Loma Linda University

TheScholarsRepository@LLU: Digital Archive of Research, Scholarship & Creative Works

Loma Linda University Electronic Theses, Dissertations & Projects

9-2009

Emotional Behavior in Subclinical Psychopathy

Kristen Lee Godenick

Follow this and additional works at: https://scholarsrepository.llu.edu/etd

 Part of the Psychology Commons, and the Social Psychology and Interaction Commons

Recommended Citation

Godenick, Kristen Lee, "Emotional Behavior in Subclinical Psychopathy" (2009). *Loma Linda University Electronic Theses, Dissertations & Projects*. 1680.
https://scholarsrepository.llu.edu/etd/1680

This Dissertation is brought to you for free and open access by TheScholarsRepository@LLU: Digital Archive of Research, Scholarship & Creative Works. It has been accepted for inclusion in Loma Linda University Electronic Theses, Dissertations & Projects by an authorized administrator of TheScholarsRepository@LLU: Digital Archive of Research, Scholarship & Creative Works. For more information, please contact scholarsrepository@llu.edu.

UNIVERSITY LIBRARIES
LOMA LINDA, CALIFORNIA

LOMA LINDA UNIVERSITY
School of Science and Technology
in conjunction with the
Department of Psychology

Emotional Behavior in Subclinical Psychopathy

by

Kristen Lee Godenick, M.A.

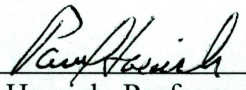
Dissertation submitted in partial satisfaction of
the requirements for the degree of
Doctor of Philosophy in Clinical Psychology

September 2009

© 2009

Kristen Lee Godenick
All Rights Reserved

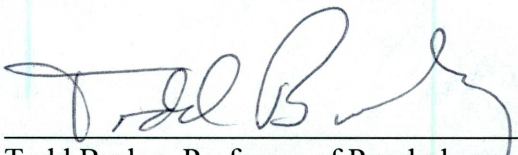
Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



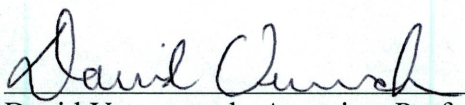
, Chairperson

Paul Haerich, Professor of Psychology

Henry Beck, Clinical Psychologist



Todd Burley, Professor of Psychology



David Vermeersch, Associate Professor of Psychology

Mark Wolkenhauer, Clinical Psychologist

ACKNOWLEGDMENTS

I would like to express my appreciation to the individuals who helped me complete this study. I am grateful to the Department of Psychology at the California State University in San Bernardino for providing the facilities.

I thank David Gilsdorf at the Loma Linda University School of Medicine for his computer programming support.

I thank the training directors at Patton State Hospital, Sharper Future, and the Wisconsin Department of Corrections for their valuable clinical mentorship and insight into the complicated mind of the psychopath.

I also wish to thank my research mentor, Dr. Paul Haerich, for seven years of dedicated support, encouragement, and tireless commitment to my professional growth.

CONTENTS

TABLES

FIGURES

Figure Page

ABSTRACT

Emotional Behavior in Subclinical Psychopathy

by

Kristen Lee Godenick

Doctor of Philosophy, Graduate Program in Psychology
Loma Linda University, September 2009
Dr. Paul Haerich, Chairperson

The unique interpersonal qualities of individuals who fall on the so-called 'psychopathic spectrum' have been regularly documented since Cleckley's observations (1941). The literature reflects the importance of understanding individuals who have high and low levels of psychopathic personality traits for research (Lilienfeld, 1998, Patrick, Edens, Poythress, Lilienfeld & Benning, 2006), clinical (Patrick, Hicks, Blonigen & Krueger, 2003) and risk assessment purposes (Skeem, Poythress, Edens, Lilienfeld & Cade, 2003) through bringing forth the position that psychopathic traits can fall on a continuum (Benning, Patrick, Salekin & Leistico, 2005). The purpose of this study was to investigate the association between psychopathic personality traits in the general population and deficits in emotion modulated psychophysiological responses as well as deficits in emotionally influenced decision making. Results indicated that individuals with higher levels of Fearless Dominance, as measured by the Psychopathic Personality Inventory, Revised (Lilienfeld & Widows, 2005) had attenuated fear responses (r = -0.26; Chi-square = 5.286, $p \leq .05$), but there were no significant abnormalities in responses to other emotional conditions. There was no association between psychopathic personality traits and emotionally influenced decision making as measured by the Iowa Gambling Task (Bechara, Damasio, Damasio & Anderson, 1994) suggesting that at subclinical

levels, psychopathic personality traits have a negligible influence on an individual's use of somatic markers to guide behavior.

Introduction

Mr. C.J. is a 59-year-old, right handed, single, Caucasian-American male who was committed by the Superior Court of Santa Barbara County to the California Department of Mental Health on September 22, 1995. He was admitted to Atascadero State Hospital (ASH) the following year after being found incompetent to stand trial. In July of 1995, while on federal parole, Mr. C.J. entered the lot of a car dealership and stole a vehicle. When a police officer attempted to pull him over for speeding, he gave chase. After his car crashed into another vehicle, he attempted to run. Mr. C.J. was hospitalized pending a hearing of his case due to his lawyer's report that he was actively hallucinating during an interview. Results of a malingering evaluation performed at ASH reveal that Mr. C.J. was acutely malingering psychotic symptoms. Notes about his presentation at the evaluation state that he was "cold, aloof, and intelligent" with "superficial cooperation" and "disturbing lack of concern" for the crash victim involved in the instant offense.

Mr. M.H. is a 36-year-old, right handed, single Caucasian-American male who has a history of multiple short term relationships throughout his 20's that were usually ended by the decision of his girlfriends. They usually complained that he "was too selfish" and "didn't seem to care about his family." He is described by others as an intelligent, well-dressed, superficially social individual who spends most of his time talking about his business dealings with anyone who will listen. He is proud of the fact that he got to where he is today in upper management. He tells others it is through his own merit and hard work but in fact he really gained the position by stealing some company information and then blackmailing a fellow employee. He owes significant

child support pay to several of his previous girlfriends but believes that the children are getting in the way of his business success.

Psychopathy is a unique psychological syndrome characterized by a pervasive and chronic disturbance in one's ability to relate to others, self, and the general environment. These patterns of interacting are usually at the root of the individual's commonly expressed antisocial behaviors. The psychopathic individual is highly prone to perceive, think, feel, and act in relatively stable way across situations, time frames, and social situations. Although not formally classified in the DSM-IV-TR, psychopathy is similar to other personality disorders because of these characteristics. Psychopathy, like the severe personality disorders, is therefore tremendously hard to treat and presents clinicians with a challenge. Because psychopathy remains one of the few psychological disorders with few to no treatment options, society is left to rely on containment interventions (e.g., incarceration, community supervision) (English, 1998) However, the containment approaches are only relevant if the individual happens to become involved with the criminal justice system (such as in the case of Mr. C.J.). Even then, the individual may not always be held in prison for life, instead being shifted in and out of prisons over his or her lifetime. If the individual is not currently or never has been involved with the criminal justice system, it is not likely that he will receive treatment, such as with the case of M. H.

Although there is no direct age where one can say psychopathy starts, it can best be viewed as a developmental disorder that evolves throughout the lifespan. The disorder can be detected throughout all stages of development from childhood through adolescence into adulthood (Larsson, Andershed & Lichtenstein, 2006; Blair, 2006).

Historically, the term "psychopathy" has been interchanged with "sociopathy" and "antisocial personality." The current clinical term for individuals like C.J. and M.H mentioned above is "psychopath." Psychopathy is considered a clinical syndrome, while individuals with "psychopathic personality traits" are not considered a clinical population.

The impact of psychopathy on today's society is immense, with a large population of criminals who are incarcerated meeting the criteria (Rhodes, 2000). The syndrome appears to act contrary to the process of human evolution; in some cases it may compel one member of the species to kill another member. It continues to disturb and confuse researchers, laypersons, clinicians and the criminal justice system. We as human beings often experience emotions such as guilt, regret, and sympathy. It is therefore difficult to imagine a lifetime spent without such feelings, as we imagine the psychopaths's experience to be. To a psychopath, the lack of these feelings leads to exploitation of others and the resulting behavioral pattern is so ingrained that it has become like breathing.

A study by Porter & Woodworth (2006) looked at the characteristics of violent homicides committed and the way that the perpetrators explained or described their own actions. A significant difference arose between psychopaths and non-psychopaths regarding the likelihood of committing instrumental homicides (e.g., premeditated or planned). Interestingly, when the self reports of the violence were compared, psychopaths described the planning of their homicides to a greater degree than non-psychopaths. However, those diagnosed with psychopathy were also significantly more likely to omit major details of their offense. Studies like the one above, which represent

the criminal justice literature on the subject, illustrate the psychopaths' ability to describe pre-planned violence while simultaneously minimizing the crime with omitted details. Researchers might suggest that the psychopaths' behavior in this study occurred because they were proud of their planning strategies and at the same time interested in self-preservation.

Psychopathy is differentiated from the personality disorders listed in the DSM-IV based on symptoms that are now commonly classified into two major factors, although alternative factor structures, such as the four factor model, have also been presented in the literature (Hare, 2003). The first factor is composed of affective and interpersonally defined traits including a distinct, profound lack of empathy, superficial emotional expression, superficial charm, deceitfulness, glibness, shallow and labile affect, inability to bond with others, lack of guilt, and unusually low levels of anxiety. The second factor is made up of behaviorally defined traits such as impulsivity, sensation seeking, lack of caution and antisocial/criminal activities and lifestyles. The focus of this research study will be on the first factor or the affective component. In particular, the affective component is the most unique part of the disorder. It is what separates psychopathy from the more commonly diagnosed Antisocial Personality Disorder (APD). APD diagnoses are usually made based on antisocial activities and behaviors which do not usually have the affective component.

Background

Two events marked the development of psychopathy research. First, Cleckley clarified what had begun to be discussed in the field and offered a description of symptoms and behaviors that marked a turning point in the understanding of psychopathy. Before his work, a number of approaches were presented without much coalescence in the field. Later, Hare's research, based upon the original ideas of Cleckley, ushered in the development of a means to accurately measure psychopathy for research purposes. After these two events, research with Hare's measure continued as new questions about brain and behavior relationships in psychopathy arose.

Psychopathy Before Cleckley

The subject of psychopathy has been woven in to the fabric of medical and psychological literature beginning significantly in the late part of the 19th century. The earliest writings on the subject focused on case studies and the commonalities between them. Prichard (1835) is credited with publishing the terms "moral insanity" and "moral imbecility" to describe psychopaths. These terms seem to be reflective of the Victorian sense of morality that pervaded society at the time. Psychopathy was addressed as more than a just a moral problem encountered on an individual patient basis and was placed in the context of a societal problem later in this century. In 1877, Teed published an article in *Postgraduate Medicine* that speculated on the differences between insanity and criminality. He also mentioned the dilemma faced by courts on how to properly treat the insane versus the criminal; he termed the latter as having a "willful disregard…of the

fitness of things, with absence of control over the actions." Teed alluded to top-down control of the nervous system in his explanation about the behavior of the insane. According to his writings, they are likely to have what we now know as disinhibition syndromes; he suggested that insanity results from "higher nervous centres" which are "overcome by more powerful excitations arising either reflexively…or by an automatic action of the brain itself…" Thus, the insane person is allowed a legal excuse for his behaviors and is relieved of the blame for his crime, whereas the criminal has no such excuse. Teed's description of criminals, which paralleled later clinical descriptions of psychopathy is rather interesting. He suggested that "lewdness may be chosen for its own sake and the gratification it may yield…so also may dishonesty or cruelty, these are preferred intelligently; and this condition…is depravity, not insanity…courses of action may be followed, regardless of consequences, all teachings of ethics are trampled underfoot…" Teed was correct in his assumptions that there is a distinct difference between insane acts and criminal acts. What he described is what we now know as the difference between an individual who has capacity for intent and understanding of the actions he is undertaking and an individual who does not.

Following Teed's work, Koch (1891) offered a description of patients who are not entirely insane but remain greatly maladjusted in their daily living. Koch was referring to neurotic people, or as they are known today, those suffering from anxiety and depression. His classification of these individuals has usually been rejected by others who attempt to describe a "purer" psychopathy, such as Cleckley (1941), because he included the psychoneurotic conditions in his classification. At the time, anxiety and mood disorders

may have been associated with psychopathy. Today, research has suggested that they are less associated (Lovelace & Gannon, 1999).

At the turn of the century the thrust in the field of psychology was classification of mental disorders. The "moral insanity" described by previous clinicians continued to be classified and re-classified accordingly. In 1904 Meyer suggested that psychopathy did not have components of neuroticism and labeled these individuals as being "constitutionally inferior." He essentially disagreed with the inclusion of psychoneurotic conditions amongst those termed "morally insane."

Birnbaum (1909 in Davidson) contributed the first idea that psychopathy was primarily a defect of emotion, terming the condition "pathological affectivity" and that this entity was separate from criminality per se. Birnbaum was not specific in what this "defect" was and did not clarify whether the primary difficulty was with an absence of emotion or the presence of a maladaptive emotion. One aspect of Birnbaum's definition of psychopathy that others disagreed with was the intellectual inferiority of the psychopath. Most other clinicians of the time period recognized that the psychopath was at average or above average intelligence.

The first individual to coin the term "psychopathic personality" was Kraeplin (1915) who described seven types of psychopathy, such as the excitable or the impulsive. At the time Kraeplin was attempting to classify the cases he knew about and there was marked diversity within his classification system. This diversity in Kraeplin's system hints at the future difficulties of clinicians in pinpointing the hallmark symptoms of psychopathy.

Finally, White (1935) was one of the first people to consider psychopathy in a psychodynamic light and suggested that the root of the problem was a marked immaturity in the psychopath's drives and ego development. This perspective was later developed in the early 1950's when the popularity of psychodynamic therapies was at a peak in the United States.

Cleckley

The Mask of Sanity (Cleckley, 1941) was a seminal work on psychopathy that was written to address the confusion in the psychiatric community concerning the defining characteristics of the disorder. Based on numerous observations from his time spent as a psychiatrist at the University of Georgia, Cleckley's work highlighted several areas. First, he suggested that there was a need to differentiate between what was essential to the construct of psychopathy and what was not. Second, he described nine cases in story format. Cleckley then described the "disorder as a part manifestation" which is similar to the currently defined "non-criminal" psychopath. According to Cleckley, these individuals exist in the world unaffected by either the mental health system or the criminal justice system. As an example, in "The Psychopath as Scientist" he described a physics professor who liked to blame others for his numerous personal and professional problems.

In addition to the case descriptions of both criminal and non-criminal psychopaths, Cleckley explained what he thought the important differences were between psychopathy and a number of other clinical disorders of the time. These included what we currently call psychosis, developmental disability, alcoholism, mood disorder, sexual

deviancy, conduct disorder, malingering, genius, organic brain disease, and ordinary criminal behavior.

From Cleckley's perspective there were many different factors that are present in a psychopath. Cleckley psychopaths, as described in *The Mask of Sanity*, were usually superficially attractive, made strong positive impressions and presented with average to above average intelligence. He indicated that they do not present with psychotic features of any kind, although it is known that many psychopaths in custody of the mental health or criminal justice system may attempt to fake psychosis for personal gain. Consistent with what contemporary psychologists call 'factor one' or 'affective' characteristics, Cleckley reported that psychopaths have no sense of responsibility to others, and when confronted with the effect that their unreliability has on others, they do not usually feel empathy or guilt. He suggested that they lie frequently and fail to see the social stigma attached to lying, instead viewing a lie as a convenient means to gain a desired end. Although they realize that saying common phrases to place blame on themselves such as "I'm sorry" work to assuage others around them, they never truly own their own mistakes and often project blame onto others. Cleckley implied that if one were to question them about why they "blame" themselves, they truly cannot find an answer. They lack a sense of shame. Consistent with what modern psychologists refer to as 'factor two' or 'behavioral' characteristics, Cleckley suggested that psychopaths often commit theft, fraud, or other asocial acts for minor reasons with sometimes no goal; these acts are usually committed at greater risk of being discovered than usual criminals.

Cleckley declared that the goal directed behavior in a psychopath is erratic and illogical, sometimes they will throw away clearly beneficial opportunities and have an

extremely poor ability to learn or profit by experience and absolutely do not react to punishment. They are egocentric, and in object relations terminology are considered to have an incapacity for object love, instead expressing 'pseudo-love' to others to achieve personal gain. Along the same lines, Cleckley described these individuals as having an overall poverty of affect, yet most have a keen ability to fake humor, angst, or passion. They lack insight with no ability to see themselves as others see them or to know how others feel when they see them. They lack ordinary responsiveness to kindness. Cleckley mentioned that psychopaths also are prone to abusing alcohol and their sexual relations lack the "desire to possess or ravish the partner emotionally." Sexual activity is usually casual to them. On the issue of whether or not one is a psychopath from birth, Cleckley was unsure due to his personal observations of a "thorough psychopath" who "was known intimately by the writer himself during years when he showed no traces of abnormal behavior" (255). He suggested that psychopaths have an inability to follow a life plan consistently, while 'partial' psychopaths can maintain fairly consistent and successful outer lives, but his inner life usually maintains purposelessness. From Cleckley's observations, the psychopath may in fact go out of his way to fail in life and rather pursues "social and spiritual self-destruction" (255).

Cleckley acknowledged that the etiology of psychopathy is inherently complex and possibly more baffling to science and medicine that schizophrenia. He described several possibilities for the genesis of psychopathy, including psychoanalytic, behavioral, and psychobiological explanations. His explanation suggested that perhaps a better, more specific term might be used to describe the cluster of symptoms and behaviors that make up psychopathic personality: semantic dementia. He compared this term to semantic

aphasia in which a patient may use words and descriptions in a grammatically correct way that seem to be full of meaning, but in fact the meaning is not apparent to the patient. Similarly, semantic dementia in Cleckley's use of the phrase is used to describe individuals who appear to be gleaning the *emotional* relevance and richness of life but in fact are not. Psychodynamically, semantic dementia is regression from a rich and full life to a level of less developed life, an existence which is marked by repeated social failure and an unconscious working of the death instinct. Failure in psychopathy is actually a necessity in the psychodynamic view, as there is a purpose for it. Additionally, there is a fixation of the libido in an early stage of development resulting in conflict. There is improper development of the id, ego, and superego resulting in an ever deepening pattern of maladjustment.

Behaviorally, Cleckley described this inability to grasp the emotional relevance in life as resulting from an improper conditioning of responses and suggests that both the psychodynamic and behavioral views perhaps merge together, with the former being simpler than the latter. Finally, Cleckley described potential psychobiological viewpoints on the etiology of semantic dementia, or psychopathy referring to the work of Sherrington (1934) and Ingham (1938). He suggested that Sherrington's work on the neurobiology of consciousness, which defined the meaningfulness of life in terms of conscious awareness and the purposive behavior that comes from this awareness, would shed light on the psychobiological factors associated with psychopathy. Sherrington suggested that there are long circuits within the brain which are responsible for a normal stimulus-organism-response process. The longer the neuronal path taken in this chain, the more responses that will be integrated and the more past sensations and perceptions

will be brought into awareness; presumably affect is part of this awareness process. Cleckley suggested that those with the semantic dementia disorder perhaps do not benefit from this chain and that the part of the neuronal pathway that contributes meaning to psychobiological reactions is missing.

Ingham's work (1938) was also mentioned by Cleckley as being an important contribution to the psychobiological account for psychopathy. Ingham suggested that growing pathways of neurons eventually develop into engrams in response to thoughts, feelings, and behavior. In the psychopath, defective nerve networks are built up to a point that even highly intelligent individuals have disordered behavior. More specifically, he reported that in the psychopath, the defective nerve networks are most likely to be found in the diencephalon, which was then known to be the main center for emotional and instinctive drives. Ingham suggested that the ability to learn and profit from experience promotes success of the instinctive impulses (e.g., possibly what is known today as emotional learning or emotional intelligence). These impulses were suggested to evolve into behavior that was adaptive to the environment at hand. However, in psychopathy, this evolution of impulses was impaired. He postulated that it is in the diencephalon where sensations are converted into meaning.

Cleckley suggested that the inability for the nerves in the diencephalon to grow and diversify might have been due to a host of factors such as developmental anomalies, heredity, somatic disease, and improper stimuli in the environment. Interestingly, Cleckley, Ingham and Sherrington were not too far from the common neurobiological theories of today which explain psychopathy in terms of a deficit in emotional functioning (Blair, 2006, Patrick, 1994; Damasio, 1990) reflected in brain structures. Of

course these writers lacked the sufficient laboratory techniques to pinpoint a more precise location or the interaction of multiple brain structures that today has been written about more extensively (Kiehl, 2006). However, their identification of the diencephalon was a good initial guess about which neuroanatomical structures might be malfunctioning in a psychopathic brain.

A criticism of Cleckley could be that he did not speculate enough on the connections between the affective and behavioral symptoms of psychopathy. For instance, his work did not explore whether psychopaths act in such asocial ways because of their lack of empathy. Additionally, Cleckley overemphasized alcoholism in psychopathy. Today alcoholism has little to do with the core features of the modern construct. To his credit, he admitted in his section on treatment of psychopaths that they in fact do not benefit from treatment, and that containment approaches were better solutions.

Overall, Cleckley's most important contribution to the understanding of psychopathy was the organization of research that had been previously published as well as the integration of that research with his clinical observations. His contributions continued to be useful in guiding subsequent research. Importantly, his writings introduced a key debate in the study and understanding of psychopathy: whether it is best understood as a dichotomous or continuous construct. The attention he paid to describing the partial psychopath suggested that today he might endorse psychopathy as a continuous cluster of personality traits. Whether there is value in studying psychopathy from the perspective that the relevant behavioral data come solely from clinical level or total psychopath or come from individuals with partial manifestations of the syndrome as

well is yet to be determined but is one of the foundational questions for this current study. There was a departure in the exploration of the psychobiological characteristics of psychopaths after Cleckley described Sherrington's work. In general, the clinical literature (at this point in time, there was no experimental literature on psychopathy) was paying less attention to psychobiological matters and placing greater emphasis on psychodynamic theories of psychopathy. The popularity of psychoanalysis took hold and the neurophysiological approach to understanding psychopathy was not seriously revisited until the late 1950's with the work of Lykken.

Psychopathy Between Cleckley and Hare

Karpman (1941) approached the problem of psychopathy from a mid-twentieth century psychodynamic viewpoint. Later works by Dawson (1952), Milburn (1954) and Davidson (1956) continued to classify and describe psychopathy from this viewpoint. Dawson (1952) suggested a difference between "aggressive psychopaths" and "passive psychopaths." Milburn (1954) in his address to the Weston State Hospital clinical faculty gave a similar opinion to Dawson's on the important characteristics of psychopathy. He suggested that the primary deficit in psychopathy was emotional, suggesting that the problem lay in a primitive emotional disorganization which overcomes judgment. He suggested that heritable personality characteristics combine with crucial environmental factors (like faulty child-rearing) in order to affect the antisocial functioning of the individual. Again, consistent with the popularity of psychoanalytic theory, Milburn suggested that a possible cause of psychopathy was emotional deprivation in childhood resulting in chronic deficiency in oral values. However, he admitted the need for further research in the areas of psychophysiological functioning in these individuals.

After reviewing the literature available to him, Davidson (1956) suggested that the "central fact" of psychopathy was a core deficit in human affective functioning and described it using the term oligothymia. He suggested that emotions were the motor end of affectivity and that affectivity was projected on the brain. He referenced Papez's emotion circuit comprised of the septohippocampal system (SHC system) including the hippocampus, the mammillary bodies, the anterior thalamic nuclei, and the cingulate gyrus. This SHC loop was responsible for regulating the processing necessary for generating emotional response. Davidson then suggested that there were two types of affectivity within the brain, that which was thalamic and that which was cortical. He implied that thalamic affectivity is intense and activates by way of a trigger resulting in acting out behaviors. In contrast, cortical affectivity according to Davidson was affect that was guided by choice or refusal. The former was thus more primitive than the latter. His view of the core brain dysfunction in psychopathy was that there is a poverty of affect originating somewhere in the cortico-thalamic pathway. This view was supported by his observations of dysfunctional posterior temporal slow wave EEG patterns in psychopaths.

Commensurate with the era, Davidson also explained how these biological problems might manifest in psychodynamic terms. Davidson's writings and observations were a positive contribution to the understanding of psychopathy from a psychobiological perspective and hinted at the plethora of research that was to come on the psychopath's brain. In particular, his research foreshadows Damasio and colleagues' (1994) Somatic Marker Hypothesis, which suggested interplay between emotion and the frontal lobe facilitates emotion-informed decision making and behavior. The psychodynamic

literature, while important to understand, was lacking in empirical support. It consisted mainly of case studies involving psychodynamic constructs based on the interest of the author (e.g., the death instinct). In contrast, the psychobiological approach, first hinted at in Cleckley's writings on Sherrington and Ingham, promised research that was empirically based with variables that were quantifiable. Indeed, empirical research based upon the characteristics of the psychopath as described by Cleckley was the aim of the early psychophysiological research concerning psychopaths.

After Davidson, interest grew in looking at the functioning of a psychopath's emotions by observing physiological processes. Research embedded in the developing emotion deficit theory of psychopathy attempted to first name the physiological phenomena that were common to the disorder and then attempt to explain its causes. From the late 1940's through the early 1970's different techniques for collecting physiological data related to emotional responses arose with such methods as electroencephalography (EEG) and galvanic skin response (GSR). Some examples of the earliest research from this period had mixed results. For example, Linder (1942) compared a group of mixed primary and secondary (neurotic) psychopaths with a group of non-psychopathic criminal controls measuring skin resistance, heart rate, and respiration rate and found no significant difference between groups either at rest or during a simple conditioning task where tones were paired with shocks. Ruilmann & Gulo (1950) had a similar design with the same types of subject groups. They induced anxiety through having subjects perform arithmetic problems. Their results were similar to Linder's; however, in their study the mixed psychopathic group showed less galvanic skin response. In subsequent years, results of studies investigating the physiological

responses of primary and secondary psychopaths to a variety of stimuli continued to be inconsistent (Tong, 1959; Fox and Lippert, 1963; Schachter & Latane, 1964; Goldstein, 1965; Lippert & Senter, 1966).

Lykken (1955) was the first to distinguish between Cleckley's concepts of primary and secondary (neurotic) psychopathy in an experimental design. He used an empirically validated measure of psychopathy for classification of subjects in an experiment with physiological variables. His measure of psychopathy was the Psychopathic Deviate (Pd) scale on the Minnesota Multiphasic Personality Inventory (MMPI). In all, he studied three groups and found that when compared with controls, primary and secondary psychopaths scored higher on the Pd scale. Primary psychopaths showed significantly less anxiety as measured by self-report questionnaire, less GSR reactivity to the aversive stimulus, and less avoidance of a punished response on a test of avoidance learning than the control group. In contrast, neurotic psychopaths scored significantly higher than either controls or primary psychopaths on the measures of self-reported anxiety. However, the classification of psychopathy in this study was based upon a self-report instrument that is susceptible to manipulation and false portrayals by the subjects who take it; both of these behaviors have been described clinically in the literature as being inherent in psychopaths.

Hare and the Beginning of the Modern Era

In 1965, Robert Hare began a prolific research career which continues today. His early work looked at the temporal gradient of fear arousal in psychopaths. He recorded skin conductance from psychopathic, non-psychopathic and noncriminal controls. The study was based on observations that the behavior of the psychopath appeared to be

guided more by immediate events than those which might happen in the future. Hare assumed that as the temporal remoteness of anticipated punishment increased, the amount of fear elicited by punishment cues would be likely to decrease. Hare hypothesized that the rate of decrease would likely be greater for psychopathic than for non-psychopathic individuals and that the psychopath would be less likely to inhibit responses for which anticipated punishment is far off into the future. Hare (1965a) had previously found that skin conductance increased to an anticipated electric shock, calibrated to a level at which the subject 'indicated that he was unwilling to accept anything stronger,' were found to be related to scores on the Psychopathic Deviate (PD) scale of the MMPI. As the application of the shock stimulus became imminent, subjects began to react later and more slowly; however, this change varied with PD scores. Individuals with higher PD scores slowed to a lesser degree than those with low PD scores.

Hare's results indicated that the mean resting skin conductance of the psychopathic group was significantly lower than the other groups. Additionally, during subsequent trials the increase in conductance during the period just prior to shock (stimuli 4-7) was significantly smaller for the psychopathic group than for the other two groups. Hare admitted that although the overall shock effects were smaller for psychopathic individuals when compared to non-psychopathic individuals, they were not significantly different when compared to the noncriminal control group. This suggested limited support for the hypothesis that psychopaths are less responsive to noxious stimulation than normal controls at that time. He presumed that cues associated with future punishment were incapable of generating sufficient fear in the psychopath for immediate behaviors to be inhibited.

In 1976, House and Milligan studied autonomic responses to modeled distress in prison psychopaths using the MMPI's PD scale as the psychopathy measure. They also subdivided the group based on high and low Welsh Anxiety Scale (WAS) scores. During the experiment, participants observed mild or severe distress to someone receiving an electric shock while heart rate and skin conductance were measured. Results indicated that low-Pd subjects were more autonomically responsive (e.g., slowed heart rate, increased skin conductance) over the 15 trials than high Pd subjects. Also, higher self-reported anxiety as measured by the WAS was associated with increased autonomic responsiveness in low-PD subjects. Interestingly, there was no effect for mild versus severe distress.

In contrast to Hare (1965) and House and Milligan (1976), Mawson & Mawson (1977) argued against the idea that a central characteristic of the psychopath was low arousal. In their review of the literature, they formed the opinion that psychopaths actually displayed a faster rate and greater magnitude of change in behavioral and physiological activity than non-psychopaths. They suggested that the variability in the psychopaths' arousal levels might be the result of variations in neurotransmitter functioning. Although isolated experiments may have independently suggested that the key variable in psychopathy was low arousal, it appeared that there might be more to the picture and that this issue would be more complex than originally anticipated.

Advances in emotion theory also characterized the late 1970's with the publication of Dickinson and Dearing's theory (1979). It renamed the two opponent motivational systems previously mentioned by Konorski (1967) as 'aversive' and 'attractive,' each activated by different unconditioned stimuli. This raised the possibility

of differences in the psychopath's behavior that could be accounted for by their differential reactions to aversive and attractive stimuli. Furthermore, this research raised the question of the relationship between motivated emotion and the psychopath's behavior. Lang's group developed of a theory of motivated emotion (Lang, Bradley & Cuthbert, 1990) based upon Konorski (1967) and Dickinson and Dearing (1979) that later became relevant to research with the emotional characteristics of psychopaths (Patrick, 1994). This theory will be addressed following the discussion of the second important development in psychopath classification, Hare's Psychopathy Checklist.

The psychophysiological research in the post-Cleckley period was interesting but as a whole, the results were mixed, inconclusive, or inconsistent. Hare reported that at the time, there was inconsistency in findings of autonomic functioning in psychopathy (e.g., findings that indicate autonomic hyperresponsivity, hyporesponsivity, and normal responsivity to a variety of neutral and stressful stimuli). He suggested that methodological differences between studies or differing criteria for selecting psychopathic subjects might have been to blame for the inconsistent findings. He reminded his readers that previous literature suggested individuals diagnosed as psychopathic might be divided into two groups: primary and secondary psychopathy (Karpman, 1961; Arieti, 1963). Mawson and Mawson (1977) suggested the psychopaths might not have low arousal at all. Thus, the construct of psychopathy, as originally suggested by Cleckley, began to appear more complex than could be assumed at first glance. Hare was correct in his opinions on the early psychophysiological research and was naturally inclined to create a more accurate way to define psychopathy. A benefit for

research purposes would be an increased level of construct validity to future experiments and the ability to generalize results on a larger scale.

At the close of the 1970's, the need for diagnostic accuracy was impressed upon the mental health community in part due to pressure from the court systems. If psychopaths could not be effectively treated in mental hospitals and were a unique problem in jails, it was necessary for clinicians to identify them accurately and consistently. This accurate identification was also necessary for the advancement of quality research. Hare (1968) had previously suggested that the primary psychopath was known as the classical or true psychopath analogous to the clinical description of Cleckley (1941). The primary psychopath was usually free of anxiety and guilt. The secondary psychopath, in contrast was also known as the neurotic or pseudopsychopath and was known to act-out in an antisocial manner with identifiable "neurotic motivations" which probably translated into some sort of emotional quality inherent in the actions of the secondary psychopath that would not likely be observed in the primary psychopath.

Hare's development of an assessment system based on the factors of psychopathy originally put forth by Cleckley is known as the Psychopathy Checklist (PCL,1980) and more recently, the Psychopathy Checklist-Revised (PCL-R; Hare, 1991, 2003). Offshoots of this measure have included a screening version (PCL-SV, Hart, Cox & Hare, 1999) and a youth version designed to classify the unique characteristics of children and adolescents with psychopathic traits (PCL-YV, Hare, Forth & Kosson, 1994). The PCL-R is set up as an interview. The content of the interview covers Cleckley's original constructs for psychopathy with some modifications. For example,

whereas Cleckley suggested partial psychopathy, Hare's system classifies the individual into two categories, psychopathic or not psychopathic. The system also allows for clinician input, such as determining levels of superficial charm based upon the impressions of the interviewer. The PCL-R's scoring mechanism places a cutoff score of 30 for the American version. Individuals scoring 30 or above are classified as psychopaths. Hare's construct, like Cleckley's, takes into account behaviors as well as the unique affective-interpersonal markers of psychopathy. Results of factor analyses suggest evidence for two separate factors. Factor 1 accounts for the affective-interpersonal dimension and Factor 2 accounts for the behavioral manifestations. The development of the PCL-R has been recognized as one of the more important achievements in research and clinical practice, on par with Cleckley's original publication of the *Mask of Sanity*.

Psychopathy and the Theory of Motivated Emotion

As previously mentioned, Lang's group developed of a theory of motivated emotion (Lang, Bradley & Cuthbert, 1990) that later became relevant to research with the emotional characteristics of psychopaths (Patrick, 1994) and suggested that emotions disposed the organism to either approach or avoid things in the environment. In the early 1980's, research involved in the analysis and interpretation of event related potentials (ERPs) shed some limited clarity on the characteristics of motivational behavior in psychopaths. ERP research began as a computer analogy of the human information processing system. ERP activity is commonly known as a manifestation of brain activities that occur in preparation for or in response to discrete events that can be internal or external to the subject (Fabiani, Gratton & Coles, 2000). ERP research allows

for an alternate view of the stimulus-response processes that characterized the early psychophysiological research on arousal.

Raine (1989) suggested that three main themes could be gathered together concerning psychopathy and ERPs. First, evoked potential (EP) studies suggested a dysfunctional arousal system at a parietal cortex/brainstem level in individuals with psychopathy. Second, studies which looked at mid-latency EPs indicated that psychopaths showed larger visual EP amplitudes at high intensity levels which might be indicative of cortical augmenting. Third, when looking at the P3 wave in psychopaths, Raine suggested that it was usually enhanced to task-relevant events. Raine's view was that the enhanced P3 was indicative of enhanced attention. Based upon these three themes, Raine (1989) suggested that psychopathy was likely to be understood according to both a sensation-seeking model as well as an information processing model based upon P3 enhancement evidence. In other words, Raine suggested that psychopaths could have abnormally large amounts of sensation seeking behavior. This finding partially fits in with the theory of motivated emotion because it suggests psychopaths might have more motivation to engage in events in their environment. However, it is limited in that the information learned from the ERP evidence could not be more specific. For example, it could not be made clear from Raine's results whether psychopaths were apt to be motivated to engage due to an excess or lack of emotional experience.

Jutai and Howard (1989) suggested that the idea of P3 enhancement being indicative of enhanced attention processing in psychopaths was only partially correct. They proposed an extended cortical immaturity hypothesis. Whereas Raine focused on a tripartite division of evoked potentials (early, middle, late), Jutai and Howard suggested

that psychopathy was better described as a cluster of chronic socially-deviant behavior reflecting a maturational deficit. According to Jutai and Howard, psychopathy was a deviation of personality that reflected deficits in cognitive appraisal processes rather than a simple stimulus seeking orientation. In other words, psychopaths are not just aroused to seek stimulation in the environment; they are aroused and have a different way of interpreting the arousal which alters their perceived emotional experience. This approach, they suggested, better encompassed the pathological sensation-seeking aspect of psychopathy as well as accounted for the lack of moral reasoning and characteristic style a psychopathic individual has with coping in interpersonal situations.

Jutai and Howard's view of psychopathy was more comprehensive. Importance was placed not on a single aspect of cognitive functioning (e.g., attention) but rather on the understanding of the interaction of behavior and cognitive appraisal processes. As such, future studies would need to be based on a more comprehensive theory that included cognitive and emotional functioning based upon brain mechanisms. The theory of motivated emotion developed by Lang and colleagues (Lang et al., 1990) attempted to accomplish this through clarifying where the emotional deficit was located.

Patrick (1994) explained the disagreement in the psychopath arousal literature of the 1960's and 1970's when he suggested that arousal was not a good index of fear. He based this opinion on prior research concerned with lie detection in psychopaths (Patrick & Iacono, 1989). Instead, it was argued that an alternate physiological mechanism more reliably represented emotional state. The fear circuit was a mechanism within the broader context of specific pathways in the brain. Patrick suggested that further

understanding of the fear circuit had the potential to expand, clarify, and augment the information gained from the ERP research.

In brief, the fear circuit is a neural network that includes connections to the brain's motivational systems. Lang, Davis & Ohman (2000) suggested that this circuit had been created early in the evolutionary history of humans. The pathways connect primitive cortex, sub-cortex and mid-brain. Their purpose is suggested to be the mediation of behaviors basic to survival. They are activated by unconditioned aversive and appetitive stimuli in the environment and determine the mobilization of the organism, reflexes, and approach/withdrawal behavior. The most essential component of the fear circuit is the amygdala, which receives sensory information through the lateral and basolateral nuclei. Following reception of stimuli, neuronal signals project to the central nucleus of the amygdala and from there project to the hypothalamus, central gray, and brainstem (Davis, 1992). Once stimulated, these pathways may lead to various fight or flight behaviors, such as freezing or fleeing. Fear, according to Lang et al (2000) is a preparatory state evoked by threat cues where the individual is mobilized and primed to respond but not yet active. When a sudden stimulus is presented to an individual in this state, an exaggerated startle reflex occurs.

The fear potentiated startle reflex was first described by Brown, Kalish, & Farber in 1951. The primary acoustic startle pathway is described by Lang and colleagues (2000) as beginning when soundwaves stimulate spiral ganglion cells in the cochlea, which send signals to cochlear root neurons. These signals are then spread to the inferior colliculus, passing through a synapse at the nucleus of the lateral lemniscus and terminating at the nucleus reticularis pontis caudalis. At this point, signals project to

motor neurons in the facial motor nucleus in the spinal cord. It is generally suggested that the lateral nucleus of the amygdala provides a link for relaying auditory information involved in fear conditioning to the amygdala (LeDoux, Cicchetti, Xagoraris & Romanski, 1990).

Patrick (1994) found that psychopaths do not show normal enhancement of the startle reflex during exposure to negative or aversive stimuli. These data indicated that psychopathy was more closely associated with a deficit in fear rather than change in arousal.

The startle probe was recommended by Patrick as an accurate way to verify processing of fearful stimuli in psychopaths. Patrick observed a significant quadratic pattern in which reflexes during both pleasant and unpleasant stimulation were diminished when compared with neutral stimuli. Of particular interest to psychopathy researchers at the time was the marked deficiency of reactions during the presentation of fearful stimuli. Post-hoc analyses of the data indicated that the deviant startle patterns between "mixed" psychopaths, or those with "moderately high" psychopathy (e.g., Cleckley's partial psychopath, or secondary psychopath) and factor one primary psychopaths were due to variations in emotional detachment (e.g., lack of empathy).

Following Patrick, more literature offered support for the fear deficit hypothesis. Evidence for amygdala dysfunction in psychopathic individuals was found in functional imaging studies (Kiehl, Smith, Hare, Mendrek, Forster, et al., 2001) and aversive conditioning tasks (Veit, Flor, Erb, Hermann, Lotze, et al., 2002). Lesions of the amygdala in normals was associated with impaired aversive conditioning (LaBar, LeDoux, Spencer, & Phelps, 1995) passive avoidance learning (Ambrogi-Lorenzini,

Baldi, Bucherelli, Sacchetti, & Tassoni, 1999), augmentation of the startle reflex by visual threat primes (Angrilli, Mauri, Palomba, Flor, Birbaumer, et al., 1996) and fearful expression recognition (Blair, 2003a). Similarly, individuals with psychopathy showed impairment in recognition of fearful expressions (Blair, Colledge, Murray & Mitchell, 2001), aversive conditioning (Flor, Birbaumer, Herman, Zeigler, & Patrick, 2002), passive avoidance learning (Newman & Kosson, 1986), and augmentation of the startle reflex by visual threat primes (Levenston, Patrick, Bradley & Lang, 2000).

The evidence for an atypical fear response in psychopaths is compelling and the research is thorough. However, as Howard suggested (1989), the collection of chronically deviant behaviors that psychopaths engage in is also likely to be influenced by an atypical higher-order cognitive process. Although the theories are not currently viable, both Ingham (1938) and Davidson (1956) had suggested psychopathic behavior might be the result of atypical processing in the higher cortical centers. Ingham commented on the connections between the brain's executive and emotional centers when he suggested that the human ability to learn and profit from experience promoted success of the instinctive impulses. Davidson suggested that the core brain dysfunction in psychopathy was a poverty of affect originating somewhere in the cortico-thalamic pathway. Perhaps the most thorough explanation for psychopathic behavior would arise from considering both an individual's processing of fearful stimuli in their environment as well as the extent to which their behaviors are moderated by frontal controls.

Psychopathy and the Somatic Marker Hypothesis

Toward the beginning of the 1990's, neurobiological research began to focus on comparisons between the behaviors of psychopathic individuals and behaviors of those

with frontal lobe damage. A classic example of behavioral change due to this type of injury was Phineas Gage, a railroad worker whose accident resulted in a traumatic brain injury severing the pathways between the orbitofrontal cortex and limbic circuits (Harlow, 1848). The resulting disinhibition syndrome was observed in many other patients with damage to their frontal lobes and has been given the name "frontal lobe syndrome." According to Mesulam (2002), prefrontal lesion patients can exhibit a remarkable diversity but present in two generally recognized subtypes, a frontal abulic syndrome and frontal disinhibition syndrome. Of interest to research in psychopathy were the similarities between psychopathy and frontal disinhibition. The anterior part of the superior temporal gyrus is connected to the frontal lobes (Petrides & Pandya, 2002). Disruptions in this pathway might contribute to the emotional abnormalities inherent in psychopathy. It extends rostrally from the anterior superior temporal gyrus running as part of the uncinate fasiculus and terminates in the orbitofrontal cortex. This pathway is thought to be important in normal regulation of emotional responses to stimuli in the environment, especially auditory stimuli. Emotional stimuli are relevant to this pathway because of direct limbic-medial frontal connections to the amygdala (Aggleton, 1992).

Damasio, Tranel, & Damasio (1990) observed that damage to the ventromedial frontal corticies in adults with previously normal personalities resulted in defects in decision-making and planning that were revealed in abnormal social conduct. They proposed that the defect was due to an inability to activate somatic (e.g., "feeling") states linked to punishment and reward. They proposed that in normal individuals, these states are experienced in association with specific social situations and are activated in connection with anticipated outcomes of response options. They developed a theory

known as the Somatic Marker Hypothesis (SMH), which states that emotions and feelings have specific, consistent effects upon executive decision making (Bechara, Damasio, & Damasio, 2000). This theory offered one explanation for the altered personalities and the "acquired sociopathy" of those suffering from ventromedial prefrontal lesions.

Damasio's group reported that it was possible that the failure to reactivate these somatic markers would likely deprive the individual of an autonomic 'device' that would signal the ultimately negative consequences that would likely bring immediate reward. They proposed that whereas correct activation of these somatic markers would force attention to future negative consequences, in individuals with ventromedial frontal damage, autonomic responses to socially meaningful stimuli were abnormal, suggesting non-activation or incorrect activation of the somatic markers. The original observations made by Cleckley suggested that psychopaths had similar deficits: erratic goal directed behavior and a poor ability to learn or profit by experience. He also contended that psychopaths did not react to punishment. As such, Damasio's group suspected that the deficits observed in psychopaths might have similar neurological origins to their ventromedial patients.

Lösel & Schmucker (2004) tested the Somatic Marker Hypothesis (SMH) with individuals who were determined to be psychopaths after being administered the PCL-R (Hare, 1991). They reasoned that since the SMH suggested individuals act according to emotional markers acquired at a very young age, the markers function automatically. They further suggested that this would allow the individual using them to make quick decisions based upon a subjective feeling. The standard method to measure the Somatic

Marker Hypothesis in the laboratory is through the Iowa Gambling Task (IGT). The task was formulated to simulate real life decision making under conditions where the individual theoretically feels varying levels of risk. Dysfunctions in the emotional markers lead to poor results on the gambling task and increased risky decision making. (Bechara, Damasio, Tranel and Anderson, 1994) Their objectives were to test the relation between psychopathy and risk taking in the gambling task, to determine how individual differences in attention might moderate the relationship between success in the gambling task and psychopathy, and to determine whether these hypotheses could be generalized to everyday punishment learning. They measured IGT performance to test the SMH, and had the subjects perform a visual discrimination/ cancellation task as a measure of sustained attention (Brickenkamp & Zillmer, 1998). The sample was dichotomized according to attention performance using a median split. Participants scoring above the median score on the attention task were referred to as attentive and the others were considered inattentive. Statistically, the attentive subjects did not differ from their inattentive subjects on PCL-R total or factor scores. What Lösel and Schmucker found was attention capacity as measured by the performance on the visual discrimination task moderated the performance of the psychopathic group. One group of psychopathic participants had significantly poorer attention performance as well as deficits in the gambling task as measured by significantly increased numbers of risky choices. A second group of psychopaths had significantly less risky choices and significantly better attention functioning. In the group of non-psychopathic participants attention had no significant impact on gambling task performance. The authors suggested that it was possible that highly attentive psychopaths may have been able to

compensate for any ventromedial functional deficits because they were able to focus more closely on the task. These findings suggest evidence for individual differences between individuals within the psychopath category. Evidence for individual differences suggests that alternative ways to describe psychopathy that move beyond the discrete categories could be useful.

Van Honk, Hermans, Putman, Montagne et al. (2002) tested the relationship between psychopathic personality and the SMH among subjects scoring in the low and high distribution tails of a measure of psychopathic behavioral characteristics in a rather large sample (n = 525). They used Carver and White's (1994) self-report measure to distinguish between high and low psychopathy. The measure was based upon Gray's theory of the Behavioral Activation System (BAS) and Behavioral Inhibition System (BIS) (Gray, 1991). Briefly, Gray proposed that the BAS is a positive feedback system associated with reward and guides the organism toward its goal for survival, thus the animal orients itself toward a stimulus. In contrast, the BIS is a system that is activated by aversive stimuli that eventually causes a termination of the ongoing behavior, an increase in arousal, and an increase in attention. The mechanism, according to Gray, involves a comparator system within the septohippocampal area which he believed could continually predict the next likely event and compare the prediction to the actual event. If a mismatch was detected, the BIS would terminate the behavior. The 'parameter value' hypothesis stated that the operating characteristics of the BIS and BAS determine patterns of emotion which influences behavior in each individual. Gray added another basic assumption about the major dimensions in personality: personalities vary in the individual as a result of each individual's unique emotional system activity. The

BIS/BAS motivational systems both serve to increase general arousal and are reciprocally related such that activation of one inhibits the activation of the other. Lykken (1995) suggested that primary psychopathy was associated with an average BAS and a hyporeactive BIS while secondary psychopathy was associated with a hyperreactive BAS and an average BIS.

In Van Honk et al (2002) subjects with extremely high levels of behavioral activation and extremely low levels of behavioral inhibition were suggested to be more psychopathic, whereas subjects with extremely high levels of behavioral inhibition and extremely low levels of behavioral activation were suggested to be less psychopathic. The low psychopathic subject group showed intact punishment learning. The researchers suggested that somatic markers likely guided these subjects' decisions during the Iowa Gambling Task. The high psychopathic group did not show punishment learning, similar to the behavior of orbitofrontal patients.

The above studies with the Iowa Gambling Task suggested that clinical level psychopaths differentiated by the PCL-R as well as individuals with certain subclinical psychopathic personality traits (behavioral activation, or tendency to be fearless) both performed poorly on the Iowa Gambling Task, implying that they may have deficient somatic markers. At this time, there has been no research published concerning other measures of subclinical psychopathy, which would add further credibility to the conclusions drawn from Van Honk's group.

Dimensional and Categorical Viewpoints

The study by Lösel and Schmucker is an example of experimental research that views psychopathy from a purely categorical perspective. Using the PCL-R, they

determined that each subject would either represent psychopathy or would not. In contrast, Van Honk and colleagues used a more dimensional perspective. While still using groups, their study acknowledged that subclinical psychopathic traits could exist on a continuum. Alongside the already vast body of experimental literature that continued to accumulate throughout the 1990's and 2000's, a new post-PCL-R branch of thought was forming that concerned itself with how to best classify psychopaths. As previously discussed, the debate concerning whether to view psychopathy as a continuous (dimensional) or dichotomous (taxonic) construct was begun by Cleckley in his work *The Mask of Sanity*. He described psychopathy as complex and varied. As early psychophysiological research confirmed, it would be difficult to pinpoint one criterion that would assure an accurate classification. Post-development of the PCL-R, the taxonic/dimensional debate continued (Harris, Rice & Quinsey, 1994). Currently, the PCL-R operates on the premise that psychopathy is a taxonic construct. This means that one is categorized as either a psychopath or a non-psychopath based on a cutoff score. Since a clinical diagnosis of psychopathy based on the PCL-R can either be or not be based on a cutoff score, the question arises as to the difference between for example, a score of 29 and a score of 10. If psychopathy is dimensional, differing levels of psychopathic traits could be hypothesized to exist in a random sample of individuals from an ordinary community. The so called "non-criminal" psychopath has been the subject of research from various angles: genetic, personality, cognitive and emotional research has been conducted based on the principle of dimensionality in psychopathy. Typically when one is referring to a non-criminal psychopath, one describes an individual "with psychopathic traits." Returning to Cleckley's "partial psychopath," one begins to wonder

if there is utility in also studying psychopathy among the undiagnosed. In fact, various community measures have been developed to trace such traits. The extent to which the neurological and behavioral traits of clinical psychopaths and individuals with sub-clinical levels of psychopathic personality traits are similar or different has not been fully determined, and will be addressed in the current experiment.

Although PCL-R defined psychopathy is the gold standard in the field today, a subset of psychopathy research has turned in a new direction (e.g., Edens, Marcus, Lilienfeld & Poythress, 2006) looking at the traits of a psychopathic personality within community samples of non-incarcerated adults and children. Several studies using both the PCL-R (Hare, 1991) and the PCL-YV (Forth, Kosson & Hare, 2003) have shown that adolescent offenders with psychopathic traits differ from other antisocial youth in that they commit more violent acts both in the community and while institutionalized (Vincent, Vitacco, Grisso & Corrado, 2003; Kosson, Cyterski, Steuerwald, Neumann & Walter-Matthews, 2002; Brandt, Kennedy, Patrick & Curtain, 1997). Interestingly, Frick & Hare (2001) developed a screening measure for the presence of psychopathic traits called the Antisocial Process Screening Device (ASPD). Studies utilizing this measure indicate that a subgroup of antisocial adolescents exists with a more aggressive and severe pattern of behavior problems when compared to other children with general conduct problems (Enebrink, Andershed & Långström, 2005; Caputo, Frick & Brodsky, 1999).

It is assumed that learning about the development, interaction, variation, and unique characteristics of psychopathic traits may continue to reveal insights into treatment options for individuals with psychopathy. Widom (1977) is arguably the first

researcher to study psychopathy in community samples. He used Robins' (1966) criteria for sociopathy to measure psychopathic traits in a sample of 28 participants from the community and found the sample showed characteristics such as heavy alcohol use, substance abuse, and persistent criminal behavior. Noticeably absent from these findings are any sort of personality traits that tie in to the affective component of Hare's Factor 1.

Harris, Rice & Quinsey (1994) addressed the debate on whether the construct of psychopathy was taxonic or dimensional. They conducted a taxometric analysis to the scores of prisoners on the PCL. Their findings suggested that antisocial behaviors (e.g., stealing, fire setting in childhood, harming animals) originated from a latent taxon whereas the core features of the psychopathic personality (e.g., remorseless, cold, lack of empathy) originated from a latent dimension. Marcus, Edens, & Lilienfeld (2004) showed no confirmation that either Factor 1 or Factor 2 psychopathy was taxonic. Widiger (2001) suggested that taxometric analysis itself did not take into account the varying behavior patterns, beliefs or cognition within a taxon that could be better understood as variations along an underlying dimension. The proponents of the dimensional view hoped to build upon and expand Hare's classification system.

Edens, Marcus, Lilienfeld & Poythress (2006) further addressed the debate in their paper, which examined the latent structure of psychopathy using taxometric procedures developed by Meel & Yonce (1994, 1996). The results offered no support for psychopathy as a taxonic construct. In a study conducted by DeMatteo, Heilbrun & Marczyk (2006) the construct of psychopathy was investigated using the PCL-R in a general population sample. The rationale behind this study was the authors' perspective that there was not much research examining psychopathy among community samples and

that what was known about psychopaths who have avoided interactions with the criminal justice system is very little. They argued that empirical evidence for the "psychopaths among us" had been lacking. Also argued was that studying psychopathy in younger populations was often fruitless because the incidence of the traits is expected to be low. Participants in DeMatteo and colleagues' study were recruited in such a way as to increase the chances of gathering a sample with moderate psychopathic personality traits. The researchers developed an advertisement that used the characteristics of psychopathy in a non-pejorative manner. Subjects exhibited the personality features of psychopathy (Factor 1) to a greater extent than the behavioral features (Factor 2). A moderate percentage of the sample (40%) reported no history of involvement with the criminal justice system, yet these participants exhibited moderately elevated PCL-R scores. The results of this study suggest evidence for psychopathy as a continuous construct. Also suggested was that psychopathic personality traits could be present within a group of individuals without involvement in the criminal justice system. As can be seen by this exploratory study, an increase in research on the characteristics and classification of subclinical psychopathy would perhaps clarify the boundaries between criminal and non-criminal orientations. The subsequent development of the Psychopathic Personality Inventory (PPI) by Lilienfeld resulted from this research on the dimensionality of the construct. The PPI was a self-report measure that is useful in studying the factor one contributions to psychopathic personality in community samples.

The interest in studying psychopathy in the community has yielded some interesting findings regarding the prevalence of traits. It has been proposed that to a large extent, successful psychopaths are the ones who do not get caught by law enforcement,

the ones who evade detection, and the ones who generally fool society into believing that they are productive members when in fact they are actually profiting and gaining on others' losses. The emotional disability that is the hallmark of the psychopath is less likely to require incarceration for these individuals. Like other personality patterns both maladaptive and adaptive, it has been proposed that psychopathic personality might have developmental trajectory.

The literature has laid an ample foundation for those who venture into psychopathy research today. It began with the observations of physicians more than a century ago. These physicians, through communications in the literature, began to see that there were many similarities within the group known as the "morally insane." Next, a volume was produced on the subject (Cleckley, 1941) that illustrated in depth what a psychopath was and called for a new classification scheme. Soon after, researchers became intrigued by the physiological differences observed when a psychopathic individual was placed in an "emotional" situation. Psychopathy research evolved alongside various theories of the psychophysiology of emotion such as the aversive and appetitive theory of Dickenson & Dearing (1979). Robert Hare, in his early years (1968) called for a distinction of psychopathy in terms of the primary and secondary psychopath. He did this after observing inconsistent methodology in the prior studies on the autonomic functioning of psychopaths. Later, the shift moved toward studying autonomic functioning within social contexts, most commonly in situations of aggression. With the advent of newer equipment to study the brain, experimental research with psychopaths broadened to include measuring event-related brain potentials in relationship to specific experimental events, shedding light on attention and cognition. Difficulties in

attention functioning were debated in the literature, highlighting the first time a cognitive function without emotion was studied in psychopathy.

Alongside the development of more sophisticated measures for looking at both the brain and other physiological measures relevant to psychopathy, Hare was developing the PCL and later the PCL-R. The development of this measure lent some consistency to classification of psychopaths for research and clinical purposes. Working with neurological patients, Damasio and colleagues observed similarities in behavior between those with injuries in the frontal lobe and psychopaths. Imaging techniques such as fMRI and PET were being developed at this time ushering a whole new era in brain research for psychopathy. Damasio proposed the Somatic Marker Hypothesis (SMH) in relationship to psychopathy originally termed "acquired sociopathy." Patrick's work (1994) offered evidence for psychopathy as a dysfunction in the fear system. His series of experiments embedded the abnormal physiological findings of the psychopath (e.g., reduced startle in negative picture conditions) within a neural network theory of emotion which relied heavily on the proper functioning of the amygdala to augment the production of a properly augmented startle reflex. After this research, others had gone on to report that psychopathy was not just a disorder of the fear emotion, but potentially a disorder involving multiple frontal-limbic connections (Kiehl, 2006). While this explosion of brain research in the psychopath was occurring, separate research fields have looked at the development of psychopathy as well as new ways to measure psychopathic traits within community samples on the premise that psychopathy is a dimensional rather than taxonic construct. Presumably, the ability to measure psychopathy in community samples will allow a wider variety of methods to be used and a wider variety of

investigators access to subjects. Additionally, future longitudinal studies on the development of psychopathy would more easily be addressed through community sample research. As might be concluded from this discussion, the extent to which the neurological and behavioral characteristics of clinical psychopaths and individuals with sub-clinical psychopathic traits are similar or different requires further clarification.

Specific Aims

In this study, the aim was to investigate both cognitive and psychophysiological outcomes in a sample with variations in sub-clinical psychopathic personality traits as measured by the Psychopathic Personality Inventory-Revised. While clinically defined psychopaths require a certain score on the PCL-R, individuals have been found to have psychopathic personality traits at a sub-clinical level (Patrick, Poythress, Benning, Edens & Lilienfeld, 2006; Lilienfeld & Benning, 2006; Benning, Patrick, Salekin & Leistico, 2005; Gordon, Baird & End, 2004; Benning, Patrick, Hicks, Blonigen & Krueger, 2003; Skeem, Poythress, Edens, Lilienfeld & Cade, 2002; Lilienfeld, 1998; Edens & Lilienfeld, 1998). These traits have so far been identified through reliable and valid measures such as the Psychopathic Personality Inventory (Lilienfeld & Andrews, 1996) and more recently the Psychopathic Personality Inventory-Revised (PPI-R, Lilienfeld & Widows, 2005). The PPI and PPI-R have been used to refine the construct of psychopathy for research (Lilienfeld, 1998, Patrick, Edens, Poythress, Lilienfeld & Benning, 2006), clinical (Patrick, Hicks, Blonigen & Krueger, 2003) and risk assessment purposes (Skeem, Poythress, Edens, Lilienfeld & Cade, 2003). The theory behind the PPI suggests that psychopathic traits can fall on a continuum (Benning, Patrick, Salekin & Leistico, 2005) and may be maladaptive, independent from the syndrome. The research using the

PPI-R is based upon the assumption that as the understanding of psychopathic personality traits in the normal population increases, the likelihood of further understanding clinical psychopathy will increase.

The previous discussion has covered two main areas concerning clinical psychopathy (and to a limited extent sub-clinical psychopathy). First, research has been dedicated to establishing who psychopaths are and who they are not (Hare, 1991, 1993, 2006; Patrick et al, 2006; Lilienfeld & Benning, 2006; Benning et al, 2005). This research has improved our classification of these individuals through observations of their behaviors in the environment. Second, extensive research has been dedicated to clarifying what makes these individuals do what they do (Patrick, 1994; LaPierre, Braun & Hodgins, 1995; Laakso, Vaurio, Koivisto et al., 2001; Miller & Rosenfeld, 2003; Benning, Patrick & Iacono, 2005; Larsson, Andershed & Lichtenstein, 2006 and Kiehl, 2006). This research body collectively attempts to explain the physical basis for the traits.

The specific aims for this project were to investigate the behavior of individuals with varying levels of psychopathic personality traits. The specific behaviors investigated were twofold: 1) The physiological reactions of these individuals in an emotion-modulated startle reflex experiment and 2) their usage of somatic markers to guide decision making behavior. It was expected that individuals who self-report higher degrees of psychopathic personality patterns would differentiate themselves based upon these tasks.

Research Questions

Based on the current body of research in psychopathy, the following research questions concerning individuals who have psychopathic personality traits were explored: First, it was of interest to verify Patrick's fear deficit hypothesis with a community sample of individuals with psychopathic personality traits. Specifically, the effect of different types of images designed to evoke various emotions on startle response magnitude was investigated. Positive, neutral, and threatening images, and images of humans in distress were used in order to verify previous findings: individuals with higher levels of psychopathic personality traits tended to have lower average startle response magnitudes when experiencing distressing, negative emotions rather than fear-based emotions (Blair, Jones, Clark & Smith, 1997). Second, it was of interest to explore the relationship between psychopathic personality and an individual's use or non-use of somatic markers to guide risky decision making behavior. Specifically, the individual's performance on the Iowa Gambling Task (IGT) was used. The literature has suggested that higher levels of psychopathic personality associated with reduced performance on the IGT, implying that these individuals have reduced capacity to utilize somatic markers.

Method

Subjects

Based on power analysis for medium effect size, (Cohen et al., 1988) the goal was to recruit 85 subjects. A total of 85 subjects participated in this study. Four subjects were lost due to equipment problems. After data screening and considering missing data, 81 subjects were entered into the measurement of emotion modulated startle (average maximum blink magnitude). These data were processed and scored with PSYLAB 8 (Contact Precision Instruments, London, UK) analysis software. Eighty-one subjects were entered into the repeated measures analysis investigating differences in average maximum startle magnitude among valence categories. These 81 subjects were also entered into the analysis correlating average maximum magnitude data and personality data as well as the analysis correlating personality data with data from the Iowa Gambling Task data. Demographic data are presented in Table 1 for the sample that underwent all three analyses. Subjects were undergraduate students at or above age 18 recruited from The California State University, San Bernardino. Recruitment method followed a standardized protocol for human subject research at CSUSB. Participants signed up for 5 extra credit points for participation. As a component of the informed consent process, each participant signed a written informed consent document indicating they understood the procedure including the risks and benefits of participation.

Emotion Modulated Startle

Evidence of emotional response deficits has been observed in startle reflex experiments (Patrick, 1994). Further refinement of psychophysiological research with

Table 1

Sample Demographic Data

	Males	Females
N	15	66
Average Age	27.3	23.8
% Caucasian	33	38
% Hispanic	47	38
% African American	13	20
% Asian	7	4
% Other	0	0

psychopaths revealed that the type of stimulus used to evoke the emotional response seems to make a difference as well. In particular, negative images depicting humans in distress have resulted in subdued startle magnitudes in these individuals (Blair, Jones, Clark & Smith, 1997). Keeping with the assumption that patterns of clinically psychopathic behavior could be found in individuals with sub-clinical psychopathic personalities, it would be expected that individuals with sub-clinical psychopathy would also have is reduced startle magnitude in situations involving distress cues.

Stimuli. Visual stimuli were pictures selected from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005) on the basis of the normed affective valence ratings. Each picture (Appendix A) was selected on the basis of its membership in the positive, negative, or neutral category. A fourth category was also included that consisted of images of human beings in distress according to previous research (Blair et al, 1997). Three criteria were used to place an image in the distress category: first, the slide contained an image of one or more human beings, second, the humans depicted in the slide all displayed visible facial expressions, and third, these facial expressions were rated as negative. So that the three emotion conditions were

represented validly, pictures rated most negative, most positive, and most neutral were selected. Additionally, positive and negative pictures that were most arousing and neutral pictures that were not arousing were selected, to increase the potential for each emotion to be more accurately represented during the experiment. Similarly, pictures in the distress category were selected if they had relatively high valence (negative) and arousal ratings. Based on prior research by Lang et al., (1993) 44 pictures, (11 from each valence category) were selected. Mean normative arousal and valence scores for each of the four categories are presented in Table 2.

Table 2

Mean normative arousal and valence scores for visual stimuli.

	Positive	Neutral	Negative	Distress
Mean Arousal	6.60	3.41	6.55	5.59
Mean Valence	7.24	4.98	2.30	2.48

Note. Ratings are scored on a 9-point scale such that 9 represents a high rating on each dimension (i.e., high pleasure, high arousal), and 1 represents a low rating on each dimension (i.e., low pleasure, low arousal.)

Auditory stimuli were presented binaurally through headphones (TDH 49) with each headphone covering the entire ear. Auditory stimuli were 50 ms bursts of white noise, each at 100 dB (A). Startle responses were elicited on trials 1-3, 7-8, 10-12, 14, 16-18, 20, 22, 24-25, 27-30, 34, 36, 38, and 40-44 by the white noise stimulus presented randomly at either 4.5 or 5.5 seconds after picture onset. Picture stimuli were presented without a startle probe on trials 4-6, 9, 13, 15, 19, 21, 23, 26, 31-33, 35, 37, and 39 for a

total of 16 trials. This design resulted in 7 positive, 7 negative, 7 distress and 7 neutral pictures probed for a startle response, 28 in total.

Psychophysiological Measures

All physiological data were collected using the Psylab system (Contact Precision Instruments, London, UK). Each subject was asked to look upwards while two electrodes were attached under the right eye. The center of each electrode was placed approximately 12-13 mm apart. A third ground electrode was placed on the dorsal side of the subject's left hand. Electromyogram (EMG) waveforms from orbicularis oculi were first bandpass filtered online between 1 and 100 Hz, then digitized (16 bit) and recorded at 1000 samples per second.

Psychopathic Personality Inventory-Revised

A computerized version of the Psychopathic Personality Inventory-Revised (PPI-R) was created in E-Prime version 2.0 Beta. Previous research has supported the validity of a computerized version of this instrument (Sandler, 2007). In this study, a total of 124 respondents participated. Scores on all 15 of the PPI-R scales were found to be similar, as were all internal scale consistencies. Test-retest reliabilities for scores on the PPI-R Overall Total, Factors, and Content scales ranged from $r = .76$ (Coldheartedness) to $r = .93$ (PPI-R Total). The PPI-R has been used to refine the construct of psychopathy for research (Lilienfeld, 1998, Patrick, Edens, Poythress, Lilienfeld & Benning, 2006), clinical (Patrick, Hicks, Blonigen & Krueger, 2003) and risk assessment purposes (Skeem, Poythress, Edens, Lilienfeld & Cade, 2003). The theory behind the PPI-R suggests that psychopathic traits can fall on a continuum (Benning, Patrick, Salekin &

Leistico, 2005) and may be maladaptive, independent from the syndrome. The research using the PPI-R is based upon the assumption that as the understanding of psychopathic personality traits in the normal population increases, the likelihood of further understanding clinical psychopathy will increase. The PPI-R provided data (T-scores) for eight content scales, two validity scales, three factor scales, and one total scale. Instructions dictated to the subject as well as selected example questions from the PPI-R are provided in Appendix B.

The Iowa Gambling Task

A computerized version of the Iowa Gambling Task (IGT) was administered to all subjects on a Dell Inspiron E1405 laptop. The IGT was developed as an empirical way to measure risky decision making and is based upon the Somatic Marker Hypothesis (SMH). The SMH is based upon the assumption that humans who make decisions in risky situations usually have the ability to select the safest and most efficient means of reaching a goal. Theoretically, they are guided by cues from their emotional networks, manifested as bodily sensations. These bodily sensation representations are termed somatic markers. Using somatic markers effectively minimizes risk and maximizes reward (Bechara, Damasio & Damasio, 2000). Damasio and colleagues began to observe deficits in a task designed to mimic risky decision making situation in their prefrontal patients. Research with this task, called the Iowa Gambling Task (IGT) shows that orbitofrontal patients have reliably demonstrated poor outcome (Bechara et al., 2000). Previous research with non-clinical psychopaths suggests that they exhibit similar impairments on the task although they have not experienced direct brain injury (van

Honk, Hermans, Putman, Montagne & Schutter, 2002; Lösel & Schmucker, 2004; Blair et al., 2006).

Procedure

After providing informed consent, subjects were seated at the computer. The first task they were asked to complete was the PPI-R. They were specifically instructed to answer each of the 154 questions, which could describe opinions, likes, dislikes, feelings, etc., in a way that generally best described them. Each item consisted of a four choices: false, mostly false, mostly true, or true. Upon completion of the PPI-R, subjects were asked to complete the Iowa Gambling Task. Briefly, each subject was seated at the computer and asked to select from one of four decks of playing cards, as depicted on the screen. To select the card, they used the laptop's touchpad. Each selection resulted in a "win," defined as an increase in monetary earnings, or a "loss," defined as a loss in monetary earnings. Subjects kept track of their net earnings by two bars on the top of the screen, which either increased or diminished depending upon the subject's performance. Subjects were told that they would start with $2,000 credit. They were given the instruction to not try to figure out what the computer was doing, but to keep in mind that some decks were worse than others. They were also told that any decision on what to do with the money should be made as if they were using their own money. A full transcript of the directions read to each subject is provided in the Appendix D.

Next, the electrodes were attached and subjects underwent a startle habituation and pre-pulse inhibition task (results not presented here) followed directly by the emotion modulated startle reflex procedure. A second habituation phase preceded the emotion modulated startle phase of the experiment. A neutral pattern was presented on the screen,

and each subject was instructed to fix their gaze on the screen. In total, six startle probes were presented during this phase. Subjects were told that an occasional noise on the headphones would be heard, but to ignore it. Next, the subject was presented with an instruction slide that told them to imagine while they were viewing each image that they were encountering what was in the picture. Each trial began with the onset of a picture that was presented for 6 seconds on a computer screen in front of the subject. Each picture was presented in a pseudo-random order; a random sequence within each category was produced at the initiation of data collection and revised every 20 subjects.

Design and Data Preparation

Psychophysiological data (average maximum blink magnitude). Using analysis routines in Psylab, the EMG data for each trial were rectified and the maximum blink amplitude within a window from 20 ms to 100 ms after the stimulus onset was recorded. The difference between this maximum and the mean of the 200 ms prestimulus baseline was scored as the blink magnitude for the trial. All data were reviewed for missing trials. After this review, four subjects' data were discarded due to an excess of missing trials. Each subject's raw blink magnitude score across the four valence categories was then normalized by conversion to a T-score. Outliers were defined as those subjects with scores greater than three standard deviations above or below the mean ($T \geq 80$; $T \leq 20$). Data from the four subjects with unusable EMG waveforms and three outliers were replaced with the mean average maximum blink magnitude value for each category. Each valence category was analyzed in SYSTAT version 11 for homogeneity of variance. Normality, skewness, and kurtosis were analyzed with histograms. All values fell into appropriate ranges. The final T-scores within each of four categories (positive, neutral,

negative and distress) for each subject was used for the primary analyses. Additional analyses exploring the effects of gender on individuals who scored in the upper or lower third of the sample were conducted, so the data for each valence category was sorted into either the High or Low range based upon a median split. Those with the highest startle magnitudes in each of the four valence conditions were classified as High (e.g., High Distress, High Threat, etc.) The procedure was repeated for those with the lowest startle magnitudes resulting in a total of eight new categorical variables for the gender analysis.

PPI-R. The PPI-R data consisted of T-scores for each of the eight content scales, three factor scales, two validity scales, and one total scale. Outliers were defined as those subjects with scores greater than three standard deviations above or below the mean ($T \geq 80$; $T \leq 20$). Review of the PPI-R T-scores revealed no significant outliers. All data were analyzed in SYSTAT version 11 for homogeneity of variance. Normality, skewness, and kurtosis were analyzed with histograms. All values fell into appropriate ranges. The PPI-R did not produce output for several subjects and the data for these individuals (n=3) was replaced with the mean T-score for each scale. Additional analyses exploring the effects of gender on individuals who scored in the upper or lower third of the sample were conducted, so the data for each valence category was sorted into either the High or Low range based upon a median split. For the personality variables, this step created 16 groups from the original 8 Subscales (e.g., High Coldheartedness and Low Coldheartedness, etc.). It also created 4 groups from the original two Factor Scales (e.g., High Fearless Dominance, Low Fearless Dominance, etc.). Additionally, the PPI-R Total Scale Score was split into High and Low.

Iowa gambling task. The IGT program tracked performance at five distinct intervals throughout 100 trials (Net1-5). Additionally, a total performance score was obtained based on each subject's overall performance (Total). The program converted these six types of scores into T-scores. Outliers were determined to be those subjects with scores greater than three standard deviations above or below the mean ($T \geq 80$; $T \leq 20$). Review of the IGT T-scores revealed no significant outliers. All data were analyzed in SYSTAT version 11 for homogeneity of variance. Normality, skewness, and kurtosis were analyzed with histograms. All values fell into appropriate ranges. One subject was missing output, which was replaced with the mean T-score for each scale. Additional analyses exploring the effects of gender on individuals who scored in the upper or lower third of the sample were conducted, so the data for each valence category was sorted into either the High or Low range based upon a median split. The Iowa Total T-Score was split into High and Low resulting in the creation of two new categorical variables.

Results

Research Question 1: Emotion Modulation of the Startle Reflex

To determine if viewing pictures from positive, neutral, negative and distress valence categories produced effects on the average maximum magnitude of the startle response, a one-way repeated measures ANOVA was conducted. The 4-level within-subjects factor was defined as valence category. Variables were entered in the following order based upon the a priori hypothesis: positive, neutral, negative, and distress. No significant linear or quadratic trends were found across the valence categories in the predicted direction. As the neutral valence category was found to be significantly greater than the other three categories, a separate analysis was conducted with the remaining three variables to ascertain differences between the emotion conditions. A second one-way repeated measures ANOVA was conducted. The 3-level within-subjects factor was again defined as valence category. A significant quadratic trend was found across the remaining valence categories $F(1,80) = 5.13$, $p < .03$ (Figure 1) indicating that the mean startle response was smallest in the distress picture condition and greater in the positive and negative picture conditions. This trend did not fall in the original predicted linear direction.

A closer look at the mean normative arousal ratings of the selected visual stimuli in the positive, negative, and distress conditions revealed that distressing images were rated as significantly less arousing than negative ($t = -3.87$; $p \leq 0.001$) and positive ($t = -3.07$; $p \leq 0.02$) images (Figure 2). There was a similarity between the quadratic trend observed with the emotion modulated startle response and the general pattern of arousal. The less arousing images of individuals in distress elicited the smallest eye-blink

reactions. This suggested that at least in the current sample, arousal may have more of an impact on eye-blink magnitude than valence category.

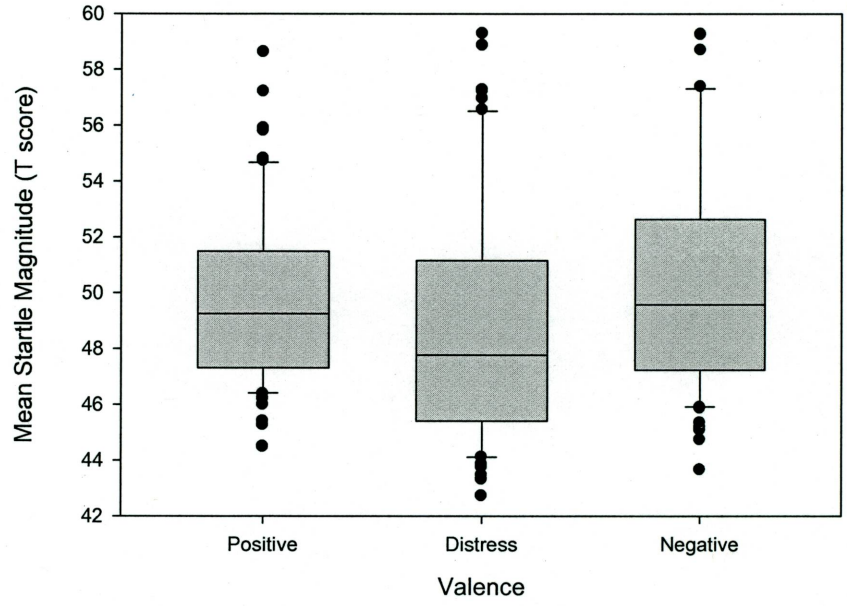


Figure 1. Emotion modulation of the startle reflex. A significant quadratic trend was found across the valence categories $F(1,80) = 5.13$, $p < .03$. Mean startle response (magnitude expressed as a T-score) was smallest in the context of distress pictures and greater for positive and negative pictures. Error bars represent standard deviations.

Figure 2. Mean normative arousal ratings for visual stimuli. Normative mean arousal rating in the distress condition was significantly lower than both the positive ($t = -3.07$, $p \leq 0.02$) and the negative ($t = -3.872$; $p \leq 0.00$) condition. The difference between the positive and negative conditions was not significant ($t = 0.44$; $p \leq 0.67$). Error bars represent standard deviations.

Research Question 2: Psychopathic Personality and Emotion Modulated Startle

To determine if psychopathic personality was associated with variations in average maximum blink magnitude in the positive, neutral, negative and distress conditions, a correlation analysis was conducted. The eight PPI-R subscales were correlated with average maximum eye-blink magnitude in four valence conditions. The scales included the PPI-R Total score as well as eight Content scale scores and three PPI-R Factor scores. Means and standard deviations for the scores are provided in Table 3. No PPI-R subscale scores were correlated with the startle magnitude in the positive, neutral, or distress conditions (Table 4) although an inverse relationship between startle magnitude in the negative picture condition and Social Influence approached significance

($r = -0.20$; Chi-square = 3.070, $p \leq .08$), suggesting that as levels of one's perceived ability to influence and manipulate others increased, their startle reactions while viewing negative (fear-base) images tended to decrease.

Table 3

Means and standard deviations, all PPI-R scales.

	Mean[a]	Standard Deviation[a]
Total	51.42	9.88
Subscale		
Machiavellian Egocentricity (ME)	50.91	11.33
Rebellious Nonconformity (RN)	49.96	9.82
Blame Externalization (BE)	49.95	9.88
Carefree Nonplanfulness (CN)	48.15	9.07
Social Influence (SOI)	53.22	10.55
Fearlessness (F)	50.94	10.15
Stress Immunity (STI)	50.14	10.12
Factor Scale		
Fearless Dominance (FD)	52.30	10.50
Self-Centered Impulsivity (SCI)	50.11	10.30
Coldheartedness (C)	52.33	9.93
Validity Scale		
Virtuous Responding (VR)	55.57	10.57
Deviant Responding (DR)	54.80	12.84

[a]N = 81

Table 4

PPI-R subscales and average maximum blink magnitude, all valence conditions.

	ME	RN	BE	CN	SOI	F	STI	C
Pos	.05	-.03	.09	-.06	.06	-.05	.08	-.01
Neut	-.13	-.01	-.16	-.07	.05	-.04	.03	-.12
Neg	-.07	-.09	.12	.13	-.20	-.14	-.17	-.11
Dis	.05	-,09	.01	.16	-.01	-.17	-.06	.07

Note. ME=Machiavellian Egocentricity; RN=Rebellious Nonconformity; BE=Blame Externalization; CN=Carefree Nonplanfulness; SOI=Social Influence; F=Fearlessness; STI=Stress Immunity; C=Coldheartedness

Next, the relationship between the PPI-R factor scales and average maximum blink magnitude in all valence conditions was examined. Calculating numerous correlations increases the risk of a Type I error, i.e., to erroneously conclude the presence of a significant correlation. To avoid this, the level of statistical significance of correlation coefficients was adjusted by Bonferroni's correction. No significant relationships were found with Coldheartedness or Self-Centered Impulsivity (Table5). However, a significant negative correlation (Figure 3) was found between Fearless Dominance and average maximum blink magnitude during the negative picture condition ($r = -0.26$; Chi-square = 5.268, $p \leq .05$), suggesting that individuals with higher levels of this personality trait tended to have an attenuated startle reaction while viewing negative pictures, but not while viewing other types of images, including those depicting humans in distress.

Table 5

PPI-R factor scales and average maximum eye-blink magnitude, all valence conditions.

	Distress	SCI	FD	C
Positive	-.09	.05	.06	-.01
Neutral	-.29**	-.09	.05	-.12
Negative	-.02	.00	-.26*	-.11
Distress	1.00	-.02	-.15	.07

Note. SCI=Self-Centered Impulsivity; FD=Fearless Dominance; C=Coldheartedness

**$p < .01$. *$p < .05$, one-tailed.

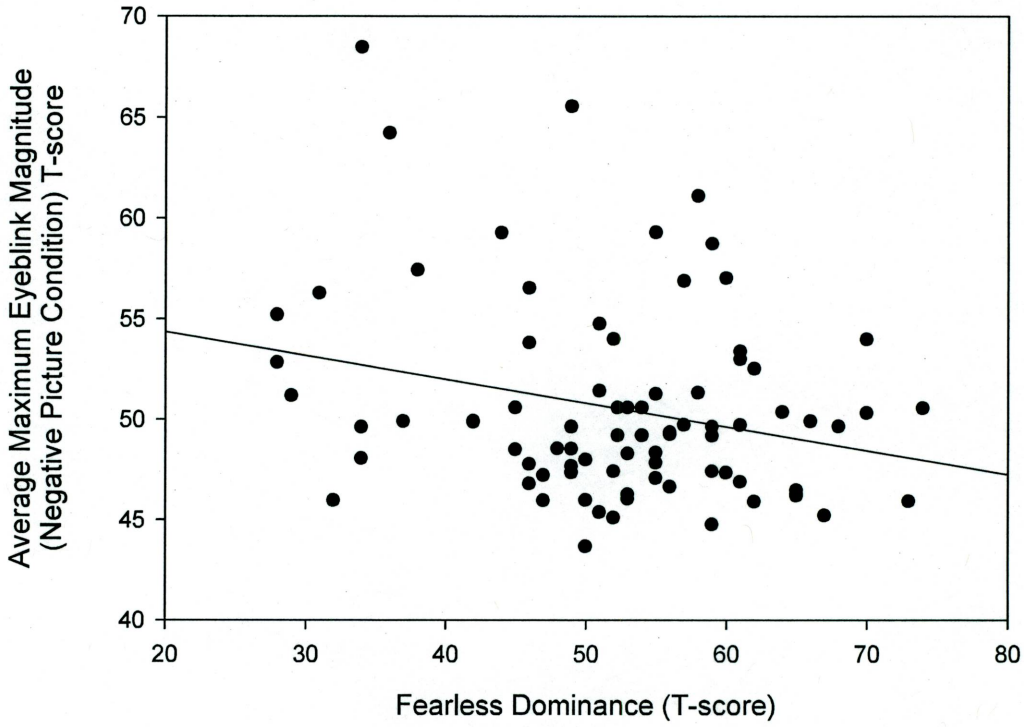


Figure 3. Fearless dominance and average maximum eye-blink magnitude. A significant negative correlation was found between the PPI-R factor Fearless Dominance and the mean startle response in the negative picture condition ($r = -0.26$; Chi-square = 5.286, $p \leq .05$). As mean startle response (magnitude expressed as a T-score) increased, levels of self-reported fearless dominance decreased.

A final analysis of the relationship between the PPI-R variables was conducted using difference scores. Specifically, two sets of difference scores were calculated by subtracting the mean startle magnitude in the positive picture condition from that of the negative picture condition and from the distress condition. It was predicted that the difference scores would be positive, thus reflecting the hypothesis of greater blink magnitude in the negative and distress conditions. The mean of the difference between positive and negative scores (Category A) was 0.57 with a standard deviation of 6.97. The mean of the difference between positive and distress scores (Category B) was -1.09

with a standard deviation of 6.21. Finally the difference scores were correlated with all PPI-R variables. The prediction was an inverse relationship that would suggest that as psychopathic personality traits increased, the differences decrease. The findings in this analysis were not significant (Table 6).

Table 6

PPI-R subscale, factor, and validity scales and difference scores.

	Tot	SCI	FD	VR	DR	ME	RN	BE	CN	SOI	F	STI	C
A	.08	-.17	-.08	.13	.10	-.08	-.04	.03	.13	-.17	-.07	-.16	-.07
B	.02	-.05	-.05	.06	-.00	.00	-.04	-.05	.15	-.04	-.09	-.10	.06

Note. A = Negative minus positive condition; B = Distress minus positive condition; Tot=PPI-R Total score; SCI=Self-Centered Impulsivity; FD=Fearless Dominance; VR=Virtuous Responding; DR=Deviant Responding; ME=Machiavellian Egocentricity; RN=Rebellious Nonconformity; BE=Blame Externalization; CN=Carefree Nonplanfulness; SOI=Social Influence; F=Fearlessness; STI=Stress Immunity; C=Coldheartedness. $^{**}p < .01$, one-tailed. $^{*}p < .05$, one-tailed.

Research Question 3: Psychopathic Personality and Risky Decision Making

A correlation analysis was conducted to determine if there was a significant relationship between all psychopathic personality variables and total average gambling score on the Iowa Gambling Task. No significant relationships were found (Table 7). A negative linear correlation between Virtuous Responding and Total IGT score approached significance ($r = -0.20$; Chi-square = 3.079, $p \leq .07$) suggesting that individuals who tended to present themselves in a positive light with relatively little personality disturbance might also tend to have poorer decision making abilities.

Table 7

PPI-R subscale, factor, and validity scales and IGT total score.

	IGT	Tot	SCI	FD	VR	DR	ME	RN	BE	CN	SOI	F	STI	C
IGT	1.0	-.03	-.03	.00	-.20	-.09	.06	-.06	-.15	.10	.07	-.08	.02	-.03

Note. IGT=Iowa Gambling Task total score; Tot=PPI-R Total score; SCI=Self-Centered Impulsivity; FD=Fearless Dominance; VR=Virtuous Responding; DR=Deviant Responding; ME=Machiavellian Egocentricity; RN=Rebellious Nonconformity; BE=Blame Externalization; CN=Carefree Nonplanfulness; SOI=Social Influence; F=Fearlessness; STI=Stress Immunity; C=Coldheartedness

Research Question 4: Emotion Modulated Startle and Risky Decision Making

A correlation analysis was conducted to determine if there was a significant relationship between average maximum blink magnitude in each of the four valence categories and total average gambling score on the Iowa Gambling Task. The mean IGT T-score for the sample was 39.91 with a standard deviation of 12.18. No significant relationships were found.

Gender Analysis

As the current sample was predominately female, and the majority of the reviewed research on psychopathy has been conducted on male subjects, an analysis of the data was performed to investigate the role of gender differences. A series of two-way ANOVAs were conducted to analyze the gender effects on the personality, IGT and emotion modulated startle data. The variables were defined as follows: gender, level of personality trait (High or Low), level of IGT score (High IGT or Low IGT) and level of startle magnitude (High or Low) were the categorical variables. Dependent variables were the T-scores of all PPI-R scales, IGT Total Scale Score, and Average Maximum Startle Magnitude in each of the four valence conditions. The series of analyses

conducted in SYSTAT Version 11 revealed a main effect for gender solely on the Fearless Dominance Factor Scale Score. Males had significantly lower FD scores overall: $F(1,186) = 9.97$, $p<.00$, independent of level of Fearless Dominance. These results will be discussed in their relationship to the current research on psychopathy in females in the following section.

Discussion

The unique interpersonal qualities of individuals who fall on the so-called 'psychopathic spectrum' have been regularly documented since Cleckley's observations (1941). The literature reflects the importance of understanding individuals who have high and low levels of psychopathic personality traits for research (Lilienfeld, 1998, Patrick, Edens, Poythress, Lilienfeld & Benning, 2006), clinical (Patrick, Hicks, Blonigen & Krueger, 2003) and risk assessment purposes (Skeem, Poythress, Edens, Lilienfeld & Cade, 2003) through bringing forth the position that psychopathic traits can fall on a continuum (Benning, Patrick, Salekin & Leistico, 2005) and are in themselves maladaptive, independent from the syndrome.

The purpose of this study was to show that psychopathic personality traits in the general population are associated with deficits in emotion modulated psychophysiological responses as well as deficits in emotionally influenced decision making, paralleling the effects observed in psychopathic individuals. Results indicated that individuals with higher levels of Fearless Dominance had attenuated fear responses, but there were no abnormalities in responses to other emotional conditions. There was no association between psychopathic personality traits and emotionally influenced decision making, suggesting that at subclinical levels, psychopathic personality traits do not influence an individual's use of somatic markers to guide behavior. In this case, the Somatic Marker Hypothesis, at least in terms of its relationship to psychopathy, was not supported.

The study was broken down into several research questions. First, it was of interest to replicate the effects of emotionally charged pictures on the startle reflex, which

has been frequently studied in the psychophysiological literature (Corr et al., 1996, 1997, 2002; Lang, 1993, 1994; Lang et al., 1997, 2000; Vrana et al., 1988). The consensus of this literature is that emotions modify the startle response in humans. Particularly, when an individual is feeling negative emotions, their startle reflex is enhanced compared to when they are feeling positive emotions. For the present experiment, in addition to the more frequently studied neutral, positive, and negative emotion conditions, a condition that consisted of images of humans in distress was added. Images of humans in distress were chosen based on previous research (Blair, Jones, Clark & Smith, 1997) that found individuals with clinical levels of psychopathy as determined by the PCL-R had reduced startle responses to distressing images above and beyond general negative (threat) images. To date, no research has attempted to elucidate the effects of these two types of negative images in individuals with varying degrees of psychopathic personality traits as measured by the PPI-R.

In the present experiment, it was found that across valence categories, the startle response was significantly lower in the distress condition than in either the positive or negative condition. Contrary to previous research, there was no significant difference between startles evoked during positive and negative images. The findings suggest that at least in this experimental population, the behavioral inhibition and activation systems (BIS/BAS) that drive fear were not differentially engaged in response to these images. However, results suggested that when viewing the distress pictures, that reflexive response was attenuated. A potential explanation for these findings might arise after considering the mean normative arousal ratings for each group of slides. The distressing images were lower in arousal according to the normative sample ratings than either the

positive or negative conditions. This might suggest that at least in the present sample, the level of arousal the individual was feeling while viewing the slides may have had a greater influence on the startle response than the perceived valence.

In addition, the order of the procedure may have had a cumulative effect upon the subjects' responsiveness to the emotional images. The emotion modulated startle phase of the experiment followed a pre-pulse inhibition phase that prolonged the subjects' exposure to the acoustic stimuli. Previous research on sensitization effects of different stimuli on emotion modulated startle is mixed. Some research suggests that the reflex is relatively robust and holds through sustained, repeated exposure to images (Smith, Bradley & Lang, 2004; Bradley, Lang & Cuthbert, 1993). Other research suggests that prolonged exposure to stimuli results in the response sensitization of the defensive systems (Hamm and Stark, 1993, Blumenthal, 1997, Figueiredo et al., 2003, Koukounas & Over, 2000). In this case, the pre-pulse inhibition trials may have had a cumulative attenuation effect upon the subsequent emotion modulation trials. Replication of the procedure would be needed to support or refute these findings.

The second research question attempted to determine if there was a significant relationship between psychopathic personality variables and average maximum blink magnitude. The PPI-R is a measure with demonstrated construct validity. The authors included a variety of focal constructs relevant to psychopathy. It allows for inclusiveness of an increased number of lower order facets of psychopathy rather than an estimate of global or primary/secondary psychopathy as provided by most other psychopathy measures. Whereas Hare's checklist suggests a dichotomous view of the construct, that an individual is either psychopathic or not psychopathic, this study looked at a continuous

view. In particular, the construction of the items avoided items measuring antisocial or criminal behaviors because the intention was to develop a measure of the personality based approach to psychopathy as put forth by Cleckley (1941).

As scores increase on the PPI-R variables, Lilienfeld and Widows (2005) suggest that individuals have increasing levels of the following characteristics: narcissism, lack of concern regarding social norms, tendency to blame others, indifference in planning one's own actions, perceived ability to influence and manipulate others, absence of anticipatory anxiety, willingness to participate in risky behaviors, and callousness. As scores decrease, Lilienfeld and Widows suggest that the level of these traits in any given individual decreases. Current results, using the conservative Bonferroni correction, suggested that when viewing pictures in the negative (threat) condition, individuals with higher levels of Fearless Dominance tended to have an attenuated startle reaction. Higher levels of Fearless Dominance are associated with lack of anticipatory social and physiological anxiety, low levels of tension and worry, low harm avoidance, and high levels of interpersonal dominance. This finding was in agreement with previous literature concerned with startle reaction and personality (Corr et al., 1997, 2002). Further, this finding offers additional experimental verification for the idea that the subtle nuances of psychopathic personality and its impact on behavior are likely to be ignored through a strictly dichotomous view of the construct. The prediction of a significant inverse relationship between startle reactions elicited during the distressing image condition and psychopathic personality was not supported. These findings were contrary to what would be predicted by Blair et al, (1997), who found that psychopaths differentiated by the PCL-R had significantly lower startle reactions while

viewing images of humans in distress versus images of negative (threat) stimuli. The findings offered in this study support the view that there are likely differences in emotion modulated physiological reactions between individuals who have psychopathic personality traits as measured by the PPI-R and those who have been diagnosed as clinical level psychopaths, at least in the context of variations in negative emotion.

The third research question addressed the relationship between psychopathic personality variables and risky decision making as measured by the Iowa Gambling Task. Based upon findings with sub-clinical psychopaths differentiated by the BIS/BAS systems (van Honk, Hermans, Putman, Montagne & Schutter, 2002), it was predicted that individuals with higher levels of psychopathic personality as determined by the PPI-R would tend to pick more frequently from riskier decks and thus have lower mean gambling scores. Results suggested no significant relationships between IGT performance and the individual PPI-R variables, lending further support to the idea that individuals with psychopathic personality traits who likely do not meet the criteria for clinical psychopathy may have cognitive strategies that are more similar to non-psychopaths. Further, the data support the idea that the BIS/BAS systems of individuals with a more extreme level of psychopathic personality as defined by high PCL-R scores are potentially more different than they are similar.

Interestingly, the relationship between Virtuous Responding and mean gambling score approached significance. Virtuous Responding on the PPI-R is primarily used to describe the participant's test-taking style and approach. In theory, as individuals' scores on this measure increase, so would their tendency to portray themselves in a positive manner and present a view of themselves that is relatively free of serious personality

flaws. In some cases, extremely high scores on the scale may indicate deliberate attempts at positive impression management (Lilienfeld & Widows, 2005). Individuals with higher levels of Virtuous Responding in the present sample tended to have poorer outcome on the Iowa Gambling Task. This outcome might fall in line with the hypothesis that poorer IGT scores are associated with other definitions of sub-clinical psychopathy (van Honk, Hermans, Putman, Montagne & Schutter, 2002; Blair et al., 2006) because these types of psychopaths have a reputation for presenting themselves in a positive light at least in social situations (Cleckley, 1941; Hare, 2000). Further experiments, perhaps with other personality measures with scales similar to the Virtuous Responding scale (e.g., the MMPI-2) would be needed to offer further support for this explanation.

Finally, the relationship between risky decision making and emotion modulated startle was explored. Considering the cognitive and emotional deficits in psychopaths, it was predicted that in as the individual's mean gambling score decreased, so would the individual's startle reactions in the emotionally modulated negative conditions. However, findings concerning the relationship between these two variables suggested that at least with the current sample, there were no significant relationships with emotion modulated startle.

The lack of significant relationship between Iowa Gambling Task outcome and the other results in the predicted direction calls into question the utility of the IGT for measuring emotional response in psychopathic personality. According to Damasio's Somatic Marker Hypothesis (SMH), decision making can be viewed as a combination of 'high reason,' carrying out a logical cost-benefit analysis of a given action, and marker

signals, indicating how rewarding or punishing an action is likely to be in complex situations where more detailed cost-benefit analysis is not possible. (Damasio et al., 1991; Damasio, 1994, 1996, 2004). Impairments in individuals with bilateral ablations of the ventromedial prefrontal cortex and related areas (Damasio et al., 1991) as well as individuals with sub-clinical psychopathy defined by BAS/BIS differences (van Honk et al., 2002) have been noted. However, there has yet to be an empirical verification of deficits in decision making in individuals with psychopathic personality traits as differentiated by the PPI-R. This study used a fairly large sample (n=81) and measured continuous relationships. Van Honk et al (2002) used two groups selected on low and high BAS/BIS characteristics from the outer extreme ranges of an extremely large subject pool (n=525). It is perhaps due to their large subject pool that the previous researchers were able to distinguish between groups on the IGT. The present study did not utilize a median split design in order to preserve variance in the sample. Additionally, the PPI-R is an arguably more diverse measure, including subscales that aim to quantify level of behavioral activation or inhibition as well as other subscales that are designed to investigate the higher level emotional qualities that are unique to psychopathy, including superficial charm and lack of empathy.

Other researchers have been critical of the validity of the IGT for evaluating the relationship between emotional functioning and risk taking behavior. For example, it has been argued that if the reward/punishment schedule can be consciously comprehended by participant prior to the development of somatic markers, cognitive outcome expectancies rather than somatic markers could guide successful IGT performance (Turnbull et al., 2003). Additionally, research has reported participant awareness of the

reward/punishment schedule as early as 20 trials into the task (Bowman et al., 2005). Further research by Maia and McClelland (2004) suggested that the IGT can be performed through access to conscious, explicit knowledge. The crucial point outlined in the Iowa laboratory is that anticipatory Skin Conductance Responses (SCRs) differentiate between the advantageous and disadvantageous decks over time (Bechara et al., 1996). Some research has found that anticipatory SCR differences have been reported only in a sub-group of the best performing healthy control participants. Crone et al (2004) split participants into three equal sized groups of poor, moderate, and good IGT performers, based on the total number of selections they made from the advantageous decks during the tasks. Anticipatory SCRs were greater for the disadvantageous than advantageous decks for the good performers group only. Analysis of the current data set revealed that the majority of the sample consisted of bad performers (e.g., those who ended up with a net loss of money). The Somatic Marker Hypothesis relies on anticipatory SCR data to suggest that emotional processes are involved in decision making. However, work done by Bradley et al (2001) suggests that SCRs are primarily sensitive arousal but do not discriminate between positive and negative valence, suggesting that they may not be the most accurate index of determining if an underlying emotion-based marker is indicating a decision to be good or bad. To summarize, there has been limited external replication of anticipatory SCR data on the IGT. It is also unclear whether SCR findings represent a response to feedback, an indicator of risk, a marker of post-decision emotion state, or a signal of how good a particular response is. Finally, it has been found in the Iowa lab that not all normal controls perform advantageously Bechara & Damasio, 2002).

Importantly, the IGT, while supporting neural substrates of decision making, may not address an important component to psychopathy: aggressive behavior. According to Blair et al. (2006), psychopathic behavior can be characterized by both reactive aggression (impulsivity, etc.), and another type of aggression, instrumental aggression (planned attack). A frontal lobe dysfunction within individuals who display aggressive behavior has been well documented. Grafman, Schwab, Warden, Pridgen et al., (1996) reported that orbital and ventrolateral frontal cortex rather than dorsolateral prefrontal cortex that was associated with increased risk for aggression. Psychopaths have deficits in response reversal and extinction tasks that employ the orbital/ventrolateral cortex (Rolls, 1997). Perhaps Damasio's task best differentiates ventromedial dysfunction, yet the true deficit in psychopaths is more related to orbitofrontal dysfunction. In either case, the current data suggest that performance on the IGT is likely unrelated to variations in psychopathic personality traits in community samples.

To conclude, the current study attempted to replicate the emotion modulated startle reflex and demonstrate that variations in psychopathic personality traits influence the startle reflex as well as an individual's inherent ability to utilize somatic markers to guide decision making behavior. When considering the fear potentiated startle reflex, the significant data suggest that there was an inverse relationship between the individual's reactions to fearful stimuli and their level Fearless Dominance. The data also suggested that there was a marginal relationship between performance on the IGT and the way individuals presented themselves in a positive light, which might be one quality of psychopathy. However, data did not support a relationship between psychopathic personality traits and emotion-modulated responses to images of humans in distress nor

did it support a relationship between psychopathic personality traits and an individual's use of somatic markers during the IGT. In general, results suggest that the neurological and behavioral characteristics of clinical psychopaths and individuals with sub-clinical psychopathic traits may be more different than they are similar.

The significant relationship between an individual's level of Fearless Dominance and their psychophysiological reactivity to fearful images in their environment may have important implications for treatment. As previously mentioned, research suggests that individuals with higher levels of FD tend to have lower levels of Axis I pathology including depression, anxiety, substance abuse, and risk for suicidal behavior (Patrick, Edens, Poythress Lilienfeld & Benning, 2005). Despite this, the qualities identified by the Fearless Dominance construct might be found in pathological mania (e.g., Bipolar I Disorder, Single Manic Episode) as well as a variety of Axis II pathologies including, for example, Antisocial Personality Disorder (of which a reckless disregard for safety is included). Depending upon the degree of impairment in their social, occupational, or relational functioning, these individuals may still become involved in therapy, either voluntarily or involuntarily (e.g., as the result of a court-ordered evaluation). As such, clinicians who use the PPI-R in an assessment battery might use it to clarify Axis II personality traits in an individual. Further, the understanding that these Axis II traits may have origins in specific brain regions such as the fear circuit underscores the need for treatment. Perhaps treatment designed to increase the individual's awareness of the differences in the way they behave in their environment in response to threat versus the way other people typically respond would be useful. In particular, facilitation of insight into individual differences could improve the way the personality disordered individual

relates to others in society at both the micro (e.g., partner relationships) and macro (e.g., societal rule violations) levels. Analyses of gender differences revealed limited findings. The significant findings were again directly related to Fearless Dominance. Overall the males included in the study had lower levels of Fearless Dominance. However, these results should be interpreted cautiously due to male subjects having a restricted sample size. Research on psychopathy in females is relatively new and underrepresented in the field. Although Cleckley (1941) and Hare (1993) have previously written case studies of female psychopaths, experimental research on psychopathy in females is relatively recent and highly limited (Rogstadt & Rogers, 2008). Some experimental evidence suggests that fundamental emotional information-processing deficits observed in male psychopaths may generalize to female psychopaths (Vitale, Brinkley, Hiatt, & Newman, 2007). Additionally, Sutton, Vitale, and Newman (2002) demonstrated that female psychopaths exhibit a moderately attenuated startle reflex while viewing unpleasant pictures. The latter study provided the first evidence of emotion processing deficits in female psychopaths.

In 2005, Forouzan & Cook discussed their opinions on the relevant factors concerning gender differences in psychopathy. They suggested that the important differences between genders may lie in the expression of psychopathic behavior, interpersonal characteristics, psychological motivations, and potential bias in the assessment of psychopathy according to social norms. Each of these different factors would presumably impact treatment regimens designed for individuals with psychopathy, however much more research is needed in these areas before effectiveness could be assessed. Certainly, a gender sensitive treatment regimen would be important in a

proposed psychopathic treatment program. For example, given the gender differences in emotion expression, female psychopaths in treatment could potentially have a greater chance of success when compared with male psychopaths. Rogstadt & Rogers (2008) put forth the view that although interventions focusing on interpersonal or affective features of the syndrome have been dismissed for use with men, they suggest that these interventions might be effective for female psychopaths, who tend to possess higher levels of positive features such as empathy. Despite this, the current findings would suggest that at least when considering the trait of fearlessness in subclinical populations, some women may in fact have less sensitivity to threat in their environment and correspondingly less trouble with anxiety and Axis I disorders. A non-psychopathic individual's level of Fearless Dominance as measured by the PPI-R could potentially be used an indicator of relative immunity to a variety of anxiety disorders. Further clinical outcome research is clearly needed in this area to determine the effects of gender sensitive treatment regimens with the individuals who demonstrate psychopathic traits. Sound clinical outcome research would need to evaluate tailored treatment programs that take into account the type of psychopathy, whether clinical or subclinical, as well as the differences between male and female emotional processing and expression.

References

Aggleton, J. P. (1992). *The Amygdala: Neurobiological Aspects of Emotion, Memory and Mental Dysfunction*. New York: Wiley-Liss, Inc.

Ambrogi-Lorenzi, C. G., Baldi, E., Bucherelli, C., Sacchetti, B., & Tassoni, G. (1999). Neural topography and chronology of memory consolidation: A review of functional inactivation findings. *Neurobiology of Learning and Memory, 71,* 1-18.

Andershed, H., Kerr, M., Stattin, H., & Levander, S. (2002). Psychopathic traits in non-referred youths: A new assessment tool. In E. Blaauw & L. Sheridan (Eds.), *Psychopaths: Current International Perspectives.* (pp. 131-158). The Hague, the Netherlands: Elsevier.

Angrilli, A., Mauri, A., Palomba, D., Flor, H., Birbaumer, N., Sartori, G. & di Paola, F. (1996). Startle reflex and emotion modulation impairment after a right amygdala lesion. *Brain, 119,* 1991-2000.

Aniskiewicz, A. S. (1979). Autonomic components of vicarious conditioning and psychopathy. *Journal of Clinical Psychology, 35,* 60-67.

Arieti, S. (1963). Psychopathic personality: Some views on its psychopathology and psychodynamics. *Comprehensive Psychiatry, 4,* 303-302.

Barry, C. T., Frick, P. J., DeShazo, T. M., McCoy, M. G., Ellis, M., & Loney, B. R. (2000). The importance of callous-unemotional traits for extending the concept of psychopathy to children. *Journal of Abnormal Psychology, 109(2),* 335-340.

Bates, J. E., Maslin, C. A., & Frankel, K. A. (1985). Attachment security, mother-child interaction, and temperament as predictors of behavior problem ratings at age three years. In I. Bretherton & E. Waters (Eds.), Growing points of attachment theory and research. *Monographs of the Society for Research in Child Development, 50,* 167-193.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition, 50,* 7-15.

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275,* 1293-1295.

Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex, 10(3),* 295-307.

Belmore, M. E., & Quinsey, V. L. (1994). Correlates of psychopathy in a noninstitutional sample. *Journal of Interpersonal Violence, 9,* 339-349.

Bergvall, Å. H., Nilsson, T., & Hansen, S. (2003). Exploring the link between character, personality disorder, and neuropsychological function. *European Psychiatry, 18,* 334-344.

Birnbaum, K. (1909). Uber Psychopatische Personkeiten. Wiesbaden, 1909. In: Davidson, G. M. (1956). The syndrome of oligothymia (psychopathy).

Blair, R. J. R. (1995). A cognitive developmental approach to morality: Investigating the psychopath. *Cognition, 571,* 1-29.

Blair, R. J. R. (2001). Neurocognitive models of aggression, the antisocial personality disorders, and psychopathy. *Journal of Neurology, Neurosurgery, and Psychiatry, 71(6),* 727-731.

Blair, R. J., & Cipolotti, L. (2000). Impaired social response reversal: A case of 'acquired sociopathy.' *Brain, 123(Pt. 6),* 1122-1141.

Blair, R. J., R., & Frith, U. (2000). Neurocognitive explanations of the antisocial personality disorders. *Criminal Behavior and Mental Health, 10,* S66-S82.

Blair, R. J. R., Colledge, E., Murray, L., & Mitchell, D. G. (2001a). A selective impairment in the processing of sad and fearful expressions in children with psychopathic tendencies. *Journal of Abnormal Child Psychology, 29,* 491-498.

Blair, R. J. R., Colledge, E., & Mitchell, D. G. (2001b). Somatic markers and response reversal: Is there orbitofronal cortex dysfunction in boys with psychopathic tendencies? *Journal of Abnormal Child Psychology, 29(6),* 499-511.

Blair, R. J. R. (2003a). Facial expressions, their communicatory functions and neuro-cognitive substrates. *Biological Science, 358,* 561-572.

Blair, R. J. R., Sellars, C., Strickland, F., Clark, A. O., Williams, M. Smith, M. & Jones, L. (1995). Emotion attributions in the psychopath. *Personality and Individual Differences, 19(4),* 431-437.

Blair, K.S., Newman, C., Mitchell, D.G., Richell, R.A., Leonard, A., Morton, J., & Blair, R.J. (2006). Differentiating among prefrontal substrates in psychopathy: Neuropsychological test findings. *Neuropsychology 20(2)*153-165.

Blair, R. J. R., Peschardt, K. S., Budhani, S., Mitchell, D. G. V., & Pine, D. S. (2006). The development of psychopathy. *Journal of Child Psychology and Psychiatry, 47(3/4),* 262-275.

Blonigen, D. M., Carlson, S. R., Kruger, R. F., & Patrick, C. J. (2003). A twin study of self-reported psychopathic personality traits. *Personality and Individual Differences, 35,* 179-197.

Blumenthal, T.D. (1997). Prepulse inhibition decreases as startle reactivity habituates. *Psychophysiology (34),* 446-450.

Blumer, D. & Benson, D. F. (1975). Personality changes with frontal lobe lesions. In: Benson, D. F., Blumer, D. (Eds.), *Psychiatric Aspects of Neurological Disease.* Grune & Stratton, New York, 151-170.

Bradley, M.M., Lang, P.J., & Cuthbert, B.N. (1993). Emotion, novelty, and the startle reflex: Habituation in humans. *Behavioral Neuroscience, 107(6),* 970-980.

Brandt, J. R., Kennedy, W. A., Patrick, C. J., & Curtain, J. J. (1997). Assessment of psychopathy in a population of incarcerated adolescent offenders. *Psychological Assessment, 9,* 429-435.

Brickenkamp, R., & Zillmer, E. (1998). The d2 test of attention. Seattle, WA: Hogrefe & Huber.

Brown, J.S. Kalish, H.I., & Farber, I.E. (1951). Conditional fear as revealed by magnitude of startle response to an auditory stimulus. *Journal of Experimental Psychology (41),* 317-328.

Caputo, A. A., Frick, P. J., & Brodsky, S. L. (1999). Family violence and juvenile sex offending: Potential mediating roles of psychopathic traits and negative attitudes toward women. *Criminal Justice and Behavior, 26,* 338-356.

Carver, C. S., & Scheier, M. F. (1999). Stress, coping, and self-regulatory processes. In L. A. Pervin & O. P. John (Eds.), *Handbook of Personality: Theory and Research* (2nd Ed.). (pp. 553-575). New York, NY: The Guilford Press.

Cleckley, H. (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of General Psychiatry, 50,* 975-990.

Coccaro, E. F., (1996). Neurotransmitter correlates of impulsive aggression in humans. *Annals of the New York Academy of Sciences, 794,* 82-89.

Cummings, E. M., & Cummings, J. L. (1988). A process-oriented approach to children's coping with adults' angry behavior. *Developmental Review, 8,* 296-321.

Damasio, A. R., Tranel, D., & Damasio, H. (1990). Individuals with sociopathic behavior caused by frontal damage fail to respond automatically to social stimuli. *Behavioral Brain Research, 41,* 81-94.

Davidson, G. M. (1956). The syndrome of oligothymia (psychopathy). *The Journal of Nervous and Mental Disease, 124(2),* 156-162.

Davis, M. (1992). The role of the amygdala in fear and anxiety. *Annual Review of Neuroscience, 15,* 353-375.

Dawson, W. S. (1952). Psychopathic personality. *The Medical Journal of Australia, July 12; 2(2),* 54-55.

Dawson, G. (1994). Development of emotional expression and emotion regulation in infancy. In G. Dawson & K. W. Fischer (Eds.), *Human Behavior and the Developing Brain* (pp. 346-379. New York: Guilford Press.

DeFries, J. C., & Fulker, D. W. (1985). Multiple regression of twin data. *Behavior Genetics, 16,* 1-10.

DeMatteo, D., Heilbrun, K., & Marczyk, G. (2006). An empirical investigation of psychopathy in a noninstitutionalized and noncriminal sample. *Behavioral Sciences and the Law, 24,* 133-146.

Dengerink, H. A., & Bertilson, H. S. (1975). Psychopathy and physiological arousal in an aggressive task. *Psychophysiology, 12,* 682-684

Edens, J. F., Marcus, D. K., Lilienfeld, S. O., & Poythress, N. G. (2006). Psychopathic, not psychopath: Taxometric evidence for the dimensional structure of psychopathy. *Journal of Abnormal Psychology, 115(1),* 131-144.

Eibl-Bibesfeldt, I. (1970). *Ethology: The biology of behavior.* New York: Holt, Rinehart & Winston.

Emery, N. J., & Amaral, D. G. (1999). The role of the amygdala in primate social cognition. In *Cognitive Neuroscience of Emotion.* R. D. Lane & L. Nadel (Eds.), New York: Oxford University Press, pp. 156-191.

Enebrink, P., Andershed, H., & Långström, N. (2005). Callous-unemotional traits are associated with clinical severity in referred boys with conduct problems. *Nordic Journal of Psychiatry, 59,* 431-440.

English, K. (1998). The containment approach: An aggressive strategy for the community management of adult sex offenders. *Psychology, Public Policy and the Law, 4, (1/2),* 218-235.

Eslinger, P. J. (1998). Neurological and neuropsychological bases of empathy. *European Neurology, 39*, 193-199.

Fabiani, M., Gratton, G., & Coles, M. G. H. (2000). Event-related brain potentials: Methods, theory, and applications. In J. T. Cacioppo, L. G., Tassinary & G. G. Berntson (Eds.), *Handbook of Psychophysiology, 2nd Edition*, Cambridge: Cambridge University Press, pp. 53-84.

Feshbach, N., & Roe, K. V. (1968). Empathy in six and seven year olds. *Child Development, 39,* 133-145.

Figueiredo, H.F., Bodie, B.L., Tauchi, M., Dolgas, C.M. & Herman, J.P. (2003). Stress integration after acute and chronic predator stress: Differential activation of central stress circuitry and sensitization of the hypothalamo-pituitary-adrenocortical axis. *Endocrinology (144)*, 5249-5358.

Flor, H., Birbaumer, N., Hermann, C., Zeigler, S., & Patrick, C. J. (2002). Aversive Pavlovian conditioning in psychopaths: Peripheral and central correlates. *Psychophysiology, 39*, 505-518.

Forth, A. E., Kosson, D. S., & Hare, R. D. (2003). *The Psychopathy Checklist: Youth Version,* manual. North Tonawanda, NY: Multi-Health Systems.

Forouzan, E., & Cooke, D.J. (2005). Figuring out la *femme fatale*: Conceptual and assessment issues concerning psychopathy in females, *Behavioral Sciences and the Law 23*, 765–778

Fox, R., & Lippert, W. (1963). Spontaneous GSR and anxiety level in sociopathic delinquents. *Journal of Consulting Psychology, 67,* 368.

Frick, P. J., (1998). *Conduct disorders and severe antisocial behavior.* New York: Plenum.

Frick, P. J., Bodin, S. D., & Barry, C. T. (2000). Psychopathic traits and conduct problems in community and clinic-referred samples of children: Further development of the psychopathy screening device. *Psychological Assessment, 12(4),* 382-393.

Frick, P. J., & Hare, R. D. (2001). *The antisocial process screening device.* Toronto, Ontario, Canada: Multi-Health Systems.

Frick, P. J., O'Brien, B. S., Wootton, J. M. & McBurnett, K. (1994). Psychopathy and conduct problems in children. *Journal of Abnormal Psychology, 103,* 700-707.

Frick, P. J., Cornell, A. H., Barry, C. T., Bodin, S. D., & Dane, H. E. (2003). Callous-unemotional traits and conduct problems in the prediction of conduct problem

severity, aggression, and self-repot of delinquency. *Journal of Abnormal Child Psychology, 31(4)*, 457-470.

Goldstein, I. B., (1965). The relationship of muscle tension and autonomic activity to psychiatric disorders. *Psychosomatic Medicine, 27,* 39-52.

Grafman, J., Schwab, K., Warden, D., Pridgen, B. S., & Brown, H. R. (1996). Frontal lobe injuries, violence, and aggression: A report of the Vietnam head injury study. *Neurology, 46,* 1231-1238.

Gray, J. A. (1991). The neuropsychology of temperament. In J. Strelau & A. Angleitner (Eds.), *Explorations in Temperament: International Perspectives on Theory and Measurement.* (pp. 105-128). New York: Plenum.

Hamm, A.O. & Stark, R. (1993). Sensitization and aversive conditioning: Effects on the startle reflex and electrodermal responding. *Integrative Physiology of Behavioral Science, (28)*, 171-176.

Hare, R.D., (1965 a,b,c). Temporal gradient of fear arousal in psychopaths. *Journal of Abnormal Psychology, 70(6)*. 442-445.

Hare, R.D. (1968). Psychopathy, autonomic functioning, and the orienting response. *Journal of Abnormal Psychology, 733,* 1-24.

Hare, R. D. (1970). *Psychopathy: Theory and Research.* New York: Wiley.

Hare, R.D. (1980). A research scale for the assessment of psychopathy in criminal populations. *Personality and Individual Differences, 1,* 111-119.

Hare, R.D. (1991). *The Hare Psychopathy Checklist-Revised.* Toronto: Multi-Health Systems.

Hare, R. D. (2003). *The Psychopathy Checklist-Revised, 2nd Edition.* Toronto: Multi-Health Systems

Hare, R. D., & Quinn, M. J. (1971). Psychopathy and autonomic conditioning. *Journal of Abnormal Psychology, 77,* 223-225.

Hare & Craigen (1974). Psychopathy and physiological activity in a mixed-motive game situation. *Psychophysiology, 11,* 197-206.

Hare, R. D., Frazelle, J., & Cox, D. N. (1978). Psychopathy and physiological responses to threat of an aversive stimulus. *Psychophysiology, 11,* 197-206.

Harlow, J. (1848). Passage of an iron rod through the head. *Boston Medical and Surgical Journal, 34* 389-393.

Harmer, C. J., Perrett, D. I., Cowen, P. J., & Goodwin, G. M. (2001). Administration of the beta-adrenoceptor blocker propranolol impairs the processing of facial expressions of sadness. *Psychopharmacology, 154(4)*, 383-389.

Harris, P. L. (1989). *Children and Emotion: The Development of Psychological Understanding.* Oxford: Blackwell.

Harris, G. T., Rice, M. E., & Quinsey, V. L. (1994). Psychopathy as a taxon: Evidence that psychopaths are a discrete class. *Journal of Consulting and Clinical Psychology, 62(2)*, 387-397.

Hart, S., Cox, D. N., & Hare, R. D. (1999). *The Psychopathy Checklist: Screening Version*. Toronto: Multi-Health Systems.

Hinson, J. M, Jameson, T. L., & Whitney, P. (2002). Somatic markers, working memory, and decision making. *Cognitive, Affective, & Behavioral Neuroscience, 2(4)*, 341-353.

Hoffmann, M. L. (1977). Sex differences in empathy and related behaviors. *Psychological Bulletin, 34*, 712-722.

Hoffmann, M. L., & Saltzstein, H. D. (1967). Parent discipline and the child's moral development. *Journal of Personality and Social Psychology, 5,* 45-57.

House, T.H. & Milligan, W.L. (1976). Autonomic responses to modeled distress in prison psychopaths. *Journal of Personality and Social Psychology, 34(4)*. 556-560.

Howard, R. Evoked potentials and psychopathy: A commentary on Raine. *International Journal of Psychophysiology 8(1)*. 27-31.

Ingham, S. D. (1938). Some neurologic aspects of psychiatry. Jounal of the American Medical Association. In H. Cleckley (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Jutai, J.W. (1989). Psychopathy and P3 amplitude: A commentary on Raine. *International Journal of Psychophysiology 8(1)*. 23-27.

Kagan, J. (1989). Temperamental contributions to social behavior. *American Psychology, 44,* 668-674.

Karpman, B. (1941). Psychopathic types: The symptomatic and the idiopathic. *Journal of Criminal Psychopathology, 3,* 112-124.

Karpman, B. (1961). The structure of neurosis: With special differentials between neurosis, psychosis, homosexuality, alcoholism, psychopathy, and criminality. *Archives of Criminal Dynamics, 4,* 599-646.

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

Kiehl, K. A., Bates, A. T., Laurens, K. R., Hare, R. D., & Liddle, P. F. (2006). Brain potentials implicate temporal lobe abnormalities in criminal psychopaths. *Journal of Abnormal Psychology, 115(3),* 443-453.

Kiehl, K. A., Smith, A. M., Hare, R. D., Mendrek, A., Forster, B.B., Brink, J., et al. (2001). Limbic abnormalities in affective processing by criminal psychopaths as revealed by functional magnetic resonance imaging. *Biological Psychiatry, 50,* 677-684.

Kling, A., Lloyd, R., Tachiki, K., Prince, H., Klimenko, V., & Komeva, E. (1992). Effects of social separation on immune function and brain neurotransmitters in cebus monkey (*C. paella*). *Annals of the New York Academy of Sciences, 650,* 257-261.

Koch, J. L. A. (1891). Die Psychopathische Minderwertigkeiten. Ravenburg: Meier, 1891. In H. Cleckley. (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Koukounas, E. & Over, R. (2000). Changes in the magnitude of the eyeblink startle response during habituation of sexual arousal. *Behavioral Research Theory (38),* 573-584.

Kosson, D. S., Cyterski, T. D., Steuerwald, B. L., Neumann, C. S., & Walker-Matthews, S. (2002). The reliability and validity of the Psychopathy Checklist: Youth Version (PCL: YV) in nonincarcerated adolescent males. *Psychological Assessment, 14,* 97-109.

Kosson, D. S., Budhani, S., Nakic, M., Chen, G., Saad, Z. S., Vythilingam, M., Pine, D. S., & Blair, R. J., R (2006). The role of the amygdala and rostral anterior cingulate in encoding expected outcomes during learning. *NeuroImage, 29,* 1161-1172.

Kraeplin, E.(1915). Psychiatrie, Ed. 8, Vol. 4. In H. Cleckley. (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Kreuger, R. F., Schmutte, P. S., Caspi, A., Moffitt, T. E, Campbell, K., & Silva, P. A. (1994). Personality traits are linked to crime among men and women: Evidence from a birth cohort. *Journal of Abnormal Psychology, 103(2),* 328-338.

Lang, P.J., Davis, M., & Öhman, A. (2000). Fear and anxiety: Animal models and human cognitive psychophysiology. *Journal of Affective Disorders, 61,* 137-159.

Lang, P. J., Bradley, M. M. & Cuthbert, B. N. (1990). Emotion, attention, and the startle reflex. *Psychological Review, 97,* 377-398.

Larsson, H., Andershed, H., & Lichtenstein, P. (2006). A genetic factor explains most of the variation in the psychopathic personality. *Journal of Abnormal Psychology, 115(2),* 221-230.

LeDoux, J. E., (1996). Emotional networks and motor control: A fearful view. *Progressive Brain Research, 107,* 437-446.

LeDoux, J.E., Cicchetti, P., Xagoraris, A. & Romanski, L.M. (1990). The lateral amygdaloid nucleus, sensory interface of the amygdala in fear conditioning. *Journal of Neuroscience (10),* 1062-1069.

LaBar, K. S., LeDoux, J. E., Spencer, D. D., & Phelps, E. A. (1995). Impaired fear conditioning following unilateral temporal lobectomy in humans. *Journal of Neuroscience, 15(10),* 6846-6855.

Levenston, G. K., Patrick, C. J., Bradley, M. M., & Lang, P. J. (2000). The psychopath as observer: Emotion and attention in picture processing. *Journal of Abnormal Psychology, 109(3),* 373-385.

Lilienfeld, S. O., Gershon, J., Duke, M., Marino, L., & De Waal, F. B. M. (1999). A preliminary investigation of the construct of psychopathic personality (psychopathy) in chimpanzees (*Pan troglodytes*). *Journal of Comparative Psychology, 113(4),* 365-375.

Linder, R. M. (1942). Experimental studies in constitutional psychopathic inferiority. Part I: Systematic patterns. *Journal of Criminal Psychopathology, 4,* 252-276.

Lorenz, K. (1966). *On Aggression.* New York: Harcourt, Brace & Jovanovich.

Losel, F., & Schmucker, M. (2004). Psychopathy, risk-taking, and attention: A test of the somatic marker hypothesis. *Journal of Abnormal Psychology, 113(4),* 522-529.

Lovelace, L. & Gannon, L. (1999). Psychopathy and Depression: Mutually exclusive constructs? *Journal of Behavior Therapy and Experimental Psychiatry, 30(3),* 169-176.

Lykken, D. T. (1955). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology, 55,* 6-10.

Lykken, D.T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Clinical Psychology, 55*, 6-10.

Lykken, D. T. (1995). *The Antisocial Personalities.*Mahwah, NJ: Erlbaum.

Lynam, D. R. (1997). Pursuing the psychopath: Capturing the fledgling psychopath in a nomological net. *Journal of Abnormal Psychology, 106*, 425-438.

Lynam, D. R. (1998). Early identification of the fledgling psychopath: Locating the psychopathic child in the current nomenclature. *Journal of Abnormal Psychology, 107(4),* 566-575.

Mandler, G. (1984). *Mind and Body*. New York: Norton.

Marcus, D. K., Edens, J. F., & Lilienfeld, S. O. (2004). Is psychopathy a taxon? In N. G., Poythress (Chair). *Contemporary issues in psychopathy research.* Symposium conducted at the Biennial Conference of the American Psychology-Law Society, Scottsdale, AZ.

Mawson & Mawson (1977). Psychopathy and arousal: A new interpretation of the psychophysiological literature. *Biological Psychiatry, 12(1)*. 49-74.

Meel, P. E., & Yonce, L. J. (1994). Taxometric analysis: I. Detecting taxonicity with two quantitative indicators using means above and below a sliding cut (MAMBAC procedure). *Psychological Reports, 74,* 1059-1274.

Meel, P. E., & Yonce, L. J. (1996). Taxometric analysis: II. Detecting taxonicity using covariance of two quantitative indicators in successive intervals of a third indicator (MAXCOV procedure). *Psychological Reports, 78,* 1091-1227.

Meerum-Terwogt, M., & Harris, P. L. (1993). Understanding of emotion. In Bennett, M. (Ed.), *The Child as Psychologist: An Introduction to the Development of Social Cognition* (pp. 62-86). Hemel Hempstead: Harvester Wheatsheaf.

Meyer, A. (1904). The anatomical facts and clinical varieties of traumatic insanity. In H. Cleckley, 1941, *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Mesulam, M. M. (2002). The human frontal lobes: Transcending the default mode through contingent encoding. In D. T. Stuss & R. T. Knight, (Eds). *Principles of Frontal Lobe Function*. New York: Oxford University Press. pp. 8-27.

Milburn, A. A. (1954). Current concepts of psychopathy. *The West Virginia Medical Journal, 50(8),* 205-208.

Mitchell, D. G., Colledge, E., Leonard, A. & Blair, R. J. R (2002). Risky decisions and response reversal: Is there evidence of orbitofrontal cortex dysfunction in psychopathic individuals? *Neuropsychologia, 40,* 2013-2022.

Mitchell, D. G., Avny, S. B. & Blair, R. J. R. (2006). Divergent patterns of aggressive and neurocognitive characteristics in acquired versus developmental psychopathy. *Neurocase, 12(3),* 164-178.

Morgan, A. B., & Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review, 20(1),* 113-136.

Murray, E. A., Gaffan, E. A., & Flint, R. W. Jr. (1996). Anterior rhinal cortex and amygdala: Dissociation of their contributions to memory and food preference in rhesus monkeys. *Behavioral Neuroscience, 110(1),* 30-42.

Mussen, P., & Eisenberg-Berg, N. (1977). *Roots of Caring, Sharing, and Helping.* San Francisco: Freeman.

Newman, J. P., (1998). Psychopathic behavior: An information processing perspective. In: D. J. Cooke, A. E. Forth, & R. D. Hare (Eds.), *Psychopathy: Theory, Research, and Implications for Society.* Dordrecht, The Netherlands: Kluwer Academic Publishers, pp. 81-104.

Newman, J. P., Patterson, C. M., & Kosson, D. S. (1987). Response perseveration in psychopaths. *Journal of Abnormal Psychology, 96,* 145-148.

Newman, J. P., Patterson, C. M., & Kosson, D. S (1987). Response perseveration in psychopaths. *Journal of Abnormal Psychology, 101,* 630-636.

Newman, J. P., MacCoon, D. G., Vaughn, L. J., & Sadeh, N. (2005). Validating a distinction between primary and secondary psychopathy with measures of Gray's BIS and BAS constructs. *Journal of Abnormal Psychology, 114(2),* 319-323.

Kosson, D. S., & Newman, J. P. (1986). Psychopathy and the allocation of attentional capacity in a divided-attention situation. *Journal of Abnormal Psychology, 95(3),* 257-263.

Patrick, C.J. (1994). Emotion and psychopathy: Startling new insights. *Psychophysiology, 31.* 319-330.

Patrick, C. J., Bradley, M. M, & Lang, P. J. (1993). Emotion in the criminal psychopath: Startle reflex modulation. *Journal of Abnormal Psychology, 102,* 82-92.

Patrick, C.J. & Iacono, W.G. (1989). Psychopathy, threat, and polygraph test accuracy. *Journal of Applied Psychology, 74,* 347-355.

Petrides, M., & Pandya, D. N. (2002). Association pathways of the prefrontal cortex and functional observations. In D. T. Stuss & R. T. Knight (Eds). *Principles of Frontal Lobe Function.* New York: Oxford University Press. pp. 31-47.

Pine, D. S., Shaffer, D., Schonfeld, I. S., & Davies, M. (1997). Minor physical anomalies: Modifers of environmental risks for psychiatric impairment? *Journal of the American Academy of Child and Adolescent Psychiatry, 36(3),* 395-403.

Porter, S., & Woodworth, M. (2006). "I'm sorry I did it…but he started it": A comparison of the official and self-reported homicide descriptions of psychopaths and non-psychopaths. *Law and Human Behavior* (published online: DOI 10.1007/s10979-006-9033-0).

Prichard, J. C. (1835). Treatise on Insanity. London: Sherwood, Gilbert & Piper. In H. Cleckley (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Raine, A. (2002). Annotation: The role of prefrontal deficits, low autonomic arousal, and early health factors in the development of antisocial and aggressive behavior in children. *Journal of Abnormal Child Psychology and Psychiatry, 43,* 311-326.

Raine, A., Brennan, P., & Mednick, S. A. (1994). Birth complications combined with early maternal rejection at age 1 year predispose to violent crime at age 18 years. *Archives of General Psychiatry, 51,* 984-988.

Raine, A. (1989). Evoked potentials and psychopathy. *International Journal of Psychophysiology, 8(1).* 1-16.

Rain, A., & Venables, P.H. (1990). Evoked potential augmenting-reducing in psychopaths and criminals with impaired smooth-pursuit eye movements. *Psychiatry Research 31(1).* 85-98.

Raskin, D. C., & Hare, R. D. (1978). Psychopathy and detection of deception in a prison population. *Psychophysiology,15,* 126-136.

Rhodes, L. (2000). Taxonomic anxieties: Axis I and Axis II in prison. *Medical Anthropology Quarterly, 14(3).* 346-373.

Robins, L. N. (1966). *Deviant Children Grown Up*. Baltimore, MD: Williams & Wilkins.

Roe, K. V. (1980). Toward a contingency hypothesis of empathy development. *Journal of Personality and Social Psychology, 39(5),* 991-994.

Rogstad, J.E. & Rogers, R. (2008). Gender differences in contributions of emotion to psychopathy and antisocial personality disorder. *Clinical Psychology Review.*

Rolls, E. T. (1997). Consciousness in neural networks? *Neural Networks, 10(7),* 1227-1240.

Rolls, E. T., Hornak, J., Wade, D., & McGrath, J. (1994). Emotion-related learning in patients with social and emotional changes associated with frontal lobe damage. *Journal of Neurology, Neurosurgery, and Psychiatry, 57,* 1518-1524.

Rothbart, M. K. (1989). Behavioral approach and inhibition. In J. S. Reznick (Ed.), *Perspectives on Behavioral Inhibition* (pp. 139-157). Chicago: University of Chicago Press.

Rubin, K. H., Coplan, R. J., Nelson, L. J., Chea, C. S. L., & Lagace-Seguin, D. G. (1999). Peer relationships in childhood. In M. H. Bornstein & M. E. Lamb (Eds)., *Developmental Psychology: An Advanced Textbook, 4th Edition*, pp. 451-501. Mahwah, NJ: Lawrence Erlbaum Associates.

Ruilmann, C. J., & Gulo, M. J. (1950). Investigation of autonomic responses in psychopathic personalties. *Southern Medical Journal, 43,* 953-956.

Russo, M. F., Stokes, G. S., Lahey, B. B., Christ, M. A. G., McBurnett, K., Loeber, R., Stouthamer-Loeber, M. et al. (1993). A sensation seeking scale for children: Further refinement and psychometric development. *Journal of Psychopathology and Behavioral Assessment, 15*, 69-86.

Schacter, S., & Latané, B. (1964). Crime, cognition, and the autonomic nervous system. In M.R. Jones (Ed.), *Nebraska symposium on motivation, 1964.* Lincoln: University of Nebraska Press, pp. 221-275. In R. D. Hare (1968). Psychopathy, autonomic functioning, and the orienting response. *Journal of Abnormal Psychology, Monograph Supplement, 73(3 pt. 2),* pp. 1-24.

Sherrington, C. (1934). The brain and its mechanism. Cambridge University Press. In H. Cleckley (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Shiffman, J., Ekstrom, M., & LaBrie, J. (2002). Minor physical anomalies and schizophrenia spectrum disorders: A prospective investigation. *American Journal of Psychiatry, 159(2)*, 238-43.

Smith, J.C., Bradley, M.M. & Lang, P.J. (2005). State anxiety and affective physiology: Effects of sustained exposure to affective pictures. *Biological Psychology (69)* 247-260.

Steklis, H. D. (1998). Arthur S. King: Pioneer of the primate social brain. *American Journal of Primatology, 44(3),* 227-230.

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

Swick, D. & Jovanovic, J. (2002). Anterior cingulate cortex and the Stroop task: neuropsychological evidence for topographic specificity. *Neuropsychologia, 408,* 1240-1253.

Teed, J. L. (1877). On mind, insanity, and criminality. *Postgraduate Medicine.*

Thomas, A., & Chess, S. (1977). *Temperament and Development.* New York: Brunner/Mazel.

Tong, J. E. (1959). Stress reactivity in relation to delinquent and psychopathic behavior. *Journal of Mental Science, 105,* 935-956.

Trunnell, T.L. (1967). Sociopathic personality in identical twins in a set of dizygotic triplets. *American Journal of Psychiatry, 124:43-51.*

Van Honk, J., Hermans, E.J., Putman, P., Montagne, B., & Schutter, D.J. (2002). Defective somatic markers in sub-clinical psychopathy. *Neuroreport 12;13(8),* 1025-1027.

Veit, R., Flor, H., Erb, M., Hermann, C., Lotze, M., Grodd, W., & Birbaumer, N. (2002). Brain circuits involved in emotional learning in antisocial behavior and social phobia in humans. *Neuroscience Letters, 328(3),* 233-236.

Vincent, G. M., Vitacco, M. J., Grisso, T. & Corrado, R. R. (2003). Subtypes of adolescent offenders: Affective traits and antisocial behavior patterns. *Behavioral Sciences & the Law, 21,* 695-712.

Vitale, J.E., Brinkley, C.A., Hiatt, K.D & Newman, J.P. (2007). Abnormal selective attention in psychopathic female offenders, *Neuropsychology* 21, 301–312.

Walker, L. E. A., & Shapiro, D. L. (2003). *Introduction to Forensic Psychology: Clinical and Social Psychological Perspectives*. New York: Kluwer/Plenum. pp. 285-287.

Weinberger, D. A., & Schwartz, G. E. (1990). Distress and restraint as superordinate dimensions of self-reported adjustment: a typological perspective. *Journal of Personality, 58(2)*, 381-417.

White, W. A. (1935). Outlines of Psychiatry, Ed. 14. Nervous and Mental Disease Publishing Company. In H. Cleckley (1941). *The Mask of Sanity, 1st Ed.* Mosby, St. Louis, MO.

Widiger, T. A. (2001). What can be learned from taxometric analyses? *Clinical Psychology: Science and Practice, 8,* 528-533.

Widom, C. S. (1977). A methodology for studying noninstitutionalized psychopaths. *Journal of Consulting and Clinical Psychology, 45,* 674-683.

IAPS Identification Numbers and Picture Descriptions

Positive

5760 Nature
5200 Flowers
5480 Fireworks
4311 Erotic Female
8180 Cliff Divers
8490 Roller Coaster
5629 Hiker
8400 Rafters
8185 Skydivers
4670 Erotic Couple
8186 Skysurfer

Neutral

7211 Clock
7044 Scale
7402 Pastry
7590 Traffic
5531 Mushrooms
7224 File Cabinets
7160 Fabric
7705 Cabinet
7235 Chair
7052 Clothespins
7217 Clothes Rack

Negative

3071 Mutilation
3064 Mutilation
3005.1 Open Grave
9810 KKK Rally
6260 Aimed Gun
9570 Dog
9910 Car Accident
6300 Knife
9600 Ship
1050 Snake
1300 Pit Bull

Distress

3180 Battered Female
2141 Grieving Female
2703 Sad Children
3022 Scream
2900.1 Crying Boy
3220 Hospital
6313 Attack
6834 Police
2799 Funeral
9421 Soldier
9429 Assault

CAPITOL BOND
25% COTTON
POST CONSUMER

PPI-R Instructions and Sample Questions

Instructions: "The items that you will be reading and answering describe many different ways that people can think and feel. There are no right or wrong answers, and by answering each item as honestly as you can, you will help me have a better understanding of your feelings and beliefs. These items have been answered by thousands of individuals and will help us get a better understanding of how you are the same as or different from other people. As you will see, the instructions ask you to read a list of items and rate how true or false the description is for you. If you aren't sure whether an item is true or false for you, choose the answer that is closest to how you would describe yourself. Please answer all the items as best as you can, even if some are difficult or don't seem to apply to you. If you have any questions or concerns, please don't hesitate to ask. You will be asked to verify if you are sure of your answer after you make a selection. Please indicate "Y" for yes or "N" for no. If you choose "N" you will have the opportunity to go back to the previous answer and change it before moving on to the next item."

1). If I really want to, I can persuade most people of almost anything.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

3). Dangerous activities like skydiving scare me more than they do most people.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

10). I am easily flustered in pressured situations.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

13). When my life gets boring, I like to take chances.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

18). A lot of people have tried to "stab me in the back."
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

24). I am hardly ever the center of attention.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

28). I tend to get crabby and irritable when I have too many things to do.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

32). I don't let everyday hassles get on my nerves.
FALSE MOSTLEY FALSE MOSTLY TRUE TRUE

34). I have a talent for getting people to talk to me.
FALSE MOSTLY FALSE MOSTLY TRUE TRUE

Participant Instructions for Startle Segment

"In this phase of the experiment, you will be asked to first view several slides of abstract patterns. Please keep your eyes fixed straight ahead on the screen. During the second phase, you will be asked to view different pictures displayed on the computer screen in front of you.

It is important that your eyes be directed towards the screen when the pictures are shown to you. You will have a few seconds to view each picture. Please remember to view the picture for the entire time it is displayed.

While you are viewing each picture, try to imagine yourself actually being in the setting or encountering the object you see. Imagine how you would feel if you encountered the object or situation in real life. While you are viewing the pictures, please ignore the sounds you may hear through your headphones. If you have any questions, please ask the experimenter at this time."

Iowa Gambling Task Instructions

"In front of you on the screen there are 4 decks of cards A, B, C, and D. I want you to select one card at a time, by clicking on the card, from any deck you choose. Each time you select a card, the computer will tell you that you won some money. I don't know how much money you will win. You will find out as we go along. Every time you win, the green bar gets bigger. Every so often however, when you click on a card, the computer tells you that you won some money, but then it says that you lost some money too. I don't know when you will lose, or how much you will lose. You will find out as we go along. Every time you lose, the green bar gets smaller.

You are absolutely free to switch from one deck to the other at any time, as often as you wish. The goal of the game is to win as much money as possible, and if you can't win, avoid losing money as much as possible. You won't know when then game will end. You must keep on playing until the computer stops. I am going to give you this $2000 credit, the green bar, to start the game. The red bar here is a reminder of how much money you borrowed to play the game, and how much money you have to pay back before we see how much you won or lost. It is important to know that just like in a real card game the computer does not change the order of the cards after the game starts. You may not be able to figure out exactly when you will lose money, but the game is fair. The computer does not make you lose money at random, or make you lose money based on the last card you picked. Also, each deck contains an equal number of cards of each color, so the color of the cards does not tell you which decks are better in this game. So you must not try to figure out what the computer is doing. All I can say is that some decks are worse than others. You may find all of them bad, but some are worse than others. No matter how much you find yourself losing, you can still win if you stay away from the worst decks. Please treat the play money in this game as real money, and any decision on what to do with it should be made as if you were using your own money."

Informed Consent Letter

Informed Consent Document
For
Variations in Emotional Behavior as a Function of Personality Type
Principal Investigator: Paul Haerich, Ph.D.
Co-Investigator: Kristen Godenick, M.A.

Purpose

You are invited to participate in this research study to help us better understand the interplay of individual differences in personality with human reflexes, human cognition, and human interpersonal interaction. This research study will investigate the way people respond to various pictures and sounds and the way they perform on a computerized decision-making task, in the context of certain aspects of personality evaluated with a simple questionnaire. The pictures you will be viewing have been chosen to cover a variety of things individuals might encounter in their life. The cognitive task asks you to choose different cards out of four response decks. Finally, your responses on the personality questionnaire are true/false responses and will reflect whether or not you feel the statement accurately describes you.

Procedure

During this study, you will first view a series of pictures depicting various subjects including (listed alphabetically): animals, guns, household objects, human nudes, nature scenes, mutilations, plants, rocks, snakes, spiders, sports scenes, etc. From time to time while viewing these slides, a brief, loud noise also will occur. The sounds used in this study are similar in loudness and duration to a loud handclap, or a book being dropped.

This procedure also will involve collecting information regarding the activity of the heart and of the muscles involved in the eye blink. A small device that clips onto the end of one finger will measure heart rate activity. Eye muscle activity will be measured by small, button-like sensors, which will be taped below your left eye and one behind the ear. Finally, two larger sensors will be taped to the palm of your left hand. These sensors will be used to measure small changes in the amount of sweat being produced - an indicator of small changes in the activity level of part of the nervous system.

In the second portion of this study, you will be asked to complete a brief computer task that will ask you to choose cards from four decks. As you choose cards, your goal will be to maximize winnings.

In the third portion of the study, you will be asked to complete a computerized personality questionnaire. For each item on the questionnaire you will be asked to rate a series of statements about your feelings, opinions and attitudes on a numerical scale using the computer keyboard.

It should take approximately 70 minutes to complete your participation in this study.

Risks

There is no increased risk associated with participation in this study beyond that of everyday life. Therefore, the committees at both CSU San Bernardino (Department of Psychology Institutional Review Board Sub-Committee) and Loma Linda University (Institutional Review Board) that review human studies have determined that participating in this study exposes you to minimal risk. The official stamp appearing on this form indicates this approval.

Although this study has been deemed of minimal risk, you should be aware that some of the content of certain slides may lead to feelings of surprise or may make you feel uneasy or uncomfortable. The sounds may be relatively loud and may cause surprise or be startling, but in no case will the sounds be louder than 110 dB, which, for the type of sounds used, has been determined by the Occupational and Safety Health Administration to be below the level that could cause temporary or permanent hearing problems.

Benefits and Reimbursement

You should not expect to receive any direct benefit from your participation in this research study other than the educational experience of participating in a scientific psychological research project. It is anticipated that the results of this study will help advance our understanding of how different people, with different personalities respond to emotional stimuli and situations. We hope that this information will eventually be useful in improving or targeting psychotherapy techniques.

Compensation

Although not a benefit from the research study itself, you may receive extra credit for a course. If you are a student at CSUSB your extra credit will be in the form of a slip for 5 units of extra credit and, at the discretion of your instructor, you may receive extra credit points for your class.

Confidentiality

All of the information gathered during your participation in this research study is confidential and will be handled anonymously. That means that your name will not be attached to or stored with your responses. The information you provide will be grouped with that of other participants. Any publications or presentations resulting from this study will refer only to the grouped results.

UNIVERSITY LIBRARIES
LOMA LINDA, CALIFORNIA

Third Party Contact & Questions

If at any time you have any other questions regarding your participation in this study, you should feel free to contact Paul Haerich, PhD at the Department of Psychology, Loma Linda University. (phone: 909-558-4770).

If you wish to contact an impartial third party not associated with this study regarding any complaint about the study, you may contact the Office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354 (phone: 909-558-4647), for information and assistance.

Participant's Rights

Participation in this study is voluntary. If, after signing this consent form, you decide to discontinue the session at any time, for any reason, you are free to do so. Discontinuing the session will not jeopardize your class standing or grade. You will receive extra credit for your participation whether you complete the session or not. If you have any questions regarding this study, we will be happy to answer them.

Consent Statement

By placing an X in the space below I acknowledge that I have been informed of, and that I have understand, the nature and purpose of this study, and I freely consent to participate. I have read the contents of the consent form and have been given the opportunity to ask questions concerning the study. I have been offered a copy of this form. I acknowledge that I am at least 18 years of age. I hereby give my voluntary consent to participate in this study. Signing this consent form does not waive my rights nor does it release the investigators or institution(s) from their responsibilities. I may call Paul Haerich, Ph.D. at (909) 558-4770 if I have additional questions or concerns.

Participant's X _____

Date: _____

CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO
PSYCHOLOGY INSTITUTIONAL REVIEW BOARD SUB-COMMITTEE
APPROVED 04/09/08 VOID AFTER 04/09/09
IRB# H-08SP-02 CHAIR