Experimental and Clinical Psychopharmacology
2007, Vol. 15, No. 2, 165–175


1064-1297/07/$12.00 DOI: 10.1037/1064-1297.15.2.165

# Risk Factors in the Relationship Between Gender and Crack/Cocaine

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Female inner-city substance users evidence greater crack/cocaine use and are more likely to be dependent on this drug than on any other drug. Additionally, female inner-city substance users evidence greater crack/cocaine use and are more likely to be dependent on this drug than their male counterparts, despite no consistent difference demonstrated in use and dependence across other drugs. Because no published work has empirically examined the factors underlying this link between females and crack/cocaine, the current study examined the role of theoretically relevant personality and environmental variables. Among 152 (37% female) individuals in a residential substance-use treatment program, females evidenced greater use of crack/cocaine (current and lifetime heaviest) and were significantly more likely to evidence crack/cocaine dependence than their male counterparts. In contrast, no gender differences were found for any other substance across alcohol, cannabis, and hallucinogens (including PCP). Surprisingly, females were more impulsive than their male counterparts, with impulsivity serving as a risk factor in the relationship between gender and crack/cocaine dependence and lifetime heaviest use. Females also evidenced higher levels of negative emotionality and childhood abuse, but neither variable served as a risk factor in the relationship between gender and crack/cocaine dependence or use. Limitations and future directions are discussed, including the need for further exploration of impulsivity across its various dimensions as well as the inclusion of additional variables such as social context variables to account more fully for this complex link between gender and crack/cocaine.

*Keywords:* gender, crack/cocaine, drug choice, impulsivity, residential treatment

An emerging body of literature suggests that inner-city drug-using females are overwhelmingly more likely to use and/or to be dependent upon crack/cocaine than any other illicit drug (Bornovalova, Lejuez, Daughters, Rosenthal, & Lynch, 2005; Lejuez, Bornovalova, & Daughters, 2005; Peters, Strozier, Murrin, & Kearns, 1997; Sterk, Theall, & Elifson, 2003). Further, in contrast to epidemiological data among community samples indicating that females evidence less frequent use and dependence across illicit substances including cocaine (Substance Abuse and Mental Health Services Administration, 2004), data indicate that this gravitation of inner-city females toward crack/cocaine is more evident than in their male counterparts. For example, evidence indicates that 74% of female substance-using inmates reported crack/cocaine as their drug of choice, compared with only 49% of male substance users (Peters et al., 1997). Additionally, in a sample of inner-city treatment-seeking substance users, a considerably larger percentage of females reported at least weekly use of crack/cocaine compared with heroin (84.5% vs. 37.0%, with 21.7% reporting at least weekly use of both drugs), whereas an almost equivalent percentage of males reported weekly use of crack/cocaine as reported weekly use of heroin (63.6% vs. 66.2%, with 29.9% of these individuals dependent on both drugs; Lejuez et al., 2005). Despite efforts to understand the link between females and crack/cocaine (Evans, Forsyth, & Gauthier, 2002; Henderson, Boyd, & Mieczkowski, 1994; Lam, Wechsberg, & Zule, 2004), no published work has directly compared males and females with the goal of empirically examining risk factors that may underlie this gender difference in relation to crack/cocaine. This gap in the literature is noteworthy and unfortunate because crack/cocaine, more so than any other drug, has been associated with health-compromising situations and behaviors including homelessness, condom nonuse, exchange of sex for money and/or drugs, and contraction of HIV (Evans et al., 2002; Henderson et al., 1994; Hoffman, Klein, Eber, & Crosby, 2000; Lam et al., 2004; Lejuez et al., 2005; Wechsberg et al., 2003).

In attempting to identify variables that may underlie the relationship between gender and crack/cocaine, researchers should consider variables that are linked to drug choice in general and then consider the extent to which these variables may present a unique vulnerability for inner-city females. One such variable is impulsivity. Considered in terms of substance use more generally across drug classes, impulsivity has been linked to substance-use vulnerability,

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This work was supported by National Institute on Drug Abuse Grants R01 DA19405 to C. W. Lejuez and F31 DA18506 to Marina A. Bornovalova.

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frequency, severity (including social and emotional consequences), and dependence (Allen, Moeller, Rhoades, & Cherek, 1998; Fishbein, Lozovsky, & Jaffe, 1989; King, Curtis, & Knoblich, 1991; Moeller & Dougherty, 2002; Moeller et al., 2001; Monterosso, Ehrman, Napier, O'Brien, & Childress, 2001; L. H. Patton, 1995; Petry, 2001) and has been considered as part of a larger externalizing spectrum that shows a clear relationship to substance use and related psychopathology including antisocial behavior (Krueger et al., 2002). Further, researchers have identified that impulsivity may be a key variable in understanding drug choice, such that crack/cocaine users are significantly higher in impulsivity than are heroin users (Bornovalova et al., 2005; Donovan, Soldz, Kelley, & Penk, 1998; Lejuez et al., 2005). Whereas numerous studies indicate greater impulsivity in males compared with females across community adolescents and adults (e.g., Krueger et al., 2002; Lejuez et al., 2002), clear evidence of greater impulsivity for males compared with females in inner-city settings is lacking, with some studies indicating higher levels of impulsivity in females compared with males (Lejuez et al., 2005). Although no studies have formally explored impulsivity as a risk factor in the relationship between gender and crack/cocaine, available evidence suggests the importance of further exploring this variable.

A second potentially relevant risk factor is childhood trauma. Specifically, several studies suggest that childhood sexual, emotional, and physical abuse is strongly related to severity of substance abuse problems (Bensley, Spieker, Van Eenwyk, & Schoder, 1999; Brems, Johnson, Neal, & Freemon, 2004; Easton, Swan, & Sinha, 2000; Roy, 2002). For instance, Brems and colleagues (2004) found that in a large sample of treatment-seeking substance users, those individuals who reported experiences of childhood abuse had more problems associated with substance use (i.e., legal problems, interpersonal dysfunction) as well as a greater likelihood of presenting with an additional psychiatric disorder. Specific to crack/cocaine use, several studies have found that abuse was related to crack/cocaine use among females (Boyd, 1993; Boyd, Guthrie, Pohl, & Whitmarsh, 1994; El-Bassel, Gilbert, & Rajah, 2003; Freeman, Collier, & Parillo, 2002). However, because these studies have focused exclusively on females, further work across both genders is necessary to establish the role of abuse in the relationship between gender and drug choice.

Finally, literature suggests that trait-negative emotionality, including a tendency toward mood disturbances as well as a poor reaction to stress, alienation, and aggression, is related to substance-use problems. For example, an 11-year prospective study by Jackson and Sher (2003) indicated that trait distress was related to a tendency to meet criteria for an alcohol-use disorder. Similarly, Krueger (1999) found that high negative emotionality (defined as a propensity to experience aversive affective states) at the first time point was linked with substance dependence 3 years later. Further, Elkins, King, McGue, and Iacono (2006) found that high negative emotionality and low constraint were significantly related to the later onset of alcohol, nicotine, and illicit drug-use disorders, further demonstrating the unique contribution of this variable beyond history of past substance-use disorders (Elkins et al., 2006). In terms of Stress Reactivity (a key subscale of Negative Emotionality), Sinha and colleagues (2003) have shown that exposure to personalized stressful imagery as well as cocaine-related imagery, compared with neutral imagery, leads to increased cocaine craving. Although these aforementioned studies did not specifically examine gender differences, several studies have shown that substance-using females reported more mood-related problems than did substance-using males (Brooner, King, Kidorf, & Schmidt, 1997; Griffin, Weiss, Mirin, & Lange, 1989; Weiss, Kung, & Pearson, 2003). Additionally, female cocaine users demonstrated greater stress reactivity than did male cocaine users (Back, Brady, Jackson, Salstrom, & Zinzow, 2005; Fox et al., 2006), suggesting that the mechanisms linking stress and substance use may be gender specific. Together these studies propose that females may be more susceptible to experiencing increases in subjective stress and therefore may be more likely to use in response to negative emotions or situations. Thus, negative emotionality and specifically stress reactivity may play an integral role in the association between gender and drug choice, but again the role of this variable specific to the relationship between gender and drug choice is lacking.

The current study sought to provide further clarification on the relationship between gender and drug choice, with a specific focus on elevated use and dependence associated with crack/cocaine for females compared with their male counterparts. In addition to controlling for demographic variables and other drug use across heroin, alcohol, cannabis, and hallucinogens including PCP, we specifically examined self-reported impulsivity, childhood trauma, and negative emotionality as potential risk factors that could account for the predicted gender differences in current dependence diagnosis, current use (past 12 months prior to treatment), and lifetime heaviest use.

## Method

### *Participants*

One hundred and eighty inpatient residents in a drug and alcohol abuse treatment center in the greater Washington, DC, metropolitan area were invited to participate in the study. Questionnaire packets were completed by 171; 9 residents refused participation, with 6 citing other commitments in the center at the time of assessment and 3 citing a lack of interest. Recruitment averaged 7 participants per week and lasted about 12 months. To limit the influence of withdrawal effects at the very start of treatment and treatment gains near the end of treatment, participants were recruited no earlier than their 3rd day in the treatment center and no later than their 2nd week. Regarding potential withdrawal effects, it should also be noted that participants were required to complete off-site detoxification as needed prior to entering the treatment center.

Treatment contracts included 30, 60, 90, and 180 days (41.4%, 29.7%, 6.3%, and 22.5% of the patients, respectively), and 76.4% of patients were court-mandated to treat-

ment; neither contract date nor court-mandated status was related to the key variables of interest in the current study. Participants in the study received standard treatment at the center, which included a mix of strategies adopted from Alcoholics and Narcotics Anonymous as well as from group sessions focused on relapse prevention and functional analysis. The center requires complete abstinence from drugs and alcohol (including any form of pharmacological treatment, such as methadone), with the exception of caffeine and nicotine; regular drug testing is provided, and any substance use is grounds for dismissal. Aside from scheduled activities (e.g., group retreats, physician visits), residents are not permitted to leave the center grounds during treatment.

Nineteen participants were excluded from analyses because of an invalid Multidimensional Personality Questionnaire–Brief Form (MPQ–BF) profile; these data were removed because of the likelihood that responses on the MPQ–BF as well as on other measures were corrupted by a lack of comprehension or motivation to answer correctly (because of both boredom and demand characteristics; Patrick, Curtin, & Tellegen, 2002). The final sample of 152 participants ranged in age from 18 to 67 years, with a mean age of 41.95 years ($SD = 8.94$). Thirty-seven percent of the participants were female ($n = 56$), and 92.8% were African-American ($n = 141$). With regard to highest education level achieved, 18.4% had not completed high school or received a GED, 42.1% had completed high school or received a GED, and 39.5% had attended at least some college or technical school or had graduated college. Fifty percent of participants reported an income of $10,000 or less per year.

## Measures

*Demographics questionnaire.* A short self-report questionnaire was administered to obtain information on age, gender, race, education level, and income.

*Multidimensional Personality Questionnaire—Brief Form.* Trait affect was measured with the MPQ–BF (Patrick et al., 2002). The MPQ–BF is a 155-item version of the original 300-item MPQ developed to assess a variety of personality traits and temperamental dispositions. Like the original MPQ, the brief form of the MPQ includes 11 primary trait scales that load onto three higher order factors. The traits of Well-Being, Achievement, Social Closeness, and Social Potency load onto the higher order factor of Positive Emotionality; the traits of Stress Reactivity, Alienation, and Aggression make up the higher order factor of Negative Emotionality; the traits of Control, Harm Avoidance, and Traditionalism load on the higher order factor of Constraint; and the trait of Absorption does not load on any of the higher order factors. Scores from the trait scales of the MPQ–BF are highly correlated with the equivalent trait scales from the original MPQ (*r*s ranged from .92 to .96) and have demonstrated high internal consistency (Cronbach's alphas range from .74 to .84). In the current sample, alphas ranged from .85 to .91.

*Barratt Impulsiveness Scale.* Trait impulsivity was assessed with the Barratt Impulsiveness Scale, Version 11 (BIS; J. Patton, Stanford, & Barratt, 1995). The BIS is a 30-item, self-report questionnaire that asks participants to rate how often a series of statements applies to them according to the following scale: *rarely/never, occasionally, often*, or *always/almost always*. Item scores range from 1 to 4. Cumulative scores range from 30 (low in trait impulsivity) to 120 (high in trait impulsivity). The BIS contains three subscales, which have been termed Motor Impulsiveness, Cognitive Impulsiveness, and Nonplanning. The BIS has been normed on a variety of sample populations, including college students ($M = 63.82$, $SD = 10.17$), inpatient substance abusers ($M = 69.26$, $SD = 10.28$), and prison inmates ($M = 76.30$, $SD = 11.86$). The BIS has been shown to be reliable in both clinical and community samples, with Cronbach's alpha coefficients ranging from .79 to .83 (J. Patton et al., 1995); a similar alpha was evidenced in the current study ($\alpha = .83$).

*Childhood Trauma Questionnaire—Short Form.* As a measure of childhood trauma, we used the three abuse subscales of the short form of the Childhood Trauma Questionnaire (Bernstein et al., 2003). Each subscale has five items utilizing a 5-point scale ranging from 1 (*never true*) to 5 (*very often true*). Each subscale has been shown to be internally consistent (alphas: emotional abuse = .89, physical abuse = .86, sexual abuse = .95), with similar levels of internal consistency evidenced in the current study (i.e., .84, .83, and .90 for emotional, physical, and sexual abuse, respectively).

*Drug use.* Drug use was measured in three ways: dependence diagnosis, current use, and lifetime heaviest use.

*Substance Dependence Module of the Structured Clinical Interview for DSM–IV, Axis I.* The Substance Dependence Module of the Structured Clinical Interview for DSM–IV, Axis I (SCID; First, Spitzer, Gibbon, & Williams, 1995a), a measure with demonstrated reliability (First, Spitzer, Gibbon, & Williams, 1995b), was used to assess diagnosis of current drug dependence. For the current study, interviews were conducted by senior graduate students trained in the administration of the interview. Twenty-five percent of the interviews were reviewed by a PhD-level clinician (Carl W. Lejuez). In the three cases for which a discrepancy was evident, areas of disagreement were discussed as a group, and a consensus was reached. All assessments were masked.

*Drug Use Diagnostic Identification Test.* In addition to assessing dependence, the Drug Use Diagnostic Identification Test (Babor & Del Boca, 2003) was used as a quantity/frequency measure of drug and alcohol use (Babor & Del Boca, 2003). This self-report measure was modeled after the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, & de la Fuente, 1993) and included the following Likert scale for current (past 6 months prior to treatment) and lifetime heaviest use: *never* (0), *one time* (1), ≤ *once per month* (2), ≤ *once per week* (3), *2–3 times a week* (4), *more than 4 times a week* (5).

## Procedure

Consent forms approved by the International Review Board were obtained for each participant, after which par-

ticipants completed the substance dependence module of the SCID. Following the interview, participants completed a self-report questionnaire packet including the measures described above. Measures were randomly sequenced across participants to limit order effects. Participants were actively encouraged to seek assistance regarding questions that were unclear. At least one male and one female researcher were available at each session to provide participants with a same-sex individual for queries regarding the questionnaires.

## Results

### *Gender Differences in Drug-Use Frequency and SCID Substance-Dependence Diagnoses*

Comparable analyses were conducted for three dependent measures of drug use and dependence, including (a) lifetime frequency of use, (b) current frequency (past 12 months prior to treatment), and (c) current dependence according to SCID diagnoses for each of five categories of drugs (crack/cocaine, alcohol, cannabis, hallucinogens including PCP, and heroin). First, each of these three dependent measures was analyzed separately within a multivariate repeated measures analysis of variance with gender (male vs. female) as a between-subjects factor and drug category (alcohol vs. cannabis vs. crack/cocaine vs. hallucinogens vs. heroin) as a within-subject factor. The primary focus of these analyses was to determine if differential gender effects were observed across the various drug categories (i.e., Gender × Drug Category interactions). Given the specific focus on differential patterns of use for crack/cocaine, these complex overall Gender × Drug Category interactions also were decomposed into independent simple interaction effect contrasts with crack/cocaine as the reference group (e.g., [a] Gender × Crack/Cocaine vs. Alcohol; [b] Gender × Crack/Cocaine vs. Cannabis; [c] Gender × Crack/Cocaine vs. Hallucinogens; and [d] Gender × Crack/Cocaine vs. Heroin). Finally, for each dependent measure, simple gender effects (*t* tests) were conducted for each drug category (see Tables 1–3 for descriptive statistics and simple gender effect results for lifetime heaviest use, past 12 months use, and SCID diagnosis, respectively).

*Lifetime heaviest frequency of use.* A significant Gender × Drug Category interaction was observed for lifetime frequency of use, $F(4, 146) = 2.53$, $p = .043$, indicating that the magnitude of gender differences in lifetime frequency of use varied significantly across drug-use categories. Simple interaction effects indicated that the size of the gender effect was larger for crack/cocaine than for all other drug categories (*p* values for simple interaction contrasts of crack/cocaine vs. alcohol, $p = .004$; cannabis, $p = .042$; hallucinogens, $p = .039$, and heroin, $p = .038$). Moreover, simple gender effects (*t* tests) confirmed that females reported significantly more frequent lifetime heaviest use of crack/cocaine ($M = 4.3$, $SD = 1.4$) than did males ($M = 3.8$, $SD = 1.7$), $t(150) = 2.18$, $p = .031$. No significant simple gender effects were observed for any other drug category. See the top third of Table 1 for means and standard deviations for lifetime frequency of use for all drug categories.

*Current frequency of use.* A significant Gender × Drug Category interaction was also observed for past 12 months

Table 1
*Means, Standard Deviations, and p Values for Drug Use Frequency Across Lifetime Heaviest Use and Current Use as Well as Current Dependence for Females and Males*

| Variable | Females | | | Males | | | |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | % | *M* | *SD* | % | *p* |
| Lifetime heaviest use frequency | | | | | | | |
| Alcohol | 3.4 | 1.8 | | 3.8 | 1.5 | | .114 |
| Cannabis | 3.1 | 2.0 | | 3.4 | 1.7 | | .393 |
| Crack/cocaine | 4.3 | 1.4 | | 3.8 | 1.7 | | .031* |
| Hallucinogens | 1.1 | 1.4 | | 1.2 | 1.5 | | .580 |
| Heroin | 2.1 | 2.4 | | 2.5 | 2.3 | | .367 |
| Current use frequency (past 12 months) | | | | | | | |
| Alcohol | 3.4 | 1.8 | | 3.2 | 1.7 | | .682 |
| Cannabis | 2.2 | 1.9 | | 2.4 | 1.8 | | .447 |
| Crack/cocaine | 4.3 | 1.3 | | 3.1 | 2.0 | | .001*** |
| Hallucinogens | 0.6 | 1.1 | | 0.6 | 1.1 | | .974 |
| Heroin | 1.9 | 2.3 | | 2.4 | 2.3 | | .285 |
| Current dependence | | | | | | | |
| Alcohol | | | 41.1 | | | 32.3 | .278 |
| Cannabis | | | 12.5 | | | 12.5 | 1.000 |
| Crack/cocaine | | | 81.8 | | | 60.4 | .006** |
| Hallucinogen | | | 3.6 | | | 1.0 | .282 |
| Heroin | | | 39.3 | | | 47.9 | .305 |

*Note.* Frequency for each substance indexed with a Likert scale as: *never* (0), *one time* (1), ≤ *once per month* (2), ≤ *once per week* (3), *2–3 times a week* (4), *more than 4 times a week* (5). *p* values are from simple effect *t* tests with gender as grouping variable.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2
*Means, Standard Deviations, and p Values for Individual Difference Across Gender*

| Variable | Females | | Males | | |
|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *p* |
| Positive emotionality (MPQ–BF) | 64.9 | 16.5 | 66.7 | 13.5 | .450 |
| Well-being | 8.1 | 3.5 | 8.0 | 2.9 | .782 |
| Social potency | 5.7 | 2.7 | 5.9 | 2.6 | .681 |
| Achievement | 6.4 | 3.0 | 6.7 | 3.0 | .493 |
| Social closeness | 5.8 | 2.8 | 6.7 | 3.0 | .074 |
| Negative emotionality (MPQ–BF) | 54.8 | 16.5 | 48.4 | 16.7 | .025* |
| Stress reaction | 7.4 | 2.9 | 6.0 | 3.3 | .007** |
| Alienation | 6.1 | 3.0 | 4.6 | 2.9 | .002** |
| Aggression | 3.6 | 2.9 | 4.0 | 3.0 | .463 |
| Constraint (MPQ–BF) | 79.2 | 12.2 | 80.9 | 12.6 | .407 |
| Control | 7.3 | 2.7 | 7.7 | 2.8 | .367 |
| Harm avoidance | 8.2 | 2.7 | 8.3 | 2.8 | .847 |
| Traditionalism | 8.1 | 1.9 | 8.0 | 1.8 | .834 |
| Impulsivity (BIS) | 79.9 | 11.4 | 74.2 | 12.6 | .006** |
| Nonplanning | 27.4 | 5.3 | 26.0 | 5.0 | .103 |
| Attention | 31.3 | 4.6 | 29.6 | 5.4 | .044* |
| Motor | 23.4 | 4.6 | 20.7 | 5.1 | .001*** |
| Childhood abuse (CTQ) | 2.1 | 0.9 | 1.7 | 0.8 | .005** |
| Emotional | 2.3 | 1.1 | 1.8 | 0.9 | .003** |
| Physical | 2.0 | 1.1 | 1.9 | 0.9 | .639 |
| Sexual | 1.9 | 1.2 | 1.3 | 0.8 | .001*** |

*Note.* MPQ–BF = Multidimensional Personality Questionnaire—Brief Form; BIS = Barratt Impulsiveness Scale; CTQ = Childhood Trauma Questionnaire.
* $p < .05$. ** $p < .01$. *** $p < .001$.

frequency of use, $F(4, 142) = 4.08$, $p = .004$, indicating that the magnitude of gender differences in past 12 months frequency of use varied significantly across drug use categories. Simple interaction effects indicated that the size of the gender effect was larger for crack/cocaine than for all other drug categories ($p$ values for simple interaction contrasts of crack/cocaine vs. alcohol, $p = .007$; cannabis, $p < .001$; hallucinogens, $p = .001$; and heroin, $p = .001$). Moreover, simple gender effects ($t$ tests) confirmed that females reported significantly more current use of crack/cocaine ($M = 4.3$, $SD = 1.3$) than did males ($M = 3.1$, $SD = 2.0$), $t(150) = 4.03$, $p < .001$. No significant simple gender effects were observed for any other drug category. See the middle third of Table 1 for means and standard deviations for past 12 months frequency of use for all drug categories.

*Current dependence.* The Gender × Drug Category interaction failed to reach a conventional level for significance for SCID diagnoses, $F(4, 146) = 1.77$, $p = .139$. However, simple interaction effect contrasts indicated that the size of the gender effect for SCID diagnoses was larger for crack/cocaine than for cannabis ($p = .035$), hallucinogens ($p = .019$), and heroin ($p = .016$). The simple Gender × Crack/Cocaine vs. Alcohol contrast was not significant ($p = .192$). Simple gender effects ($t$ tests) indicated that significantly more females (81.8%) than males (60.4%) received SCID diagnoses of crack/cocaine use disorder, $t(149) = 2.77$, $p = .006$.[1] No significant simple gender effects were observed for any SCID diagnoses for any other drug category. See bottom third of Table 1 for frequency of positive SCID diagnoses by gender for all drug categories.

### *Gender Differences on Individual Difference Measures*

Independent sample $t$ tests were conducted to determine if gender differences were observed on demographic and individual difference measures of personality (MPQ–BF negative emotionality, positive emotionality and constraint broadband factors, trait impulsivity, and childhood trauma history). Means, standard deviations, and $p$ values from these tests are presented in Table 2. With respect to demographic variables, no significant gender effects were observed for age or education level. However, females reported significantly lower yearly income than males, $t(147) = 2.55$, $p = .012$. Specifically, 57% of males reported earning more than $10,000 per year, whereas only 36% of females reported yearly income above $10,000.

[1] Results from $t$ tests with dichotomous SCID diagnoses as an outcome variable are statistically equivalent to results from significant testing for phi correlation coefficients (phi is a special case of Pearson's $r$ with two dichotomous variables). We choose to report the analyses as $t$ tests rather than tests of phi to simplify the report and because the associated descriptive statistics (mean percentages of positive diagnosis) are more intuitively accessible. Qualitatively similar conclusions about simple gender effects are reached if the dichotomous SCID diagnoses are analyzed with individual logistic regressions rather than with $t$ tests/phi coefficients. A significant gender effect ($p < .001$) was observed for crack/cocaine dependence with an odds ratio of 2.94 (i.e., women have a 2.94 increase in their odds of receiving a diagnosis of crack/cocaine dependence than do men). No significant simple gender effects were observed for other drugs within these logistic regression analyses.

Table 3
*Correlations Between Individual Differences and Crack/Cocaine Diagnosis and Use*

| | SCID (current) | Current use (past 12 months) | Heaviest use (lifetime) |
|---|---|---|---|
| Age | .14 | .26*** | .17* |
| Education | .11 | .07 | .05 |
| Income | −.16* | −.17* | −.16* |
| Positive emotionality (MPQ–BF) | −.04 | −.04 | −.07 |
| Well-being | −.01 | .00 | −.03 |
| Social potency | .07 | .06 | .03 |
| Achievement | −.02 | −.02 | −.10 |
| Social closeness | −.15 | −.13 | −.09 |
| Negative emotionality (MPQ–BF) | .12 | .07 | .05 |
| Stress reaction | .13 | .08 | .16* |
| Alienation | .15 | .12 | .05 |
| Aggression | .02 | −.03 | −.06 |
| Constraint (MPQ–BF) | −.30*** | −.20* | −.19* |
| Control | −.33*** | −.19* | −.21** |
| Harm avoidance | −.14 | −.14 | −.07 |
| Traditionalism | −.05 | .00 | −.05 |
| Impulsivity (BIS) | .22** | .21** | .28*** |
| Nonplanning | .25** | .24* | .28*** |
| Attention | .15 | .16* | .24** |
| Motor | .14 | .11 | .19* |
| Childhood Abuse (CTQ) | .19* | .15 | .11 |
| Emotional | .16* | .11 | .11 |
| Physical | .13 | .08 | .04 |
| Sexual | .19* | .20* | .11 |

*Note.* SCID = Structured Clinical Interview for DSM–IV; MPQ–BF = Multidimensional Personality Questionnaire—Brief Form; BIS = Barratt Impulsiveness Scale; CTQ = Childhood Trauma Questionnaire.
* $p < .05$. ** $p < .01$. *** $p < .001$.

With respect to broadband personality indices from the MPQ–BF, females displayed significantly higher trait negative emotionality ($M = 54.8$, $SD = 16.5$) than did males ($M = 48.4$, $SD = 16.7$), $t(150) = 2.26$, $p = .025$. No significant gender differences were observed for positive emotionality or constraint. Females reported significantly more childhood trauma on the Childhood Trauma Questionnaire–Short Form ($M = 2.1$, $SD = 0.7$) than did males ($M = 1.8$, $SD = 0.6$), $t(150) = 2.79$, $p = .006$. Females also reported significantly higher trait impulsivity on the BIS ($M = 79.9$, $SD = 11.4$) than did males ($M = 74.2$, $SD = 0.6$), $t(144) = 2.71$, $p = .008$.

### *Individual Difference Predictors of Crack/Cocaine Use and Dependence*

Pearson correlation coefficients were calculated to test for relationships between the demographic and individual difference measures and crack/cocaine frequency of use (lifetime and past 12 months) and SCID crack/cocaine diagnosis (see Table 3 for all correlations). All three indices of crack/cocaine were negatively correlated with income, and two of the three were positively related to age. All three indices of crack/cocaine were positively correlated with BIS total score and many of its subscales and negatively correlated with the MPQ–BF constraint factor (and primary trait scores on control).

### *Testing for Gender Indirect Effects via Impulsivity and Other Individual Differences*

To further examine possible explanations for the observed gender differences in crack/cocaine use/dependence, we conducted tests of indirect gender effects for impulsivity and all individual difference measures described above that could potentially function as intervening variables that could account for gender differences in crack/cocaine use/dependence. Separate tests were conducted for each of the three crack/cocaine measures (SCID dependence, past 12 months use, lifetime heaviest use). MacKinnon et al. (MacKinnon, Taborga, & Morgan-Lopez, 2002) advocated for the use of the Joint Tests of Significance to test for indirect effects. Two criteria must be met to demonstrate a significant indirect gender effect on a crack/cocaine measure via an intervening individual difference variable. First, gender must be significantly associated with the intervening variable. This criterion is reported as "Criterion A" in Table 4 and is the same test regardless of crack/cocaine measure. Second, the intervening variable must be significantly and uniquely related to the crack/cocaine measure when gender is controlled ("Criterion B"). Criterion B was tested for each intervening variable separately for each of the three crack/cocaine measures. In other words, in separate analyses, each crack/cocaine measure was regressed simultaneously on both the intervening variable and gender. These $p$ values for the unique intervening variable effect, controlling for gen-

Table 4
*Tests of Indirect Gender Effects: Joint Tests of Significance*

| Intervening variable | Criterion A | Criterion B | | |
|---|---|---|---|---|
| | | SCID (current) | Current use (past 12 months) | Heaviest (lifetime) |
| Age | .778 | .074 | .001*** | .030* |
| Education | .323 | .241 | .611 | .660 |
| Income | .012* | .136 | .155 | .114 |
| Positive emotionality (MPQ–BF) | .450 | .740 | .832 | .429 |
| Well-being | .782 | .915 | .917 | .652 |
| Social potency | .681 | .331 | .355 | .630 |
| Achievement | .493 | .966 | .986 | .261 |
| Social closeness | .074 | .132 | .278 | .429 |
| Negative emotionality (MPQ–BF) | .025* | .285 | .857 | .798 |
| Stress reaction | .007** | .311 | .912 | .132 |
| Alienation | .002** | .242 | .564 | .911 |
| Aggression | .463 | .654 | .867 | .582 |
| Constraint (MPQ–BF) | .407 | .001*** | .023* | .026* |
| Control | .367 | .001*** | .035* | .013* |
| Harm avoidance | .847 | .085 | .083 | .396 |
| Traditionalism | .834 | .510 | .968 | .547 |
| Impulsivity (BIS) | .006** | .032* | .064 | .002** |
| Nonplanning | .103 | .006** | .010** | .001*** |
| Attention | .044* | .161 | .144 | .008** |
| Motor | .001*** | .267 | .708 | .065 |
| Childhood trauma (CTQ) | .005** | .069 | .267 | .424 |
| Emotional | .003** | .155 | .638 | .393 |
| Physical | .639 | .125 | .365 | .645 |
| Sexual | .001*** | .123 | .161 | .451 |

*Note.* SCID = Structured Clinical Interview for DSM–IV; MPQ–BF = Multidimensional Personality Questionnaire—Brief Form; BIS = Barratt Impulsiveness Scale; CTQ = Childhood Trauma Questionnaire. Separate Joint Tests of Significance (JTS; MacKinnon et al., 2002) were conducted for each of the three crack/cocaine measures (SCID dependence, current use, lifetime heaviest use) to detect individual difference variables that may account for the observed gender differences in crack/cocaine use/dependence. Criterion A of the JTS is a test of the gender effect when the intervening variable is regressed on gender. Criterion B of the JTS is a test of the intervening variable effect when the crack/cocaine outcome variable is regressed simultaneously on the intervening variable and gender (i.e., the unique effect of the intervening variable controlling for gender). Gender has an indirect effect on the crack/cocaine outcome measure via the intervening variable if both Criteria A and B are significant.
* $p < .05$. ** $p < .01$. *** $p < .001$.

der, are also provided in Table 4 (with separate columns for each of the three crack/cocaine measures). An indirect effect of gender on crack/cocaine use and dependence via the specific intervening variable is supported when both Criteria A and B are significant for that intervening variable. Given these criteria, support for an indirect effect of gender on both crack/cocaine dependence diagnosis and lifetime highest frequency of crack/cocaine use via BIS was provided. Similarly, support for an indirect effect of gender on lifetime highest frequency of crack/cocaine use via the attention subscale of the BIS was also provided.

## Discussion

In a sample of inner-city, treatment-seeking drug users, the relationship between gender and crack/cocaine use and dependence was investigated, with impulsivity, childhood trauma, and negative emotionality explored as potential risk factors in this relationship. Results indicated that females evidenced greater use (current and lifetime heaviest) of crack/cocaine and were significantly more likely to evidence crack/cocaine dependence than their male counterparts, with no such gender difference for any other substance. Consistent with the literature showing elevated crack/cocaine use among females, this finding is noteworthy given the range of aggressive and health compromising behaviors more common among males than among females and typically associated with crack/cocaine compared with other drugs, including crime, homelessness, condom nonuse, exchange of sex for money and/or drugs, and contraction of HIV (e.g., heroin; Evans et al., 2002; Henderson et al., 1994; Hoffman et al., 2000; Lam et al., 2004; Lejuez et al., 2002; Wechsberg et al., 2003). As such, efforts to identify the precise mechanisms underlying this relationship are necessary to further understand this phenomenon.

BIS total score was higher in females compared with males and related to all three indices of crack/cocaine use, and most important, it served as a risk factor in the relationship between gender and frequency of lifetime heaviest use and current diagnosis, suggesting the potential importance of this variable for understanding crack/cocaine use

among females. Of note, the relationship was not found for current use. As expected, gender was related to most subscales of Abuse and Negative Emotionality, yet no subscales of Abuse and Negative Emotionality served as a risk factor in the relationship between gender and crack/cocaine dependence or use.

Several aspects of the current findings are suggestive and raise important questions worthy of interpretation. First, regarding the fact that impulsivity served as a risk factor for lifetime heaviest use but not for current use, one may consider that impulsivity was measured here as a trait-like variable and therefore may have been related to drug use over participants' lifetime as opposed to current use. As such, these findings highlight the absence of measures in the current study aimed at immediate social context that may have shed light on the relationship between gender and current drug choice. One such social context variable that may support greater crack/cocaine use among females involves means to drug access and availability. Whereas males may be able to obtain drugs on their own as a function of greater income and/or engagement in criminal activity, females in these settings typically report extremely low income and high levels of commercial sexual activity (Lejuez et al., 2002; Sterk, 1999; Wechsberg et al., 2003) and are less likely to be supplying and distributing drugs than males (Rees, Johnson, Randolph, & Liberty, 2005), which may create reliance on males for obtaining drugs.

Given empirical data strongly suggesting that crack/cocaine users are more likely to engage in risky sexual behavior than are heroin users (Lejuez et al., 2002), it is possible that females' primary source of drug availability may be male crack/cocaine users, especially in the context of sex work (Bux, Lamb, & Iguchi, 1995; Camacho, Bartholomew, Joe, & Cloud, 1996; Camacho, Bartholomew, Joe, & Simpson, 1997; Grella, Anglin, & Wugalter, 1995; Joe & Simpson, 1995; Lejuez et al., 2002). Supporting this hypothesis, Baseman, Ross, & Williams (1999) noted that in poverty-stricken, urban environments, crack/cocaine is tightly intertwined with elevated rates of prostitution, such that crack/cocaine is considered "currency" and sex a "commodity" (Baseman et al., 1999; Ross, Hwang, Leonard, Teng, & Duncan, 1999; Ross, Hwang, Zack, Bull, & Williams, 2002). Although speculative at this point and in need of empirical support, these findings suggest the possibility that impulsivity in females may lead them to environments where crack/cocaine is prevalent, with the social context possibly playing a role in perpetuating crack/cocaine use. Of course, one limitation of the conjecture above is the assumption that simply because females may be obtaining drugs from males who are primarily crack/cocaine users, females do not have access to other drugs such as heroin. As such, future work must consider all aspects of social context.

Second, although the lack of consistency across the BIS subscales and MPQ–BF control subscale in their relationship with gender and drug choice could be interpreted as evidence against the identification of impulsivity as a risk factor, it could also be used to suggest the need for a greater level of precision in the measurement of impulsivity as a multidimensional construct (de Wit & Richards, 2004; Evenden, 1999). In terms of precision, we exclusively used measures that were retrospective in nature, and therefore responses may have been based on behavior occurring under the influence of drugs, especially for those with a long history of drug use. Although it is important to consider level of impulsivity while intoxicated, doing so provides an index that may be influenced by differential acute pharmacological effects across crack/cocaine and heroin, which may provide a different picture from an index of more trait-like impulsivity independent of acute pharmacological effects.

To address limitations pertaining to self-report and multidimensional issues, the use of behavioral measures that allow for a real time assessment of impulsivity, such as the stop-go task for behavioral inhibition (Logan, Schachar, & Tannock, 1997) and the money-choice task for delay discounting (Kirby & Marakovic, 1996), are necessary in future studies to further clarify this relationship. Indeed, previous studies have shown crack/cocaine users to be impulsive across these dimensions of impulsivity, with these studies indicating that crack/cocaine users (a) differ from nonusers in terms of poor response inhibition (Fillmore & Rush, 2002) and (b) differ from heroin users in terms of delay discounting (Bornovalova et al., 2005). Although neither study examined gender, both suggest the potential value of extending such measurement strategies to the questions posed here. Relatedly, Krueger and colleagues (2002) indicated that impulsivity may occur within a larger externalizing spectrum linking substance use, personality factors such as impulsivity, and psychological conditions such as antisocial personality disorder. Given this work, it may be useful to move toward larger models with a focus on the externalizing spectrum that can accommodate more thoroughly the complexity underlying the relationship between gender and drug choice.

Other limitations in measurement are also of consideration. The retrospective nature of the measures may have limited accuracy, especially given the possibility of chronic pharmacological drug effects (e.g., brain damage). Additionally, greater detail would be helpful regarding drug use frequency across crack/cocaine and heroin at the point of initiation, as opposed to patterns more indicative of chronic use as indexed by current and lifetime heaviest use. Moreover, information on route of administration may shed light on gender differences, with one hypothesis that females may use a drug such as crack/cocaine more than heroin because the latter is more frequently injected, a route of administration that may be less appealing to females (Brecht, O'Brien, & von Mayrhauser, 2004). Information on route of administration across drugs would provide useful information to address such a hypothesis. Finally, our clinical interview was limited to substance use, and therefore the influence of other comorbid conditions could not be evaluated.

Beyond these limitations, it is also important to acknowledge the parsimonious hypothesis that the direct relationship between gender and drug choice may be the result of a sampling bias, which would obviate efforts to identify risk factors. That is, perhaps females in the current sample may not be representative of female substance users in general or

even the larger population of inner-city substance users. In the current study, we utilized drug users in a residential drug treatment center. As such, our sample is both a major strength and a limitation. Specifically, although individuals in residential drug treatment may have the most severe drug problems and be the most in need of assistance, there is also a chance that the current results may not generalize to individuals who are not seeking treatment or who reside outside of an inner-city setting (Evans et al., 2002). Alternatively, as discussed above, it may be that gender differences in both drug choice and impulsivity are simply due to the overinclusion of females with more severe drug problems. In this way, it may be that the level of substance use severity and consequences would need to be considerably greater for females than males to choose residential treatment or engage in behaviors that would result in court-ordered treatment (Belenko & Peugh, 2005; Daley et al., 2000). As such, the females in our sample may be considerably more impaired than those who are not mandated and do not choose to enroll in residential treatment. This account would explain both the preference for crack/cocaine and higher levels of childhood abuse and negative affectivity in the females compared with the males. This result also may help explain the surprising higher impulsivity scores in females compared with males, which stand in marked contrast to a larger body of research in other types of samples (e.g., college students, community samples) indicating that males are more impulsive than females (Hunt, Hopko, Bare, Lejuez, & Robinson, 2005; Zuckerman & Kuhlman, 2000). Thus, it is important not to overgeneralize these findings to all females, or even to all inner-city females, without addressing these potentially confounding issues more clearly.

Despite limitations, the current results represent the first systematic effort to highlight and explain the somewhat counterintuitive finding of greater crack/cocaine use and dependence in females compared with males. Clearly, these results are preliminary and must be evaluated in light of limitations and additional questions raised for future work. Nevertheless, these findings set the stage for cross-sectional and longitudinal studies with a more comprehensive set of potential risk factors within the context of more well-defined frameworks (e.g., externalizing spectrum; Krueger et al., 2002), replicating this work in similar samples as well as in more diverse samples to establish generalizability. There are great public health possibilities for extending this work, including the development of prevention and treatment efforts targeting females who are especially at risk for crack/cocaine use and its consequences.

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Received May 24, 2006
Revision received September 29, 2006
Accepted October 4, 2006 ■