

ABSTRACT

Title of thesis: **PSYCHOPATHIC TRAITS, AFFECT, AND
COCAINE USE-RELATED OUTCOMES**

Katherine Elena Long, Masters of Science, 2015

Thesis directed by: Professor Carl W. Lejuez, Department of
Psychology

Substance abuse and associated public health and economic consequences represent a pervasive and costly problem. Among inner-city substance users, crack/cocaine is the most common drug of choice and is associated with health compromising behaviors. Substance Use Disorders (SUDs) are more prevalent, severe, and difficult to treat among individuals with Antisocial Personality Disorder (ASPD). Psychopathy is a construct which is related to but distinct from ASPD, and the relation between primary psychopathic traits and substance use is not well understood. The present laboratory experimental study of cocaine use-related outcomes in the context of mood inductions among cocaine users found that primary psychopathic traits were negatively associated with attentional bias for cocaine-related cues but not associated with self-reported craving. Assignment to the negative affect manipulation was related to greater attentional bias but not to craving. The interaction between mood condition and primary psychopathic traits was not a significant predictor of either outcome.

PSYCHOPATHIC TRAITS, AFFECT, AND COCAINE USE-RELATED
OUTCOMES

By

Katherine Elena Long

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Masters of Science
2015

Advisory Committee:

Professor Carl W. Lejuez, Chair

Associate Professor Laura MacPherson

Professor Andrea M. Chronis-Tuscano

© Copyright by
Katherine Elena Long
2015

TABLE OF CONTENTS

Chapter 1: Introduction	1
Substance use as a public health concern.....	1
Crack/cocaine use among inner-city substance users.....	2
Substance use among individuals with Antisocial Personality Disorder.....	3
Importance of psychopathic traits for understanding drug use among individuals with ASPD....	4
Differences between individuals with and without high levels of primary psychopathic traits....	6
Studying drug use across affective states in a laboratory setting.....	10
Current study.....	13
Chapter 2: Research Design and Methods	15
Study recruitment.....	15
Measures.....	15
Assessment procedures.....	20
Chapter 3: Results	24
Analysis plan.....	24
Participant characteristics.....	25
Preparation of dot-probe data.....	26
Manipulation check.....	27
Identification of covariates.....	28
Primary analyses.....	28
Chapter 4: Discussion	31
Summary of findings.....	31
Limitations and future directions.....	34
Conclusions.....	36
Tables.....	37
Bibliography.....	43

Chapter 1: Introduction

Substance Use as a Public Health Concern

Substance abuse and associated public health and economic consequences represent a pervasive and costly problem for both individuals and society at large. According to the 2011 National Survey on Drug Use and Health, 20.6 million people aged 12 and older (8% of the population aged 12 or older) met criteria for substance dependence or abuse in the past year. Of those, 6.5 million people were dependent on or abused illicit substances (SAMHSA, 2012). In addition to being highly prevalent, substance use results in multiple negative consequences including increases in unemployment (Luck, Elifson, & Sterk, 2004), homelessness (e.g., Nyamathi, Wenzel, Lesser, Flaskerud, & Leake, 2001), and violent crime (e.g., Friedman, Glassman, & Terras, 2001). The annual economic cost of illicit drug abuse has been estimated at \$180.9 billion, with this value increasing at an approximate rate of 5.3% each year. This estimate represents substance use-related costs including treatment and prevention, health care expenditures, lost wages, reduced job productivity, accidents, and crime (Office of National Drug Control Policy, 2004). Beyond the economic costs associated with substance use, drug use is also related to engagement in many potentially health-compromising behaviors such as risky sexual behaviors including condom non-use and sex with multiple partners, which increases risk for HIV/AIDS (Bornovalova, Daughters, & Lejuez, 2010; Miller & Neaigus, 2002).

Substance use disorders (SUDs) are also especially difficult to treat, and dropout rates from drug treatment programs can be as high as 50% (SAMHSA, 2005). Furthermore, relapse is also more often the norm than the exception, and many

individuals who attend treatment have done so multiple times over “treatment careers” (e.g., Hser, 1997). For example, data on treatment admissions in the United States revealed that 60% of individuals admitted to publically funded substance use treatment programs had had prior treatment exposure (SAMHSA, 2003). Overall, drug use is a significant public health concern due to the financial costs of increased unemployment among drug users, high costs of substance use treatment, the risky health behaviors associated with drug use including an increased risk for HIV/AIDS, and societal costs of drug-related accidents and crime.

Crack/Cocaine Use among Inner-city Substance Users

Among the estimated 6.5 million people nationally who meet criteria for illicit substance abuse or dependence, approximately 800,000 individuals are dependent on or abuse cocaine in particular (SAMHSA, 2012). Rates of crack/cocaine use disorders are especially high among inner-city substance users in the Washington, D.C. metropolitan area. In one sample of inner-city substance users seeking treatment, 84.5% of women and 63.6% of men reported weekly crack/cocaine use (Lejuez, Bornovalova, & Daughters, 2005). In a study of adult substance-using inmates, over 80% reported some crack/cocaine use, and half of the sample reported a pattern of regular crack/cocaine use (Peters & Kearns, 1992). Furthermore, the consequences of using crack/cocaine are highly impairing for those who use the drug regularly. More so than any other drug, crack/cocaine use has been associated with many health-compromising behaviors and situations such as homelessness, exchange of sex for drugs or money, condom nonuse, and contraction of HIV (Hoffman, Klien, Eber, & Crosby, 2000; Lejuez et al., 2005; Wechsberg et al., 2003).

Treatment studies focusing on cocaine-using populations have found very high attrition rates. In studies of treatment for cocaine use, results indicate that anywhere from 30-62% of participants drop out before completing treatment (e.g., Fernandez-Montalvo, & Lopez-Goni, 2010; Rohsenow, Martin, Eaton, & Monti, 2007; Siqueland et al., 1998). Furthermore, studies examining relapse rates among crack/cocaine users in the year following treatment have found that 29-60.2% of patients return to cocaine use (Simpson, Joe, Fletcher, Hubbard, & Anglin, 1999; Hubbard & Marsden, 1986). Taken together, the research evidence related to prevalence, impairment, treatment dropout, and relapse rates suggests that crack/cocaine use is a significant problem among inner-city substance users.

Substance Use among Individuals with Antisocial Personality Disorder

Substance use is especially prevalent among individuals with co-occurring psychiatric conditions such as personality disorders (e.g., Wu et al., 2011). In particular, individuals with Antisocial Personality Disorder (ASPD) evidence especially high rates of co-occurring SUDs (Grant et al., 2004). Individuals with ASPD are characterized by a pervasive pattern of disregard for, and violation of, the rights of others. To qualify for an ASPD diagnosis, this behavior must begin in childhood or early adolescence (before age 15), reaching diagnostic threshold for Conduct Disorder, and the behavior must continue into adulthood. ASPD can be diagnosed beginning at age 18. Three of the following seven symptoms must be present to warrant a diagnosis: “(1) Failure to conform to social norms with respect to lawful behaviors as indicated by repeatedly performing acts that are grounds for arrest, (2) Deceitfulness, as indicated by repeated lying, use of aliases, or conning

others for personal profit or pleasure, (3) Impulsivity or failure to plan ahead, (4) Irritability and aggressiveness, as indicated by repeated physical fights or assaults, (5) Reckless disregard for the safety of self or others, (6) Consistent irresponsibility, as indicated by repeated failure to sustain consistent work or honor financial obligations, and (7) Lack of remorse, as indicated by being indifferent to or rationalizing having hurt, mistreated, or stolen from another,” (APA, 2000).

SUDs are highly prevalent among individuals with ASPD. It is estimated that 80-90% of individuals with ASPD have a current or past drug use disorder (e.g., Gerstley, Alterman, McLellan & Woody, 1990; Kessler et al., 1996). Similarly, 40% of individuals with SUDs also have ASPD (Grant et al., 2004). The co-occurrence of ASPD and SUDs is associated with more severe problems related to substance use including family conflict, interpersonal problems, legal issues, and financial problems (Westermeyer & Thuras, 2005). Co-occurring ASPD and SUDs is also related to poorer treatment outcomes among individuals receiving drug treatment, including significantly earlier post-treatment failure compared to individuals without ASPD (Goldstein et al., 2001). One study found that 87% of individuals with co-occurring SUDs and ASPD relapsed following treatment (Thomasson & Vaglum, 2000).

Individuals with ASPD and substance use problems represent an important population of study, given the common co-occurrence of the two conditions, the severity of problems associated with having both diagnoses, and the difficulties associated with successfully treating clients with both conditions.

Importance of Psychopathic Traits for Understanding Drug Use among Individuals with ASPD

Understanding the link between substance use problems and ASPD and effectively treating those with both diagnoses is difficult, as ASPD is a heterogeneous disorder encompassing different subgroups of individuals whose behavior may be differentially motivated and characterized by distinct etiological mechanisms (Smith & Newman, 1990). Psychopathy is a personality condition that is related to but distinct from ASPD. Psychopathy refers to a maladaptive personality profile comprised of both emotional deficits and antisocial behaviors (Cleckley, 1941). Psychopathic traits are commonly conceptualized along two factors, with the development of factors serving to disentangle the affective and interpersonal characteristics of psychopathy from those associated with antisocial and impulsive behaviors. Primary psychopathic traits refer to the emotional and interpersonal deficits which characterize psychopathy, including immunity to guilt or shame, a lack of anxiety, and diminished emotional responsiveness. In contrast, secondary psychopathic traits encompass the antisocial deviance associated with psychopathy, such as blame externalization and aggressive, reckless, and criminal behavior (Harpur, Hare, & Hakstian, 1989).¹

A diagnosis of ASPD based on the DSM-IV largely reflects secondary traits of psychopathy. An ASPD diagnosis does not adequately capture the extent to which individuals are characterized by primary psychopathic traits, such as emotional and interpersonal detachment, boldness, or fearlessness. This is important, because research supports that individuals who are characterized by these emotional and interpersonal deficits are characteristically different from those who do not, and these differences may have important implications for drug use. A functional

understanding of how drug use is likely to differ based on level of primary psychopathic traits is enhanced by an understanding of the specific features which characterize individuals with and without primary psychopathic traits.²

Differences between Individuals with and without High Levels of Primary Psychopathic Traits

As mentioned above, individuals who are high in primary psychopathic traits are considered to be immune to guilt and anxiety and show diminished emotional responsiveness. They also evidence high levels of fearlessness, boldness, and sensation seeking. They are characterized by an affective deficiency in the experience of fear or anxiety as well as blunt or deficient emotional responding (Blair, 2005; Kiehl, 2006). One of the classic theoretical approaches to explaining psychopathy is the low fear hypothesis (Lykken, 1957) which posits that deficient emotional responding to aversive stimulation is the core underlying substrate for the disorder.

¹ *Note:* The measurement of psychopathy is an area of research characterized by considerable ongoing debate. Specifically, there is no single agreed upon measure of psychopathy, and independent research groups use different measures to assess for psychopathic traits, with each measure possibly capturing a slightly different variant of psychopathy. Commonly used measures of psychopathy include an interview assessment developed by Robert Hare (the Psychopathy Checklist-Revised; Hare, 1999) and self-report measures including the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005) and the Levenson Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995). Factor analyses of these measures reveal two higher-order factors, which are called Factor 1 and Factor 2 (PCL-R), Fearless Dominance and Self-Centered Impulsivity (PPI-R), or primary and secondary (LSRP) psychopathy. Throughout the manuscript, we refer to “primary” psychopathic traits when discussing the interpersonal and affective features of psychopathy and “secondary” traits to refer to the antisocial deviance traits of psychopathy to limit the use of multiple terms when discussing dimensions of psychopathy. The measure utilized to capture primary psychopathic traits in this study was the Fearless Dominance scale of the PPI-R.

² *Note:* Moving forward, when discussing “psychopathic traits,” we are referring to primary traits unless otherwise noted.

A substantial body of research has demonstrated that psychopathic individuals are under reactive to fear and threats of punishment compared to nonpsychopathic individuals. For example, research with prison inmates has found that psychopaths, compared to nonpsychopaths, show diminished reactivity to threatening cues (e.g., Levenston, Bradley, Patrick, & Lang, 2000). Additionally, many studies have identified deficits in passive avoidance learning among psychopathic individuals, identifying an under reactivity to punishment (e.g., Lykken, 1995; Newman & Kosson, 1986). Passive avoidance learning involves the inhibition of a response that has on prior occasions resulted in punishment (i.e., electric shocks or monetary loss) (Patterson, Kosson, & Newman, 1987). Across a variety of experimental paradigms, psychopathic individuals commit more passive avoidance errors than nonpsychopathic individuals, indicating a characteristic failure to learn from punishment. Similar deficits have also been found in studies which examined aversive conditioning as it relates to psychopathy. For example, López, Poy, Patrick, and Moltó (2013) found that primary features of psychopathy were related to diminished acquisition of physiological fear in undergraduates participating in a classical conditioning paradigm. In a similar study comparing noncriminal psychopaths and healthy controls on a fear conditioning paradigm, the psychopaths failed to exhibit a conditioned fear response (Flor, Birbaumer, Hermann, Ziegler, & Patrick, 2002).

Taken together, results from experimental studies comparing psychopathic and nonpsychopathic individuals indicate that psychopathic individuals are characterized by low levels of arousal and deficient affective responding. Accordingly, it has been hypothesized that individuals who are high in primary

psychopathy engage in risky behaviors as a means of seeking excitement and heightening their lower basal levels of arousal (Lykken, 1957; Hare, 1965). This could also be the case with regard to substance use, as these individuals may use drugs as a means of sensation and excitement seeking.

For individuals who are low in primary psychopathic traits, risky behavior, including substance use, is often related to heightened affective reactivity (e.g., Wilens et al., 2013) or impulsivity (e.g., Leeman & Potenza, 2012), with substance use serving to regulate heightened negative emotion. With his self-medication hypothesis, Khantzian (1985) highlights his clinical observations that individuals with SUDs suffer with painful affective states and relevant psychiatric diagnoses, and he proposes that substance use functions as a compensatory means to self-soothe in the context of these painful affective states. In addition to hypothesizing that drug use occurs because drugs produce relief from psychological suffering, Khantzian also proposed that an individual's preference for a particular drug is based on the drug's psychopharmacological properties. Cocaine specifically was hypothesized to be appealing because of its ability to relieve distress associated with depression in addition to other forms of psychological suffering. The self-medication hypothesis proposes that individuals with SUDs use drugs for the purpose of regulating negative emotion. This hypothesis may apply to substance users who are prone to experiencing negative emotions and who do not experience the blunted affect associated with high levels of primary psychopathic traits.

The temperamental differences across these two clinical profiles suggest that those who are high and low in psychopathic traits likely use drugs in different

contexts or for different reasons. Highly psychopathic individuals likely use drugs as a means of thrill and sensation seeking, using mood-altering substances to satisfy the need for arousal and excitement. Furthermore, the fearlessness that characterizes this group of individuals makes them unlikely to be deterred by the potential negative consequences of drug use such as addiction, interpersonal problems, or legal consequences. Additionally, given their deficits in emotional responding, psychopathic individuals are less likely to engage in substance use to cope with negative emotions. In contrast, nonpsychopathic individuals may use drugs as a way of relieving negative affect, consistent with Khantzian's (1985) self-medication hypothesis mentioned above.

Overall, the nature and function of drug use should differ as a function of primary psychopathic traits. Researchers have hypothesized that individuals at either end of the primary psychopathy continuum should experience different drug outcomes in terms of diversity and chronicity of drug use as well as severity of drug-related symptoms and impairment. Specifically, Verona (personal communication, 2013) has proposed that those high in psychopathic traits are more likely to use a wide range of illicit substances, use for purposes of sensation seeking, and engage in substance use for shorter periods of time, whereas those without may have greater dependence symptoms, engage in more chronic forms of substance use, and experience poorer health outcomes.

Very little work has identified these distinct drug use profiles, but some related work (So, 2005) found that individuals high in primary psychopathy used a wider variety of drugs than their counterparts with low levels of primary psychopathy

and also used drugs for a shorter period of time. Other research has reported that primary traits are related to more years of regular drug use and using drugs at a younger age (Corrado et al., 2004), but secondary traits are related to meeting criteria for more drug dependencies (Cope et al., 2014). Clinical writings from Cleckley (1988) note less craving and withdrawal among substance using psychopaths as compared to nonpsychopaths when access to drugs is externally limited (e.g., during incarceration).

Moving forward, a promising line of research is to study differences in drug use among psychopathic and nonpsychopathic individuals across different mood states. Psychopathic and nonpsychopathic substance users likely seek out and use drugs most often in different affective states, with those high in primary psychopathy using more in the context of a positive mood to gain greater stimulation and excitement and those low in primary psychopathy using more in the context of negative moods, using drugs to avoid or eliminate stress or sadness. No prior research has examined the role of affective context and primary psychopathic traits in predicting drug use.

Studying Drug Use across Affective States in a Laboratory Setting

One way to improve understanding of drug use generally, or crack/cocaine use specifically, is to study drug use through naturalistic observation of individuals in their normal environments. While this method of studying drug use allows researchers to directly observe the target behavior (i.e. drug use) as it occurs naturally, there are many limitations of naturalistic observation that make it a less than ideal way to study the functional role of drug use. In addition to limitations

regarding the amount of time and resources required for such a study, a primary limitation of naturalistic observation is that it does not allow for determining the exact cause of behavior, as we cannot control for extraneous variables which could influence drug use. The presence of extraneous variables which could be accounting for differences in drug use behaviors compromises internal validity.

Another way to study reasons for drug use is to examine the specific processes of interest in a controlled laboratory setting. While ethical and other concerns prevent actual drug use in the lab, numerous previous studies have employed drug-use indices to serve as a proxy for drug use in a laboratory setting. These drug use-related outcome measures include measures such as self-reports of craving (e.g., Sinha, Garcia, Paliwal, Kreek, & Rounsaville, 2006) and attentional-bias paradigms such as dot-probe tasks (Tull, McDermott, Gratz, Coffey, & Lejuez, 2011), among others. Each of these drug use-related outcomes is a construct in its own right and is not entirely redundant with drug use. However, these variables are appropriate for use as proxy variables given that craving and attentional biases for drug related cues are meaningfully related to substance use and have been used as outcome measures across multiple studies.

Drug craving is generally regarded as the desire to use a drug and has been conceptualized as reflecting a drug-acquisitive state which motivates drug use (Sayette et al., 2000). It is frequently measured through self-report, as craving is considered to be a subjective experience in that one must be aware of a desire in order to crave (Kassel & Shiffman, 1992). Reports of cocaine craving are relevant as a proxy for drug use, as cocaine craving predicts time to relapse (e.g., Paliwal, Hymen,

& Sinha, 2008). Tasks which measure attentional biases have also been used in many research studies, including studies of substance use. Habitual substance use is associated with an attentional bias for stimuli related to the use. For example, elevated attentional biases for alcohol identify problem drinkers among college students (Murphy & Garavan, 2011). While measuring craving and attentional bias does not directly capture drug use, measuring these outcomes helps to provide an estimate of severity of drug use behavior.

One advantage to studying drug use outcomes in a laboratory setting is the ability to control the context in which substance use is examined, including the ability to manipulate affect or mood. It is likely that affective state plays a differential role in drug use for individuals who are either high or low in primary psychopathic traits and that different mood states will lead to higher drug use outcomes depending on one's level of primary psychopathic traits. Drug use among substance users who are low in primary psychopathic traits is likely to occur in the context of stress or negative affect, as this group of individuals is high in negative urgency and highly reactive to stress. In contrast, individuals with high levels of primary psychopathic traits are unresponsive to stress and are characterized by blunted affect. Thus, drugs are more likely to be used by this group when they are excited (or experiencing positive affect) as a means of seeking stimulation. Studying drug use in a laboratory setting allows for the manipulation of mood and the measurement of drug-related outcomes, which will allow for a better understanding of differences in drug use in different affective contexts. Studying drug use in this format also allows us to control for extraneous variables, improving the internal validity of the study.

Current Study

The aim of the current study was to examine the relationship between primary psychopathic traits, when controlling for other psychopathic traits, and cocaine use-related outcomes (including attentional bias for crack/cocaine-related cues and crack/cocaine craving) as a function of induced mood (positive or negative affect). To address this question, regular crack/cocaine users were recruited for participation.

Participants' levels of psychopathic traits and baseline affect were measured.

Participants were then randomized into one of two mood manipulation conditions: positive affect or negative affect. For each mood manipulation, participants viewed images selected from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1995). One set of pictures was used to induce positive affect and another to induce negative affect. Following their assigned mood manipulation, participants reported on their affect and completed a brief self-report measure of cocaine craving and a dot-probe task which assessed attentional bias for cocaine-related cues. A diagram of study procedures is located in the method section below.

The study had the following aim and hypotheses associated with this aim:

Study Aim: To examine the main effects of primary psychopathic traits, after controlling for other psychopathic traits, and mood condition as well as the effect of the interaction between primary psychopathic traits and mood condition on cocaine use-related outcomes.

Hypothesis: While we did not hypothesize a main effect of primary psychopathic traits or mood condition on drug use-related outcomes, we did hypothesize that level of primary psychopathic traits would moderate the

mood condition-drug use outcome relationship. Specifically, we hypothesized that:

- In response to the negative affect mood manipulation, those with low levels of primary psychopathic traits, as compared to those with high levels, would have higher scores on drug use-related outcome measures, including greater attentional bias for cocaine-related cues and higher self-reports of cocaine craving.
- In response to the positive affect manipulation, those with high levels of primary psychopathic traits, as compared to those with low levels, would have higher scores on drug use-related outcome measures, including greater attentional bias for cocaine-related cues and higher self-reports of cocaine craving.

Chapter 2: Research Design and Methods

Study Recruitment

Participants were recruited from the Salvation Army Harbor Light Drug Treatment Center in Washington, DC (Harbor Light). As part of ongoing research at Harbor Light, all clients who give informed consent complete an intake interview to assess for current and past psychopathology. Participants were recruited for participation based on the results of this intake assessment. To qualify for participation in the current study, participants had to report weekly crack/cocaine use before coming to treatment and report no current psychotic symptoms.

Measures

Measures assessed demographic information, psychopathology and past drug use, psychopathic traits, and affect. Measures also included two cocaine use-related outcome measures, including a self-report of craving and a dot-probe task designed to measure attentional bias for cocaine-related cues. Measures are described in detail below.

Clinical interviews and self-report questionnaires.

1. ***Demographic Information.*** A self-report questionnaire was administered to obtain information about demographic variables (e.g., age, race, gender, and education level).
2. ***The Structured Clinical Interview for the DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1995).*** The SCID-IV is a widely used semi-structured interview used to assess for the presence of DSM-

IV-TR diagnoses. It is used extensively in both research and clinical settings. The SCID-IV was used to assess for Axis I disorders and Antisocial Personality Disorder (ASPD) as part of the intake screening process. Interviews were conducted by doctoral trainees and post-baccalaureate research assistants, trained and supervised in the administration of this interview.

3. ***Drug Use and Availability (DUA; adapted from Kirisci, Vanyukov, Dunn, & Tarter, 2002)***. The DUA is an interview assessment measure used to gather relevant information about substance use during the participants' first year of use, during the heaviest period of use, and during the past 12 months of a participant's life. Participants provided information regarding the frequency and, when applicable, method of use of alcohol, marijuana, crack/cocaine, stimulants, sedatives, opioids, ecstasy, and hallucinogens over these time periods. In the current study, the DUA was used to measure frequency of crack/cocaine use and method of use (e.g. smoking, intranasal).
4. ***Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005)***. The PPI-R is a 154-item, self-report measure designed to assess psychopathic personality traits as first described by Cleckley in *The Mask of Sanity* (1941). The measure is a revised version of the Psychopathic Personality Inventory (Lilienfeld & Andrews, 1996). Total scores on the PPI-R are interpreted as a

global index of psychopathy. The PPI-R also yields scores on eight factor-analytically derived subscales: impulsive nonconformity, blame externalization, Machiavellian egocentricity, carefree nonplanfulness, stress immunity, social potency, fearlessness, and coldheartedness. Seven of the eight subscales load onto two higher-order factors (called Fearless Dominance and Self-Centered Impulsivity), and coldheartedness does not load substantially onto either factor (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003). The Fearless Dominance (FD) factor is composed of scores on the Social Potency, Fearlessness, and Stress Immunity subscales, and the Self-Centered Impulsivity (SCI) factor is composed of scores on the Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, and Carefree Nonplanfulness subscales. Coldheartedness was examined as a stand-alone dimension in the present study (see also Lilienfeld & Widows, 2005), as it does not load highly onto either higher-order factor. The FD factor of the PPI-R was used to measure primary psychopathic traits in the present study. FD traits as measured by the PPI-R capture social and physical boldness, venturesomeness, and resilience in the face of stress.

5. ***Positive and Negative Affect Scale (PANAS; Tellegen, Watson, & Clark, 1988).*** The PANAS is a commonly used mood measure that assesses two global dimensions of affect: negative and positive. A

large body of literature supports the validity of the PANAS (Watson, 2000), and the PANAS is commonly used to detect changes in emotional reactions to stimuli in experimental settings (e.g., Sharpe & Gilbert, 1998). The measure has good internal consistency (Cronbach's α = .86-.90 for positive affect, .84-.87 for negative affect; Crawford & Henry, 2004) and good construct, convergent and discriminant validity in clinical and non-clinical samples (Tellegen et al., 1988). In the present study, we utilized the "moment" temporal PANAS instructional set to index positive and negative affect in the current time period (i.e., "rate how you feel right now"). The PANAS served as a measure of mood at baseline and following the mood manipulation.

6. ***Ratings of Feelings of Pleasantness and Unpleasantness.*** In addition to the PANAS, participants will rate how "pleasant" and "unpleasant" they feel at baseline and following the mood manipulation. This procedure has been used by other researchers to assess for changes in mood following an experimental manipulation (e.g., Rowe, Hirsh, & Anderson, 2007).

Drug Use Outcome Assessments.

1. ***The Cocaine Craving Questionnaire-Brief (CCQ-Brief; Sussner, Smelson, Rodrigues, Kline, Losconsky, & Ziedonis, 2006).*** The CCQ-Brief is a 10-item self-report assessment of in the moment cocaine craving, adapted from the original 45-item CCQ-Now (Tiffany et al.,

1993). Participants indicated on a 7-point Likert scale how much they agreed or disagreed with statements such as, “Using cocaine now would make thing seem just perfect,” and, “I have an urge for cocaine.” The CCQ-Brief is strongly correlated with the CCQ-Now ($r = .85$) and is also correlated with other measures of cocaine craving. The measure has high internal consistency ($\alpha = .90$; Sussner et al., 2006).

2. *Dot-probe task (Tull, McDermott, Gratz, Coffey, & Lejuez, 2011).*

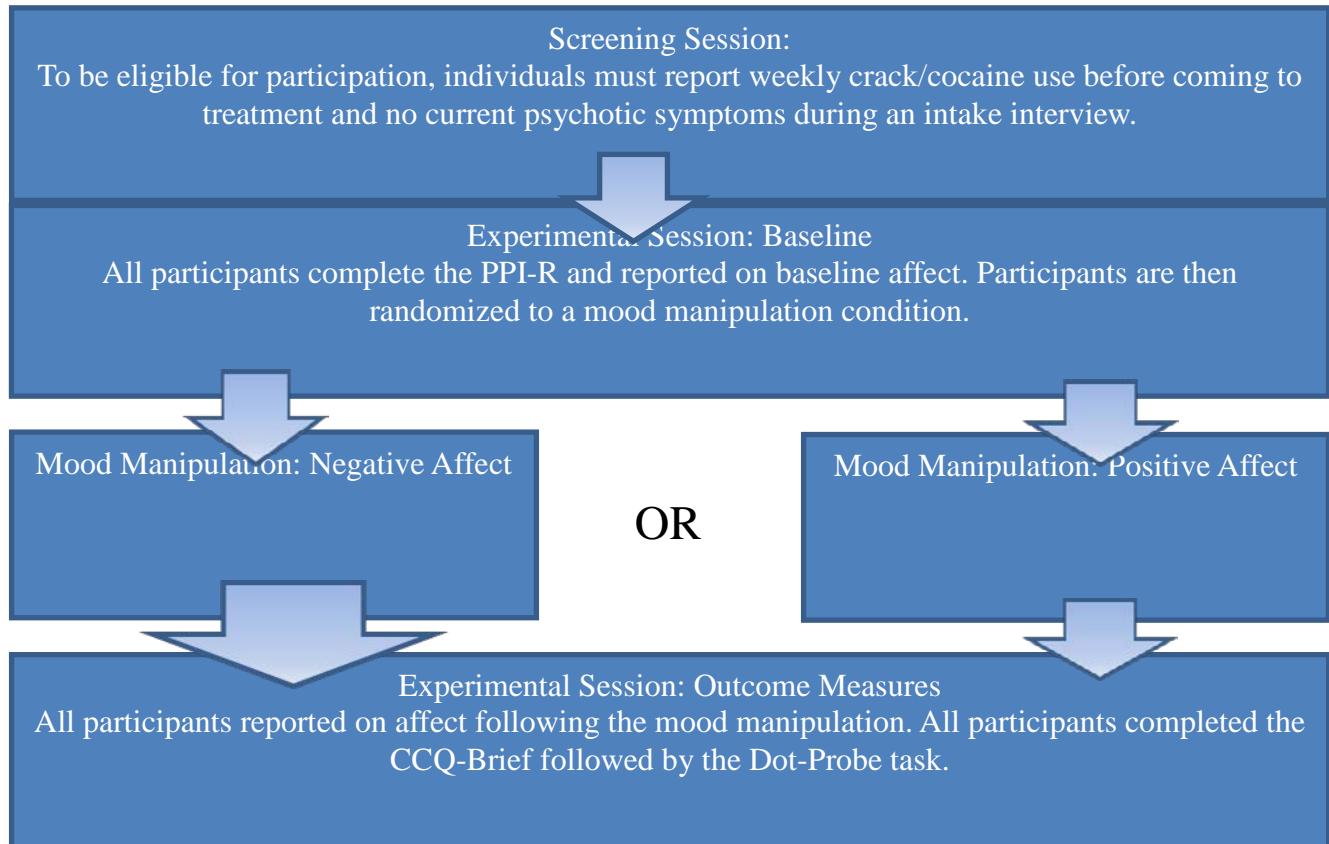
Dot-probe tasks have extensive support as a measure of attentional bias within substance using samples (Townshend & Duka, 2001; Robbins & Ehrman, 2004). The dot-probe task is also a preferred task for the examination of attentional biases in substance use, as it corresponds to real-world conditions where substance-related cues may compete for attention. In the current study, we used a dot-probe task identical to the one used by Tull and colleagues (2011) in a previous study conducted in the same substance use treatment center. This measure was used to determine whether attentional biases for cocaine-related stimuli were present after the experimental mood manipulations. Similar to the stimuli used by Tull et al. (2011), pictorial stimuli for this study consisted of cocaine-related images (e.g., crack rocks, powder cocaine, crack pipes) chosen based on clinical experiences with this particular patient population, and images of furniture which were used as control stimuli. An attentional bias

index score was obtained by calculating the difference in reaction times for trials where the dot-probe appears in the same location as the cocaine image (congruent trials) from trials where the dot-probe appears opposite from the cocaine image (i.e., in the place of the neutral image; incongruent trials).

Assessment Procedures

Study procedures are outlined in Figure i. The study consisted of two sessions held at the Salvation Army Harbor Light Drug Treatment Center in Washington, D.C. (Harbor Light). The first session was conducted to determine eligibility for participation in this study as well as other ongoing research studies at Harbor Light, and the second session was an experimental session. All procedures were approved by the University of Maryland's Institutional Review Board.

Figure i. Study procedures.



Screening. The initial screening for participation included a semi-structured diagnostic interview to assess for ASPD, drug dependencies, and other Axis I diagnoses. Participants completed the SCID-IV, which was administered by trained doctoral students and post-baccalaureate research assistants. Demographic information such as date of birth, gender, ethnicity/race, marital status, level of education attained, and referral status for treatment were also collected at this time. Participants also completed the DUA to assess for frequency of drug use. To qualify for participation, participants had to report weekly crack/cocaine use during this interview. Individuals who reported experiencing current psychotic symptoms were excluded from participating in the study, as these symptoms had the potential to

interfere with participants' ability to complete the study and give informed consent. Individuals who were eligible for participation in the study were contacted within a week of completing the initial interview to see if they were interested in participating. Those who did not meet inclusion criteria for this study based on their intake interviews were still eligible for participation in other research studies conducted at the center.

Experimental Session. Participants completed consent procedures at the beginning of the experimental session. Following consent, participants completed the PPI-R. Before the mood manipulation occurred, all participants completed the PANAS and reported on how “pleasant” and “unpleasant” they felt, in order to assess baseline affect. Participants were then assigned to either the positive or negative affect manipulation. Stimuli used for mood manipulations were images from the International Affective Picture System (IAPS) developed by Lang and his colleagues (Lang, Bradley, & Cuthbert, 1995). The IAPS images are a well-established source of emotional stimuli used in research. The IAPS includes over 700 standardized color photographs evoking a range of affective responses. The system also includes reliable normative ratings of each photograph with respect to valence (pleasure), arousal, and dominance (Lang, Bradley, & Cuthbert, 2008). For the present study, images chosen for the affect manipulations were identical to those used by both Conklin and Perkins (2005) and Vinci, Copeland, and Carrigan (2012). Conklin and Perkins (2005) conducted extensive pilot work to develop sets of IAPS images which reliably induced negative, positive, and neutral moods in their target sample of cigarette smokers. More recently, Vinci, Copeland, and Carrigan (2012) successfully used the

same images to induce affect, and the authors included these images in an appendix. The “positive” and “negative” slides from this study were used for the positive and negative affect mood manipulations in the present study.

Before viewing the IAPS images, participants were instructed to focus on the emotions they experienced when viewing the pictures. Participants viewed a total of 108 images, presented in three groups of 36, with each picture shown for ten seconds. In between groups of pictures, participants were asked brief questions regarding the content of what they saw, to assure that they were paying attention to the stimuli. Following the manipulation, participants completed the PANAS and reported how “pleasant” and “unpleasant” they felt at that time. They then completed a self-report of craving and the dot-probe task. At the end of the session, participants were debriefed and compensated for participation. Debriefing procedures included asking participants to rate their level of distress at the end of the study, as some participants viewed upsetting images and all participants viewed images of crack/cocaine-related cues. Procedures were in place to assist clients who reported significant distress in response to this question, but no participants reported elevated distress at the end of the study.

Chapter 3: Results

Analysis Plan

Dot-probe data were prepared by identifying and removing outlier RT data and RT data from trials with errors. Additionally, neutral-neutral trial RT data were removed. While some researchers have argued that RTs on neutral-neutral trials can be used to determine whether an attentional bias is due to vigilance for or difficulty disengaging attention from cues (Koster, Crombez, Verschuere, & De Houwer, 2004), others have advised against this approach and have demonstrated that evidence of disengagement (i.e. a difference in incongruent RTs relative to neutral-neutral trial RTs) might also be due to a slowing effect of threat cues on motor responses (Mogg, Holmes, Garner, & Bradley, 2008). Therefore, we did not utilize neutral-neutral trial RT data in our analyses, which is similar to the data analyses procedures of Tull and colleagues (2011), who utilized the same dot-probe task.

To identify potential covariates for analyses, a series of correlational analyses was conducted to explore associations between demographic factors (age, gender, race, and education completed) and frequency of crack/cocaine use prior to coming to treatment and outcome variables of interest (self-reported craving and attentional bias scores). Covariates were selected in cases where there was a significant relation between a variable and our outcome variables of interest. To determine whether the two mood manipulations resulted in significant changes in self-reported affect, a series of paired-sample t-tests were conducted. To examine main and interactive effects of independent variables (FD traits and mood manipulation condition) on outcome variables of interest (self-reported craving and attentional bias scores), a

series of hierarchical regression analyses was conducted, with relevant covariates entered into the first step and main effects of independent variables and interactions entered into subsequent steps. Separate regression analyses were conducted for the two outcomes of interest (self-reported craving and attentional bias scores).

Skewness and kurtosis were calculated for CCQ-Brief scores (Skewness = .886, SE = .378; Kurtosis = .436, SE = .741) and attentional bias index scores (Skewness = -.095, SE = .378; Kurtosis = 2.151, SE = .781). These values were acceptable, thus hierarchical linear regression were conducted using the raw scores from the CCQ-Brief and attentional bias outcomes.

Participant characteristics

Forty regular crack/cocaine users participated in the present study. One participant was called to a court appointment while participating and did not complete outcome measures for the study. Pre-mood manipulation data from two participants was not saved due to a computer malfunction. Therefore, demographic information is provided for 38 participants. All other participants participated fully in the study procedures. Table i includes sample demographics and means and standard deviations for PPI-R subscales for each mood manipulation condition group and for the sample as a whole. All individuals who participated in this study identified their race as African-American. Per the eligibility criteria mentioned above in the Method section, all participants were using crack/cocaine at least once per week in the past year before beginning treatment. The majority of participants (79.1%) reported using crack/cocaine more than once per week in the past year. The sample was 42.5% female and 57.9% of participants did not complete high school.

Preparation of dot-probe data

Means and standard deviations for RT data for the sample as a whole and for each mood manipulation condition are presented in Table ii. Across both conditions and all trials, the mean reaction time was 438.16 milliseconds ($SD = 160.67$). Results from trials with errors as well as RT data that were less than 200 milliseconds, greater than 2000 milliseconds, or greater than three standard deviations above the mean were excluded from analyses, which is consistent procedures followed by other researchers with similar tasks (Tull et al., 2011; Bradley, Mogg, Wright, & Field, 2003; Bradley, Field, Mogg, & De Houwer, 2004). Less than 6% of trails were excluded from analyses based on this procedure. For the sample as a whole and for the positive and negative affect groups, an attentional bias index score was obtained by subtracting average RTs for trials where the dot-probe appeared in the same location as the cocaine image (congruent trials) from average RTs for trials where the dot-probe appeared opposite from the cocaine image (incongruent trials). Higher scores suggest a greater attentional bias, with positive scores indicating an attentional bias towards cocaine images and negative scores reflecting the avoidance of those images.

Internal consistency estimates were calculated using procedures outlined by Schmukle (2005). Specifically, the 160 critical trials were divided into 40 quadruplets consisting of one of each kind of critical trial (left and right, congruent and incongruent). An attentional bias index was then calculated for each quadruplet, and a Cronbach's alpha for RT data was calculated using these values. Consistent with past

dot-probe studies (see Ataya et al., 2012), internal consistency for RTs during the dot probe task in this study was low ($\alpha = .41$).

Manipulation check

Paired sample t-tests were conducted to determine whether the two mood manipulations resulted in significant changes in self-reported affect on the PANAS and feelings of pleasantness or unpleasantness. Following the negative affect manipulation, participants' ratings of how pleasant they felt decreased significantly ($t(17) = -2.83, p = .03$), but there were not significant changes in PANAS scores. All results for paired-sample t-tests for the negative affect (NA) condition are reported in Table iii. Following the positive affect condition, participants reported an overall decrease in negative affect as measured by PANAS Negative Affect total scores ($t(16) = -2.43, p = .03$). All results for paired-sample t-tests for the positive affect (PA) condition are reported in Table iv. Generally, across both conditions, the mood manipulations significantly changed affect in the expected direction. However, results indicated that the positive mood manipulation made participants feel less negative as opposed to more positive affect and the negative mood manipulation made participants feel less pleasant as opposed to more unpleasant (see Tables iii and iv).

Repeated measures ANOVAs were conducted to determine if the interaction between time (pre or post manipulation) and mood condition was a significant predictor of PANAS PA, PANAS NA, ratings of pleasantness, and ratings of unpleasantness. The timeXcondition interaction was nonsignificant as a predictor of PANAS PA scores ($F(1) = 1.61, p = .21$). The timeXcondition interaction approached significance as a predictor of PANAS NA scores ($F(1) = 3.58, p = .07$).). The

timeXcondition interaction also approached significance as a predictor of ratings of pleasantness ($F(1) = 3.12, p = .09$). Finally, the interaction between time and condition significantly predicted ratings of unpleasantness ($F(1) = 4.71, p = .04$). Significant interactions and interactions which approached significance were in the expected directions, such that they reflected increases in pleasantness and decreases in PANAS NA and unpleasantness following the positive manipulation and decreases in pleasantness and increases in PANAS NA and unpleasantness following the negative manipulation.

Identification of covariates

Age, gender, and race were not related to attentional bias indices or self-reported craving at the univariate level. Therefore, these variables were not included as covariates in regression analyses. Participants' level of education was inversely related to how much they self-reported craving crack/cocaine. Those who had a higher education level reported significantly less craving on the CCQ-brief ($r = -.36, p = .03$). In contrast, more frequent use of crack/cocaine before prior to coming to treatment was positively related to attentional bias for crack/cocaine related cues. Those who reported more cocaine usage before treatment had greater attention bias index scores ($r = .34, p = .04$). Therefore, level of education and amount of cocaine use were entered as covariates in subsequent regression analyses.

Primary Analyses

Self-reported craving

Hierarchical linear regression analyses were performed to examine the main and interactive effects of primary psychopathy traits and mood manipulation

condition on crack/cocaine craving as measured by the CCQ-Brief. Predictor variables were centered. Covariates including education level, pre-treatment cocaine use, and Self-Centered Impulsivity and Coldheartedness traits were entered in the first step (Model 1). Main effects of Fearless dominance (FD) traits and mood manipulation condition were entered separately in subsequent steps (Models 2 and 3). Finally, the interaction between FD traits and mood manipulation condition (FDxCondition) was entered in the final step (Model 4).

Results are shown in Table v. In Model 3, there were no significant main effects of FD traits ($\beta = .217, p = .77$) or of mood manipulation condition ($\beta = .004, p = .98$) on CCQ-Brief Scores. Additionally, in Model 4, the FDxCondition interaction was nonsignificant as a predictor of CCQ-Brief scores ($\beta = .061, p = .77$).

Attentional Bias Index Scores

Hierarchical linear regression analyses were also performed to examine the main and interactive effects of primary psychopathy traits and mood manipulation condition on attentional bias index scores. Predictor variables and their composites were centered. As with the regression analyses predicting CCQ-Brief scores, covariates including education level, pre-treatment cocaine use, and Self-Centered Impulsivity and Coldheartedness traits were entered in the first step (Model 1). Main effects of FD traits and mood manipulation condition were entered separately in subsequent steps (Models 2 and 3). The interaction between FD traits and mood manipulation condition (FDxCondition) was entered in the final step (Model 4).

Results are shown in Table vi. After controlling for education level, amount of pretreatment cocaine use, and other psychopathic traits, both FD and mood

manipulation condition were significant predictors of attentional bias index scores. Specifically, FD traits showed an inverse relationship with attentional bias index score; having higher levels of FD traits was related to a lower attentional bias for crack/cocaine-related cues ($\beta = -.376, p = .04$). Additionally, mood condition was a significant predictor of attentional bias index score; assignment to the negative affect condition was related to a higher attentional bias for crack/cocaine related cues ($\beta = -.486, p = .01$). There were significant main effects of both FD traits and mood manipulation condition on attentional bias (Model 3).

In the final step of the regression analyses, we tested whether the interaction between FD traits and mood manipulation condition was a significant predictor of attentional bias. The FDxCondition interaction was nonsignificant as a predictor of attentional bias index scores ($\beta = -.081, p = .68$) (Model 4).

Chapter 4: Discussion

Summary of Findings

The present study provided an experimental examination of the relationship between primary psychopathic traits, affect, and an explicit and an implicit measure of crack/cocaine craving in order to understand the functional role of drug use as related to an individual's level of psychopathic traits. Previous research has demonstrated a positive relation between total psychopathy scores and SUDs. However, this research also has suggested that secondary psychopathic traits, rather than primary traits, are what accounts for this relationship (Taylor & Lang, 2006). Less is known about the relation between primary traits and substance use or the different functional role of drug use for individuals who are high or low in primary psychopathic traits. Given the characteristic affective *over*reactivity that characterizes most regular substance users and the affective *under*reactivity associated with primary psychopathy, we examined both affective state and primary psychopathic traits as predictors of cocaine craving and attentional bias for cocaine-related cues among regular crack/cocaine users in residential treatment.

We hypothesized that there would be no main effects of primary psychopathic traits or mood condition on self-reported craving or attentional bias for cocaine-related cues. Instead, we predicted that the interaction between these two variables would significantly predict self-reported craving and attentional bias. Specifically, we hypothesized that participants with high levels of psychopathic traits would report higher levels of craving and display greater attentional bias for cocaine-related cues following the positive affect manipulation, while participants with low levels of

psychopathic traits would report higher levels of craving and display greater attentional bias for cocaine-related cues following the negative affect manipulation.

Results from this study were contrary to our predictions. While the interaction between primary psychopathic traits and mood condition was not a significant predictor of either craving or attentional bias, the main effects of primary psychopathic traits and mood condition were both significant predictors of attentional bias, after controlling for other psychopathic traits and relevant demographic variables. Assignment to the negative affect mood manipulation was related to greater attentional bias for cocaine-related cues. Conversely, primary psychopathic traits (measured as PPI-R FD traits in this study) were negatively related to attentional bias for cocaine-related cues. In analyses predicting a more explicit measure of craving, the CCQ-Brief, there were no significant main effects of either primary psychopathic traits or mood condition on self-reported craving. The effect of the interaction between these two variables on self-reported craving was also nonsignificant.

The finding that assignment to the negative affect manipulation was associated with a greater attentional bias is consistent with findings from previous research which has examined attentional bias for other appetitive cues. For example, in a study of dysfunctional appetitive motivation, Hepworth and colleagues (2010) found that negative mood increased both attentional bias for food cues and subjective appetite. Researchers have also found that negative mood increases subjective urges for smoking among undergraduate cigarette smokers (Brandon, Wetter, & Baker 1996).

The finding that primary psychopathic traits were associated with less attentional bias for cocaine-related cues is interesting in light of recent research by Cope and colleagues (2014). She investigated the modulatory effect of psychopathic traits on the neurobiological craving response to pictorial drug stimuli. Specifically, she used functional magnetic resonance imaging to monitor hemodynamic activity in incarcerated offenders with a history of substance dependence while they viewed drug-related and neutral pictures. Results indicated a negative relationship between total psychopathy scores (as measured by the PCL-R) and the hemodynamic response (which is associated with drug use) to drug-related stimuli. Interestingly, the negative effect of psychopathy on the hemodynamic response to drug-related stimuli was most strongly correlated with Factor 2 (or secondary) traits; when controlling for Factor 2 traits, there were no negative associations between primary (Factor 1) traits and neural response.

The direction of the psychopathy-attentional bias relationship found in results from the present study was consistent with the negative relation between psychopathy and neural response to drug-related cues observed by Cope and colleagues (2014). However, while she reported that primary traits were not significant predictors of hemodynamic response, we did find that primary traits were negatively related to attentional bias for drug-related cues. However, the differences in results could be due to a number of methodological differences in the research by Cope et al. and the present study. These include different but related outcome variables, different samples, and different measures of psychopathy. Cope and colleagues (2014) used a large prison sample, neuroimaging techniques, and an interview assessment of

psychopathy (the Psychopathy Checklist-Revised/PCL-R; Hare, 1999). Our study used a smaller sample of individuals in residential substance use treatment, reaction time and self-report data, and a self-report measure of psychopathy (the Psychopathic Personality Inventory-Revised/PPI-R; Lilienfeld & Widows, 2005), and we collected outcome data following mood manipulations. Therefore, further research should seek to clarify which aspects of psychopathy are and are not related to substance use-related outcomes and to actual substance use.

Finally, while we found significant main effects of primary psychopathy traits and mood condition when predicting what could be considered an implicit measure of craving (attentional bias), the same pattern of results did not occur when predicting a more explicit, self-report of craving (CCQ-Brief scores). This could be due to a social acceptability bias when self-reporting craving, or it could be the case that mood and primary traits have different effects on attentional bias and craving. Regarding the relation between self-reported craving and mood, previous research has found that cocaine dependent individuals self-report higher craving following a stress imagery manipulation than they do following a neutral imagery manipulation (Sinha, Fuse, Aubin, & O'Malley, 2000; Sinha, Catapano, & O'Malley, 1999). Our results regarding the relation between mood and self-reported craving are inconsistent with previous research. Regarding the relation between self-reported craving and primary psychopathic traits, Cope and colleagues (2014) also reported no significant relation between primary psychopathic traits (in this study, Factor 1 of the PCL-R) and self-reported cocaine craving when controlling for secondary traits.

Limitations and Future Directions

Results from the present study should be interpreted with the following limitations in mind. First, the sample for this study was fairly small, and all participants in the study were African-American and regular crack/cocaine users who were in residential substance abuse treatment at the time of participation. It is unclear how these findings might generalize to a more diverse population of crack/cocaine users, to cocaine users in other settings, or if these findings would generalize to other illicit drugs or alcohol or tobacco. Interpretation of results from the explicit measure of crack/cocaine craving utilized in this study (the CCQ-Brief) is complicated by the study location. In the residential treatment setting in which many participants are court mandated to attend treatment, participants may have believed that verbalizing their experiences of drug craving would be discouraged or result in negative consequences. Second, the study utilized a self-report measure of psychopathic traits rather than an interview assessment such as the Psychopathy Checklist-Revised (Hare, 1999). Although prior research has shown that self-report measures are valid for detecting psychopathic traits (Lilienfeld & Fowler, 2006), the questionnaire measurement of psychopathy is hardly without controversy, and some researchers have argued that the PPI-R in particular captures a more adaptive variant of primary psychopathic traits than the PCL-R or other measures (see for example, Miller & Lynam, 2012; Lilienfeld, Patrick, Benning, Berg, Selbom, & Edens, 2012). It should therefore be borne in mind that different results could emerge with a different measure of psychopathic traits, and future research should attempt to replicate and extend these results using different measures of psychopathy. Third, this study utilized a positive and negative affect manipulation, but we did not measure

attentional bias for cocaine-related cues or self-reports of craving in the context of a neutral mood. As this is the first study to find a significant negative relation between primary psychopathic traits and attentional bias for cocaine-related cues, our findings should be replicated and extended to include a neutral mood state.

Conclusions

Substance abuse in general and crack/cocaine use among inner-city drug users in particular remains a major public health concern, and the prevalence of SUDs is higher and impairment due to substance use is greater among individuals with co-occurring psychopathology and personality disorders. While previous research has identified a link between both ASPD and SUDs and total psychopathy scores and SUDs, the specific relation between primary psychopathy (or Fearless Dominance or Factor 1 traits) is not well understood. Indeed, much of the existing research suggests that the psychopathy-SUDs relation is driven mostly by secondary (or Self-Centered Impulsivity or Factor 2) traits (Taylor & Lang, 2006). The present study is the first to our knowledge to experimentally examine the functional relationship between primary traits of psychopathy, affect, and cocaine craving and attentional bias for cocaine-related cues. While the interaction between primary traits and mood condition was not a significant predictor of craving or attentional bias as hypothesized, there were significant main effects primary traits and mood condition on attentional bias for cocaine-related cues. Future research should continue to explore the relations between different aspects of psychopathy and substance use in order to better understand this relationship and eventually develop treatments for SUDs among individuals with psychopathic traits.

Table i. Sample demographics and scores on PPI-R subscales.

	Full Sample (n=38)	Negative Affect (n=20)	Positive Affect (n=18)
Age <i>M(SD)</i>	48.08 (8.07)	46.20 (8.31)	50.17 (7.47)
Gender (% female)	42.5%	36.4%	50.00%
Race (% African American)	100%	100%	100%
Median Education Level	GED	GED	GED
Pre-treatment Cocaine Use	79.1% More than once per week	75.2% More than once per week	83.3% More than once per week
Fearless Dominance Traits <i>M(SD)</i>	118.84 (14.62)	123.25 (16.77)	113.94 (10.13)
Self-Centered Impulsivity Traits <i>M(SD)</i>	154.05 (21.26)	154.40 (22.29)	153.67 (20.68)
Coldheartedness Traits <i>M(SD)</i>	29.87 (5.73)	29.40 (5.99)	30.39 (5.54)
Total PPI-R Score	302.76 (27.59)	307.05 (32.36)	298.00 (20.99)

Table ii. Attentional bias indices and raw reaction time data for all participants and for each mood manipulation condition for congruent and incongruent trials. Raw RT data are measured in milliseconds.

Trials (240 trials/participant)	Mean	Standard Deviation
<u>Full Sample</u>		
Attentional bias index	1.67	19.67
Congruent trials	427.28	91.10
Incongruent trials	428.95	88.50
<u>Negative Affect Condition</u>		
Attentional bias index	5.46	19.80
Congruent trials	408.51	74.35
Incongruent trials	413.96	69.95
<u>Positive Affect Condition</u>		
Attentional bias index	-3.23	18.93
Congruent trials	451.58	106.50
Incongruent trials	448.35	107.10

Table iii. Descriptive statistics and t-test results for negative affect (NA) manipulation.

	Pre		Post		n	r	t	df
	M	SD	M	SD				
PA Total	36.30	7.10	34.20	10.45	20	.68**	-1.22	19
Pleasant	4.17	1.04	3.56	1.38	18	.75**	-2.83**	17
NA Total	20.50	7.16	19.80	10.45	20	.66**	-.47	19
Unpleasant	1.39	.70	1.67	.91	18	.40	1.32	17

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

Table iv. Descriptive statistics and t-test results for positive affect (PA) manipulation.

	Pre		Post		n	r	t	df
	M	SD	M	SD				
PA Total	34.88	8.79	35.94	8.83	17	.65**	.59	16
Pleasant	3.71	.61	3.71	.91	14	.19	.00	13
NA Total	20.50	7.16	19.80	10.45	17	.18	-2.43*	16
Unpleasant	1.57	1.02	1.14	.36	14	.39	-1.71	13

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

Table v. Hierarchical linear regression predicting total scores on the CCQ-Brief.

Predictor	B	SE(B)	β	ΔR^2
<u>Model 1</u>				.200
Education*	-1.943	.948	-.331	
Pre-treat Coke	.917	1.382	.107	
SCI Traits	.090	.061	.235	
Coldheartedness	.052	.231	.037	
<u>Model 2</u>				.040
Education*	-2.323	.986	-.395	
Pre-treat Coke	.806	1.371	.094	
SCI Traits	.089	.061	.234	
Coldheartedness	-.010	.234	-.007	
FD Traits	.119	.094	.215	
<u>Model 3</u>				.000
Education*	-2.327	1.019	-.396	
Pre-treat Coke	.795	1.480	.093	
SCI Traits	.089	.062	.234	
Coldheartedness	-.011	.245	-.008	
FD Traits	.120	.105	.217	
Mood Condition	.063	2.988	.004	
<u>Model 4</u>				.002
Education*	-2.367	1.043	-.403	
Pre-treat Coke	.819	1.505	.096	
SCI Traits	.092	.063	.240	
Coldheartedness	-.015	.250	-.011	
FD Traits	.105	.117	.190	
Mood Condition	.280	3.119	.017	
FD*MoodCond	.068	.226	.061	

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

Table vi. Hierarchical linear regression predicting attentional bias index scores.

Predictor	B	SE(B)	β	ΔR²
<u>Model 1</u>				.108
Education	1.303	2.419	.092	
Pre-treat Coke	3.632	3.524	.176	
SCI Traits	.224	.157	.243	
Coldheartedness	-.438	.589	-.128	
<u>Model 2</u>				.023
Education	1.999	2.546	.141	
Pre-treat Coke	3.835	3.542	.185	
SCI Traits	.225	.157	.244	
Coldheartedness	-.325	.604	-.095	
FD Traits	-.217	.242	-.163	
<u>Model 3**</u>				.176
Education	3.160	2.349	.223	
Pre-treat Coke*	6.996	3.411	.338	
SCI Traits	.200	.143	.217	
Coldheartedness	.059	.566	.017	
FD Traits*	-.502	.242	-.376	
Mood Condition**	-19.048	6.890	-.486	
<u>Model 4</u>				.004
Education	3.288	2.401	.232	
Pre-treat Coke	6.919	3.464	.335	
SCI Traits	.192	.146	.208	
Coldheartedness	.073	.574	.022	
FD Traits	-.455	.270	-.341	
Mood Condition**	-19.744	7.18	-.504	
FD*MoodCond	-.218	.521	-.081	

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

Bibliography

- APA. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*: American Psychiatric Association.
- Ataya, A. F., Adams, S., Mullings, E., Cooper, R. M., Attwood, A. S., & Munafò, M. R. (2012). Internal reliability of measures of substance-related cognitive bias. *Drug and alcohol dependence, 121*(1), 148-151.
- Benning, S. D., Patrick, C. J., Hicks, B. M., Blonigen, D. M., & Krueger, R. F. (2003). Factor structure of the Psychopathic Personality Inventory: Validity and implications for clinical assessment. *Psychological Assessment, 15*(3), 340-350.
- Blair, R. J. R. (2005). Applying a cognitive neuroscience perspective to the disorder of psychopathy. *Development and psychopathology, 17*(3), 865-891.
- Bornovalova, M. A., Daughters, S. B., & Lejuez, C. W. (2010). Motivations for Sexual Risk Behavior across Commercial and Casual Partners Among Male Urban Drug Users: Contextual Features and Clinical Correlates. *Behavior modification, 34*(3), 219-246.
- Bradley, B., Field, M., Mogg, K., & De Houwer, J. (2004). Attentional and evaluative biases for smoking cues in nicotine dependence: component processes of biases in visual orienting. *Behavioural pharmacology, 15*(1), 29-36.
- Bradley, B. P., Mogg, K., Wright, T., & Field, M. (2003). Attentional bias in drug dependence: vigilance for cigarette-related cues in smokers. *Psychology of Addictive Behaviors, 17*(1), 66.

- Brandon, T. H., Wetter, D. W., & Baker, T. B. (1996). Affect, expectancies, urges, and smoking: Do they conform to models of drug motivation and relapse?. *Experimental and Clinical Psychopharmacology*, 4(1), 29.
- Cleckley, H. (1941/1988). *The mask of sanity; an attempt to reinterpret the so-called psychopathic personality.*
- Conklin, C. A., & Perkins, K. A. (2005). Subjective and reinforcing effects of smoking during negative mood induction. *Journal of abnormal psychology*, 114(1), 153.
- Cope, L. M., Vincent, G. M., Jobelius, J. L., Nyalakanti, P. K., Calhoun, V. D., & Kiehl, K. A. (2014). Psychopathic traits modulate brain responses to drug cues in incarcerated offenders. *Frontiers in human neuroscience*, 8.
- Corrado, R. R., Vincent, G. M., Hart, S. D., & Cohen, I. M. (2004). Predictive validity of the Psychopathy Checklist: Youth Version for general and violent recidivism. *Behavioral sciences & the law*, 22(1), 5-22.
- Crawford, J.R. & Henry, J.D. (2004). The positive and negative affect schedule: Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 43, 245-265.
- Fernandez-Montalvo, J., Lopez-Goni, J. (2010). Comparison of completers and dropouts in psychological treatment for cocaine addiction. *Addiction Research & Theory*, 18(4), 433-441.
- First, M. B., Spitzer R. L., Gibbon M., Williams J. B. W. *Structured Clinical Interview for DSM-IV Disorders.* New York State Psychiatric Institute; New York: 1995.

- Flor, H., Birbaumer, N., Hermann, C., Ziegler, S., & Patrick, C. J. (2002). Aversive Pavlovian conditioning in psychopaths: Peripheral and central correlates. *Psychophysiology*, *39*(4), 505-518.
- Friedman, A. S., Glassman, K., & Terras, A. (2001). Violent behavior as related to use of marijuana and other drugs. *Journal of addictive diseases*, *20*(1), 49-72.
- Gerstley, L. J., Alterman, A. I., McLellan, A. T., & Woody, G. E. (1990). Antisocial personality disorder with substance abuse disorders: A problematic diagnosis. *American Journal of Psychiatry*, *147*, 173-178.
- Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, S. P., Dufour, M. C., Compton, W., Pickering, R.P., & Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of general psychiatry*, *61*(8), 807.
- Goldstein, R., Bigelow, C., McCusker, J., Lewis, B. F., Mundt, K. A., Powers, S. I. (2001). Antisocial behavioral syndromes and return to drug use following residential relapse prevention/health education treatment. *The American Journal of Drug and Alcohol Abuse*, *27*(3), 453-482.
- Hare, R. D. (1965). Temporal gradient of fear arousal in psychopaths. *Journal of Abnormal Psychology*, *70*(6), 442.
- Hare, R. D. (1999). *The Hare Psychopathy Checklist-Revised: PLC-R*. MHS, Multi-Health Systems.
- 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.
- Hepworth, R., Mogg, K., Brignell, C., & Bradley, B. P. (2010). Negative mood increases selective attention to food cues and subjective appetite. *Appetite*, 54(1), 134-142.
- Hser, Y. I., Anglin, M. D., Grella, C., Longshore, D., & Prendergast, M. L. (1997). Drug treatment careers A conceptual framework and existing research findings. *Journal of Substance Abuse Treatment*, 14(6), 543-558.
- Hoffman, J., Klein, H., Eber, M., & Crosby, H. (2000). Frequency and intensity of crack use as predictors of women's involvement in HIV-related sexual risk behaviors. *Drug and Alcohol Dependence*, 58, 227-236.
- Hubbard, R. L., & Marsden, M. E. (1986). Relapse to use of heroin, cocaine, and other drugs in the first year after treatment. *Relapse and Recovery in Drug Abuse. National Institute on Drug Abuse Research Monograph*, 72, 157-166.
- Kassel, J. D., & Shiffman, S. (1992). What can hunger teach us about drug craving? A comparative analysis of the two constructs. *Advances in Behaviour Research and Therapy*, 14(3), 141-167.
- Kessler, R. C., Nelson, C. B., McGonagle, K. A., Edlund, M. J., Frank, R. G., & Leaf, P. J. (1996). The Epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization. *American Journal of Orthopsychiatry*, 66(1), 17-31.

- Khantzian, E.J. (1985). The self-medication hypothesis of addictive disorders: Focus on heroin and cocaine dependence. *The American Journal of Psychiatry*, *142*(11), 1259-1264.
- Kiehl, K. A. (2006). A cognitive neuroscience perspective on psychopathy: evidence for paralimbic system dysfunction. *Psychiatry research*, *142*(2-3), 107.
- Kirisci, L., Vanyukov, M., Dunn, M., & Tarter, R. (2002). Item response theory modeling of substance use: an index based on 10 drug categories. *Psychology of addictive behaviors*, *16*(4), 290.
- Koster, E. H., Crombez, G., Verschuere, B., & De Houwer, J. (2004). Selective attention to threat in the dot probe paradigm: Differentiating vigilance and difficulty to disengage. *Behaviour research and therapy*, *42*(10), 1183-1192.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1995). *The international affective picture system (IAPS): Photographic slides*. The Center for Research in Psychophysiology, University of Florida.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2008). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-8*. University of Florida, Gainesville, FL.
- Leeman, R. F. & Potenza, M. N. (2012). Similarities and differences between pathological gambling and substance use disorders: A focus on impulsivity and compulsivity. *Psychopharmacology*, *219*(2), 469-490.
- 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.

- Levenston, G. K., Patrick, C. J., Bradley, M. M., & Lang, P. J. (2000). The psychopath as observer: Emotion and attention in picture processing. *Journal of Abnormal Psychology, 109*(3), 373.
- Lejuez, C.W., Bornovalova, M.A., & Daughters, S.B. (2005). Differences in impulsivity and sexual risk behavior among inner-city crack/cocaine users and heroin users. *Drug and Alcohol Dependence, 77*, 169-175.
- 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.
- Lilienfeld, S. O., & Fowler, K. A. (2006). The Self-Report Assessment of Psychopathy: Problems, Pitfalls, and Promises. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp.107-132). New York, NY US: Guilford Press.
- Lilienfeld, S. O., Patrick, C. J., Benning, S. D., Berg, J., Sellbom, M., & Edens, J. F. (2012). The role of fearless dominance in psychopathy: Confusions, controversies, and clarifications. *Personality Disorders: Theory, Research, and Treatment 3*(3), 327-340.
- Lilienfeld S. O., Widows M. R. (2005): Professional Manual for the Psychopathic Personality Inventory–Revised: (PPI-R).Lutz, FL: Psychological Assessment Resources.
- López, R., Poy, R., Patrick, C. J., & Moltó, J. (2013). Deficient fear conditioning and self-reported psychopathy: The role of fearless dominance. *Psychophysiology, 50*(2), 210-218.

- Luck, P. A., Elifson, K. W., & Sterk, C. E. (2004). Female drug users and the welfare system: a qualitative exploration. *Drugs: Education, Prevention, and Policy, 11*(2), 113-128.
- Lykken, D. T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology, 55*, 6–10.
- Lykken, D. T. (1995). *The antisocial personalities*. Mahwah, NJ: Erlbaum.
- Miller, J. D., & Lynam, D. R. (2012). An examination of the Psychopathic Personality Inventory's nomological network: A meta-analytic review. *Personality Disorders: Theory, Research, and Treatment, 3*(3), 305-326.
- Miller, M., & Neaigus, A. (2002). An economy of risk: Resource acquisition strategies of inner city women who use drugs. *International Journal of Drug Policy, 13*(5), 409-418.
- Mogg, K., Holmes, A., Garner, M., & Bradley, B. P. (2008). Effects of threat cues on attentional shifting, disengagement and response slowing in anxious individuals. *Behaviour research and therapy, 46*(5), 656-667.
- Murphy, P., & Garavan, H. (2011). Cognitive predictors of problem drinking and AUDIT scores among college students. *Drug and alcohol dependence, 115*(1), 94-100.
- Newman, J. P., & Kosson, D. S. (1986). Passive avoidance learning in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology, 95*(3), 252.
- Nyamathi, A., Wenzel, S. L., Lesser, J., Flaskerud, J., & Leake, B. (2001). Comparison of psychosocial and behavioral profiles of victimized and

- nonvictimized homeless women and their intimate partners. *Research in nursing & health*, 24(4), 324-335.
- Office of National Drug Control Policy. (2004). *National drug control strategy: Update*. Washington, DC: White House.
- Paliwal, P., Hyman, S. M., & Sinha, R. (2008). Craving predicts time to cocaine relapse: Further validation of the Now and Brief versions of the cocaine craving questionnaire. *Drug and alcohol dependence*, 93(3), 252-259.
- Patterson, C. M., Kosson, D. S., & Newman, J. P. (1987). Reaction to punishment, reflectivity, and passive avoidance learning in extraverts. *Journal of personality and social psychology*, 52(3), 565.
- Peters, R. H., & Kearns, W.D., (1992). Drug abuse history and treatment needs of jail inmates. *The American Journal of Drug and Alcohol Abuse*, 18(3), 355-366.
- Robbins, S. J., & Ehrman, R. N. (2004). The role of attentional bias in substance abuse. *Behavioral and Cognitive Neuroscience Reviews*, 3(4), 243-260.
- Rohsenow, D., J., Martin, R.A., Eaton, C. A., & Monti, P. M., (2007). Cocaine craving as a predictor of treatment attrition and outcomes after residential treatment for cocaine dependence. *Journal on Studies of Alcohol and Drugs* 68(5), 641-648.
- Rowe, Hirsh, & Anderson (2007). Positive affect increases the breadth of attentional selection. *PNAS*, 104(1), 383-388
- Sayette, M. A., Shiffman, S., Tiffany, S. T., Niaura, R. S., Martin, C. S., & Schadel, W. G. (2000). The measurement of drug craving. *Addiction*, 95(8s2), 189-210.

- Schmukle, S. C. (2005). Unreliability of the dot probe task. *European Journal of Personality, 19*(7), 595-605.
- Sharpe, J.P. & Gilbert, D.G. (1998). Effects of repeated administration of the beck depression inventory and other measures of negative mood states. *Personality and Individual Differences, 24*, 457-463.
- Simpson, D. D., Joe, G. W., Fletcher, B. W., Hubbard, R. L., & Anglin, M. D. (1999). A national evaluation of treatment outcomes for cocaine dependence. *Archives of General Psychiatry, 56*(6), 507.
- Sinha, R., Catapano, D., & O'Malley, S. (1999). Stress-induced craving and stress response in cocaine dependent individuals. *Psychopharmacology, 142*(4), 343-351.
- Sinha, R., Fuse, T., Aubin, L. R., & O'Malley, S. S. (2000). Psychological stress, drug-related cues and cocaine craving. *Psychopharmacology, 152*(2), 140-148.
- Sinha, R., Garcia, M., Paliwal, P., Kreek, M. J., & Rounsaville, B. J. (2006). Stress-induced cocaine craving and hypothalamic-pituitary-adrenal responses are predictive of cocaine relapse outcomes. *Archives of General Psychiatry, 63*(3), 324.
- Siqueland, L., Crits-Christoph, P., Frank, A., Daley, D., Weiss, R., Chittams, J., Blaine, J., & Luborsky, L. (1998). Predictors of dropout from psychosocial treatment of cocaine dependence. *Drug and Alcohol Dependence, 52*(1), 1-13.

- Smith, S. S., & Newman, J. P. (1990). Alcohol and drug abuse-dependence disorders in psychopathic and nonpsychopathic criminal offenders. *Journal of Abnormal Psychology, 99*(4), 430.
- So, H. W. (2005). Substance Abuse and Psychiatric Comorbidity: Millon Clinical Multiaxial Inventory-III Profiles of Chinese Substance Abusers. *Hong Kong Journal of Psychiatry, 15*(3), 89-96.
- Substance Abuse and Mental Health Services Administration. (2003). *Results from the 2002 National Survey on Drug Use and Health: National Findings* (Office of Applied Studies, NHSDA Series H-22, DHHS Publication No. SMA 03–3836). Rockville, MD.
- Substance Abuse and Mental Health Services Administration, Office of Applied Studies. *National Survey of Substance Abuse Treatment Services (N-SSATS): 2005. Data on Substance Abuse Treatment Facilities*, DASIS Series: S-34, DHHS Publication No. (SMA) 06-4206, Rockville, MD, 2006.
- Substance Abuse and Mental Health Services Administration, *Results from the 2011 National Survey on Drug Use and Health: Summary of National Findings*, NSDUH Series H-44, HHS Publication No. (SMA) 12-4713. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2012.
- Sussner, B. D., Smelson, D. A., Rodrigues, S., Kline, A., Losonczy, M., & Ziedonis, D. (2006). The validity and reliability of a brief measure of cocaine craving. *Drug and alcohol dependence, 83*(3), 233-237.
- Taylor, J., & Lang, A. R. (2006). Psychopathy and Substance Use Disorders.

- Tellegen, A., Watson, D., & Clark, L. A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of personality and social psychology*, 54(6), 1063-1070.
- Tiffany, S. T., Singleton, E., Haertzen, C. A., & Henningfield, J. E. (1993). The development of a cocaine craving questionnaire. *Drug and alcohol dependence*, 34(1), 19-28.
- Thomasson, K., & Vaglum, P. (2000). Antisocial addicts: the importance of additional axis I disorders for the 28-month outcome. *European psychiatry*, 15(8), 443-449.
- Townshend, J., & Duka, T. (2001). Attentional bias associated with alcohol cues: differences between heavy and occasional social drinkers. *Psychopharmacology*, 157(1), 67-74.
- Tull, M. T., McDermott, M. J., Gratz, K. L., Coffey, S. F., & Lejuez, C. W. (2011). Cocaine-related attentional bias following trauma cue exposure among cocaine dependent in-patients with and without post-traumatic stress disorder. *Addiction*, 106(10), 1810-1818.
- Vinci, C., Copeland, A. L., & Carrigan, M. H. (2012). Exposure to Negative Affect Cues and Urge to Smoke. *Experimental and Clinical Psychopharmacology*, 20(1), 47.
- Watson, D. (2000). *Mood and temperament*. The Guilford Press.
- Wechsberg, W., Lam, W., Zule, W., Hall, G., Middlesteadt, R., & Edwards, J. (2003). Violence, homelessness, and HIV risk among crack-using African-American women. *Substance Use and Misuse*, 38, 669-700.

- Westermeyer, J., & Thuras, P. (2005). Association of Antisocial Personality Disorder and Substance Disorder Morbidity in a Clinical Sample. *The American Journal of Drug and Alcohol Abuse*, 31(1), 93-110.
- Wilens, T.E., Martelon, M., Anderson, J.P., Shelley-Abrahamson, R., & Biederman, J. (2013). Difficulties in emotional regulation and substance use disorders: A controlled family study of bipolar adolescents. *Drug and Alcohol Dependence*, 132(114-121).
- Wu, L. T., Gersing, K., Burchett, B., Woody, G. E., & Blazer, D. G. (2011). Substance use disorders and comorbid Axis I and II psychiatric disorders among youth psychiatric patients: Findings from a large electronic health records database. *Journal of psychiatric research*, 45(11), 1453-1462.