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The Obsessive Compulsive Cocaine Scale: Assessment of Factor Structure, Reliability, and Validity

Bianca F. Jardin, MA¹, Steven D. LaRowe, Ph.D.^{1,2,3}, Brian J. Hall, MA¹, and Robert J. Malcolm, M.D.²

¹Charleston Consortium Psychology Internship Training Program, 67 President Street, Charleston, South Carolina, 29425

²Center for Drug and Alcohol Programs, Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, 67 President Street, Charleston, South Carolina, 29425

³Ralph H. Johnson VAMC, Charleston, SC, 109 Bee Street, Charleston, SC 29401

Abstract

The present study assessed the factor structure, reliability, test retest, convergent validity, and predictive validity of the Obsessive Compulsive Cocaine Scale (OCCS), a newly developed questionnaire adapted from the Obsessive Compulsive Drinking Scale (OCDS). The questionnaire was administered to 189 cocaine-dependent individuals participating in two medication treatment trials for cocaine dependence. Confirmatory factor analysis of this measure revealed that it primarily assesses two factors, obsessions and compulsions. In addition, the data provided strong support for the internal consistency, test-retest reliability, predictive validity, and convergent validity of this two-factor measure. Overall, the data provide support for the psychometric strength of a modified version of the OCDS specifically designed to assess obsessive and compulsive cocaine use among those with cocaine dependence.

Keywords

Obsessive Compulsive Cocaine Scale; Cocaine; Confirmatory factor analysis; Psychometric properties

1. Introduction

Following the observation that alcohol and drug dependence may share phenomenological similarities with obsessive-compulsive disorder, various measures have been developed to

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*Corresponding Author: Bianca Jardin, Phone: 843-792-5811, Fax: 843 792-3388, jardin@musc.edu.

Contributors

Bianca Jardin participated in developing the study design, analyzing the data, and preparing the manuscript. Steven LaRowe contributed to developing the study, collecting and analyzing the data, and provided assistance in preparing the manuscript. Brian Hall participated in analyzing the data. Robert Malcolm contributed to developing the study, collecting and analyzing the data, and provided assistance in preparing the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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capture obsessive thoughts and compulsive behaviors believed to be associated with alcohol and drug taking behavior. Most notably, Anton and colleagues “(1995) Obsessive Compulsive Drinking Scale (OCDS) has become a widely used assessment tool for examining obsessive-compulsive features of alcohol craving. This 14-item self-report questionnaire, initially adapted from the Yale-Brown Obsessive Compulsive Scale (YBOCS-hd; Modell, Glaser, Mountz, Schmaltz, & Cyr, 1992), assesses a variety of craving-related phenomena, including the intensity, frequency, ability to resist, and the degree of interference caused by drinking-related thoughts and behaviors. Previous studies have demonstrated that the OCDS can track changes in drinking behavior over the course of treatment, reliably discriminate participants according to their drinking status, and predict future alcohol consumption (e.g. Kranzler, Mulgrew, Modesto-Lowe, & Burleson, 1999; Roberts, Anton, Latham, & Moak, 1999; Flannery, Poole, Gallop, & Volpicelli, 2003). The success of this measure has prompted the development of similar versions for other drinking populations (e.g. adolescents, Deas, Roberts, Randall, & Anton, 2002) as well as for individuals who abuse substances other than alcohol (e.g. heroin; Franken, Hendricks, & Van den Brink, 2002).

Much like with alcohol, obsessions and compulsions have been accorded an important function in terms of their relationship to the development and maintenance of cocaine-use disorders. For example, clinical evidence has demonstrated an association between chronic use of cocaine and compulsive foraging behavior (i.e., ritualistic scanning of environment for misplaced pieces of cocaine). Rosse and colleagues (1993) examined compulsive foraging behavior among a sample of crack cocaine addicts and found that approximately 80.5% of sample reported engaging in compulsive foraging within the context of heavy cocaine use and usually lasting for 90 minutes. Further evidence demonstrating a link between cocaine use and OCD stems from findings reported in the Epidemiological Catchment Area surveys, which have shown that individuals who actively use cocaine are at significantly elevated risk for OCD (Crum & Anthony, 1993). Recent estimates suggest that the prevalence of past-year cocaine use ranges between 9.2–15.3% while the prevalence of cocaine-use disorder within the US population ranges from 0.3–0.6% (Gruza, Abbacchi, Przybeck, & Gfroerer, 2007). Together these data suggest that there is a need to develop a clinical instrument that can reliably and validly assess cocaine obsessions and compulsions. The development and adoption of such a measure, particularly within treatment-based settings, would prove helpful in terms of assisting health care professionals with monitoring patients’ clinical status and ultimately predicting their risk for future cocaine use (i.e., relapse). Given the success of the OCDS and its ability to achieve the above-related goals within the context of alcohol use, it stands to reason that a version, modified for cocaine use, might achieve these goals as well. At present, however, there appears to be a lack of assessment instruments that measure these dimensions within the domain of cocaine use. Therefore the development and evaluation of such an instrument is warranted.

The purpose of the present study was to modify and adapt the OCDS to create the Obsessive Compulsive Cocaine Scale (OCCS), a measure that specifically assesses the obsessive-compulsive features of cocaine-related thoughts and behaviors. Since the OCDS has been subjected to factor analytic studies, and since these studies have generated different factor solution outcomes, we sought to test several of the models identified in the literature in order to determine the best fit for cocaine use. For example, several studies have identified a two-factor structure (Deas, et al., 2002; Deas et al., 2001), while other studies have found a three-factor structure (Kranzler et al., 1999; Roberts, Anton, Latham, & Moak, 1999) to the OCDS.

In addition to an analysis of the factor structure of the OCCS, we also sought to assess its psychometric properties. In particular, we predicted that the measure would demonstrate

acceptable internal consistency, test-retest reliability, and predictive validity. Further, it was predicted that the OCCS would show convergent validity with other criterion measures that assess motivation for cocaine use, including the Cocaine Selective Severity Assessment (CSSA, Kampman et al., 1998) and the Brief Substance Craving Scale (BSCS, Somoza, Baker, LoCastro, Mezinskis, Simon, & Tracy, 1999).

2. Methods

2.1 Participants

Participants consisted of 189 volunteers involved in two separate pharmacological cocaine treatment trials for cocaine use disorder (i.e. N-Acetylcysteine and Modafinil). Participants were males and females aged 18 to 65 years who were seeking treatment for cocaine use. Approximately 48% of the participants were “treatment naïve,” based on self-reports, with nearly 90% having no contact with outpatient treatment (including AA/NA) prior to entering the study. Of these, 129 were eventually randomized for participation in the clinical treatment trials. Available demographic information for non-randomized participants included age, gender, ethnicity, and days of cocaine use in the prior 30 days (see Table 1). Randomized participants ($n = 129$) met DSM-IV criteria for cocaine dependence (APA, 1994) and were free of dependence on any substances other than cocaine, alcohol, nicotine, or marijuana. Participants had to be free of alcohol detoxification requiring medical intervention as well as free from serious medical conditions, major axis I psychiatric disorders, or a past medical history of asthma or seizures. Participants were free of medications felt to be hazardous if taken with N-Acetylcysteine or Modafinil for at least 14 days. None of the female participants were pregnant or nursing.

The overall volunteer pool that included all 189 participants consisted of 112 African Americans, 75 Caucasians, and 2 Hispanics. Fifty-four were women. Average age of participants was 43.5 ($SD = 8.6$). Participants reported using cocaine an average of 14.6 days ($SD = 8.6$) in the 30 days prior to entering the study. Those randomized differed from those not randomized with respects to mean age, 41.6 ($SD = 8.8$) v. 44.5 ($SD = 8.4$), respectively, $t_{187} = 2.2$, $p < .05$, but did not differ with respects to ethnicity, gender, and number of days of cocaine use in the 30 days prior to the study. For the randomized group who completed screening procedures, demographic data pertaining to co-morbid alcohol dependence/abuse, co-morbid mood conditions (e.g. depression), co-morbid anxiety conditions (e.g., GAD) are presented in Table 1.

2.2 Measures

2.2.1 Obsessive Compulsive Cocaine Scale (OCCS)—We modified the original OCDS (Anton et al., 1995) to assess for obsessive and compulsive urges to use cocaine. In particular, all the items were identical to the items in the OCDS except that the word “alcohol” was replaced by the word “cocaine.” This 14-item self-report measure assesses the inability to control or resist cocaine-related thoughts and behaviors, frequency and impact of thoughts and impulses related to cocaine use, and the degree of interference caused by cocaine related thoughts and behaviors. (See Table 2 for list of specific items).

2.2.2 Cocaine Selective Severity Assessment (CSSA; Kampman et al., 1998)—The CSSA is an 18-item clinician-administered instrument that assesses the severity of early cocaine abstinence signs and symptoms (e.g., cocaine cravings, sleep disturbances, appetite changes). Each of the 18 items is rated on a 0 (no symptoms) –7 (maximum severity) scale. This instrument has well-established psychometric properties, including good reliability and validity (Kampman et al., 1998).

2.2.3 Brief Substance Craving Scale (BSCS; Somoza et al., 1999)—We used the BSCS to collect information on intensity, length, and frequency of cocaine craving. Responses to each of these three items were formatted on a 5-point Likert scale. A total score was derived by summing responses to the latter three items.

2.2.4 Achievement of Abstinence—Participants were assessed to determine whether each individual achieved two consecutive weeks of abstinence. Abstinence was determined using urine screens, collected at each research visit (up to 3 per week) in participants who were randomized into the clinical trials. Urine screens were processed for quantitative levels of benzoylecognine levels (i.e., cocaine metabolite) at either Northwest Toxicology Inc. (Salt Lake City, UT) or Clinical Reference Laboratories (Lenexa, KS). Quantitative benzoylecognine levels were coded as “new use” or “non-new use” using the Preston rules (Preston, Silverman, Schuster, Cone, 1997). Participants who had no “new use” within a 7-day week were considered to be abstinent for that week.

2.3 Procedure

Volunteers for both studies were recruited via flyers, billboard, newspaper, and television advertisements. In both studies, patients were initially screened over the phone and subsequently invited to the research center for a formal consent session. After providing written and oral informed consent approved by the University Institutional Review Board, all participants completed an extensive screening assessment, which typically occurred over 2 to 3 sessions and prior to the administration of any medications. The screening assessment entailed completing the above referenced measures, a diagnostic interview, a medical history and physical, an electrocardiogram, and collection of laboratory values. Participants who met inclusion/exclusion criteria were randomized to one of the clinical trials. Prior to taking any medication, they once again completed the OCCS, CSSA, and BSCS measures. Thereafter, they entered one of two 8-week medication trials (i.e. on going trials assessing N-Acetylcysteine or Modafinil). During each week of the 8-week trials, participants completed up to three research visits during which time urine samples were collected to assess for abstinence. Participants were compensated for travel expenses at each research visit.

2.4 Data Analysis

Several models of the factor structure of the OCCS were tested using confirmatory factor analysis (CFA). OCCS data obtained from the first screening assessment visit ($n=189$), were used for these analyses. First we specified two models that served as base models against which several alternative nested models were evaluated. Model 1a was a one-factor model that specified that all items loaded on a single factor. Model 1b was also a one-factor model but with the two frequency items (items 7 and 8) removed. These frequency items assess use and not urges per se, and therefore, as previous research findings have shown, do not necessarily load on factors assessing obsessions or compulsions (Anton et al., 2006; Fedoroff, Sobell, Agrawal, Sobell, & Gavin, 1999; Nakovics, Diehl, Croissant, & Mann, 2008).

We specified several models (Model 2a – Model 4) that tested the hypothesized factor structure of the OCCS based on past factor analytic outcomes of the OCDS. Model 2a was a two-factor model nested in Model 1a that was based on the Deas et al. (2001, 2002) model with two correlated factors, irresistibility and interference. Model 2b was a two-factor correlated model that measured obsessions and compulsions, and has been shown to be a more efficient model of the latent OCDS factor structure because it omits the frequency items (Nakovics et al., 2008). This model was nested in Model 1b. Model 3a, was a three-factor model that consisted of obsessions, control/consequences, and consumption factors

(Kranzler et al., 1999), and was nested in Model 1a. Model 3b tested a three-factor model, consisting of obsessions, compulsions, and a separate factor that included the two frequency items (item 7 and 8). This model was also nested in Model 1a. In the final model, Model 4, we tested Roberts et al. (1999) original model for the OCDS, which consists of three factors including resistance/control impairment, obsession, and interference. This model was nested in Model 1a. Sattora-Bentler χ^2 difference tests were conducted to evaluate whether the nested models were superior to the one-factor models. A summary of the mapping of individual items onto their respective factors of each of these models is provided in Table 2.

Confirmatory factor analysis procedures used full information maximum likelihood estimation for missing data (covariance coverage was higher than .99%) and MLR estimation (i.e., robust methods) for non-normally distributed data, with Mplus version 6 (Muthen & Muthen, 2010). Chi-square tests of model fit along with five goodness-of-fit indices were used to evaluate the adequacy of the models: the comparative fit index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Bentler & Bonett, 1980; Tucker & Lewis, 1973), the standardized root mean square residual (SRMR), and the root mean square of approximation (RMSEA; Steiger, 1990). Values equal to, or greater than, .95 for the CFI and TLI, and values lower than .08 for the RMSEA and SRMR, were considered indicators of excellent model goodness-of-fit (Bentler, 1990; Browne & Cudeck, 1993; Vandenberg & Lance, 2000).

Nested CFA models were compared using Sattora-Bentler χ^2 difference test (S-B χ^2) incorporating the scaling correction factor for non-normal data provided by Mplus (Bollen, 1989), with a p value set at .05. Changes in the CFI, TLI, RMSEA, SRMR, and the Bayesian information criterion (BIC; Muthen & Muthen, 1998) values were also evaluated (Cheung & Rensvold, 2002). Although not an indicator of model fit when evaluated alone, lower relative BIC values indicate an improvement in model fit.

The internal consistency of the overall scale and the corresponding subscales was examined using Cronbach's alpha. In order to evaluate the convergent validity of the OCCS we calculated Pearson correlations between the OCCS and other criterion measures (i.e., BSCS, CSSA). Pearson correlations were also used to calculate test-retest stability using data from participants who were successfully enrolled in the medication trial and who completed the OCCS a second time, immediately prior to starting one of the medication trials ($n = 129$). Among the randomized participants, predictive validity was examined using logistic regression to assess whether OCCS factor scores collected immediately prior to entering the medication trial predicted whether participants achieved two consecutive weeks of abstinence.

3. Results

3.1 Confirmatory Factor Analysis

The fit statistics for all 7 models are shown in Table 3. Model fit was generally adequate for the majority of the models tested. All items loaded significantly on their respective factors. Modification indices called for the error covariance between items 1 and 2, 7 and 8, 9 and 10, and 13 and 14 to be freely estimated. As has been noted in previous investigations, these item pairs are all quite similar in wording, and may represent a separate latent factor (e.g., Deas et al., 2002). The best fitting among these were the two models that removed the frequency items (Model 1b and Model 2b). Inspection of the various fit indices indicated that Model 2b, the nested two-factor correlated model that measured obsessions and compulsions, demonstrated superior fit to the data. Furthermore, the results of the chi-square difference test supported the overall superior fit of this particular model (scaled S-B $\chi^2 =$

4.30, $df\ 1$, $p < .05$). The means, standard deviations, item-total correlations, and factor loadings are shown in Table 4

3.2 Reliability and Concurrent Validity

The total OCCS score, as well as the two subscales identified in Model 2b, were found to have good internal consistency. Specifically, the Cronbach's alpha value for the total 12-item OCCS was equal to 0.91. Similarly, the alpha coefficient for both the Obsessions and Compulsions factors was 0.85.

Pearson correlation coefficients were calculated to examine the relationship between the overall score and subscale scores of the measure with other indices of cocaine use, including the frequency, intensity, and length of cocaine craving as well as severity of early cocaine abstinence signs and symptoms. As shown in Table 5, the total OCCS score, as well as the two subscales, obsessions and compulsions, all showed moderate correlations with the CSSA and BSCS.

3.3 Test-Retest Reliability

Test retest reliability was calculated using scores obtained on the OCCS at initial baseline and correlating them with OCCS scores obtained during a follow-up assessment (which occurred prior to the administration of any medications). The average retest interval was approximately 7 days. Test retest reliability was .71 for the OCCS Total Score, .64 for the Obsessions Subscale, and .69 for the Compulsions Subscale, all $p < .001$.

3.4 Predictive Validity

Among the 129 randomized individuals, 33 achieved two consecutive weeks of abstinence, and this number was associated with the Obsessive factor score, $Wald\ \chi^2 = 6.5$, $p < .05$, OR = .92 (CI₉₅: .77, .97), but not with the Compulsive factor, $p = .59$. The results suggested that higher Obsessive scores were associated with less likelihood of achieving two consecutive weeks of abstinence. On an exploratory basis, these analyses were repeated while including either the CSSA or BSCS in order to assess the relative predictive strength of the OCCS compared to these measures. In general, the Obsessive factor results remained the same. When coupled with the CSSA, the Obsessive factor remained significantly associated with two-week abstinence, $Wald\ \chi^2 = 6.1$, $p < .05$, OR = .84 (CI₉₅: .74, .97), while the CSSA was not, $p = .74$. Similarly when coupled with the BSCS, the Obsessive factor approached significance, $Wald\ \chi^2 = .3.1$, $p = .08$, OR = .88 (CI₉₅: .77, 1.02), while the BSCS did not, $p = .32$.

4. Discussion

We evaluated the factor structure, reliability, and validity of a new measure of obsessions and compulsions for cocaine based on the OCDS (Roberts et al., 1999). Results of confirmatory factor analysis indicated that the correlated two-factor model of obsessions and compulsions best represented the latent structure of the OCCS. This model represented a curtailed version of the OCDS such that it removed the two items assessing for abuse frequency. This two-model factor solution demonstrated excellent internal consistency and moderate test-retest reliability. This model also exhibited strong convergent validity through significant correlations with other indices of cocaine use. Importantly, there was evidence of predictive validity as well, as higher scores on this Obsessive scale were associated with reduced likelihood of achieving two consecutive weeks of abstinence, and appeared to be more strongly related to this outcome than either the CSSA or BSCS scales.

The findings of the current study must be interpreted in light of several methodological limitations. The gender distribution and ethnic breakdown of the sample may limit the generalizability of the findings. Future studies with more women and that include other ethnic/racial minorities are recommended. The exclusion criteria employed in the current study may further limit the generalizability of the current findings. The results of the current study are largely exploratory in nature, and therefore, require further replication. In particular, future studies further examining the factorial structure of the OCCS are needed to assess the stability of this measure.

At present, a number of empirically supported interventions exist for the treatment of cocaine abuse. While the existence of validated treatment approaches represents a good starting point, the ultimate success of delivering these empirically supported treatments is based largely on the intimate link that exists between assessment and intervention (Hunsley & Mash, 2007). Specifically, assessment measures allow researchers and clinicians to achieve a multitude of goals, all of which contribute to enhanced treatment process and outcomes. In particular, assessment data assists mental health professionals with planning treatments, monitoring treatment progress, modifying treatment approaches when necessary, and informing ongoing treatment practices. The ability to achieve the latter objectives is contingent, in part, on the development of empirically supported measurements. The findings of the present study provide support for the psychometric strength of a modified version of the OCDS specifically designed to assess obsessive and compulsive cocaine use among those with cocaine dependence.

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Highlights

- The psychometric properties of a newly developed questionnaire, OCCS, were examined
- Measure was administered to 192 cocaine-dependent individuals
- CFA analyses revealed a two factor solution, obsessions and compulsions
- Internal consistency, test-retest reliability, convergent validity was strong

Table 1

Demographic information

	Screened <i>n</i> = 189	Non-Randomized <i>n</i> = 60	Randomized <i>n</i> = 129
	%	%	%
Male	71.4	68.3	72.9
White	39.7	35.0	41.9
Alcohol Dep/Abuse	-	-	41.9
Mood DO	-	-	18.5
Anxiety DO	-	-	8.5
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Age	43.5 (8.6)	41.5 (8.8)	44.5 (8.4) ^a
Days of Cocaine Use	14.6 (8.6)	15.5 (41.6)	14.2 (8.5)
Years of Cocaine Use	-	-	15.5 (8.2) ^b
Years of Alcohol Use	-	-	20.6 (12.6) ^c
Education	-	-	13.4 (2.3) ^c

^a $t_{187} = 2.2, p < .05$

^b Missing data for *n*=8 participants

^c Missing data for *n*=7 participants

Table 2

Item mapping for the confirmatory analysis models

OCCS Items	Model						
	1a	1b	2a	2b	3a	3b	4
1. When you're not using cocaine, how much of your time is taken up by ideas, thoughts, urges or images about cocaine?	OC	OC	IR	O	O	O	O
2. How often do these thoughts occur?	OC	OC	IR	O	O	O	O
3. How much do these ideas, thoughts, urges or images about using cocaine get in the way of your social life or work? Is there anything you don't or can't do because of them? [If you are not currently working, how much of your work would be affected if you were still working]	OC	OC	IN	O	O	O	IN
4. How much upset does the ideas, thoughts, impulses, or images related to using cocaine cause you when you're not using cocaine?	OC	OC	IN	O	O	O	O
5. How much effort do you make to stop these thoughts or try to turn your attention away from these thoughts? (Rate your effort made to lose these thoughts, not your success or failure in actually getting rid of them.)	OC	OC	IN	O	O	O	RCI
6. How successful are you in stopping or changing your thoughts about cocaine when you're not using cocaine?	OC	OC	IN	O	O	O	RCI
7. On average, how much did you spend on cocaine in the past week?	OC	-	IR	-	CC	CC	RCI
8. In the past week, how many days did you use cocaine?	OC	-	IR	-	CC	CC	RCI
9. How much does your cocaine use cause problems with your work? Is there anything that you don't or can't do because of your cocaine use? (If you are not working now, how much would you be affected if you were working?)	OC	OC	IN	C	CAC	C	IN
10. How much does your cocaine use cause problems with your social life? Is there anything that you don't or can't do because of your cocaine use?	OC	OC	IN	C	CAC	C	IN
11. If something or someone was stopping you from using cocaine when you wanted to get high, how anxious or upset would you become?	OC	OC	IR	C	CAC	C	O
12. How much of an effort do you make to resist getting high on cocaine? (Only rate your effort to resist, not your success or failure in actually controlling the urge to use cocaine).	OC	OC	IR	C	CC	C	RCI
13. How strong is the drive to use cocaine?	OC	OC	IR	C	CAC	C	O
14. How much control do you have over the cocaine use?	OC	OC	IR	C	CAC	C	RCI

Note. OC = obsessions/compulsions. IR = irresistibility. IN = interference. O = Obsessions. C = Compulsions. CC = cocaine consumption. CAC = control and consequences. RCI = resistance/control/impairment.

Table 3

Results of confirmatory factor analyses

Model	df	S-B χ^2	CFI	TLI	RMSEA	SRMR	BIC
1a	73	148.583	.93	.92	.073 (.056 – .090)	.05	7307.242
1b	51	98.351	.95	.94	.070 (.049 – .090)	.05	6111.140
2a	72	144.054	.94	.92	.072 (.055 – .089)	.05	7307.264
2b	50	93.112	.96	.94	.067 (.045 – .088)	.04	6110.566
3a	70	143.910	.93	.91	.074 (.057 – .091)	.05	7317.498
3b	71	143.282	.94	.92	.073 (.055 – .090)	.05	7311.910
4	70	128.665	.95	.93	.066 (.048 – .084)	.05	7302.348

Note. S-B χ^2 = Satorra-Bentler χ^2 . CFI = comparative fit index. TLI = Tucker Lewis Index. RMSEA = root mean square of approximation. SRMR = standardized root mean square residual. BIC = Bayesian information criterion. Model in bold is the best fitting model.

Table 4

Means and Standard deviations of the OCCS model 2b

OCCS items	Mean	Standard deviation	<i>r</i>	Factor loadings
Obsessions				
OCCS-1	1.80	1.09	0.57	0.56
OCCS-2	1.64	1.08	0.63	0.61
OCCS-3	1.47	1.22	0.64	0.78
OCCS-4	1.42	0.91	0.71	0.75
OCCS-5	1.99	1.13	0.65	0.72
OCCS-6	1.82	1.02	0.62	0.72
Compulsions				
OCCS-9	1.74	1.31	0.63	0.63
OCCS-10	2.13	1.27	0.68	0.68
OCCS-11	1.97	1.03	0.63	0.70
OCCS-12	2.59	1.22	0.57	0.66
OCCS-13	2.02	1.14	0.70	0.76
OCCS-14	2.13	1.07	0.63	0.65

Note. *r* = corrected item-total correlation. Factor loadings are standardized.

Table 5

Correlations between total OCCS score and subscale scores and other measures of cocaine use

	Total CSSA	Total BSCS
Total OCCS	.55**	.53**
Obsessions	.54**	.58**
Compulsions	.49**	.41**

Note.

**
 p< .001. CSSA = Cocaine Selective Severity Assessment. BSCS = Brief Substance Craving Scale. There were some missing data for the CSSA and for the BSCS; the correlations are based on n=184 and n = 152, respectively.