Daily Stressor Sensitivity, Abuse Effects, And Cocaine Use In Cocaine Dependence

Angela E. Waldrop[a,b], **Sudie E. Back**[a], **Kathleen T. Brady**[a], **Himanshu P. Upadhyaya**[a], **Aimee L. McRae**[a], and **Michael E. Saladin**[a]

a*Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, 67 President Street, Box 250861, Charleston, SC 29425*

Abstract

This study highlights respondent sensitivity to daily hassles as it relates to situational cocaine use and perceived long-term effects of adverse events in childhood. Data were drawn from a larger study on stress reactivity in cocaine dependent individuals. Participants (n=104) were cocaine dependent men and women without comorbid posttraumatic stress disorder (PTSD). They completed the Early Trauma Inventory (ETI), the Daily Hassles Scale (DHS), the Inventory of Drug-Taking Situations (IDTS), and the Time-Line Follow-Back (TLFB; for 90 days prior to interview). There were no gender differences in amount or frequency of cocaine use, although the patterns of use differed between male and female users. Overall, there were some associations in patterns of cocaine use and sensitivity to daily hassles, particularly use in response to conflict with others. Early negative life events were positively related to response to daily hassles, but current triggers were more relevant. Reactivity to cocaine cues was related to daily hassle sensitivity among women only. Limitations and implications of the findings are discussed.

Keywords

cocaine; coping; stress; human sex differences

1. Introduction

1.1. Cocaine Dependence

Cocaine dependence is a chronic illness involving repeated episodes of drug abuse, abstinence, and relapse (Leshner, 1997). The risk for cocaine relapse is influenced by the presence of psychiatric comorbidity and is often exacerbated by chronic stress (Back et al., 2000; Brady & Sinha, 2005). Evidence has accumulated that PTSD occurs at rates as high as 43% lifetime and 22% current in cocaine dependent individuals (Back et al., 2000), but adverse early life experiences, even in individuals without PTSD, also appear to contribute to risk for cocaine dependence and poor treatment outcomes (Goeders, 2003). Little research has examined trauma-exposed individuals who do not meet the criteria for PTSD (Hall, 2000; Kendler et al., 2000), although studies have demonstrated that many individuals with cocaine dependence have numerous traumatic life experiences regardless of PTSD status (Back et al., 2000; Dansky, Brady, & Saladin, 1998).

1.2. Stress in Relapse and Maintenance of Cocaine Dependence

Many clinicians and researchers have recognized that stress elevates the potential for cocaine relapse (e.g., McMahon, 2001). Cocaine dependent individuals report significantly greater use of cocaine in response to negative situations, such as unpleasant emotions and physical discomfort, regardless of PTSD status (Waldrop, Back, Verduin, & Brady, 2007). Substance dependent individuals with trauma exposure and PTSD report increased substance cravings in response to trauma memories (Coffey et al., 2002). A history of childhood sexual abuse has been found in as many as 60-84% within this subgroup (Freeman, Collier, & Parillo, 2002). In fact, early experience of trauma may create lasting cognitive and affective vulnerabilities to develop a variety of severe clinical symptoms (Bak et al., 2005).

Recent research indicates that the timing and number of stressors, such as adverse childhood events early in development, may play a significant role in the development of substance use disorders (Dube et al., 2001). In one study, groups were divided into children abused at a very early age (younger than age 5 years), children abused later in childhood (age 5 years and older), and children who were not abused. Overall, earlier maltreatment was associated with more negative sequelae, including attachment insecurity, impaired self-control processes and social information processing patterns, and lowered self-esteem (Keiley, Howe, Dodge, Bates, & Pettit, 2001). In those cases that do not result in natural recovery or benefit from the assistance of knowledgeable healthcare providers, the lasting impact of childhood adverse events may be associated with the development of substance use disorders as well as other psychopathology (Hall, 2000).

Research in other populations has indicated that sensitivity to day-to-day stressors has a large influence on psychological functioning, although most research has focused on the impact of larger life events (Kanner, Coyne, Schaefer, & Lazarus, 1981; Takeshita, Maruyama, & Morimoto, 1998). The relationship between larger life traumas, in particular early childhood adverse events, and current sensitivity to daily stressors has also not received a great deal of attention. The present study examined the relationship of early adverse events, low and high magnitude stressor sensitivity, and cocaine use including response to triggers for cocaine use.

2. Methods

2.1. Participants

Participants were 39 women and 65 men, ages 18–56 (mean age = 38.7, SD = 9.76) who met criteria for cocaine dependence. Nearly all participants were crack cocaine users. Exclusion criteria included 1) dependence on other substances, except nicotine, caffeine, alcohol, and marijuana; 2) medical conditions that could be made worse by or confound the results of the study; and 3) diagnoses of major depression (current), bipolar disorder, schizophrenia, or schizoaffective disorder. Recruitment was conducted through newspaper, radio, and television advertisements, flyers in local businesses and treatment facilities, and through participant referral of friends and acquaintances. Data for the present study were drawn from a larger study on stress and cue reactivity among cocaine dependent and control participants. The participants in this study represent the cocaine dependent group of the larger study. Analyses involving the control group participants will be reported in future publications.

Over half of the sample were smokers (59%). More than half were African American (56.7%), about a third (36.5%) were Caucasian, and the remainder were from another racial group or their data were missing (6.8%). Over half of the sample were employed (54.8%). Most participants were unmarried (80.7%), and about half had never been married (48.1%). Also, most of the sample had completed high school (26.9%) or at least some college (36.5%). Co-occurring Axis I disorders were present. These included current alcohol abuse or dependence

($n = 11$), marijuana abuse or dependence ($n = 7$), hallucinogen abuse ($n = 1$), substance-induced mood disorder ($n = 7$), dysthymia ($n = 4$), and anxiety disorders ($n = 13$).

2.2. Materials and Procedure

Structured Clinical Interview for DSM-IV—(SCID; First, Spitzer, Gibbon, & Williams, 2002). The SCID is a structured diagnostic interview that is considered the gold standard for the assessment of a full range of psychiatric disorders. The questions parallel the items for each diagnosis in the DSM-IV (American Psychological Association, 1994). It was used to assess substance use disorders and other psychopathology.

Daily Hassles Scale—(DHS; DeLongis, Folkman, & Lazarus, 1988). The DHS assesses frequency of and responses to common day-to-day potential irritants, including traffic, time pressures, finances, work events, and others. It is a 117-item self-report scale on which respondents indicate which items they have experienced in the past month, then rate the severity of each item as somewhat, moderately, or extremely severe.

Timeline Follow-Back—(TLFB; Sobell & Sobell, 1992). The TLFB is a calendar-based method of assessing frequency and severity of substance use. Cocaine was quantified by dollar value. Cocaine use data were collected for the 90 days prior to the interview. This means of acquiring substance use data has well-established reliability and validity (Sobell & Sobell, 1992).

Inventory of Drug-Taking Situations—(IDTS; Turner, Annis, & Sklar, 1997). The IDTS was developed to assess patients' substance use in response to situations defined as high risk for relapse (Marlatt, 1980). The measure is a 50-item self-report form. Scores range from 0 to 100 for three global categories and eight subcategories: 1) Negative situations (NS; Unpleasant Emotions, Physical Discomfort, Conflict With Others), 2) Positive situations (PS; Pleasant Emotions, Pleasant Times With Others), and 3) Temptation situations (TS; Social Pressure, Urges/Temptations, Testing Personal Control). The subscales have internal reliability coefficients from .70 to .92, and convergent and divergent validity have been well-established (Turner et al., 1997).

Early Trauma Inventory—(ETI; Bremner, Vermetten, & Mazure, 2000). The ETI assessed the frequency and severity of responses to 62 different emotional, physical, sexual, and general potentially traumatic events that may have occurred before age 18. The measure has excellent reliability and validity (Bremner et al., 2000).

Trier Social Stress Test—(TSST; Kirschbaum, Pirke, & Hellhammer, 1993). The TSST is a widely used psychosocial stress task that requires participants to complete an impromptu speech and mental arithmetic before an audience of three strangers. First, the participant is given 10 minutes to prepare a five-minute speech for a hypothetical job opening. Next, the participant is asked to speak for 5 minutes on that topic without the aid of notes. The three audience members are not permitted to provide any verbal or nonverbal feedback to the participant. In the final segment, the participant is asked to complete a mental serial subtraction task in which he or she must begin again after any error. During the speech and arithmetic portions, participants are told that they are being audiotaped. A modified version of the Within Session Rating Scale was used to quickly assess craving and mood responses to the task (Childress, McLellan, & O'Brien, 1986). The scale is a 100mm 10-point Likert scale with the anchors "not at all" to "extremely." Responses on the scale were collected at baseline, immediately following the TSST and at 5, 30, 60, and 120 minutes post-task. This task was completed in the General Clinical Research Center (GCRC).

Cocaine Cue Exposure—During a 10-minute period, participants watched an audio-visual presentation with scenes of cocaine use from popular films, then were shown and instructed to handle cocaine-related paraphernalia. As with cues used by other cue exposure researchers (e.g., Sinha, Garcia, Paliwal, Kreek, & Rounsaville, 2006), this procedure was developed for the present study. The handling of the in vivo cues was guided by a pre-recorded audio presentation with step-by-step instructions. The modified Within Session Rating Scale was administered during this session at the same intervals as in the TSST. This task was also completed in the GCRC.

3. Results

3.1. Data Screening

An examination of TLFB data indicated that one cocaine female and one cocaine male reported quantities of use (mean use per using day and total use in past 90 days) that fell more than four standard deviations beyond their group means. Those participants' data were not included in the analyses involving amount of use.

The DHS total was significantly positively skewed. Examination of the residuals indicated that the distribution could probably be made more normal through a mathematical transformation. The range of the standardized residuals of the original scores was -1.45 to + 3.60. The standardized residuals after a natural log transformation ranged from -2.41 to +3.15, significantly improving the normality of the distribution. The natural log of the total DHS score was used in all subsequent analyses.

Due to attrition between the assessment interview and the GCRC stay, the number of completers for the laboratory sessions was smaller than for baseline measures. Also, because the TSST was added after the study began, there were fewer respondents than on the cue task. To address the question of possible differential attrition due to participant characteristics, a number of baseline variables were compared between those who did and those who did not complete the laboratory tasks in the GCRC. Completers and non-completers did not differ by gender, age, race, early trauma history, and frequency and severity of cocaine use. Cocaine use was the only variable related to differential attrition; participants who reported using cocaine on a greater percentage of days pre-study were less likely to complete the cocaine cue task. Cue task completers used cocaine an average of 12% of the 90 days prior to baseline (SD = 26.9) and cue task non-completers used cocaine an average of 36.2% of the prior 90 days (SD = 31.7), $F = 5.91$, $p = .02$.

3.2. Correlations Between Measures

To examine the possibility that the DHS and IDTS were measuring the same or similar constructs, we computed the zero-order correlation between them. The associations between the log-transformed DHS scores and the IDTS subscales were small to modest: negative situations ($r = .54$), positive situations ($r = .22$), and temptation situations ($r = .36$), all p's < .05.

3.3. Cocaine Use Severity

Among cocaine dependent participants, there were no gender differences in frequency or severity of cocaine use in the 90 day baseline period (see Table 1). This pattern also held when we made comparisons without the data from two extreme users (one male, one female) whose quantity of use fell more than three standard deviations beyond the mean. When associations between transformed DHS scores and measures of cocaine use were examined, the average amount of cocaine used per day was not related to responses to daily hassles. However, among women, average quantity of use per day was negatively associated with greater reactivity to

daily hassles ($r = -.31$, $p < .05$) and among men, the percent of days on which cocaine was used was positively associated with reactivity to daily hassles ($r = .45$, $p < .01$).

3.4. Triggers for Cocaine Use

The next set of analyses examined the associations between perceived distress from daily hassles and triggers for use of cocaine. Based on earlier work (Waldrop et al., 2007), we expected that there would be differences among men and women on their patterns of cocaine use triggers. However, because the sample sizes were small, we were limited to examining within-gender relationships (see Table 2). The results indicated that men and women who are more sensitive to daily stressors are more likely to report using cocaine in negative situations and temptation situations. Among men, use in positive situations was associated with greater sensitivity to daily hassles. There was a trend for this relationship among women, as well ($p = .16$).

Given the associations among IDTS scales (Spearman's $r = .37$ to .57), the relationships among daily hassles and IDTS scores were examined in linear regression equations. When DHS scores were regressed on gender and each of the IDTS primary subscales (i.e., negative, positive, and temptation situations), negative situations predicted negative responses to daily hassles ($p < .001$; $R(4, 90) = R^2 = .31$, $p < .001$). The total number of reported daily hassles was not associated with any of the other predictors, however (p's $> .05$). As a post hoc analysis, the component subscales of the negative situations subscale (Unpleasant Emotions, Physical Discomfort, and Conflict with Others) were entered with gender into a regression equation to predict negative responses to daily hassles. The Conflict with Others subscale, indicating a tendency to use cocaine in response to interpersonal conflict, accounted for 33% of the variance in reactivity to daily hassles ($p < .01$; $R(4, 90) = R^2 = .33$, $p < .001$). The other predictors were not statistically significant.

3.5. Early Traumatic Events

Abuse exposure rates were high in this sample. The box plots in Figure 1 illustrate the median number of items endorsed from each event category. Despite the study exclusion criteria which included current PTSD, 97% of participants who completed the ETI (n=69) had experienced at least one traumatic event. This number is much higher than in studies with larger samples, even when emotional and "general traumas" were not counted (participants with either physical or sexual abuse histories: 91%). For example, Norris (1992) found that 69% of adults had experienced at least one lifetime traumatic event. Regression analyses were employed to examine the relationships among daily hassles sensitivity and exposure to potentially traumatic events in childhood. For each gender, total number of emotional, sexual, physical, and general trauma events were regressed on daily hassles total scores. Among men, a greater number of emotional abuse items was associated with greater sensitivity to daily hassles ($p = .06$, final $R(4, 35) = .47$, $p = .09$. Among women, a great number of general trauma items was associated with greater sensitivity to daily hassles ($p = .11$, final $R(4, 16) = .52$, $p > .05$). As indicated by the degrees of freedom, only a subset of the sample completed the ETI. This measure was added to the protocol after the larger study had begun.

3.6. Stress and Cue Reactivity

Difference scores were calculated, and individual's peak change scores (compared to baseline) were used as the outcome variables on the TSST and cue tasks. The relationship between daily hassles scores and reactions to the stress task were examined first. None of the associations were significant among either male or female participants. Next, reactions to the cue task were examined. Among women, ratings of subjective stress ($r = .63$, $p = .01$) and sadness ($r = .68$, $p = .008$) were strongly related to sensitivity to daily hassles. In addition, subjective craving to

the cues was also strongly related to sensitivity to daily hassles among women ($r = .59$, $p =. 02$). These relationships did not emerge among male participants.

4. Discussion

The present study examines the long-term association of cocaine dependence and childhood abuse with sensitivity to ordinary daily hassles. It also investigates the relationship between responses to laboratory stressors and cocaine cues and sensitivity to common stressors. Despite the small sample size, a number of interesting relationships and trends emerged.

Initial analyses revealed no gender differences in amount or frequency of cocaine use, eliminating concerns about a potential confound of cocaine use and gender. There were gender differences in the relationships among some variables, however. Among cocaine dependent men, frequency of cocaine use was related to greater reactivity to daily hassles. The question remains whether increased stress encouraged more frequent cocaine use or if the reverse pattern was true. Because cocaine use can increase irritability and hostility, it seems likely that increased cocaine use might make an individual more reactive to environmental events. However, increased substances use in response to stress has been documented (Sinha, 2001).

In contrast to the pattern among men, in cocaine dependent women, greater quantity of cocaine use was associated with less reactivity to daily hassles. Although this seems counterintuitive, perhaps women's response to day-to-day stressors was diminished by their use of cocaine. The lack of information on order of events complicates interpretation. Two recent studies used interactive voice response technology to address these issues by monitoring the relationship between reported stress and alcohol use. One study of seven participants (5 were men) found that participants reported less alcohol consumed on days with more positive moods (Kranzler, Abu-Hasaballah, Tennen, Feinn, & Young, 2004). The larger of the two studies, which tracked 30 male drinkers over two years, found an inverse relationship between alcohol use and reported stress (Helzer, Badger, Searles, Rose, & Mongeon, 2006). While the reasons for the gender difference in the present study are unclear, the relationships are correlational and the retrospective nature of the data for both cocaine use and stress response makes it difficult to interpret the data. It is clear, however, that men and women use cocaine differently, highlighting the need to examine gender and multiple indicators of use.

The examination of triggers for cocaine use offers a better level of detail regarding situational use. Among both men and women, cocaine use in negative and temptation situations was associated with greater sensitivity to daily hassles. After accounting for overlap between these two categories of triggers, negative situations were closely associated with the sensitivity to daily hassles, but not with the number of hassles reported. The relationship between sensitivity to hassles and use of cocaine motivated by interpersonal conflict was particularly strong. These results suggest that self-medicating, at least in response to conflict with others, is associated with sensitivity to common sources of stress. Based on prior research, these relationships are complex. For example, one prospective study with a large sample of community adults found that the relationships between substance use and psychological distress over the long-term are reciprocal in nature (Newcomb, Vargas-Carmona, & Galaif, 1999). These results fit with other studies on the functional relationships of stress and substance use that help to explain the initiation and maintenance of substance use. Perhaps these functional relationships differ between men and women based on different approaches to distress management and reinforcement-seeking.

Certainly, the extant research on PTSD and substance use suggests that the two are causally related, most likely in a reciprocal fashion. The results of the present study indicate that gender differences may influence not only the reaction to present-day stressors but also the type of

traumatic events that influence later functioning. Negative reactions to daily stressors were related to the accumulation of early emotional abuse among males and early general trauma among females. In general, early abuse and other traumatic events have been linked to adult psychological distress (Medrano, Hatch, Zule, & Desmond, 2002). Early emotional abuse may have precipitated the development of maladaptive coping strategies in males, perhaps reducing resilience to everyday stressors. Emotional abuse has been linked to self-criticism in another largely male sample (Mendelson, Robins, & Johnson, 2002). The general trauma category contained a broad range of possible experiences, including such items as crimes, the death of a family member, and family substance use. Although the total numbers of these events were similar across genders, perhaps women were more likely to be exposed to events that are more related to present-day stress responding. A study with a larger sample may be necessary to achieve the base rates to clarify this issue.

In addition to written assessments, the present study allowed comparison of subjective responses to a controlled social stressor in the laboratory with day-to-day stressors, but did not find significant results. It may be that the sample size in the laboratory stressor portion was too small to detect differences (n=34). However, in spite of the small number of subjects, subjective sadness, stress, and craving to cocaine cues in the laboratory were positively associated with reports of sensitivity to daily hassles among women. These relationships fit with our earlier work on triggers for cocaine use (Waldrop et al., 2007), which found that negative emotional states were often a trigger for increased cocaine use. The gender difference did not emerge in that self-report based study, however. Perhaps the laboratory paradigm in the present study, which presented cocaine cues and elicited reports of subjective states, is more sensitive to minute-by-minute responses to cocaine cues and may therefore be more sensitive to gender differences. The laboratory findings also contrast with the trend for women's quantity of cocaine use to be inversely related to reactivity to daily hassles. Perhaps when women are more hassled day-to-day, then are exposed to cocaine cues, they are more likely to use because of an increased sensitivity to cues. In other words, the relationship of hassles to cocaine use may be an indirect one. The larger study from which these data were drawn includes biologic measures for responses to both the social stressor and cue tasks. These may reveal gender differences and relationships that the subjective reports have not demonstrated.

5. Conclusions

As with other cross-sectional research, the findings of the present study are correlational in nature. Future research might seek to clarify the potential causal relationships among these variables by measuring cocaine use and triggers for use in "real time" through promising research tools such as interactive voice response (Helzer et al., 2006) or handheld computers (Bernhardt, Usdan, & Burnett, 2005). The gender differences found suggest the possibility of different pathways of risk for cocaine dependence and relapse between men and women. This is an area that clearly warrants further investigation. The small sample sizes in the present study likely interfered with the ability to detect some statistically significant relationships, even in cases where effect sizes were moderately large. Also, because of attrition, our results may not generalize as well to cocaine dependent people who typically use more than ten days per month. Despite the limitations of the study, it seems clear that adult functioning and coping with minor to moderate common stressors are associated with some childhood stressors and a tendency to rely on cocaine in negative situations. These findings may be used to inform the continued development of effective treatments for cocaine dependence.

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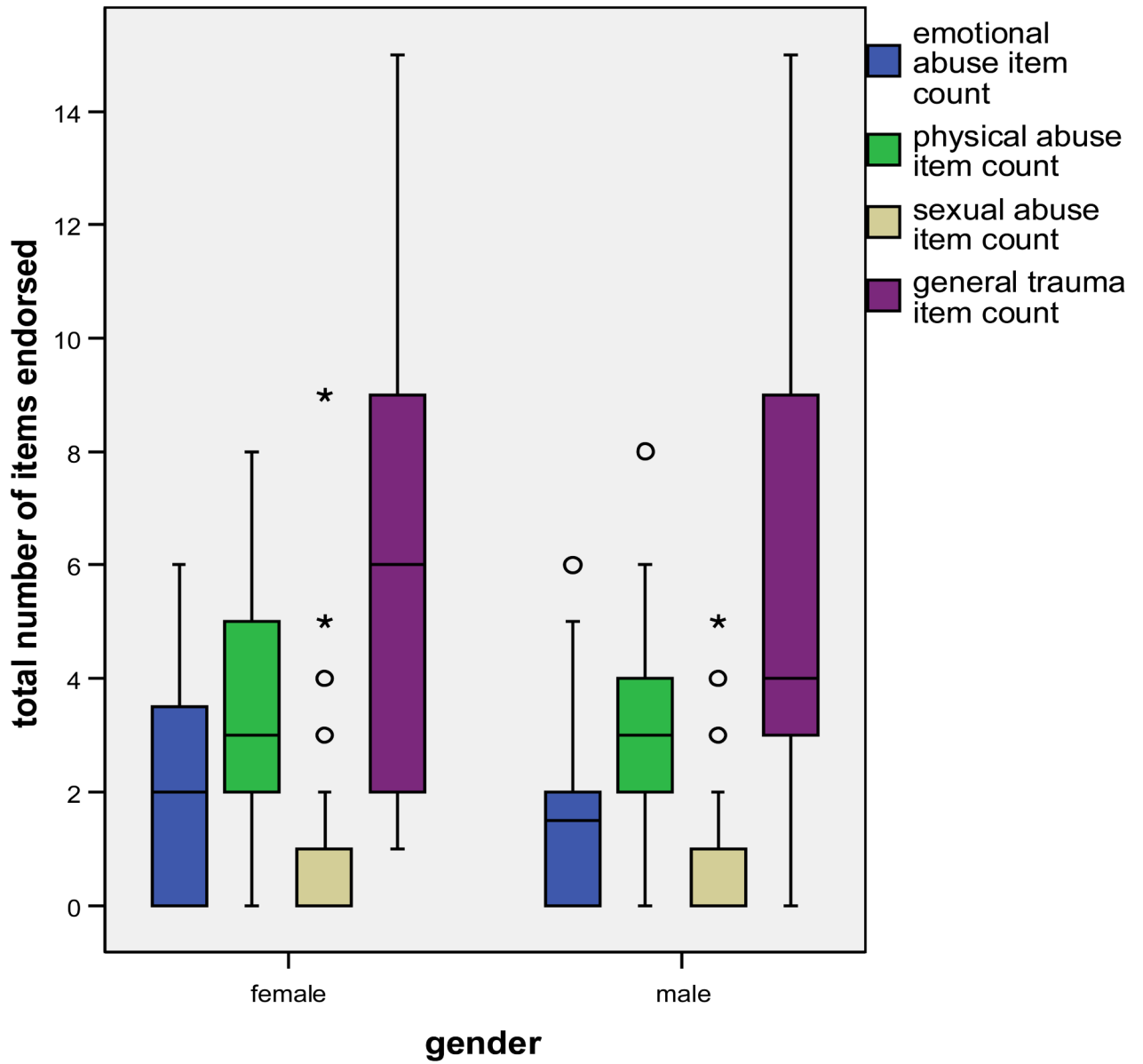
Figure 1.
Abuse item totals by gender.

Table 1

Cocaine use by gender.

	Female (n=39)	Male (n=64)	Test Statistics
% Cocaine using days	35.4 (31.5)	28.9 (30.4)	$F = 1.10, p = .30$
Mean cocaine used per day ($ value)	24.7 (38.07)	26.9 (53.7)	$F = .05, p = .82$
Mean cocaine used per *using* day ($ value)	63.3 (78.2)	68.8 (117.8)	$F = .07, p = .80$

Table 2

Correlations between Daily Hassles severity totals and Inventory of Drug Taking Situations subscale scores by gender.

	Female (n=31) Daily Hassles Total	Male (n=60) Daily Hassles Total
Negative Situations	.67[***]	.52[***]
Positive Situations	.18	.25[*]
Temptation Situations	.51[***]	.32[**]

[*] $p < .05$.

[**] $p < .01$.

[***] $p < .001$.