal style, or self-image.

Appendix C

Collateral Interview and Script

Hello my name is Ian Broom and I am a master's student in Psychology at Carleton University. I am contacting you because recently, _____ (participant's name) _____ has agreed to participate in a study I am conducting. _____ (participant's first name) _____ identified you as someone with whom I could speak with and ask a few questions.

This interview will take anywhere between 10 and 15 minutes. I want to make clear to you that some questions are of a personal, sensitive nature regarding _____ (participant's first name) _____'s activities currently, and in the past. You do not have to participate, you may withdraw at any time, and you can decline to answer any questions you wish. Anything that you tell me, including your identity, will remain strictly confidential.

Do you have any questions?

[short pause]

Would it be possible, then, to ask you a few questions right now? By saying "Yes", you are consenting to your participation in this phone interview whereby the answers that you give me will be used for research purposes. Do you wish to continue?

Subject # _____ Date: _____ (DD/MM/YY)

A: General Information

1. How long have you known "X"
2. What is your relationship with him/her?
3. How well would you say you know "X"?
4. What is his/her age and date of birth?

B. Education

5. Tell me about his/her present educational situation.
 - How does she/he find school? (difficult, boring, challenging.)
 - How are his/her grades?

C. Work History

6. What type of work has he/she done in the past?
 - Has he/she had any problems at work?

D. Goals and Ambitions

7. What are his/her long term plans?

- Do you think he/she will succeed in what he/she wants to do?

E. Family/Relationships

8. How did "X" get along with his/her family?

- What was his/her behaviour like when he/she was growing up?
- What is his/her relationship like with his/her family now?

9. How well does "X" get along with his/her friends?

- Is he/she concerned about how they (friends) are doing?

F. Antisocial Behaviours

10. Has he/she ever been in trouble with any authorities (e.g. campus security, police, professors, parking fines, library fines)?

G. Overall Impressions

11. The very first time you met him/her, what was your overall impression?

- Once you got to know him/her, did your impression change?

12. What kind of adjectives would you use to describe "X"?

13. What kind of reputation does he/she have amongst those who know him/her?

Thank-you very much for taking the time to answer these questions!!!!

Appendix D

Welsh Anxiety Scale

Each of the following items takes a True/False form.

1. I find it hard to keep my mind on a task or job.
2. I have more trouble concentrating than others seem to have.
3. At periods my mind seems to work more slowly than usual.
4. When in a group of people I have trouble thinking of the right things to talk about.
5. I have often lost out on things because I couldn't make my mind up soon enough.
6. I usually have to stop and think before I act even in trifling matters.
7. I have several times had a change of heart about my life work.
8. Sometimes some important thought will run through my mind and bother me for days.
9. I am apt to take disappointments so keenly that I can't keep them out of my mind.
10. I do many things which I regret afterwards (I regret things more and more often than others seem to).
11. I feel anxiety about something or someone almost all the time.
12. I must admit that I have at times been worried beyond reason over something that really did not matter.
13. I wish I could get over worrying about things I have said that may have injured other people's feelings.
14. I worry quite a bit over possible misfortunes.
15. I brood a great deal.

16. I have often felt guilty because I have pretended to feel more sorry about something than I really was.
17. Even when I am with people I feel lonely much of the time.
18. I wish I could be as happy as others seem to be.
19. Most of the time I feel blue.
20. I very seldom have spells of the blues.
21. Life is a strain for me much of the time.
22. I feel tired a good deal of the time.
23. I have had periods of days, weeks, or months where I couldn't take care of things because I couldn't get going.
24. I have difficulty in starting to do things.
25. My plans have frequently seemed so full of difficulties that I have had to give them up.
26. I have sometimes felt that difficulties were piling up so high that I could not overcome them.
27. Often, even though everything is going fine for me, I feel that I don't care about anything.
28. I have often felt that strangers were looking at me critically.
29. I am apt to pass up something I want to do because others feel that I am not going about it the right way.
30. It makes me feel like a failure when I hear of success of someone I know well.
31. Often I cross the street in order not to meet someone I see.
32. People often disappoint me.

- 33. I feel unable to tell anyone all about myself.
- 34. I am easily embarrassed.
- 35. Criticism or scolding hurts me terribly.
- 36. At time I think that I am no good at all.
- 37. I sometimes feel that I am about to go to pieces.
- 38. I often feel as if things were not real.
- 39. I have a daydream life about which I do not tell other people.

Appendix E

Antisocial Behaviour Scale (ABS)

Participant Number: _____

The purpose of this questionnaire is to determine how often you engage in antisocial activity. The next few pages lists a variety of antisocial behaviours that you may or may not have engaged in. When you are completing this questionnaire please include all activities that you have engaged in. This means crimes that you have been formally charged and/or convicted for as well as those that you have never been caught for.

Sample question and explanation:

	<u>EVER</u>	
	(# OF TIMES)	
1. Have you ever driven under the influence of drugs?	0	AGE OF
	1	ONSET _____
	2-5	
	6-10	AGE OF
	11-20	OFFSET _____
	21 or more	

Under the column labelled "EVER", you would circle the appropriate response if you have ever (as far back as you can remember) driven under the influence of drugs. After you circle your response, and if it is not zero, please indicate at what age you first started engaging in this behaviour ("AGE OF ONSET") and at what age you stopped engaging in this behaviour ("AGE OF OFFSET"). If you would still be engaging in this behaviour had you not been incarcerated, write down your current age.

IF YOU DO NOT WISH TO ANSWER A PARTICULAR QUESTION YOU MAY OMIT IT AND PROCEED WITH THE NEXT. IF THERE IS ANYTHING THAT IS UNCLEAR OR IF YOU DO NOT UNDERSTAND SOMETHING, PLEASE CONSULT THE RESEARCHER.

PLEASE TURN OVER

EVER (# OF TIMES)

1. Have you ever cheated on an exam?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
2. Have you ever plagiarised an assignment or essay?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
3. Have you ever pulled a fire alarm in school?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
4. Have you ever had library fines?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
5. Have you ever vandalised school property?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
6. Have you ever lied to a professor or teaching assistant in order to miss an exam?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
7. Have you ever put graffiti on walls, toilet doors, etc?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

8. Do you ever speed over 20 km?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
9. Do you commit minor traffic violations? i.e., running stop signs/red lights, use old plates, etc.?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
10. Have you ever damaged a parked vehicle without notifying the owner or police?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
11. Have you ever injured a pedestrian while driving and left without checking to see if he/she was alright?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
12. Have you ever driven while impaired?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
13. Have you ever driven under the influence of drugs?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
14. Have you ever engaged in vandalism? i.e., breaking windows, defacing/damaging property etc.?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

15. Have you ever made harassing phone calls?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
16. Have you ever verbally assaulted someone? I.e., police officers, teachers, security guards, etc?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
17. Have you ever committed arson?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
18. Have you ever shoplifted items worth less than \$50?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
19. Have you ever shoplifted items worth more than \$50?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
20. Have you ever trespassed?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
21. Have you ever committed a break and enter?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

22. Have you ever engaged in 'purse snatching'?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
23. Have you ever mugged someone without using a weapon?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
24. Have you ever mugged someone with a weapon?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
25. Have you ever stolen a bicycle or bicycle parts?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
26. Have you ever stolen a car?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
27. Have you ever stolen a car stereo, speakers or any other property from a vehicle?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
28. Have you ever been in possession of stolen property?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

29. Have you ever robbed a store, gas station, bank, or any other 'business' without using a weapon?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
30. Have you ever robbed a store, gas station, bank, or any other 'business' using a weapon?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
31. Have you ever threatened someone with a gun, knife, or any other weapon?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
32. Have you ever been in possession of a weapon, i.e., gun, knife (excluding pocket knife) for which you were not liscensed to carry?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
33. Have you ever injured someone using a weapon? i.e., a knife, gun, rock, baseball bat.	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
34. Have you ever injured someone badly? i.e. left bruises, caused visible bleeding, or broken bones?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
35. Have you ever killed someone intentionally? (does not include self-defense)	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

36. Have you ever killed someone accidentally? I.e., car accident?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
37. Have you ever tried marijuana and/or hashish?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
38. Have you tried LSD / psychedelics, cocaine, heroin, or crack?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
39. Have you ever used uppers or downers? (excludes prescription medication)	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
40. Have you ever sold drugs?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
41. Have you ever drank alcohol in public places illegally?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
42. Have you ever bought alcohol for minors?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

43. Have you ever engaged in prostitution?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
44. Have you ever lived off money made from prostitution?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
45. Have you ever resisted arrest?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
46. Have you ever violated the conditions of your release?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
47. Have you ever used a stolen credit card?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
48. Have you ever forged a cheque?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
49. Have you ever 'conned' someone out of money, drugs, or possession (s)?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

EVER (# OF TIMES)

50. Have you ever secretly tried to see women/men or girls/boys undressing by looking in windows or by other means?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
51. Have you ever rubbed up against or touched a woman/man or a girl/boy, who did not know you, in a sexual way in public?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
52. Have you ever exposed your genitalia to a woman/man or a girl/boy, who did not know you, in a public place such as a street, park or field, an alleyway, a car, in a show, or through a window?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
53. Have you ever engaged in sex play (touching, kissing, petting, but not intercourse) with a woman/man or girl boy when she/he didn't want to, by overwhelming them with continual arguments and pressure?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
54. Have you ever engaged in sex play (but not intercourse) with a woman/man or girl/boy when he/she did not want to by threatening or using some degree of physical force (arm twisting, holding down, bondage, etc.?)	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

55. Have you ever attempted or engaged in sexual intercourse with a woman/man or a girl/boy when she/he didn't want to by overwhelming him/her with continual arguments and pressure?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____
56. Have you ever attempted or engaged in sexual intercourse with a woman/man or a girl/boy when she/he didn't want to by threatening or using some degree of physical force (arm twisting, holding down, bondage etc.)?	0 1 2-5 6-10 11-20 21 or more	AGE OF ONSET _____ AGE OF OFFSET _____

Appendix F

Self Assessment Manikin (SAM)

A) Arousal

Please describe your level of arousal, from excited to calm.

B) Valence

Please describe your mood, from positive to negative.

Appendix G

Interest

Please rate your interest in the previous slide.

Not at all interesting			Moderately interesting			Very interesting		
1	2	3	4	5	6	7	8	9

Appendix H

IAPS Picture Set, Organized by Content, Gender, and Intensity

<i>Males</i>	Erotic	Action	Neutral (Not intense)		Victim	Threat
High Intensity	4320	5629	2215	7009	6313	1300
	4666	5626	2480	7010	6540	6250
	4669	8034	2518	7020	9050	6300
	4672	8200	2570	7090	9250	6370
	4770	8340	2850	7100	9600	6510
	2030	8490	2870	7180	9921	9630
Low Intensity	2616	7503	2890	7233	2661	2120
	4004	8041	5390	7490	2682	2130
	4603	8130	5731	7491	6350	2681
	4606	8162	5740	7595	9582	2692
	4617	8220	7000	7705	9592	6242
	4631	8280	7004	7080	9912	6930

Table Continues

<i>Females</i>	Erotic	Action	Neutral (Not intense)		Victim	Threat
High Intensity	4672	5629	2190	7031	3022	1101
	4670	8034	2215	7040	6211	1113
	4660	8161	2391	7100	6530	1931
	4656	8180	2440	7130	8480	6250
	4572	8300	2480	7140	9230	6410
	4687	8400	2570	7175	9250	6190
Low Intensity	2616	5622	2870	7180	3022	1240
	4530	8050	2890	7217	6211	2110
	4534	8117	5740	7491	7010	2130
	4536	8250	7000	7500	9402	2681
	4601	8280	7004	9210	9584	5970
	4625	8465	7020	7080	9912	6314

Appendix I

Telephone Recruitment

Participants will be recruited via the mass testing program available at Carleton University. The MACH IV questionnaire will be appended to a series of questionnaires administered to 49.100 psychology students. Students will then be contacted based on their scores on this questionnaire. When contacted by phone or e-mail, students will be given the following announcement:

Announcement for Recruiting Participants

We are calling you based on your responses to the Mass Testing questionnaire that you completed in the Fall of 2002 (Where you provided your phone number/e-mail address). This study will examine the relationship between personality style and the physiological reactions to emotional pictures. If you are interested in participating in this study, we ask that you come to room C567 Loeb, 1125 Colonel By Dr. (Carleton University Campus) for an hour interview, followed by an approximately a 60 minute slide show featuring emotional pictures. At this time I would like to warn you that there are slides that you will see that may be disturbing. Slides range in pleasantness and intensity. You will see neutral (e.g., household objects like hammers), unpleasant (e.g., burn victims, insects, violent assaults) and pleasant (e.g., unclothed people, smiling children, exciting activities) slides. During the pictures we will be recording your emotional reaction using two electrode sensors placed beneath either your right or left eye. At times during the

experiment a brief, harmless noise click will be presented through headphones. You would also be making ratings of the pictures on a video monitor.

The entire process should take about two hours. We also ask that you provide us with the contact information for a close friend or family member who we would like to ask a couple of questions regarding your interpersonal style. Participation in this study is entirely voluntary, and even if you initially agree to participate, you may discontinue participation at any time. In addition I would like to make clear that any information we gather in the course of this study is kept strictly confidential.

Participation in this exercise will yield a total of 2 credits for the interview and slide show. The video-taping and collateral interview are entirely optional with respect to class credit.

Are you interested in participating in this study?

Appendix J

Consent Form

The purpose of informed consent is to insure that you understand the purpose of the study and the nature of your involvement. This consent form must provide you with sufficient information about this study so as to allow you to determine whether you wish to participate. We ask that you read this form and ask the researcher any questions that you might have before agreeing to the study.

PART 1- Personality Styles Interview

By signing this form, you are indicating that you consent to participate in a study on personality styles and emotional response while viewing pictures through your involvement in responding to a personality styles interview.

This part of the study will consist of 1 interview session that is approximately 60 minutes in duration. The responses you give during this interview will be coded in such a way that you cannot be identified in any report of the results. You should understand that some of the questions in this study are of a personal nature such as those involving social behaviour and drug use. You do not have to answer any questions that you do not wish to and you have the option of withdrawing from this study at any time without penalty.

Attached to this consent to participate is a request that the interview be videotaped (Part 3). Also attached is a request that you name a person whom the researchers may contact

to verify answers in the interview (Part 4). Some of the questions refer to personal, sensitive information such as any problems you might have had with authorities, or problems at work/school. You should understand that you DO NOT have to give consent to either of these two additional requests (Parts 3 and 4) in order to participate in this interview.

In addition to the interview you will also be asked to complete two short written questionnaires.

PART 2- Emotional Response While Viewing Pictures

By signing this form you are consenting to participate in a study on personality styles and emotional response while viewing pictures. You will be involved in a picture viewing session where your emotional response to pictures will be recorded.

This study will consist of 1 picture viewing session that is approximately 60 minutes in duration. The physiological recordings taken, and descriptions that you give of your emotional state will be used for research purposes only and will remain strictly confidential. The answers you give, and recordings that are made, will be coded in such a way that you cannot be identified in any report of the results. You should understand that some of the pictures that you will view may be highly emotional and potentially disturbing such as pictures depicting violence, nudity, and human suffering. Also, two electrodes will be placed by the researcher below your right or left eye. In addition, at

some point during the experiment a brief, harmless noise click (not exceeding 105 dB, about the volume of a subway train, for a fraction of a second) will be presented through headphones. You have the option of withdrawing from this study at any time without penalty.

For your involvement in the interview and picture viewing sessions you will receive 2 credits towards your introduction psychology course.

For more information about this study, please contact one of the following investigators:

Ian Broom	520-2600 x1408	ibroom@magma.ca
Adelle Forth	520-2600 x1267	adelle_forth@carleton.ca

Testing will take place in room C567 of Loeb Building, Carleton University.

If you have any concerns regarding ethical issues, please contact:

Dr. Kim Matheson	520-2600 x2648
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Chair, Department of Psychology, Carleton University

Dr. Mary Gick	520-2600 x2664
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Chair of Carleton University Research Ethics Committee for Psychological Research,
Carleton University

My signature below indicates that I have read the above and that I agree to participate in the interview and emotional picture viewing.

Participant's name: _____ Date (DD/MM/YY) _____

Participant's signature: _____ Date (DD/MM/YY) _____

PART 3- Videotaping

This interview will be videotaped for research purposes. These tapes will remain confidential and anonymous and will not be viewed by anyone not associated with this research study. By signing your name below, you are consenting to the videotaping of this interview.

Participant's Name _____

Participant's Signature _____

Part 4- Collateral Contact

This study wishes to use information obtained from a collateral contact of your choice.

By signing your name below, you are consenting to the researchers in this study

contacting _____ (collateral contact name)

at the following number:

_____ - _____ (collateral contact phone number)

Participant's Name _____

Participant's Signature _____

Date (DD/MM/YY) _____

Appendix K

Participant Information Sheet

Date: _____

Study ID #: _____

Participant Information Sheet

Please fill out the following information about yourself:

a) Age _____

b) Year in university _____

c) Do you wear eyeglasses or contact lenses? Yes ____ No ____

If yes:

Which are you wearing today? (circle one)

glasses contacts neither

Approximately what is your vision in each eye?

Left eye _____ Right eye _____

d) Do you have any hearing difficulties?

If so, please explain _____

e) Which hand do you write with (predominantly)? Right ____ Left ____

f) Are you currently under a physician's care for a physical or medical condition? (if yes, please specify:) _____

g) Are you currently taking any prescription medications? (if yes, please specify:) _____

h) How many hours of sleep did you get last night? _____

Appendix L

Instructions to participants

Let me explain what you will be doing in this procedure. You will be viewing a series of pictures and making some ratings of how you felt while viewing them. During the picture series you will be wearing headphones, and occasionally you will hear a brief noise “click”, which you can simply disregard. Each picture will appear on the computer screen in front of you, and I would like you to look at the picture the entire time it is on the screen.

After the picture goes off, a display will appear on the screen that you will use to rate how you felt while viewing the picture you just saw. This is SAM (“Self Assessment Manikin”), which was developed to allow you to rate how you felt while you watched each picture. You will be asked to describe your feelings along two dimensions: in control vs controlled by the pictures, and pleasant vs. unpleasant. The numbers 1 through 9 will be used to represent how you feel along these two dimensions.

The pleasant-unpleasant dimension is one type of feeling that SAM can represent. If you felt extremely happy or pleasant while you viewed the picture you would enter 1. If you felt extremely unhappy or unpleasant you would enter 9. If you felt completely neutral, enter 5.

The excited-calm dimension is another type of feeling that SAM can represent. If you felt completely aroused or excited while viewing the picture, you would enter 1. If you felt completely calm and relaxed while viewing the picture, you would enter 9. If you felt in the middle, that is neither really excited nor really calm, then you would enter 5.

The last rating does not involve SAM, but is a rating of how interesting the picture was that you saw. By interesting, I mean how much did the slide capture your attention? Was it fascinating, boring, or somewhere in between? Enter 1 through 9 at the appropriate point on the scale. The middle position on the interest rating does not indicate neutral, but rather an intermediate level of interest.

Do you have any questions about the ratings you will be making?

As much as possible, try to remain still during the procedure, because movements may interfere with our recordings. If you feel a need to move or adjust your position in the chair, please wait until the ratings come on to do so. Once you finish the ratings, just relax and watch for the next picture to appear on the screen.

Once again, try not to blink during the first one or two seconds the picture is presented.

I will now fit you with the headphones I said you would be wearing during the procedure.

****Put headphones on subject. Make sure they fit correctly. Let subject adjust them, and ask if they feel "o.k." Make sure no wires are caught or strained by the headphones.**

OK, we're ready to begin. I will turn down the lights now, and the pictures will start in just a few moments. Please relax in the chair and direct your eyes toward the white screen on the wall in front of you. Remain still during the procedure; if you need to move or adjust your position in the chair, please do so only during the ratings procedure.

****Turn down lights in subject room – turn off overhead lights and turn on desk lamp.**

Appendix M

Debriefing

We would like to thank you for participating in this study. Your participation will help us in the exploration of the relationship between personality, emotion, and reflexive response. The study of the relationship between these variables has already proven helpful in developing a theoretical understanding of the biological pathways and processes underlying certain personality styles.

The noise click and the electrodes placed beneath your eye were used to study your startle-blink response. The electrodes recorded the electrical activity in muscles located beneath your eye that are part of the group of muscles used when you blink. The noise "click" that was administered was done in order to record whether or not you blink, and how often, when startled whilst viewing emotional pictures.

The questionnaire you filled out in mass testing, the interview we gave you, and the collateral interview (if conducted) were designed to study your personality characteristics and interpersonal style when dealing with other people and in relation to rules.

The kind of study that you have participated in today has been conducted with a variety of people of different ages and from different walks of life. This work should help us to understand more about how different types of people respond to a range of emotional stimuli. In the longer term, we expect that this research will contribute to a better understanding of emotional and personality problems that people commonly face.

We understand that some of the slides that you viewed today may have been upsetting and anxiety provoking. It is even possible that one or more of the slides triggered some personal traumatic episode that you have experienced. If that is the case, or if you feel that you have been disturbed in any way by the content of the slides you have seen, please refer to the list of contact agencies attached to this form.

Due to the nature of this research, we ask that you not discuss the subject matter with other potential participants until testing is complete (approximately April of 2003). We appreciate your cooperation in this regard.

If you wish to discuss any additional aspects of the research, we are available for appointments. You may contact: Ian Broom in room C567 (520-2600, ext. 1408, e-mail: ibroom@magma.ca), or Dr. Adelle Forth (Faculty Sponsor, 520-2600, ext. 1267, e-mail: Adelle_Forth@carleton.ca). Should you have any ethical concerns about this study please contact Dr. M. Gick (Chair, Carleton University Research Ethics Committee for Psychological Research, 520-2600, ext. 2664). Should you have any other concerns about this study then please contact Dr. K. Matheson (Chair, Dept. of Psychology, 520-2600, ext. 2648).

We very much appreciate your willingness to participate in this study.

Contact numbers:

24 Hour Distress Lines: Distress Centre 238-3311

Carleton University Counselling Services 520-2600 x 6600