

DIFFERENTIATING SUCCESSFUL PSYCHOPATHS FROM NON-
PSYCHOPATHIC CONTROLS

by

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DEDICATION

To my wonderful parents Teri and Keith, it is with great certainty that I would not have made it this far in life without you. It is through your guidance, compassion, and unconditional love that I have become the strong, independent, and goal-driven person I am today. You have enabled me in every aspect of life by giving me the tools necessary to succeed, and undoubtedly empowered me to accomplish every ambition of mine. I simply cannot thank you both enough for all the support and love you have shown me, and standing by me even through my craziest and most far-fetched dreams and aspirations. Dad, I thank you showing me what a stand-up person looks like, and I will never stop striving to be like you. I am grateful of you always challenging me intellectually as it continues to flourish my craving of knowledge about the world (and universe) around me. Mom, I thank you for endlessly encouraging me to ask questions and showing me what being a lifetime student is all about. It is because of this that I never want to stop learning and pushing myself educationally. If nothing else, my greatest accomplishment in life will be being a daughter you both can be proud of.

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LIST OF ABBREVIATIONS

Abbreviation	Description
OFC	Orbitofrontal Cortex
ASPD	Antisocial Personality Disorder
PCL-R	Psychopathy Checklist – Revised
PPI-R	Psychopathic Personality Inventory – Revised
PPI-I	Psychopathic Personality Inventory – Factor 1
PPI-II	Psychopathic Personality Inventory – Factor 2
LSRP	Levenson’s Self-Report Psychopathy
BIS	Behavioral Inhibition System
BAS	Behavioral Activation System
ANS	Autonomic Nervous System
vmPFC	Ventromedial Prefrontal Cortex
PFC	Prefrontal Cortex
ToM	Theory of Mind
IRI	Interpersonal Reactivity Index
SMH	Somatic Marker Hypothesis
High-P	Top 25% of the norm for age group in psychopathy
Low-P	Bottom 25% of the norm for age group in psychopathy

RMET	Reading the Mind in the Eyes Test
IGT	Iowa Gambling Task
HR	Heart Rate

ABSTRACT

Modern day psychopaths are categorized into two distinct types: criminal and noncriminal psychopaths, who are thought to display different profiles of neural and cognitive function (Gao & Raine, 2010). More specifically, criminally-deviant behavior in unsuccessful psychopaths is associated with impulsive, antisocial tendencies characterized by deficits in executive function. The purpose of this study was to gain insight into successful psychopaths. It was predicted that relative to non-psychopathic controls, they would have enhanced response to reward cues and reduced response to punishment cues associated with anxiety, intact cognitive empathy, but impaired emotional empathy. Self-report measures of psychopathy, behavioral indices and empathy were administered to identify college students who were either high or low in psychopathic traits. Independent samples *t*-tests were conducted to examine if behavioral activation and inhibition systems and different forms of empathy could differentiate between the two groups. Behavioral modulation, specifically reward responsiveness, and emotional processing (i.e., emotional empathy) were not significantly different between groups. However, elevated sensation seeking and intact cognitive empathy are consistent with previous research on successful psychopaths. These results inform and embellish the Gao and Raine (2010) model, providing further insight into how successful psychopaths differ non-psychopathic controls, with implications for prevention of criminal psychopathy.

I. INTRODUCTION

The term “psychopath” is common in every day parlance, but psychopathic personality disorders are widely misunderstood (Lilienfeld & Arkowitz, 2007). Media and popular culture have perpetuated this confusion by depicting psychopaths as criminals, with colorful descriptions of serial killers or con-artists (e.g., Dexter or Agent 007; Berg et al., 2013). Individuals displaying shallow affect and callousness, who have poor behavioral control (i.e., are impulsive), and are seen as irresponsible in their actions are commonly classified as psychopaths. Psychopathy, however, is a concept used to describe a personality type initially characterized by emotional instability and social drift. First conceptualized in the early 19th century by Pinel (1809) as “mania sans delire” (mania without delirium), the association between psychopathy and criminal behavior is attributable, in part, to the fact that early research regarding psychopathy was conducted using prison samples, or “unsuccessful psychopaths” (Hare, 1970). More recently, research has begun to focus on characterizing “successful psychopaths,” or individuals who share the social and emotional features of psychopathy, yet appear to function successfully in society (Gao & Raine, 2010).

In the early 1900’s, almost a century later, Cleckley (1941) developed a specific set of criteria to identify the psychopathic personality, wherein the defining criteria encompassed affective, interpersonal, and behavioral traits (Cooke & Michie, 2001). Although Cleckley denied that psychopaths were inherently impulsive, and that the disorder required criminally-based aberration, these traits were most commonly associated with serial killers (e.g., Jeffrey Dahmer or Ted Bundy). These individuals use their charm to manipulate their victims and commit heinous, premeditated murders by

acting on dark and malevolent impulses without remorse (Hare, 1996). Research has characterized psychopaths as conning, manipulative and empowered with a sense of grandiose self-worth, but also displaying poor behavioral control, criminal versatility, and juvenile delinquency (Cleckley, 1941; Hare, 1991). As mentioned, this research relied heavily upon prison populations consisting of incarcerated or unsuccessful, criminal psychopaths and was used to create a stereotypical profile for diagnostic purposes. As a result of this early research, criminal behavior has been strongly associated with the concept of psychopathy. However, increased interest in successful psychopaths, or individuals with who exhibit these characteristics in the general population, without criminal behavior (Widom & Newman, 1985), has led to the suggestion that psychopathy may not be limited to individuals with criminally-deviant behavior (i.e., behaviors that violate social norms), and may be found in socially-adjusted individuals (Weber, Habel, Amunts, & Schneider, 2008).

The study of noncriminal or successful psychopaths, individuals who possess psychopathic tendencies yet are high-functioning members of society and able to maintain successful careers while avoiding criminal behavior, can shed light on the etiological underpinnings of psychopathy. The proposed research is based upon a neurobiological model of psychopathy proposed by Gao and Raine (2010) in efforts to better understand social, emotional, and cognitive function in successful psychopaths. The operational definition of “successful” with respect to psychopathy remains questionable (Lilienfeld, Watts, & Smith, 2015). While successful psychopaths may successfully achieve life goals without breaking the law, they may not be quite as well adjusted when it comes to violating social norms or using others (e.g., nonconventional or

immoral) as means to get what they want (e.g., the manipulation of coworkers to get a promotion; Hall & Benning, 2006). Therefore, for the purpose of this review, the term successful psychopath will refer to those who possess psychopathic traits but have not been criminally convicted, and are thought to avoid criminal behavior in order to achieve goals. The term unsuccessful psychopath will refer to individuals who have been criminally incarcerated or criminal psychopaths.

Gao and Raine's (2010) neurobiological model of psychopathy proposes that there are certain psychopathic traits, such as a lack of empathy and impaired executive functioning (characteristics previously thought to be shared by all psychopaths), that noncriminal psychopaths may not display compared to criminal psychopaths. While noncriminal psychopaths display some affective-interpersonal and personality characteristics of the disorder (e.g., superficial charm, manipulative, and pathological lying), other traits may not be manifested as strongly or are completely absent (e.g., antisocial behavior). Ishikawa, Raine, Lencz, Bihrlé, and Lacasse (2001) found that the neurocognitive (e.g., executive function) and behavioral (e.g., motivational response) markers that characterize unsuccessful psychopaths were nonexistent in successful psychopaths. In fact, research suggests that noncriminal psychopaths may even have enhanced brain and cognitive function, compared to criminal psychopaths (see Gao & Raine, 2010, for a review). Rigorous examination of this model may help identify the features and characteristics of psychopathy and how they differ in successful and unsuccessful psychopaths, as well as how psychopaths differ from non-psychopathic individuals.

The objective of this study was to systematically examine features of the neurobiological model (Gao & Raine, 2010) in college students who are low and high in psychopathic traits, with the assumption that those scoring highly in these traits with no history of criminal behavior are noncriminal or successful psychopaths. In order to test this, individuals classified as noncriminal psychopaths and controls (individuals with low psychopathy scores) participated in a self-report assessment. The findings from this study were interpreted in the context of Gao & Raine's (2010) neurobiological model of successful psychopaths, which suggests that noncriminal psychopaths have intact or enhanced orbitofrontal cortex (OFC) and amygdala function, information processing, fear conditioning, somatic markers and cognitive empathy. However, similar to criminal psychopaths, they were hypothesized to display deficits in behavioral modulation and emotional empathy.

Of the two psychopathy measures being examined, it was predicted that there would be significant differences in the factor scores and similarity across the two scores. Additionally, it was expected there would be significant differences in behavioral inhibition and activation measurements across the high and low psychopathy groups and differences in the two scales such that the high psychopathy group would show decreased behavioral inhibition but increased activation compared to the low psychopathy group. As for empathy, it was predicted that there would be no significant differences between successful psychopaths and non-psychopathic controls on cognitive empathy (i.e., perspective taking), but that successful psychopaths would show impairments in emotional empathy (i.e., empathic concern). This study informs the field of psychopathy by directly testing predictions regarding successful psychopaths generated by the Gao

and Raine (2010) model and yields information which contributes to our understanding of successful psychopaths. Specifically, the results inform our understanding of why certain psychopaths act on their impulses, committing criminally-deviant acts, while other psychopathic individuals are able to achieve their desires and remain high-functioning members of society. Finally, this research facilitates advancements in the assessment and possible treatments for psychopathic personality disorder.

II. LITERATURE REVIEW

The construct of psychopathy is a multidimensional disorder on individual, as well as interpersonal levels. Conventionally, those diagnosed with psychopathic personality disorder possess characteristics including callousness, a lack of empathy, impulsive tendencies, and an inability to learn from experience – punishment in particular. The study of psychopathy has contributed to our understanding of how emotional processing, social behavior, and key areas of learning (e.g., reward/punishment and fear conditioning; Müller, 2010) are affected in this disorder. The study of psychopathic individuals has linked deficits in social and emotional behavior, and to structural and functional differences in specific brain areas of psychopaths relative to controls. However, with a shift in the way psychopathy was studied (i.e., self-report assessment within the general population as opposed to strictly prison samples), new discoveries with respect to how the disorder manifests itself across different individuals were made. Specifically, a body of research has converged to demonstrate that not all psychopathic individuals share the same psychosocial profile.

Traditionally, the study of psychopathy was limited to forensic samples, as those who were incarcerated were the only ones thought to have the disorder. This is because criminally deviant behavior was considered a key behavioral characteristic of psychopathy. More recently, the investigation of psychopaths within the general population received increased attention and led to the recognition of non-incarcerated psychopaths as a distinct subgroup. While it is generally acknowledged there are psychopaths among us who function well in society, the question of why they are able to avoid criminal behavior remains a mystery. In order to characterize these separate

populations of psychopaths (i.e., criminal and noncriminal) and how different factors (e.g., personality traits and antisocial behavior) of the construct are represented in these two populations, our current understanding of psychopathy, including the clinical features and attributes, and how it is assessed will be discussed. A comprehensive overview of the neurobiological correlates of psychopathy is also provided. Research regarding the functional and structural deficits is highlighted, as well as an overview of inconsistencies regarding processes such as cognitive function within psychopaths. The literature review concludes with the importance of future research into the underlying mechanisms associated with psychopathy, leading into the rationale for this study which examines social and emotional processing in noncriminal psychopaths. The results of this research provide insight into why certain psychopathic individuals are predisposed to criminality but not others, with implications for the treatment and prevention of criminal behavior.

Assessment

The classifications of psychopathy and antisocial personality disorder (ASPD) are still easily confused and used synonymously, which may possibly lead to inconsistencies regarding the identification of at-risk individuals, with implications for early intervention and treatment options. This confusion regarding the clinical assessment and diagnosis of psychopaths is due to overlap between psychopathy and ASPD with respect to a shared behavioral characteristic, antisocial behavior. Psychopathy is currently outlined in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013), which is widely used by researchers and clinicians in the assessment and diagnosis of mental disorders. However, it is classified under Cluster B of personality disorders, not as a unitary disorder, but as a subtype of ASPD.

This is most likely due to the fact that both ASPD and psychopathy are considered developmental disorders, where approximately one-quarter of those who meet the criteria for ASPD fall within the psychopathy subgroup (Blair, 2005).

ASPD is defined as a behavioral condition, and the diagnostic criteria consists of a pervasive pattern of disregard for and violation of the rights of others, marked by a history of antisocial behaviors (e.g., deceitfulness, impulsivity, aggressiveness, irresponsibility, lack of remorse, etc.) and criminal behavior (i.e., failure to conform to social norms with respect to lawful behaviors; APA, 2013). This definition of ASPD is not far from what is commonly thought of psychopathy, which assumes psychopathy is associated with criminality (Harpur, Hare, & Hakstian, 1989). However, the diagnosis of psychopathy is also largely personality-based, stressing mannerisms such as glibness, charm and fearlessness (Lilienfeld & Andrews, 1996), interpersonal and affective traits that are not as strongly implicated in ASPD. Thus, psychopathic individuals who lack a history of criminal, antisocial behavior but display the personality features of ASPD would undoubtedly fail to meet the diagnostic criteria for ASPD, thereby remaining undetected. This is where the distinction between ASPD and psychopathy should be emphasized, as not all psychopaths are necessarily criminal.

A notable researcher of psychopathy, Robert D. Hare, described the psychopath as a senseless predator, notorious for their guiltless, remorseless behavior and violation of social norms without consciousness, using charm and manipulation to achieve desires (1996). He used this framework to create the Psychopathy Checklist, the revised version (PCL-R; Hare, 1991), and now what is known as the “gold standard” measurement and assessment instrument for psychopathy (Mahmut, Homewood, & Stevenson, 2007;

Thompson, Ramos, & Willett, 2014). It was developed as a means for understanding the key characteristics and behaviors that define the psychopathic personality and operationalizing Cleckley's (1941) diagnostic criteria, while evaluating both the core personality characteristics (e.g., lack of remorse, callousness) as well as the behavioral traits that Hare thought were essential to psychopathy (i.e., impulsivity; 1996). However, the PCL-R can be a tricky instrument to use, specifically within the general population, as it involves a lengthy interview process, an extensive review of background files, and requires trained clinicians to administer (Harpur et al., 1989). For these reasons, the use of the PCL-R is typically confined to criminal psychopaths or individuals from prison-based samples. As a result of this targeted sampling, the majority of research in the field of psychopathy using the PCL-R has been primarily focused on criminal populations.

Harpur, Hare, and Hakstian (1989) conducted a factor analysis of the PLC-R that suggested that the personality disorder consists of two main sub factors, or scales, and four different facets (with two facets loading on each factor). Factor 1 consists of the core psychopathic traits of callousness/lack of remorse, grandiose self-worth, shallow affect, and deceitfulness. These make up the interpersonal (Facet 1) and affective (Facet 2) aspects of the factor. Factor 2 assesses the behavioral aspects such as impulsivity and criminal versatility, and consists of lifestyle (Facet 3) and antisocial (Facet 4) features. (Lilienfeld & Andrews, 1996). Providing the “gold standard” construct in terms of assessment (Lynam, Whiteside, & Jones, 1999), the PCL-R has also become the soundest two-factor diagnostic tool for psychopathy (Levenson, Kiehl, & Fitzpatrick, 1995). With respect to criminal and noncriminal psychopath, criminal psychopaths load on the antisocial, Facet 4 aspects (e.g., poor behavior control) and noncriminal psychopaths are

thought to be more limited to the interpersonal, Facet 1 features (e.g., glibness and grandiose sense of self-worth; Gao & Raine, 2010).

The Psychopathic Personality Inventory

In order to provide an easier means of assessing individuals with psychopathic personality traits in nonincarcerated samples, Lilienfeld and Andrews (1996) developed the Psychopathic Personality Inventory and then the revised version (PPI-R), a self-report measure designed to assess a variety of facets of the psychopathic personality type (Sellbom & Verona, 2007). The PPI-R consists of eight subscales, seven of which were found to noticeably load on two factors. The fearless dominance factor (PPI-I) combines the affective-interpersonal scales of Stress Immunity, Social Influence, and Fearlessness. The impulsive antisociality factor (PPI-II) is a combination of the socially deviant scales: Machiavellian Egocentricity, Carefree Nonplanfulness, Rebellious Nonconformity, and Blame Externalization (Sellbom & Verona, 2007). It has been noted that the PPI-R has a resemblance to the PCL-R, and research indicates that there is a moderate to strong correlation between the corresponding factor scores of each scale (Sellbom & Verona, 2007). However, the two psychopathy measures do in fact differ in terms of their content and administration, and it is still unclear as to whether the PPI-R factors index the core personality features of psychopathy or entirely encompass the same construct as the PCL-R, especially with respect to criminality (Sellbom & Verona, 2007). Research examining differences between criminal and noncriminal psychopaths suggest that there are differences in how these two groups differ with respect to scores on these two factors, such that that higher scores on the PPI-I (Factor 1) are associated with enhanced cognitive functioning (i.e., noncriminal psychopaths) and higher scores on the PPI-II

(Factor 2) are associated with antisocial behavior (i.e., criminality; Sellbom & Verona, 2007).

Levenson's Self-Report Psychopathy Scale

As self-report assessments of psychopathy progressed to ease administration while still encompassing both the interpersonal and behavioral aspects in diagnosis of the disorder as defined by the PCL-R, Levenson's Self-Report Psychopathy scale (LSRP; Levenson et al., 1995) was developed. A much shorter scale, the LSRP is divided into similar factors as the PCL-R. Factor 1 of the LSRP, also termed "Primary" psychopathy, attempts to identify individuals thought to have a predisposition toward callousness (Miller, Gaughan, & Pryor, 2008); these individuals are also considered narcissistic, low in anxiety, and high in fearless-dominance (i.e., PPI-Factor I; Blackburn, 1975; Lykken, 1995). Factor 2, coined "Secondary" psychopathy, aims to identify individuals with behavioral problems thought to be due to environmental factors (Miller, Gaughan, & Pryor, 2008); these individuals are considered impulsive, high in aggression, and high in impulsive antisociality (i.e., PPI-Factor II; Blackburn, 1975; Lykken, 1995). The LSRP scale was designed to obtain the same key information used to identify psychopathic personality features and assess the behavioral aspects traditionally deemed central to the disorder (e.g., impulsivity), as the PCL-R construct and two-factor model of psychopathy, but in non-institutionalized samples. To test this assumption, Brinkley, Schmitt, Smith, and Newman (2001) examined the relationship between the LSRP scale and the two factors of the PCL-R. The findings revealed a similar relationship to the criminality aspect as defined by the PCL-R (Brinkley et al., 2001).

A study conducted a factor analysis using a combination of the PPI-R and LSRP factors, among other measures, to represent Primary and Secondary psychopathy; Primary psychopathy was indexed by PPI-R I and LSRP primary psychopathy scale, and Secondary psychopathy by PPI-R II and LSRP secondary psychopathy scale (Ross et al., 2007). In another study looking at how the two factors of the LSRP (primary & secondary psychopathy) compare to the two factors of the PPI-R (Factor 1 & 2), the degree of overlap was modest at best (Ross, Benning, Patrick, Thompson, & Thurston, 2008); therefore, these two self-report measures and their factors will both be evaluated in the current study.

As demonstrated, the assessment of psychopathy can be complex due to the multifaceted nature of the disorder. With the help of the assessments described above, converging evidence is emerging for a two-factor structure of psychopathy. In other words, there is one factor that encompasses the affective-interpersonal personality characteristics upon which all psychopaths load (Factor 1) and a second factor that comprises the antisociality-lifestyle characteristics, upon which Secondary, or criminal, psychopaths tend to score more highly (Factor 2). With the validation of said assessments, investigation into neuropsychological and physiological correlates of psychopathy has been further facilitated through the use of behavioral tasks and/or neuroimaging which have identified putative brain areas responsible for impairments resulting in the personality and behavior of psychopaths.

As mentioned previously, Gao and Raine's (2010) theoretical neurobiological model of successful psychopaths provides a framework for understanding similarities and

differences between successful and unsuccessful psychopaths with respect to various assessment criteria, as well as neural and psychophysiological correlates (see Figure 1).

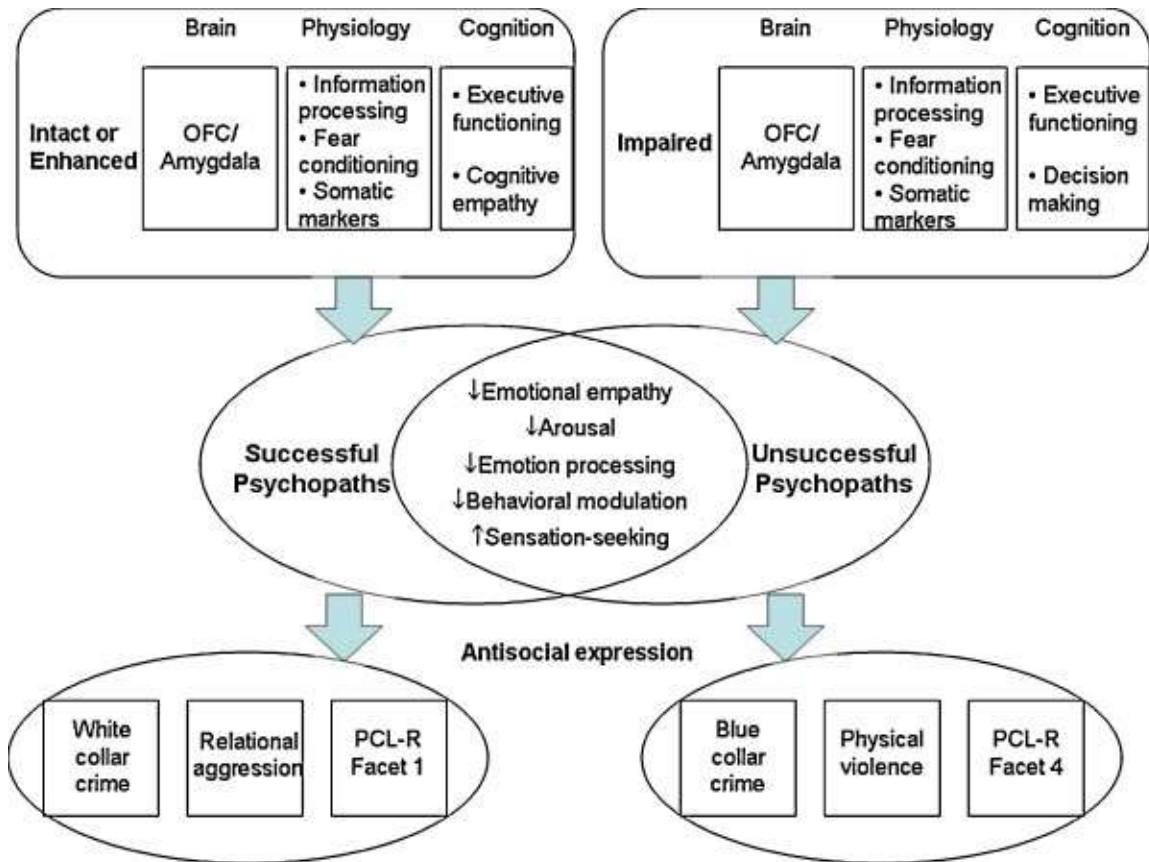


Figure 1: Neurobiological Model proposed by Gao and Raine (2010)

In terms of assessment, Gao and Raine (2010) suggest that successful psychopaths should score high in PCL-R Facet 1, the interpersonal facet of Factor 1, which consists of characteristics such as glibness/superficial charm, grandiosity, and being cunning/manipulative; the opposing unsuccessful psychopaths, who tend to score high in PCL-R Facet 4, the antisociality facet of Factor 2, display poor behavioral control and more antisocial behaviors. As for neural and cognitive processes, successful psychopaths are thought to have intact or even enhanced executive function and cognitive empathy,

and normal prefrontal and amygdaloid volume relative to unsuccessful psychopaths (Gao & Raine, 2010). With regard to the successful psychopaths' physiological processes, increased autonomic reactivity and intact somatic markers (physiological responses elicited by external stimuli) are present compared to unsuccessful psychopaths (Gao & Raine, 2010). This model and the predictions generated with respect to how successful psychopaths should differ from non-psychopaths form the foundation of the current study, and are outlined in further detail below. However, prior to this discussion, contextual information regarding how psychopathy is related to behavioral activation and inhibition is required.

Gray-Fowles Behavioral Inhibition and Activation Systems

An important theoretical model to consider when studying psychopathy is Gray's (1987) model of behavioral inhibition and activation, a framework designed to explain relationships between human personality and pathology (van Honk, Hermans, Putman, Montagne, & Schutter, 2002). This model describes two main components or systems that influence avoidance- and approach-related responses: the Behavioral Inhibition System (BIS) and Behavioral Activation System (BAS). The BIS facilitates withdrawal or inhibitory responses to cues and signals associated with warning and punishment and is thought to be linked to anxiety, while the BAS facilitates approach-related response to cues associated with reward and is thought to be linked to impulsivity (Ross et al., 2008). Fowles (1980) was the first to theorize how these systems would be involved in psychopathic individuals and suggested that primary psychopaths who load highly on the affective-interpersonal aspect of psychopathy (Factor 1 of the PPI-R) should have lower levels of anxiety and a tendency toward narcissism (as indexed by the PPI-R), and

therefore a reduced BIS. On the other hand, individuals loading on impulsive antisociality (Factor 2 of the PPI-R) should be more impulsive and aggressive and have an enhanced BAS. In other words, a weak BIS accounts for the Primary, or noncriminal psychopath's fearlessness, and strong BAS accounts for the Secondary, or criminal psychopath's impulsive reward craving, and inability to learn from punishment (Montagne et al., 2005).

Based on Gray's (1987) model, Carver and White (1994) designed the orthogonally-dimensional behavioral inhibition and activation system (BIS/BAS) self-report scales. The BIS scale has seven items which examine apprehensive anticipation, and the BAS scale has 13 items which are broken up into 3 subscales: Drive (four items), Fun Seeking (four items), and Reward Responsiveness (five items). The Drive scale indexes the pursuit of goals; Fun Seeking taps into the search for rewards; and Reward Responsiveness indicates the level of response to a rewarding situation or the anticipation of a reward (Carver & White, 1994). In the context of psychopathy, only inhibition and activation have been systematically examined. In the case of activation (BAS), typically the subscale scores have been combined. However, Carver and White (2007) advise against combining the subscales of the BAS, as they are thought to index different dimensions of incentive/reward sensitivity. To date, little is known about whether there are differences with respect to the involvement of the individual BAS subscales with respect to successful and unsuccessful psychopaths.

In a study investigating the relationship between the PPI-R and BIS/BAS scales within a non-institutionalized sample, both factors of the PPI-R were correlated with BAS activity, corresponding with the notion that greater impulsivity would be associated

with more activation of this system. Additionally, PPI-I Factor 1 was inversely associated with BIS activity (Ross et al., 2008). Further research investigating relationships between primary and secondary psychopathy scores and BIS/BAS measurements suggests that primary psychopaths (i.e., the prototypical psychopath) are associated with a weak BIS and normal BAS, and that secondary psychopaths (i.e., the antisocial, criminal psychopath) show significantly higher BAS scores relative to non-psychopaths (Newman, MacCoun, Vaughn, & Sadeh, 2005). While this research identifies that primary psychopaths don't display the same level of inhibition as non-psychopaths (i.e., a weakened BIS which mediates warning signals associated with anxiety), results most strongly highlight secondary psychopaths impulsive tendencies, in addition to their inhibited responsiveness toward punishment cues. This is consistent with Fowles (1980) theories regarding secondary psychopaths (i.e., individuals high in impulsive antisociality) increased impulsivity and weakened behavioral response (Ross et al., 2008). BIS/BAS assessment may be of particular relevance when assessing noncriminal psychopaths, because processes that facilitate emotional learning (i.e., reward and punishment), as well as their somatic markers, are thought to be impaired in criminal psychopaths. Although most research suggests that it is largely the BIS which differentiates primary and secondary psychopaths, less is known about how the individual subscales within the BAS map onto the psychopathy construct, specifically, how these scores are manifested in non-criminal psychopaths. The current study investigates how the four subscales differ between non-criminal psychopaths and non-psychopaths.

Neurobiological Basis of Psychopathy

Theories regarding the etiology of psychopathy, and its associated characteristics and behaviors (e.g., deficits in emotional reactivity) are best explained subsequent to understanding the neural areas that facilitate said processes. According to Gao and Raine's (2010) neurobiological model of psychopathy, both successful and unsuccessful psychopaths have impairments in emotional processing. However unsuccessful psychopaths seem to have greater deficits with respect to impulsivity. Psychopathy as a disorder has often been investigated as a model of emotional pathology (Patrick, 1994), where there is an impairment in emotions that are normally highly involved in various fundamental processes and response mechanisms, and facilitated by the autonomic nervous system (ANS; e.g., "fight-or-flight" reactions). Dysregulation of these processes has been associated with the progression of psychopathy (Gao, Glenn, Schug, Yang, & Raine, 2009). This is primarily seen in social information processing, which allows individuals to successfully interact with society. This facility in non-criminal psychopaths may be the reason why this population is able to successfully function in society without committing criminal acts. Development and regulation of these emotional processes are subserved, in part, by the limbic system and frontal cortices. These brain areas, their associated functions, and their interactions are outlined in further detail below.

The limbic system, which consists of regions near or in the medial temporal lobes, has been implicated in emotional, motivational, and social processing. While the limbic system houses important areas such as the hypothalamus and olfactory bulbs, the amygdala has consistently been implicated in socioemotional processing and with psychopathy (Kiehl et al., 2001). The amygdala responds rapidly and automatically to

motivationally-relevant stimuli and has been implicated in emotional learning, including fear conditioning. Frontal areas, specifically the OFC/ventromedial (vmPFC) region of the prefrontal cortex (PFC), act as inhibitory areas, down-regulating limbic activity (e.g., fear response). Damage to this frontal region and the amygdala can be associated with “pseudopsychopathic” behavior, or an “acquired sociopathy,” where damage to the vmPFC and amygdala, and connecting fibers in previously normal patients results in similar interpersonal/social deficits as those observed in psychopaths (Bechara, Damasio, Damasio, & Anderson, 1994).

Sociopathy is similar to ASPD in that it is associated with antisocial behavior, or a violation of social norms, which is an attribute associated with Factor 2 (impulsive antisociality) psychopathy scores. Examining the neural correlates associated with psychopathy and sociopathy has proven beneficial, specifically in understanding the etiological foundations of psychopathy and how it can manifest due to a case of “acquired sociopathy” (Blair & Cipolotti, 2000; Pemment, 2013). Impairments in frontal and limbic function should affect how information is processed and external cues are perceived, affecting both emotional reactivity and subsequent emotion regulation. However, studies examining successful psychopaths have shown adequate levels of cognitive and affective processing, which may result in more prosocial behaviors (Mullins-Nelson, Salekin, & Leistico, 2006).

Empathy: Neural Correlates and Behavioral Measures

The amygdala, a limbic system structure, facilitates social and emotional processes and is has been implicated in some of the deficiencies inherent to psychopathic individuals (Blair, 2003). Amygdala dysfunction gives rise to impairments in emotion

processing/arousal, and likely contributes to deficits in the ability to accurately perceive and understand another person's emotions (Soderstrom, 2003). Empathy, specifically a lack of empathy, is a trait inherent to psychopathy based on the diagnostic criteria that has been linked to amygdala function (Blair, 2005). Empathy, however, exists in multiple forms and may not be a unitary phenomenon as one form may be present without another. There are three types of empathy according to Blair (2005): motor, emotional and cognitive. Motor empathy is simply mirroring a perceived motor response. Cognitive empathy, or emotion recognition, is our ability to identify with the mental state of another, essentially using Theory of Mind (ToM), which is described in detail below. Emotional empathy, or affective responsiveness, describes the emotional lability in responding to an emotional state of another individual or to emotional stimuli in general.

Psychopathic tendencies, specifically empathetic dysfunction, result from poor social information processing, possibly due to impaired connectivity between the amygdala, (a region highly implicated in emotional processing), and the vmPFC, (an area critical for morality, cognitive empathy, and emotion regulation; Soderstrom, 2003). In other words, studies showing correlations between social and affective processing in psychopaths and brain areas linked to empathy reveal that the regions responsible for emotional processing (i.e., the amygdala and vmPFC) are hypoactive, and that those who possess this deficit will have deficits in empathy (Soderstrom, 2003). Thus, a lack of empathy results from an inadequate response to emotional cues, a consequence of an impairment in processing of social and emotional information.

Cognitive and emotional empathy have been implicated in psychopathy (Blair, 2005) such that they differ across successful and unsuccessful psychopaths. While both

types of psychopaths show reduced emotional empathy, cognitive empathy may be intact or possibly enhanced in successful psychopaths (Gao & Raine, 2010). Theory of Mind (ToM), the understanding of another's psychological state of mind, is a related construct that may contribute to the antisocial behavior which is thought to be central characteristic of the psychopathic personality. It has been suggested that understanding someone else's state of mind (i.e., cognitive empathy) is essential for appropriate emotional responses, and that the intensity of empathetic reactions (i.e., emotional empathy) is related to the level of antisocial behavior expressed (Richell et al., 2003). In other words, a diminished ability to put one's self in another's place (i.e., role-taking or perspective taking) derives from a lack of cognitive empathy, and the inability to appropriately respond to the emotions of others originates from a lack of emotional empathy, enhancing antisocial behavior. The term ToM has also been referred to as social intelligence, mentalizing, and even mind reading, and is thought to correspond directly to cognitive empathy (Baron-Cohen, Wheelwright, Hill, Raste & Plumb, 2001).

Empathy has been commonly examined in psychopathy through self-report measures, including the Interpersonal Reactivity Index (IRI; Davis, 1983). This scale assesses the degree of empathy (i.e., cognitive and emotional) individuals possess, and was developed in order to tap into social cognitive dysfunction. It is a tool used to examine both forms of empathy and consists of four subscales: fantasy, perspective-taking, personal distress, and empathic concern. The fantasy element assesses an individual's ability to relate to fictitious characters by imagining feeling and acting as they do. Perspective-taking indexes the tendency to consider another's view point as one's, and most commonly associated with the construct of cognitive empathy. Empathic

concern and personal distress are thought to be indices of emotional empathy – empathic concern is sensitive to emotional responses associated with concern for another’s well-being, while personal distress is sensitive to personal anxiety in the context of emotional interpersonal situations (Davis, 1983).

Research with the IRI and psychopathy suggests that the degree of empathy present depends on these factor scores and subtypes of psychopaths, i.e. Factor 1 and Factor 2 psychopaths, and may differ in terms of affective (empathic concern) and cognitive empathy (perspective-taking). In a study investigating empathy and perspective-taking abilities within successful psychopaths, overall scores as indexed by a shorter version of the PPI (determined by the normative scores on the both Factor 1 and Factor 2), the Psychopathic Personality Inventory-Short Form (PPI-SF; Lilienfeld, 2004), suggested they had the ability to perspective-take but were less likely to show empathic concern. However, when specifically looking at psychopaths scoring high in Factor 1, they were not associated with perspective-taking (cognitive empathy) nor empathic concern (emotional empathy); and when only looking at those high in Factor 2 (which generally implies criminal psychopathic tendencies), results implied impairments in both cognitive and emotional empathy (Mullins-Nelson et al., 2006).

In line with these findings, Gao and Raine (2010) suggest that successful psychopaths have intact or even superior cognitive empathy compared to unsuccessful psychopaths; however, emotional empathy is impaired in both types (i.e., criminal and noncriminal). Recent research supports this by providing evidence that cognitive empathy does not differ between individuals with high levels of psychopathy and those with low levels, yet there was a strong relationship indicating successful psychopaths are inversely

related to affective empathy (Mullins-Nelson et al., 2006). Therefore, it is theorized that psychopaths are unable to fully experience the affective aspects of empathy. Even so, cognitive empathy may help successful psychopaths to compensate for these deficits, which may be a guiding force in keeping these psychopaths out of the criminal justice system. Overall, the inconsistency of these findings, with respect to empathy and successful psychopaths, points to the need for further investigation. Although neuroimaging studies of psychopathy, empathy, and ToM provide evidence of deficiencies in individuals displaying antisocial behavior and psychopathy (Dolan & Fullam, 2004), research has been inconsistent as to whether this measurement is a valid index of a person's perspective-taking abilities (i.e., cognitive empathy). Nevertheless, Dolan and Fullam (2004) suggest that perspective-taking (i.e., cognitive empathy) may be an important feature of noncriminal psychopaths, as it can facilitate the process of manipulation to achieve goals.

Decision-Making: Neural Correlates and Behavioral Measures

Research regarding the neural correlates of psychopathy suggests that the amygdala and vmPFC/OFC are not only implicated in emotion reactivity, but also in decision making. It has been noted that the vmPFC and amygdala are linked to emotion regulation and fear conditioning (Yang, Raine, Colletti, Toga, & Narr, 2010); however, activity in these regions may also modulate decision making processes. In other words, functional or structural abnormalities in prefrontal and limbic regions may predispose an individual toward impulsive decision making and lapses in moral judgement (Gao et al., 2010; Müller, 2010). Patients with brain damage in the prefrontal cortex, specifically the vmPFC, show deficits in personal and social decision making, specifically difficulty in

learning from past experiences, especially prior mistakes and punishment (Bechara, Tanel, & Damasio, 2000).

One hypothesis that may inform our understanding of the neural systems associated with impaired decision making in psychopaths is the somatic marker hypothesis (SMH). According to this hypothesis, the vmPFC links emotional learning and knowledge with physiological states, such that damage to this area results in the inability for somatic markers typically associated with the prediction of reward and punishment to be activated (Weber, Habel, Amunts, & Schneider, 2008; van Honk et al., 2002). In other words, the SMH posits that emotions are involved in decision making, such that decisions are often made based on emotional, or gut-level, reactions. This, in turn, may predispose an individual toward risky decision making and behavior. This hypothesis seems likely, as there are reciprocal connections between the OFC and vmPFC. The importance of the vmPFC in risky decision making is seen in patients with brain lesions to this area, which results in impairments in emotional recognition and deficits in decision making abilities (Bechara, 2004; van Honk et al., 2002). Deficits predominantly in the prefrontal cortical regions and amygdala have major implications in decision making, behavioral control, and emotional processing and regulation that when damaged, may give rise to psychopathic features such as impulsivity and shallow affect.

Findings are inconsistent in providing evidence of the degree to which these impairments and deficits predispose individuals toward psychopathic tendencies in general, and/or whether these deficits are specific to certain subgroups (i.e., criminal vs. noncriminal psychopaths). While it has been difficult to confirm the specific etiology of different aspects of psychopathy and characterize individual differences in psychopathic

tendencies, a noteworthy neurodevelopmental hypothesis (Gao et al., 2009) has been proposed in efforts to understand the biological bases of psychopathy. This hypothesis suggests that structural deficits in the brain resulting from unusual neurological development (e.g., brain impairments early in life due to genetic predispositions or early childhood deprivation) may cause dysfunctions in cognitive and emotional processing, and certain downstream physiological variables (e.g., impaired somatic markers; Thompson et al., 2014).

As emotional and cognitive deficits have been discussed as being major contributing factors to the emergence of psychopathic tendencies, noncriminal psychopaths may also display autonomic/limbic hypoarousal in otherwise arousing situations, which may explain irregularities in emotion regulation and impairments in decision making capabilities. While decision making and autonomic reactivity were not directly evaluated in this study, understanding the underlying mechanisms is important when analyzing specific neurobiological aspects associated with psychopathic tendencies and differences with respect to successful and unsuccessful psychopaths. Assessing empathy (i.e., IRI) and behavioral components (e.g., BIS/BAS) in psychopaths may give insight to the aforementioned processes which can explain discrepancies in psychopaths' behavior and affect.

Hypotheses and Rationale

The goal of this study was to investigate the differences between successful psychopaths, those who score high in psychopathy as indexed by the PPI-R, and non-psychopathic controls, those who score low in psychopathy, as indexed by the PPI-R. In other words, successful psychopaths were examined to see if their behavioral profiles

conform to those predicted by Gao and Raine's (2010) model. It is understood that specific neural regions (e.g., amygdala and OFC) and emotional processes (e.g., empathy and fear conditioning) may only be impaired in the unsuccessful/incarcerated psychopath. However, insights regarding why individuals displaying the same affective-interpersonal characteristics of psychopathy (e.g., shallow affect, manipulative, and pathological lying), yet are able to continue being high functioning members of society and avoid criminal behavior, remains uncertain. On the basis of the Gao and Raine (2010) model, it is suggested that successful psychopaths still display inhibited behavioral modulation and enhanced sensation-seeking (i.e., hypoactive BIS activity and hyperactive BAS activity) similar to unsuccessful psychopaths; yet it is also hypothesized that they possess intact, or even enhanced cognitive empathy which may buffer the antisocial and impulsive effects, increasing their ability to achieve their desires without resorting to criminal behavior.

For the purposes of this study, self-report measures that are believed to tap into processes implicated in amygdala and OFC function, and used in the study of unsuccessful psychopaths, were chosen. Based on extensive research, it is suggested that individuals who display psychopathic personality and antisocial lifestyle characteristics will show evidence of irregularities in social and emotional processing (Thompson et al, 2014). However, psychopaths without these characteristics may have behavioral and physiological profiles that are more similar to non-psychopathic controls.

To address this question, individuals high and low psychopathic personality traits among healthy adults were first identified from the PPI-R: successful, noncriminal psychopaths (i.e., individuals scoring in the top 25% of the norm for their age group for psychopathy – High-P) and non-psychopathic controls (individuals scoring in the bottom

25% of the norm for their age group for psychopathy – Low-P). The emotional and behavioral tendencies for these groups, specifically scores for the LSRP, BIS/BAS, and IRI, were then compared between noncriminal and non-psychopaths (High- and Low-P). It was predicted that there would be significant differences across groups on the PPI-R Factor 1 and 2 scores as well as differences within each of the subscales. Additionally, the same was predicted for the factor scores of the LSRP (Primary and Secondary), since there is a high degree of correspondence across factor scores on the LSRP and the PPI-R. For example, Factor 1 scores on the PPI-R should be positively associated with Primary psychopathy (Factor 1) scores on the LSRP. This was expected due the logical nature of those scoring high verses low on the PPI-R, showing the same differences on the LSRP. I

It was also predicted that there would be group differences on BIS/BAS function, such that the High-P group would exhibit a higher BAS and lower BIS compared to the Low-P group. No predictions were made in regard to the subscales within the BAS measurement as previous research has yet to address significant differences in findings, however, it is possible to make a few educated guesses pertaining to some possible results. One possibility could be that the three subscales are unitary, so that the High-P group will have higher scores than the Low-P group across all subscales. Another possibility may that the BAS subscales index different aspects of reward/incentive sensitivity (Carver, 2007) such that differences between the High- and Low-P groups vary across subscales. Finally, regarding empathy, it was predicted that there would be significant group differences in empathic concern (i.e., the ability to sympathize with others) measured by the IRI, but that groups would score similarly on all other empathy measures (perspective taking, fantasy, and personal distress). Both of these predictions

were driven by the fact that successful psychopaths may have specific, underlying mechanisms at work which allow them to highly function in society, while still possessing primary psychopathic personality characteristics (e.g., intact cognitive empathy and reduced BIS activity).

III. RESEARCH METHODS AND DESIGN

Participants

Volunteers were healthy undergraduate students between the ages of 19 and 45 ($M = 21.99$), with normal or corrected-to-normal vision, who received extra course credit for participation. Participants were recruited from the Psychology Subject Pool in the Department of Psychology and from class announcements in the Criminal Justice Department at Texas State University. Procedures for human subjects for this study were approved by the Institutional Review Board (IRB) at Texas State University. The initial sample consisted of 114 undergraduate students (91 females). Full-scales scores on the PPI-R, along with age and gender information, were used to determine the percentile ranking for each participant with respect to their psychopathy scores, based on normative data from the PPI-R manual (Lilienfeld & Widows, 2005). Based on the normed data (which accounts for age and gender), individuals scoring in the top 25th percentile were selected for inclusion in the High-P group ($n = 27$, 21 females, $M_{age} = 21.40$). Similarly, individuals scoring in the bottom 25th percentile for their age and gender were selected for inclusion in the Low-P group ($n = 30$, 23 females, $M_{age} = 22.00$). These data were used in subsequent analyses to examine group differences and correlations between the PPI-R and LSRP,

Self-report Measures

The online questionnaire asked participants for basic demographic information in addition to the PPI-R, the LSRP, the BIS/BAS scales, and the IRI. The Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005) was used to evaluate psychopathic traits and create the High-P and Low-P groups. Studies have confirmed that

the scale has high internal consistency (Cronbach's alpha = .90 overall, subscales = .82-.94), as well as high test-retest reliability ($r = .95$; Lilienfeld & Andrews, 1996).

Standardized (age, sex) full scale scores were used to determine whether participants fall in the bottom or top 25% of psychopathic scores.

Levenson's Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995) was used to further evaluate psychopathy and relationships between psychopathy scales. In previous studies, the LSRP has been shown to have high internal consistency (Cronbach's alpha = .85, full scale; Factor 1 = .83; Factor 2 = .69); and it has been shown that when compared to the PLC-R, the LSRP scores are highly correlated, suggesting that the two measures are tapping into the same constructs (Brinkley et al., 2001).

Behavioral Inhibition System and Behavioral Activation System scales (BIS/BAS; Carver & White, 1994) were administered to examine the relationship between affect and behavioral variables. Reliability (Cronbach's alpha) has been reported as .75 for BIS, .78 for BAS total score, with the 3 BAS subscales ranging from .68-.75 (Ross et al., 2008). The factor structure of the scales has been confirmed and convergent and discriminate validity have been demonstrated (Jorm et al., 1999).

The Interpersonal Reactivity Index (IRI; Davis, 1983) was used to assess the two forms of empathy, emotional and cognitive, primarily focusing on the empathic concern and perspective taking scales. The IRI has been shown to have good internal (Cronbach's alpha = .77) and test-retest reliability ($r = .71$; Mullins-Nelson et al., 2006; Davis & Franzoi, 1991).

Procedure

Participants completed one, forty-five minute, online survey. Upon completion of the consent form, participants completed the online survey which consisted of 230 questions using Qualtrics software (Qualtrics, Provo, UT). Normed scores derived from raw scores on the PPI-R (adjusted for gender and age) were used. Individuals scoring in the top 25% for their age and gender created the High-P group, and individuals scoring in the bottom 25% for their age and gender created the Low-P group.

Analytic Strategy

Comparisons across the High- and Low-P groups were performed with independent samples *t*-tests to examine group differences in factor scores and subscales of the PPI-R and LSRP. Correlations between PPI-R factors and LSRP factors were also conducted to determine relationships between scales. Finally, group differences were assessed on the BIS/BAS and IRI scales and subscales. Since there were no a priori hypotheses regarding the PPI-R and BAS subscales, Bonferroni corrections were performed on PPI-R and BAS subscale comparisons to correct for Type I error.

IV. RESULTS

The primary objective of this research was to examine similarities and differences between successful, non-criminal psychopaths and non-psychopaths within a college sample with respect to their factor and subscale scores on the PPI-R, factor scores on the LSRP, subscale scores on the BIS/BAS and the IRI. A secondary objective was to examine relationships between the PPI-R and LSRP.

First, to test which variables differed between Low- and High-P groups, multiple between-subjects independent t-tests were conducted. Bonferroni correction was used to correct for Type I error as there were no a priori hypotheses regarding PPI-R subscales. Table 1 shows the descriptive statistics for the PPI-R subscales and factors. The High-P group scored higher than the Low-P group on factor 1 and factor 2 as expected. All subscales and of the PPI-R, apart from one – Stress Immunity, were significantly different between Low- and High-P groups (see Table 1).

Table 1: Means, standard deviations, and independent *t*-test results for three subscales and eight subscales of the PPI-R

Variable	PPI-R	N	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Factor1	Low-P	30	116.17	13.58	-11.67	< .001
	High-P	27	163.96	17.28		
Factor2	Low-P	30	95.93	13.76	-6.54	< .001
	High-P	27	120.41	14.47		
Factor3	Low-P	30	26.97	6.92	-4.78	< .001
	High-P	27	35.85	7.11		
PPI ME	Low-P	30	33.67	5.77	-4.22	< .001
	High-P	27	47.85	6.18		
PPI RN	Low-P	30	26.8	5.42	-9.09	< .001
	High-P	27	41.15	6.49		
PPI BE	Low-P	30	27.40	6.03	-3.71	< .001
	High-P	27	34.07	7.54		
PPI CN	Low-P	30	28.30	5.25	-7.29	< .001
	High-P	27	40.89	7.68		
PPI SOI	Low-P	30	40.47	6.03	-6.26	< .001
	High-P	27	49.81	5.14		
PPI F	Low-P	30	27.03	7.64	-4.88	< .001
	High-P	27	36.85	7.48		
PPI STI	Low-P	30	28.43	8.06	-2.79	.007
	High-P	27	33.74	6.06		
PPI C	Low-P	30	26.97	6.92	See Factor 3	
	High-P	27	35.85	7.11		

Note: *df* = 55

Regarding the LSRP, there was also a significant difference in Primary and Secondary psychopathy, such that the High-P group scored significantly higher on both factors as expected. Descriptive and summary statistics are provided in Table 2.

Table 2: Means, standard deviations, and independent *t*-test results for the two factors of the LSRP

Variable	PPI-R	N	<i>M</i>	<i>SD</i>	<i>t</i>	<i>P</i>
LSRP Primary	Low-P	30	26.23	8.14	-4.23	< .001
	High-P	27	34.56	6.55		
LSRP Secondary	Low-P	30	17.97	4.55	-3.87	< .001
	High-P	27	22.48	4.22		

Note: *df* = 55

Confirmatory correlations were conducted among the factor scores of the PPI-R and LSRP which is shown in Table 3. Between the factors of the two psychopathy measures, PPI-R Factor 1 was moderately correlated with both LSRP Primary, $r = 0.48$, $p < .05$, $R^2 = .23$ and LSRP Secondary factor, $r = 0.62$, $p < .05$, $R^2 = .38$. Additionally, LSRP Primary was moderately correlated with LSRP Secondary $r = 0.59$, $p < .05$, $R^2 = .35$.

Table 3: Correlation matrix for PPI-R and LSRP Factor scores

	PPI-R Factor 1	LSRP Primary	PPI-R Factor 2	LSRP Secondary
PPI-R Factor 1	1.00	-	-	-
LSRP Primary	0.48**	1.00	-	-
PPI-R Factor 2	0.14	-.00	1.00	-
LSRP Secondary	0.62**	0.59**	-0.40	1.00

**Correlation is significant at the 0.01 level; (*df* = 113)

Additional between-subjects independent t-tests were conducted on BIS/BAS and IRI scales. Descriptive and summary statistics for BIS/BAS subscales are shown below in

Table 4. Bonferroni correction was used to correct for Type I error as there were no a priori hypotheses regarding BAS subscales. Analysis of the BIS and BAS subscales revealed that the High-P group had significantly lower BIS scores relative to the Low-P group, and elevated BAS Drive and Fun subscale scores compared to the Low-P group. There was no significant difference between groups on BAS Reward subscale after correcting for Type I error (i.e., Bonferroni correction for multiple comparisons).

Table 4: Means, standard deviations, and independent *t*-test results for four subscales of the BIS/BAS scale

Variable	PPI-R	N	<i>M</i>	<i>SD</i>	<i>t</i>	<i>P</i>
BAS Drive	Low-P	30	10.50	2.22	-2.52	.015
	High-P	27	12.00	2.27		
BAS Fun	Low-P	30	11.30	1.97	-3.86	< .001
	High-P	27	13.37	2.08		
BAS Reward	Low-P	30	18.17	1.90	2.16	.036
	High-P	27	16.74	2.92		
BIS	Low-P	30	23.03	3.21	4.47	< .001
	High-P	27	19.33	3.01		

Note: *df* = 55

Descriptive and summary statistics for the IRI subscales are shown below in Table 5. Independent samples *t*-tests conducted on IRI subscale scores revealed that while the High-P group had a tendency toward lower scores on all subscales of the IRI, no significant differences were observed across groups.

Table 5: Means, standard deviations, and independent *t*-test results for four subscales of the IRI

Variable	PPI-R	N	<i>M</i>	<i>SD</i>	<i>t</i>	<i>P</i>
IRI F	Low-P	30	24.67	5.13	0.11	.971
	High-P	27	24.52	5.49		
IRI EC	Low-P	30	26.93	7.38	0.76	.449
	High-P	27	25.74	4.12		
IRI PT	Low-P	30	25.57	6.976	0.1	.919
	High-P	27	25.41	4.352		
IRI PD	Low-P	30	20.4	3.979	0.94	.353
	High-P	27	19.48	3.355		

Note: *df* = 55

V. DISCUSSION

The underlying construct of psychopathy, a personality type which describes individuals who are conning, manipulative and empower a sense of grandiose self-worth, and who also display poor behavioral control, criminal versatility, and juvenile delinquency (Cleckley, 1941; Hare, 1991), and the factors that ultimately contribute to whether or not an individual is incarcerated for criminal behavior leads to questions regarding the factors that predispose an individual to criminal behavior. Researchers have shown increased interest in the topic of successful, noncriminal psychopaths as they discover variables which may serve as protective factors (e.g., normal or even enhanced neurobiological functioning and cognitive empathy) for individuals who have a predisposition toward psychopathic tendencies such as risky decision making and impulsivity. However, the question of what personality attributes differentiate between psychopaths who are high functioning members of society (i.e., successful) and non-psychopaths has received less attention in the literature.

The purpose of this study was to investigate the similarities and differences between successful psychopaths and non-psychopathic controls in light of Gao and Raine's (2010) model of psychopathy which suggests that similar to non-psychopaths, successful psychopaths should have intact somatic markers, fear conditioning, and cognitive empathy. While the majority of previous research has specifically analyzed primary and secondary psychopaths based on the LSRP or a combination of multiple diagnostic scales, in the current study, successful psychopaths were evaluated as those scoring in the top 25% of normed scores based on the PPI-R. It was predicted that Low- and High-P would score significantly different on all subscales and factors of the PPI-R,

which was confirmed apart from one subscale, Stress Immunity. The same was predicted for the BIS/BAS measurement, which was also confirmed, apart from the BAS Reward Responsiveness subscale. For the IRI, it was predicted empathy would be consistent across all subscales except for Empathic Concern, which was predicted to show a significant difference between groups. Results were not in line with this hypothesis as Low- and High-P groups scored similarly on all measures. These findings are discussed in further detail below.

The PPI-R was the foundation of this study, as the two groups being compared (Low- and High-P) were formed based on the normative data (percentile scores based on normative data for gender and age; Lilienfeld & Widows, 2005) for this scale. Given this, it was expected that factors and subscales of the PPI-R would be significantly different across groups. Results were consistent with these predictions. The High-P group scored significantly higher on all three factors. The High-P group had significantly higher scores on seven out of eight subscales after Bonferroni correction for Type I error. For the individual subscales, there was a significant difference between groups on Social Influence, Fearlessness (PPI-I), Machiavellian Egocentricity, Rebellious Nonconformity, Blame Externalization, Carefree Nonplanfulness (PPI-II), and Coldheartedness whereas the High-P group scored higher on every scale. The only scale that did not show a significant difference was PPI-I STI (Stress Immunity). The Stress Immunity scale indexes responses to anxiety-eliciting situations, such that those scoring high on this scale show inhibited reactions (Lilienfeld & Widows, 2005). Since the High-P group did not show a significant difference on this scale compared to the Low-P group, it is possible that successful psychopaths may display similar levels of anxiety as non-psychopaths to

anxiety provoking events which could be a factor deterring successful psychopaths from socially-deviant acts that unsuccessful psychopaths might commit. Studies have investigated whether anxiety is a key component and/or indicator of psychopathy. It is suggested that measuring anxiety levels can prove beneficial when differentiating primary and secondary psychopaths such that primary psychopaths show lower levels of anxiety, or behavioral inhibition (Newman et al., 2005). However, more recent research suggests there is not a valid link between psychopathy and anxiety, or that this link is minimal at best (Williams, Paulhus, & Hare, 2007). Results found that the anxiety factor of the PPI-R did not act as a predictor of criminal behavior or misconduct (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003). Results from this study require further replication in order to validate the conclusion that successful psychopaths display similar levels of stress immunity as non-psychopaths, especially in light of results regarding BIS/BAS subscales which are discussed below.

As for LSRP, the High-P group was expected to score significantly higher on both factors (Primary and Secondary) compared to the Low-P group. This was likely due to the nature of the scale being a valid index of psychopathy. Results confirmed this and the High-P group scored significantly higher in Primary and Secondary factors. Confirmatory correlations of the PPI-R and LSRP indicated a significant, but moderate relationship for PPI-R Factor 1 and LSRP primary psychopathy. Interestingly, LSRP secondary psychopathy also showed a significant relationship with PPI-R Factor 1. This research is consistent with previous research, which employed these two measurements, and found that the strength of their relationship was modest at best (Ross et al., 2008) suggesting the factors may tap into different aspects of psychopathy.

With respect to the BIS/BAS scales, it was hypothesized that there would be group differences on overall BIS/BAS function, such that the High-P group would show weak BIS activity and strong BAS activity. In terms of the subscales within BAS however, there were no a priori hypotheses formed apart from possible outcomes which would either provide evidence for the combination of the BAS subscales (i.e., consistency across all three scales) or provide evidence that they index different dimensions of incentive/reward sensitivity (e.g., differences across scales; Carver & White, 2007). In line with predictions, the High-P group did score significantly lower on the BIS scale and significantly higher on two out of three BAS subscales (Drive and Fun Seeking). However, there was no significant difference on the BAS Reward subscale (i.e., Reward Responsiveness). In fact, the Low-P group had a tendency to score more highly (albeit non-significantly) on this subscale relative to the High-P group, meaning successful psychopaths in this study do not show higher levels of response to rewarding situations.

Results are consistent with Gao and Raine's (2010) neurobiological model which suggests both unsuccessful and successful psychopaths show enhanced sensation seeking (i.e., elevated BAS Fun Seeking) and reduced behavioral modulation (i.e., weakened BIS). Additionally, these findings are in line with Fowles (1980) theories regarding primary (i.e., successful) psychopaths, such as their ability to do certain things non-psychopaths deter from due to anticipatory anxiety (Ross et al., 2008). Fowles (1980) also suggests primary psychopaths can have elevated BAS similar to secondary psychopaths. One explanation for the observed differences in the BAS subscales is, as previously mentioned, that they index separate aspects of the pursuit of rewards and sensitivity to

reward cues. For example, in successful psychopaths, BAS Drive and Fun Seeking may be hyperactive yet BAS Reward Responsiveness is hypoactive, which could provide an explanation as to why successful psychopaths display Factor 1 personality characteristics, yet lack Factor 2 behavioral aspects. In other words, if their response to the anticipation of a reward is reduced, this could inhibit their predisposition towards impulsivity and compromised decision making in response to reward cues. Further research is needed to confirm this theory.

The final trait analyzed in this study was empathy. It was predicted that there would be a significant difference between Low- and High-P groups in affective empathy (i.e., empathic concern as measured by the IRI), but that they would score similarly on all measures, specifically that there would be no difference in cognitive empathy (i.e., perspective taking). Regarding the hypothesis regarding emotional empathy, there was no significant difference between groups on empathic concern, which is surprising as it is inconsistent with what most research suggests for successful psychopathy, specifically in the context of the Gao and Raine (2010) model. According to this model, cognitive empathy may be intact or possibly enhanced in successful psychopaths; however, both successful and unsuccessful psychopaths should show reduced emotional empathy (Gao & Raine, 2010). One reason for this finding may be the nature of the measurement itself. Many discrepancies can arise with self-reported data including response bias (e.g., social desirability, inaccurate self-evaluation, and bias character judgement). Another possibility is that the IRI may not be the most accurate tool when used alone in evaluating the affective aspects of empathy, and may be a better index of empathy when used in conjunction with other self-report measures or tasks designed to tap into cognitive

empathy. In terms of the second hypothesis, there was no significant difference in perspective taking, consistent with the Gao & Raine (2010) model which posits that cognitive empathy can aide successful psychopaths' neurological impairments, and may be compelling enough to help deter them from committing criminal acts and avoiding incarceration (Gao & Raine, 2010).

Limitations and Future Directions

The greatest limitation of this study was the reliance on self-report measures. As previously mentioned, self-report methods may not be as reliable as more direct measures as individuals can be susceptible to making incorrect judgements and reporting inaccurate portrayals of themselves either due to social desirability or a lack of awareness of their own behavior. This can ultimately impact the validity of the results and conclusions being drawn regarding behavior. Incorporating behavioral tasks and measures in addition to self-report methods could address response biases and provide a different behavioral profile of what differentiates successful psychopaths from non-psychopaths.

An important factor not addressed by Gao and Raine's model is gender differences. Given that participants in this study were predominantly female, it is worth noting that psychopathy may be manifested differently in men and women, especially with respect to behavioral modulation and emotional processing. Previous research has found evidence of gender variations in psychopathy with respect to the core characteristics and behaviors expressed (Forouzan & Cooke, 2005), such that developmental manifestations of psychopathy in males and females differ interpersonally (e.g., males act more conning whereas females more flirtatious) and behaviorally (e.g., males impulsivity is expressed through violent behavior whereas females more through

self-harming behaviors; Rogsted & Rogers, 2008). However, when psychopathy and the processing of emotional stimuli is examined in non-institutionalized boys and girls, emotional deficits appear to be equally significant across gender (Kimonis, Frick, Fazekas, & Loney, 2006), suggesting females display similar levels of emotional impairment. Additionally, in a study looking at psychopathy, prosocial behaviors and empathy, relationships were consistent across males and females (White, 2014). Given this conflicting research, there has yet to be a consensus as to whether the construct of psychopathy and whether assessment should be altered to account for gender.

Another possible limitation was a low sample size. Large samples are especially important when using self-report measures as there are problems with attrition due to missing data. Furthermore, large samples are key to maximize statistical power and increasing sample size would address this possible limitation, especially in light of the lack of a priori hypotheses regarding PPI-R and BAS subscales. Furthermore, evaluation of a college sample may not yield results that are generalizable to the general population as a whole. This may be due, in part, to individuals attending college possibly having a predisposition to enhanced cognitive functioning (e.g., higher IQ) compared to individuals not attending college, which could threaten external validity. Additionally, environmental factors such as socioeconomic status and racial/cultural factors were not examined in this study. These factors may affect the how the operational definition of “success” with respect to the ability to avoid incarceration influences conclusions on successful psychopathy. For example, examining socioeconomic factors may show differences in whether psychopathic individuals avoid incarceration simply because they do not break the law, or that they do in fact commit criminal acts, yet are able to

successfully evade detection by means of affluence or being in a position of power.

Administration of self-report measures outside of a college campus, including questions which address socioeconomic status, could address these limitations.

This research leads to numerous future directions regarding successful psychopathy research. The inclusion of additional self-report measures that tap into self-monitoring (i.e., the tendency to change behavior in response to circumstances), and sensitivity to emotions and perceptions of others (i.e., cognitive role-taking), may be better predictors of cognitive empathy as opposed to the IRI. On the other hand, the Mehrabian scale (Mehrabian & Epstein, 1972), which taps into empathic emotional responses, may be a better predictor of affective empathy compared to the IRI. Furthermore, because this study only utilized self-reported measures, it would be beneficial to incorporate behavioral measures and tasks which directly tap into motivational systems, decision making, and empathy, specifically, ToM. For example, to confirm the inconsistencies found between groups on the IRI, studies could integrate the Reading the Mind in the Eyes Test (RMET; Baron-Cohen, 2001), a task designed to tap into social cognitive dysfunction. In the RMET, participants are presented with close ups of the eye region of emotional faces and required to attribute a state of mind to each (Richell et al., 2003) based upon inferences about what the person is thinking or feeling (Baron-Cohen et al., 2001). Although neuroimaging studies of psychopathy, empathy, and ToM provide evidence of deficiencies in individuals displaying antisocial behavior and psychopathy (Dolan & Fullam, 2004), research has been inconsistent as to whether this test a valid index of a person's perspective-taking abilities (i.e., cognitive empathy). Nevertheless, Dolan and Fullam (2004) suggest that perspective-taking (i.e., cognitive

empathy) may be an important feature of noncriminal psychopaths, as it can facilitate the process of manipulation to achieve goals. Furthermore, impairments in emotional empathy may be easier seen, confirming the neurological model proposed by Gao and Raine (2010).

When it comes to further evaluation of BIS/BAS activity and specifically how motivational cues influence decision making (e.g., reward and punishment), there is a notable behavioral task worth mentioning: the Iowa Gambling Task (IGT). The IGT was initially utilized to assess decision making in patients with orbitofrontal lesions (and damage to the vmPFC), who were found to make more risky or disadvantageous choices than brain-damaged controls, even after recognizing that these decisions were not a good strategy (Bechara, 2004). After neuroimaging studies identified the OFC as an area of interest in psychopaths, the IGT was adopted to test risky decision making in individuals with psychopathic personalities. According to the neurobiological model previously mentioned (Gao & Raine, 2010), unsuccessful psychopaths are thought to have impaired decision making capabilities. By comparison, successful psychopaths may exhibit intact or even enhanced decision making (Gao & Raine, 2010), a protective factor for noncriminal psychopaths, which could explain why certain psychopaths are high-functioning, productive members of society.

One aspect of particular interest with respect to research on psychopathy, not directly assessed in this study, is psychophysiology: the study of the physiological correlates of psychological processes, such as heart rate, blood pressure, and brain activity. Investigating psychophysiological correlates of psychopathy and whether somatic markers and processes demonstrating the association between external stimuli

and physiological responses, has yet to show consistency with regard to the differences between successful psychopaths and non-psychopaths. Regardless, methods examining the physiological responses in psychopaths have been useful in understanding how autonomic processes/automatic physiological functions, such as changes in heart rate (HR), are altered by cognitive and emotional behaviors relevant to survival.

Psychophysiological differences between criminal psychopaths and controls have been reported; most notably, attenuated autonomic stress reactivity during anticipatory fear and stress in psychopaths (Ishikawa et al., 2001). Contrary to non-psychopathic controls, noncriminal psychopaths also display hypoarousal, or a lower than normal resting HR and smaller autonomic reactions to emotionally negative stimuli.

The autonomic nervous system (ANS), consisting of the parasympathetic and sympathetic nervous systems, is enervated by the amygdala and responsible for these involuntary physiological changes. This is seen in the aforementioned “fight-or-flight” response, where the amygdala coordinates the appropriate physiological responses and emotional reactions to emotion-inducing situations and/or arousing/emotionally charged stimuli (Blair, 2001). For example, with respect to risky decision making, non-psychopathic individuals should show anticipatory autonomic arousal and responsivity, such as increased HR and greater levels of electrodermal activity (i.e., sweating) in response to emotional stimuli. Cardiovascular functioning is affected when changes occur in either the sympathetic or parasympathetic nervous systems or as a combination of the two (e.g., increased HR can be the result of a decreased activation of the parasympathetic nervous system and increased activation of the sympathetic nervous system; Hanson, Johnsen, Thornton, Waage, & Thayer, 2007). These systems are implemented in

emotional regulation and behavioral modulation, and evaluation of them may be beneficial to the study of how psychopaths can pursue non-criminal, productive lifestyles.

Research on resting and reactive HR in psychopathy has primarily been confined to psychopathic offenders. Widom (1978) was among the first to suggest that noninstitutionalized (noncriminal) psychopaths may not show the same autonomic reactivity as unsuccessful psychopaths relative to normal controls. Gao et al. (2009) notes that the overall body of evidence suggests that there is not a reliable difference in the HR of unsuccessful psychopaths when exposed to aversive or stressful stimuli, and also with respect to HR activity in the absence of a stressor. They conclude that because affective-interpersonal features of psychopathy are linked to abnormal autonomic reactivity, impairments may only apply to criminal psychopaths as compared to non-offenders (successful psychopaths; Gao et al, 2009). According to the neurobiological model proposed by Gao & Raine (2010), it is believed that successful psychopaths may exist in a state of autonomic hypoarousal, and should demonstrate a hyporeactivity to unpleasant stimuli. As previously mentioned, according to the SMH, diminished autonomic responses to aversive stimuli as a result of deficits in brain regions such as the OFC and amygdala should accompany risky decision making and impulsive behavior. It is imperative to further investigate autonomic processes in noncriminal psychopaths, to determine differences, if any, between successful psychopaths and non-psychopathic controls and to verify predictions set forth by the Gao and Raine (2005) model.

In sum, this research informs the field of psychopathy by directly testing possible theories constructed by the Gao and Raine's (2010) neurobiological model and further establishes hypotheses regarding successful psychopathy (e.g., hypoactive behavioral

inhibition system and intact cognitive empathy). Most notably, this study found that successful psychopaths show reduced BIS activity and overall enhanced BAS activity, except when concerning response to reward cues. Additionally, results indicated that there are no differences in cognitive or affective empathy between individuals scoring high in psychopathy and non-psychopathic controls. When these results are taken as a whole, the profile of the successful psychopath that emerges is that of an individual who displays core psychopathic personality and behavioral characteristics, including reduced behavioral inhibition and enhanced sensation seeking (i.e., impulsive), yet who also has response to anxiety-eliciting situations and rewards, and the emotional intelligence, similar to that of a non-psychopath (e.g., intact cognitive and emotional empathy). Given this, it is possible that functioning emotional processing, specifically empathetic response, may mediate poor behavioral modulation in response to anxiety-inducing situations. These results contribute to our understanding of what differentiates psychopaths successfully functioning in society, undetected by the criminal justice system, and psychopaths who act on their impulses, ultimately resulting in incarceration, and non-psychopathic individuals by confirming specific predictions regarding behavioral modulation and cognitive empathy laid out by Gao and Raine's (2010) neurobiological model.

Finally, and possibly most importantly, this research provides further support for future diagnostic tools, progression of evaluation techniques, and advancements in possible successful prevention of criminal behavioral such as early detection of psychopathic personality characteristics and tendencies for individuals predisposed to psychopathic personality disorder. While early research on psychopathy suggested the

personality disorder was untreatable (Hare, 1970), more recent research evaluating therapeutic communities and cognitive behavioral therapy, which focus on prosocial behaviors, perspective-taking, and delaying gratification, suggest these practices as possible treatment outcomes (Wong & Hare, 2005; Harris & Rice, 2006). However, further research advises that using traditional approaches and therapeutic techniques have proven unsuccessful (Villanueva, 2015) and may actually lead to high violent recidivism in psychopathic individuals, as the behaviors learned can be used to exploit and manipulate others (Harris & Rice, 2006). Furthermore, there has been some success with risk reduction when a 2-component treatment model, which addresses both the affective and interpersonal characteristics of psychopathy as well as the antisociality features, is utilized (Olver, Lewis, & Wong, 2013). Risk assessment tools which are tailored to individual levels of motivation and impulsivity have proven effective in reducing the risk of violent recidivism and criminality (Wong & Olver, 2015). Results of the current study suggest that treatment options which target responses to anxiety-eliciting situations (i.e., stress immunity) and reducing reward sensitivity may be beneficial in preventing individuals high in psychopathy from committing criminal acts.

LITERATURE CITED

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The “Reading the Mind in the Eyes” test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, *42*(2), 241-251.
- Bechara, A. (2004). The role of emotion in decision-making: evidence from neurological patients with orbitofrontal damage. *Brain and Cognition*, *55*(1), 30-40. doi: 10.1016/j.bandc.2003.04.001
- Bechara, A., Damasio, A. R., Damasio H., Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*(1-3), 7-15. doi: 10.1016/0010-2777(94)90018-3
- Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, *10*(3), 295-307.
- Bechara, A., Tranel, D., & Damasio, H. (2000). Characterization of the decision-making deficit of patients with ventromedial prefrontal cortex lesions. *Brain*, *123*(11), 2189-2202. doi: <http://dx.doi.org/10.1093/brain/123.11.2189>
- Benning, S. D., Patrick, C. J., Hicks, B. M., Blonigen, D. M. and Krueger, R. F. (2003). Factor structure of the Psychopathic Personality Inventory: Validity and implications for clinical assessment. *Psychological Assessment*, *15*: 340–350. doi: 10.1037/1040-3590.15.3.340
- Berg, J. M., Smith, S. F., Watts, A. L., Ammirati, R., Green, S. E., & Lilienfeld, S. O. (2013). Misconceptions regarding psychopathic personality: implications for clinical practice and research. *Neuropsychiatry*, *3*(1), 63-74.
- Blackburn, R. (1975). An empirical classification of psychopathic personality. *British Journal of Psychiatry*, *127*, 456-460. doi: 10.1192/bjp.127.5.456

- Blair, R. J. R. (1995). A cognitive developmental approach to morality: investigating the psychopath. *Cognition*, 57, 1-29. doi: 10.1016/0010-0277(95)00676-P
- Blair, R. J. R., & Cipolotti, L. (2000). Impaired social response reversal: A case of 'acquired sociopathy'. *Brain*, 123(6), 1122-1141.
<http://dx.doi.org/10.1093/brain/123.6.1122>
- Blair, R. J. R. (2003). Neurobiological basis of psychopathy. *The British Journal of Psychiatry*, 182(1), 5-7. doi: 10.1192/bjp.182.1.5
- Blair, R. J. R. (2001). Neurocognitive models of aggression, the antisocial personality disorders, and psychopathy. *Journal of Neurology, Neurosurgery & Psychiatry*, 71(6), 727-731. doi:10.1136/jnnp.71.6.727
- Blair, R. J. R. (2005). Responding to the emotions of others: dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition*, 14(4), 698-718. doi: 1.1016/j.concog.2005.06.004
- Blair, R. J. R. (2008). The amygdala and ventromedial prefrontal cortex: functional contributions and dysfunction in psychopathy. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 363(1503), 2557-2565.
doi:10.1098/rstb.2008.0027
- Blanchard, A., & Lyons, M. (2010). An investigation into the relationship between digit length ratio (2D:4D) and psychopathy. *The British Journal of Forensic Practice*, 12(2), 23-31. doi: 10.5042/bjfp.2010.0183
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, 67(2), 319-333.
<http://dx.doi.org/10.1037/0022-3514.67.2.319>
- Carver, C. S., & White, T. L. (2007). Behavioral Inhibition & Activation Scales (BIS/BAS). Retrieved October 23, 2016, from
http://www.sjdm.org/dmidi/Behavioral_Inhibition_&_Activation_Scales.html

- Cleckley, H. (1941). The mask of sanity; an attempt to reinterpret the so-called psychopathic personality.
- Cooke, D. J., & Michie, C. (2001). Refining the construct of psychopathy: Towards a hierarchical model. *Psychological Assessment, 13*(2), 171-188. doi: 10.1037//1040-3590.13.2.171
- Davis, M. H. (1983). The effects of dispositional empathy on emotional reactions and helping: A multidimensional approach. *Journal of Personality, 51*(2), 167-184. doi: 10.1111/j.1467-6494.1983.tb00860.x
- Davis, M. H. & Franzoi, S. L. (1991). Stability and change in adolescent self-consciousness and empathy. *Journal of Research in Personality, 25*, 70-87. [http://dx.doi.org/10.1016/0092-6566\(91\)90006-C](http://dx.doi.org/10.1016/0092-6566(91)90006-C)
- Dolan, M., & Fullam, R. (2004). Theory of mind and mentalizing ability in antisocial personality disorders with and without psychopathy. *Psychological Medicine, 34*(06), 1093-1102. doi: 10.1017/S0033291704002028
- Fowles, D. C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity, and psychopathy. *Psychophysiology, 17*, 87-104. doi: 10.1111/j.1469-8986.1980.tb00117.x
- Gao, Y., Glenn, A. L., Schug, R. A., Yang, Y., & Raine, A. (2009). The neurobiology of psychopathy: a neurodevelopmental perspective. *Canadian Journal of Psychiatry, 54*(12), 813-823. doi: 10.1177/070674370905401204
- Gao, Y., & Raine, A. (2010). Successful and unsuccessful psychopaths: a neurobiological model. *Behavioral Sciences & the Law, 28*(2), 194-210. doi: 10.1002/bsl.924
- Gray, J. A. (1987). The psychology of fear and stress (Vol. 5): Cambridge University Press Archive.
- Glenn, A. L., Iyer, R., Graham, J., Koleva, S., & Haidt, J. (2009). Are all types of morality compromised in psychopathy?. *Journal of Personality Disorders, 23*(4), 384-398. doi: 10.1521/pedi.2009.23.4.384

- Hall, J. R., & Benning, S. D. (2006). The “successful” psychopath. *Handbook of psychopathy*, 459-478.
- Hansen, A. L., Johnsen, B. H., Thornton, D., Waage, L., & Thayer, J. F. (2007). Facets of psychopathy, heart rate variability and cognitive function. *Journal of Personality Disorders*, 21(5), 568-582.
- Hare, R. D. (1991). *Manual for the Revised Psychopathy Checklist*. Toronto, Canada: Multi-Health Systems.
- Hare, R. D. (1996). Psychopathy: A clinical construct whose time has come. *Criminal Justice and Behavior*, 23(1), 25-54. doi: 10.1177/0093854896023001004
- Hare, R. D. (1970). *Psychopathy: Theory and research*. Oxford, England: John Wiley.
- Harris, G. T., & Rice, M. E. (2006). Treatment of psychopathy. *Handbook of Psychopathy*, 555-572.
- Harpur, T. J., Hare, R. D., & Hakstian, A. R. (1989). Two-factor conceptualization of psychopathy: Construct validity and assessment implications. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 1(1), 6-17. <http://dx.doi.org/10.1037/1040-3590.1.1.6>
- Ishikawa, S. S., Raine, A., Lencz, T., Bihrlé, S., & Lacasse, L. (2001). Autonomic stress reactivity and executive functions in successful and unsuccessful criminal psychopaths from the community. *Journal of Abnormal Psychology*, 110(3), 423. doi: 10.1037//0021-843X.110.3423
- Jorm, A. F., Christensen, H., Henderson, A. S., Jacomb, P. A., Korten, A. E., & Rodgers, B. (1998). Using the BIS/BAS scales to measure behavioural inhibition and behavioural activation: Factor structure, validity and norms in a large community sample. *Personality and Individual Differences*, 26(1), 49-58. [http://dx.doi.org/10.1016/S0191-8869\(98\)00143-3](http://dx.doi.org/10.1016/S0191-8869(98)00143-3)

- Kiehl, K. A., Smith, A. M., Hare, R. D., Mendrek, A., Forster, B. B., Brink, J., & Liddle, P. F. (2001). Limbic abnormalities in affective processing by criminal psychopaths as revealed by functional magnetic resonance imaging. *Biological Psychiatry*, *50*(9), 677-684. doi: 10.1016/S0006-3223(01)01222-7
- Kimonis, E. R., Frick, P. J., Fazekas, H., & Loney, B. R. (2006). Psychopathy, aggression, and the processing of emotional stimuli in non-referred girls and boys. *Behavioral Sciences & the Law*, *24*(1), 21-37. doi: 10.1002/bsl.668
- Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutionalized population. *Journal of Personality and Social Psychology*, *68*(1), 151-158. <http://dx.doi.org/10.1037/0022-3514.68.1.151>
- Lilienfeld, S. O., & Andrews, B. P. (1996). Development and preliminary validation of a self-report measure of psychopathic personality traits in noncriminal population. *Journal of Personality Assessment*, *66*(3), 488-524. http://dx.doi.org/10.1207/s15327752jpa6603_3
- Lilienfeld, S. O., & Arkowitz, H. (2007). What “psychopath” means. *Scientific American Mind*, *18*(6), 80-81. doi: 10.1038/scientificamericanmind1207-80
- Lilienfeld, S. O., Watts, A. L., & Smith, S. F. (2015). Successful Psychopathy: A scientific status report. *Association for Psychological Science*, *24*(4), 298-303. doi: 10.1177/0963721415580297
- Lilienfeld, S. O., & Widows, M. R. (2005). *PPI-R: Psychopathic personality inventory revised: professional manual*. Lutz, FL: Psychological Assessment Resources, Inc.
- Lykken, D. T. (1995). *The antisocial personalities*. Mahwah, NJ: Lawrence Erlbaum.
- Lynam, D. R., Whiteside, S., & Jones, S. (1999). Self-reported psychopathy: A validation study. *Journal of Personality Assessment*, *73*, 110-132. <http://dx.doi.org/10.1207/S15327752JPA730108>

- Mahmut, M. K., Homewood, J., & Stevenson, R. J. (2008). The characteristics of non-criminals with high psychopathy traits: are they similar to criminal psychopaths? *Journal of Research in Personality*, *42*(3), 679-692. doi: 10.1016/j.jrp.2007.09.002
- Mehrabian, A., & Epstein, N. (1972). A measure of emotional empathy1. *Journal of Personality*, *40*(4), 525-543. doi: 10.1111/j.1467-6494.1972.tb00078.x
- 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*(12), 2013-2022. doi: 10.1016/S0028-3932(02)00056-8
- Montagne, B., van Honk, J., Kessels, R. P., Frigerio, E., Burt, M., van Zandvoort, M. J., Perrett, D. I., & de Haan, E. H. (2005). Reduced efficiency in recognising fear in subjects scoring high on psychopathic personality characteristics. *Personality and Individual Differences*, *38*(1), 5-11. doi: 10.1016/j.paid.2004.02.008
- Montoya, E. R., Terburg, D., Bos, P. A., Will, G. J., Buskens, V., Raub, W., & van Honk, J. (2013). Testosterone administration modulates moral judgments depending on second-to-fourth digit ratio. *Psychoneuroendocrinology*, *38*(8), 1362-1369. <http://dx.doi.org/10.1016/j.psyneuen.2012.12.001>
- Müller, J. L. (2010). Psychopathy – an approach to neuroscientific research in forensic psychiatry. *Behavioral Sciences & the Law*, *28*, 129-147. doi: 10.1002/bsl.926
- Mullins-Nelson, J. L., Salekin, R. T., & Leistico, A. M. R. (2006). Psychopathy, empathy, and perspective-taking ability in a community sample: Implications for the successful psychopathy concept. *International Journal of Forensic Mental Health*, *5*(2), 133-149. doi: 10.1080/14999013.2006.10471238
- 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. <http://dx.doi.org/10.1037/0021-843X.114.2.319>

- Olver, M. E., Lewis, K., & Wong, S. C. (2013). Risk reduction treatment of high-risk psychopathic offenders: The relationship of psychopathy and treatment change to violent recidivism. *Personality Disorders: Theory, Research, and Treatment*, 4(2), 160. doi: 10.1037/a0029769
- Patrick, C. J. (1994). Emotion and psychopathy: Startling new insights. *Psychophysiology*, 31(4), 319-330. doi: 10.1111/psyp.1994.31
- Patrick, C. J., Bradley, M. M., & Lang, P. J. (1993). Emotion in the criminal psychopath: startle reflex modulation. *Journal of Abnormal Psychology*, 102(1), 82. doi: 10.1037/0021-843X.102.1.82
- Pemment, J. (2013). Psychopathy versus sociopathy: Why the distinction has become crucial. *Aggression and Violent Behavior*, 18(5), 458-461. <http://dx.doi.org/10.1016/j.avb.2013.07.001>
- Perez, P. R. (2012). The etiology of psychopathy: A neuropsychological perspective. *Aggression and Violent Behavior*, 17(6), 519-522. <http://dx.doi.org/10.1016/j.avb.2012.07.006>
- Pinel, P. (1809). *Traité medico-philosophique sur l'aliénation mentale [Medico-philosophical treatise on mental derangement]*, 2nd ed. Paris: Brosson
- Raine, A. (1997). Antisocial behavior and psychophysiology: A biosocial perspective and a prefrontal dysfunction hypothesis. D. Stoff, J. Breiling, & J. D. Maser (Eds.), *Handbook of antisocial behavior* (pp. 289-304). New York: Wiley.
- Richell, R. A., Mitchell, D. G. V., Newman, C., Leonard, A., Baron-Cohen, S., & Blair, R. J. R. (2003). Theory of mind and psychopathy: can psychopathic individuals read the 'language of the eyes'?. *Neuropsychologia*, 41(5), 523-526. [http://dx.doi.org/10.1016/S0028-3932\(02\)00175-6](http://dx.doi.org/10.1016/S0028-3932(02)00175-6)
- Rogstad, J. E., & Rogers, R. (2008). Gender differences in contributions of emotion to psychopathy and antisocial personality disorder. *Clinical psychology review*, 28(8), 1472-1484. <http://dx.doi.org/10.1016/j.cpr.2008.09.004>

- Ross, S. R., Benning, S. D., Patrick, C. J., Thompson, A., & Thurston, A. (2008). Factors of the psychopathic personality inventory: Criterion-related validity and relationship to the BIS/BAS and Five-Factor models of personality. *Assessment*. doi: 10.1177/1073191108322207
- Ross, S. R., Moltó, J., Poy, R., Segarra, P., Pastor, M. C., & Montañés, S. (2007). Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionalized young adults. *Personality and Individual Differences*, 43(7), 1644-1655. doi:10.1016/j.paid.2007.04.020
- Ruiz-Padial, E., Sollers, J. J., Vila, J., & Thayer, J. F. (2003). The rhythm of the heart in the blink of an eye: Emotion-modulated startle magnitude covaries with heart rate variability. *Psychophysiology*, 40(2), 306-313. doi: 10.1111/1469-8986.00032
- Sellbom, M., & Verona, E. (2007). Neuropsychological correlates of psychopathic traits in a non-incarcerated sample. *Journal of Research in Personality*, 41(2), 276-294. doi: 10.1016/j.jrp.2006.04.001
- Sifferd, K. L., & Hirstein, W. (2013). On the Criminal Culpability of Successful and Unsuccessful Psychopaths. *Neuroethics*, 6(1), 129-140. doi: 10.1007/s12152-012-9172-6
- Soderstrom, H. (2003). Psychopathy as a disorder of empathy. *European Child & Adolescent Psychiatry*, 12, 249-252. doi: 10.1007/s00787-003-0338-y
- Thompson, D. F., Ramos, C. L., & Willett, J. K. (2014). Psychopathy: Clinical features, developmental basis and therapeutic challenges. *Journal of Clinical Pharmacy and Therapeutics*, 39, 485-495. doi: 10.1111/jcpt.12182
- Weber, S., Habel, U., Amunts, K., & Schneider, F. (2008). Structural brain abnormalities in psychopaths—A review. *Behavioral Sciences and the Law*, 26(1), 7-28. doi: 10.1002/bsl.802
- White, B. A. (2014). Who cares when nobody is watching? Psychopathic traits and empathy in prosocial behaviors. *Personality and Individual Differences*, 56, 116-121. <http://dx.doi.org/10.1016/j.paid.2013.08.033>

- Widom, C. S., & Newman, J. P. (1985). Characteristics of non-institutionalized psychopaths. *Aggression and Dangerousness*, 57-80.
- Widom, C. S. (1977). A methodology for studying noninstitutionalized psychopaths. *Journal of Consulting and Clinical Psychology*, 45(4), 674-683.
<http://dx.doi.org/10.1037/0022-006X.45.4.674>
- Williams, K. M., Paulhus, D. L., & Hare, R. D. (2007). Capturing the four-factor structure of psychopathy in college students via self-report. *Journal of Personality Assessment*, 88(2), 205-219. <http://dx.doi.org/10.1080/00223890701268074>
- Van Honk, J., Hermans, E. J., Putman, P., Montagne, B., & Schutter, D. J. (2002). Defective somatic markers in subclinical psychopathy. *Neuroreport*, 13(8), 1025-1027. doi: 10.1080/00223890701268074
- Wong, S. C., & Hare, R. D. (2005). Guidelines for a psychopathy treatment program. Toronto, ON, Canada: Multi-Health Systems.
- Wong, S. C., & Olver, M. E. (2015). Risk reduction treatment of psychopathy and applications to mentally disordered offenders. *CNS spectrums*, 20(03), 303-310. doi: 10.1017/S1092852915000322
- Villanueva, M. (2015). Developing a Neuroplasticity-Based Treatment Program for Psychopathy: Treatment Foci and Options.
- Voracek, M., & Dressler, S. G. (2006). Lack of correlation between digit ratio (2D: 4D) and Baron-Cohen's "Reading the Mind in the Eyes" test, empathy, systemising, and autism-spectrum quotients in a general population sample. *Personality and Individual Differences*, 41(8), 1481-1491. doi:10.1016/j.paid.2006.06.009
- Yang, Y., Raine, A., Colletti, P., Toga, A. W., & Narr, K. L. (2010). Morphological alterations in the prefrontal cortex and the amygdala in unsuccessful psychopaths. *Journal of Abnormal Psychology*, 119(3), 546. doi: 10.1037/a0019611

Zimak, E. H., Suhr, J., & Bolinger, E. M. (2014). Psychophysiological and neuropsychological characteristics of non-incarcerated adult males with higher levels of psychopathic personality traits. *Journal of Psychopathology and Behavioral Assessment*, 1-13. doi: 10.1007/s10862-014-9430-5