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Substance Use after Participation in Laboratory Studies Involving Smoked Cocaine Self-Administration

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Abstract

Objective—Laboratory studies in which drugs of abuse are self- or experimenter-administered to non-treatment-seeking research volunteers provide valuable data about new pharmacotherapies for substance use disorders, as well as behavioral and performance data for understanding the neurobiology of drug abuse. This paper analyzed follow-up data from six smoked cocaine self-administration laboratory studies, in order to determine whether changes in substance use occurred 1 and 3 months after study participation compared to pre-study baseline.

Methods—Ninety-eight healthy, non-treatment-seeking cocaine users were admitted to inpatient and combined inpatient/outpatient studies lasting from 12 to 105 days. The studies allowed participants to self-administer repeated doses of smoked cocaine (0, 6, 12, 25, and/or 50 mg per dose) on multiple occasions. Participants returned for follow-up at 1 and 3 months, at which time self-reported consumption of cocaine, alcohol, marijuana, and nicotine was assessed.

Results—Compared to baseline (\$374.04/week, S.D. \$350.09), cocaine use significantly decreased at 1 month (\$165.13/week, S.D. \$165.56) and 3 months (\$118.59/week, S.D. \$110.48) after study participation ($p < 0.001$; results based on the 39 participants who completed all 3 time points). This decrease was not accompanied by a change in other drug use, e.g., a compensatory increase in alcohol, marijuana or nicotine use.

Conclusion—Study participation was not associated with increased post-study cocaine, alcohol, marijuana, or nicotine use. Thus, human laboratory models of cocaine self-administration, conducted in non-treatment-seeking research volunteers, are relatively safe, and study participation does not exacerbate ongoing drug use.

Keywords

substance use; cocaine administration; research participation; non-treatment

1. Introduction

Laboratory studies in which drugs of abuse are self- or experimenter-administered to non-treatment-seeking research volunteers provide valuable drug interaction data about new pharmacotherapies for substance use disorders. In addition, these studies provide valuable

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behavioral and performance data for understanding the neurobiology of drug abuse (Comer et al., 2008; Fischman et al., 1990; Foltin and Fischman, 1994; Haney and Spealman, 2008). Such studies characterize the subjective, reinforcing and physiological effects of a drug of abuse over a range of doses, often in the presence and absence (placebo) of potential pharmacotherapies. In this way, the effects of a candidate pharmacotherapy on the direct effects of the abused drug can be assessed. Such studies also characterize the behavioral, performance and cognitive effects of a drug of abuse, which can be useful in the development and assessment of effective treatment interventions. Finally, these laboratory studies can yield important insights into neurobiological, behavioral, and social factors underlying initiation and maintenance of problematic drug use (Childs and de Wit, 2010; Hamidovic et al., 2010).

Studies involving the administration of drugs of abuse have been extensively used and are typically accepted as relatively safe and ethically sound (Fischman and Johanson, 1998; Modell et al., 1993). However, there are limited data to address concerns about how drug administration during a laboratory study may influence subsequent drug use patterns. Some studies have shown no significant change from pre-admission to post-study follow-up (Bigelow et al., 1994; Kaufman et al., 2000; Vadhan et al., 2006). Other studies have shown a significant decrease in substance use from pre-admission to post-study follow-up (Drobes and Anton, 2000; Elman et al., 2001; Pratt and Davidson, 2005; Sinha et al., 1999). Overall, participation in drug administration studies has not appeared to increase subsequent drug use.

This paper adds to the literature by presenting an analysis of follow-up data from six laboratory studies carried out by the Substance Use Research Center at Columbia University in which participants self-administered smoked cocaine. The primary aim was to determine whether changes in substance use occurred 1 and 3 months after study participation compared to pre-study baseline. Based on the existing literature, we hypothesized that substance use would significantly decrease following study participation. Other analyses investigated whether those who completed the study differed in baseline demographics, psychiatric diagnoses or drug use from those who did not, and determined whether features of cocaine use at baseline predicted changes in cocaine use at post-study follow-up.

2. Methods

2.1 Screening Procedures and Measures

After providing informed consent, volunteers for study participation underwent comprehensive screening to ensure that they were physically and psychiatrically healthy. Screening procedures are described in detail elsewhere (Evans and Foltin, 2006; Haney et al., in press; Reed et al., 2011; Vosburg et al., 2010a; Vosburg et al., 2005; Vosburg et al., 2010b). Only non-treatment-seeking candidates were recruited. All potential candidates underwent an initial telephone-screening interview, followed by 5–7 in-person medical and psychiatric screening visits for suitable candidates. To enter a study, candidates were required to provide at least one cocaine-positive urine toxicology test during screening to confirm cocaine use.

After completing screening, participants provided informed consent specific for the study to which they were assigned. Six smoked cocaine self-administration laboratory studies (conducted between 2003 and 2010) were included in this analysis. Participants were admitted to inpatient and combined inpatient/outpatient studies lasting from 12 to 105 days. The studies allowed participants to self-administer repeated doses of smoked cocaine (0, 6, 12, 25, and/or 50 mg per dose) on multiple occasions. Maximum possible exposure to

cocaine in each study ranged from 486 mg/week to 1,598 mg/week. Data from three studies have been reported (Haney et al., in press; Reed et al., 2011; Vosburg et al., 2010a).

Although the total sample size from all studies was 107, nine participants completed two studies; only data from the first study they completed were included, which reduced the total sample size at baseline to 98.

A total of 53 participants did not complete the study to which they were assigned for the following reasons (numbers in each category in parentheses): failed to show up for appointments (15), medical issue (12), no longer interested in study participation (11), non-adherent to study procedures (6), family emergency (6), wanted treatment after study entry (2), legal issue (1).

All studies involved 1-month and 3-month follow-up visits. This procedure has been in place for over 2 decades in our laboratory, primarily to ensure the safety of participants, including monitoring for possible increased drug use after study participation. Both study completers and study non-completers were encouraged and paid to return for the follow-up visits in order to have complete data for both groups. Participants were all offered the option to be referred to treatment during screening, at any point during the study, and upon study completion, but treatment referrals were only provided if requested. At follow-up visits, psychiatric, medical, social, and substance use history were collected via locally created self-report forms. Participants also provided a urine sample for toxicology. All studies were approved by the New York State Psychiatric Institute's Institutional Review Board. All participants were compensated for their time during screening, study participation and follow-up visits.

2.2 Statistical Analysis

Since no clinical interview was performed at 1-month and 3-month follow-up, we used substance use history collected via self-report forms and urine toxicology data at baseline, 1-month and 3-month follow-up for analyses.

Regarding the coding of substance use for analyses, 1) alcohol use was converted into standard drinks, 2) one marijuana "blunt" was coded as 3 "joints", based on quantities reported by Sifanek et al. (2005), and 3) one tobacco cigar was coded as 3 cigarettes, based on the "cigarillo" type of cigar according to the National Cancer Institute on Fact Sheet on Cigarette Smoking and Cancer (NCI, 2011).

All analyses were conducted using SPSS version 18 (SPSS Inc., Chicago, IL). Initial analyses assessed for differences among baseline demographic, psychiatric, and substance use variables between completers versus non-completers. For continuous variables, Kolmogorov-Smirnov and Shapiro-Wilk tests assessed normality; Levene's test assessed homogeneity of variance. Independent t-tests were used to compare mean values between completers and non-completers where distributions were normal; in the case of non-normality, Mann-Whitney tests were used. Non-parametric results are reported in the case that they generated different results from parametric results. Chi-square tests of independence were used to compare categorical variables across groups; where the expected frequencies were less than 5, the Fisher's exact test was used. P-values < 0.05 were considered significant. For each continuous variable, z-scores assessed for univariate outliers. Values with a z-score >3.29 were adjusted to the next highest value; adjusted results did not differ from original data, so original data were retained.

Overall, few differences were observed between completers and non-completers. However, non-completers used cocaine for a significantly longer period than completers (Table 2).

There was a trend for females and non-African-Americans to be more likely to complete a study (Table 1), and a trend for non-completers to be positive for marijuana at 1-month follow-up (Table 3). Opioid, caffeine, amphetamine and benzodiazepine use was also assessed at all time points, and no significant differences between completers and non-completers were found. Completer status did not impact the change of substance use with time as noted in the Results section.

Changes in the following variables were assessed from baseline to 1-month and 3-month follow-up: a) mean dollars of cocaine used/week, b) mean number of alcoholic drinks used/day, c) mean dollars of marijuana used/week, and d) number of tobacco cigarettes smoked/day. Where distributions were normal, repeated-measures ANOVA was used (Bonferroni corrected pairwise *post hoc* tests were used as necessary). All analyses were conducted on both the raw and adjusted variables as described above; original data were retained as adjusted results did not differ from original data. Where the Mauchly's test of sphericity indicated significant departure from sphericity, the Greenhouse-Geisser corrected degrees of freedom and significance levels were used; otherwise, we interpreted the *F*-test with uncorrected degrees of freedom. Where distributions were non-normal, Friedman's ANOVA was used; the Wilcoxon signed-rank test (corrected for number of tests) was used for *post hoc* comparison testing. Non-parametric results are reported where they differ from parametric results. The Cochran's Q test, a non-parametric test that analyzes binary outcomes over 2 or more time points (SPSS Inc., Chicago, IL), was used for analyzing changes in urine toxicology data among the 3 time points.

Simple regression was used to assess whether the following variables individually predicted the change in mean dollars of cocaine used from baseline to 1-month follow-up: total years of cocaine use at baseline and SCID diagnosis of cocaine dependence at baseline. To maintain an adequate sample size for the regression analyses, the continuous dependent measure selected was the change from baseline to 1-month follow-up. Logistic regression was used to assess whether the same variables predicted the presence/absence of cocaine on urine toxicology testing at 1-month follow-up.

Given that more than 20% of data were missing for some variables, the sample sizes for each study were small, and analyses were not based on one trial, standard parametric and non-parametric approaches were more appropriate than mixed models for conducting these analyses (Hamer and Simpson, 2009). In addition, though the studies included in this analysis were not clinical trials, we conducted a separate analysis with missing urine toxicology results being coded as positive for cocaine and report the results below, a common imputation strategy used to deal with missing data in clinical trials (Streiner, 2002).

3. Results

3.1 Baseline Features and Substance Use

Table 1 presents baseline demographics and SCID diagnoses. Table 2 presents substance use at baseline, 1-month and 3-month follow-up. Table 3 presents urine toxicology results at baseline, 1-month and 3-month follow-up.

Based on the 39 individuals for whom there were data at all three time points, Figure 1 (top panel) shows that there was a significant effect of time on mean dollars of cocaine used/week [baseline (\$374.04/week, S.D. \$350.09), 1-month (\$165.13/week, S.D. \$165.56), 3-month (\$118.59/week, S.D. \$110.48), $F(1.21, 46.01) = 18.02, p < 0.001, \eta_p^2 = 0.32$]. Pairwise contrasts revealed a significant decrease in mean cocaine use between both baseline and 1-month follow-up [$F(1, 38) = 15.50, p < 0.001, \eta_p^2 = 0.29$] and 1-month and 3-month follow-up [$F(1, 38) = 5.45, p = 0.025, \eta_p^2 = 0.13$].

In contrast, there was no significant change in the number of alcoholic drinks used/day [$F(1.04, 12.47) = 0.28, p = 0.62$], dollars of marijuana used/week [$F(2, 8) = 0.57, p = 0.59$], and number of tobacco cigarettes smoked/day [$F(1.41, 42.3) = 0.43, p = 0.58$] over the 3 time points.

3.2 Urine Toxicology

Figure 1 (bottom panel) shows that there was a significant decrease in the number of cocaine-positive urines over the 3 time points [baseline cocaine-positive $n = 45$, 1-month cocaine-positive $n = 30$, 3-month cocaine-positive $n = 27$, $Q(2) = 22.32, p < 0.001$] (Figure 1, bottom panel). However, all enrolled participants were required to be cocaine-positive at baseline.

In a separate analysis, missing urine toxicology results were coded as positive for cocaine at the 1-month and 3-month visits, and the significant decrease in the number of cocaine-positive urines over the 3 time points remained [baseline cocaine-positive $n = 94$, 1-month cocaine-positive $n = 72$, 3-month cocaine-positive $n = 75$, $Q(2) = 25.88, p < 0.001$].

3.3 Predictors of Change in Cocaine Use and Urine toxicology at 1-month Follow-up

Neither total years of cocaine use ($B = 16.01$, S.E. = 8.22, $\beta = 0.26, p = 0.057, R^2 = 0.066$), nor a SCID diagnosis of cocaine dependence at baseline ($B = 22.99$, S.E. = 104.57, $\beta = 0.03, p = 0.83, R^2 = 0.01$) significantly predicted the change in mean dollars of cocaine used from baseline to 1-month follow-up. Consistent with self-report data, neither total years of cocaine use ($B = 0.03$, S.E. = 0.04, $p = 0.50$, odds ratio 1.03 [C.I. 0.94 to 1.12], Nagelkerke's $R^2 = 0.09$, model $\chi^2(1) = 0.46, p = 0.50$), nor a SCID diagnosis of cocaine dependence at baseline ($B = 0.57$, S.E. = 0.61, $p = 0.35$, odds ratio 1.76 [C.I. 0.54 to 5.78], Nagelkerke's $R^2 = 0.02$, model $\chi^2(1) = 0.91, p = 0.34$) significantly predicted the presence/absence of cocaine in urine toxicology tests at 1-month follow-up.

4. Discussion

We found that compared to pre-study baseline, non-treatment-seeking cocaine users decreased their self-reported cocaine use at 1-month and 3-month follow-up after participation in a smoked cocaine self-administration laboratory study. This decrease was not accompanied by a compensatory increase in alcohol, marijuana or nicotine use.

There are a range of possible explanations for the robust decrease in self-reported cocaine use observed during follow-up for these studies. For instance, due to the extensive medical and psychiatric workup that all participants received during screening, the screening process may have raised their awareness of the effects of cocaine use on their health and functioning. This awareness may, in turn, have played a role in their subsequent reduced cocaine use.

It is also possible that participants may have over-reported substance use at study entry in order to be eligible for participation, and that the follow-up self-report data may represent reversion to a more accurate description of substance use. However, this scenario is unlikely, given that considerable effort goes into ensuring that participants in our cocaine laboratory studies (and the broader screening pool) remain unaware of each study's eligibility criteria. Candidates are seen over several screening visits to assess suitability for participation, with a variety of clinicians and interviewers assessing drug use at entry and questioning any discrepancies between reports. Moreover, all participants must provide at least one cocaine-positive urine toxicology test during the screening process to confirm that they are cocaine users, and they are unaware of this requirement, further limiting the likelihood of initial misrepresentation of drug use to obtain entry into our studies.

An additional possibility is that perhaps participants reduced cocaine use as a matter of expectation. Participants knew they had follow-up visits, and they may have reduced use as a way of showing research staff that they were doing well since their last visit. However, unlike substance abuse clinical trials, participants enrolled in these laboratory studies are non-treatment-seekers; so, there is little motivation to reduce cocaine use and prove to the research staff that they are doing well. All are treated in a non-judgmental manner regardless of their level of use.

Another explanation is that crack cocaine costs may have decreased over time in New York City, resulting in the observed reduction in money spent on cocaine. However, the street costs of crack cocaine based on the National Institute on Drug Abuse's Community Epidemiology Work Group (CEWG) between 2003 and 2009 (the most recent data available) show that crack cocaine costs in New York City have remained stable. According to the December 2003 report (CEWG, 2003), the price of a crack rock was \$7–\$10, and according to the June 2009 report (CEWG, 2009), the price of a crack rock was \$5–\$15. These publications agree with what our participants told us about the cost of crack cocaine in New York City over this time frame and confirm that prices were stable across the study duration.

These current findings have several important strengths which add to the literature on this topic. First, we simultaneously analyzed the most common substances used by our sample, rather than just cocaine, as we wanted to explore whether decreased use of one substance may be compensated for by increased use of another. We found no evidence of a compensatory increase in other substance use, similar to other studies (Fairbank et al., 1993; Patkar et al., 2006). Second, as all participants underwent a structured clinical interview (i.e., the SCID) during screening, we were able to explore whether a clinical diagnosis of cocaine dependence predicted any of the outcomes. Third, we were able to combine data from several studies to obtain an adequate sample size, which allowed us to compare differences between study completers and study non-completers and to undertake exploratory analyses of predictors of change in cocaine use at post-study follow-up. Fourth, as urine toxicology is an important component for verifying cocaine use (Ehrman et al., 1997), having access to urine toxicology results at all time points allowed for analyses to include this objective measure. Finally, we conducted an additional analysis of the urine toxicology results using an imputation strategy commonly used to deal with missing data in clinical trials that assumed all missing samples were cocaine-positive, and still found that cocaine use decreased over time. Though all participants were required to be cocaine-positive at baseline, this imputation strategy strengthens our finding of a decrease in cocaine use after study participation, rather than suggesting that the decrease is simply an artifact from those participants that were adherent to study procedures.

These analyses also have some limitations, many of which are common to other secondary analyses of studies designed for other purposes. The studies were not specifically designed to assess the aims of this paper, and the follow-up data were based only on self-report and urine toxicology rather than also including clinician-assessed drug use measures as obtained at baseline. There was no control condition (i.e., assessment of cocaine users who did not participate in a cocaine self-administration laboratory study). Thus, it is not possible to conclude that the decrease in cocaine use was necessarily due to study participation rather than time; however, it can at least be concluded that study participation did not *increase* cocaine use or other drug use.

In addition, we did not explore whether non-substance addictions were present, such as addiction to gambling, exercise or sex, and whether these addictions may have increased at follow-up ["substitute addiction" (Sussman and Black, 2008)]. Knowledge of such

addictions can shed light on the full clinical picture of participants after study participation, but such a comprehensive assessment was not feasible in these studies. We also used the metric with which participants were most comfortable reporting cocaine and marijuana use: self-reported dollar values on the self-report forms. Future analyses could incorporate quantity in grams for cocaine or blunts for marijuana in order to more clearly assess the extent of drug use. Finally, as we do not have data on other variables such as days of cocaine used in the past month, we were unable to conduct analyses comparing groups of participants as a function of baseline cocaine use other than years of use or SCID diagnosis. While the baseline cocaine use variables assessed did not predict changes in use over time, it is possible that other aspects of baseline cocaine use may have been more important in predicting use at follow up.

5. Conclusion

These analyses indicate that participation in laboratory studies involving self-administration of smoked cocaine does not increase, and may be associated with reductions in cocaine use among non-treatment-seeking cocaine users, as compared to pre-study baseline. Cocaine use decreased at 1- and 3-month follow-up after participation, regardless of whether participants completed the study in which they enrolled. Moreover, this decrease was not accompanied by a compensatory increase in use of alcohol, marijuana or nicotine. Laboratory studies in which drugs of abuse are self- or experimenter-administered to non-treatment-seeking research volunteers remain a relatively safe and important paradigm for providing valuable drug interaction data about new pharmacotherapies for substance use disorders and valuable behavioral and performance data for understanding the neurobiology of drug abuse.

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Figure 1.

Cocaine Use at Baseline, 1-month and 3-month Follow-up.

Figure 1 – top panel.

Self-reported dollars of cocaine used/week.

Data are means; error bars represent S.E.Ms.

* $p < 0.001$ from baseline. These self-report data differ from those presented in Table 2, which included all data available at each time point. Data presented in this figure are only those participants who completed all 3 time points (baseline, 1-month and 3-month follow-up, $n = 39$).

Figure 1 – bottom panel.

Percentage of cocaine-positive urine toxicology results.

* $p < 0.001$ from baseline. These urine toxicology data differ from those presented in Table 3, which included all data available at each time point. Data presented in this figure are only those participants who completed all 3 time points (baseline, 1-month and 3-month follow-up, $n = 45$). All participants were required to be cocaine-positive at baseline.

Table 1Baseline Demographics & SCID^a Diagnoses.

		Non-Completers (<i>n</i> = 45)	Completers (<i>n</i> = 53)	Independent <i>t</i> -test or χ^2 and significance between groups
Age (mean years, SD ^b)		41.36 (3.69)	40.11 (4.53)	<i>t</i> (95.85) = 1.50, <i>p</i> = 0.14
Education (mean years, SD)		12.40 (1.47)	12.74 (1.53)	<i>t</i> (96) = 1.10, <i>p</i> = 0.27
		Frequency		
Sex	Male	40	40	χ^2 (1) = 2.92, <i>p</i> = 0.09
	Female	5	13	
Race	AA ^c	42	43	χ^2 (1) = 3.15, <i>p</i> = 0.08
	Non-AA	3	10	
Work Status ^d	Unemployed	37	44	χ^2 (1) = 0.48, <i>p</i> = 0.49
	Employed	5	9	
Marital Status ^d	Single/never married	32	43	χ^2 (1) = 0.34, <i>p</i> = 0.56
	All other	10	10	
Current SCID Diagnoses ^e	Cocaine dependence	30	37	χ^2 (1) = 0.07, <i>p</i> = 0.79
Lifetime SCID Diagnoses ^e	Cocaine dependence	25	30	χ^2 (1) = 0.13, <i>p</i> = 0.72
	Cocaine abuse	3	4	χ^2 (1) = 0.004, <i>p</i> = 0.95
	Alcohol dependence	8	12	χ^2 (1) = 0.16, <i>p</i> = 0.69
	Alcohol abuse	11	10	χ^2 (1) = 0.79, <i>p</i> = 0.38
	Cannabis dependence	6	7	χ^2 (1) = 0.03, <i>p</i> = 0.86
	Cannabis abuse	10	8	χ^2 (1) = 1.23, <i>p</i> = 0.27
	Opioid dependence	1	3	χ^2 (1) = 0.61, <i>p</i> = 0.44

^a SCID = Structured Clinical Interview for DSM-IV-TR Axis I Disorders.^b SD = Standard Deviation.^c AA = African-American.^d *n* = 42 for non-completers due to 3 missing data points.^e *n* = 40 for non-completers due to 5 missing data points & *n* = 51 for completers due to 2 missing data points.

Table 2

Substance Use – Baseline, 1-month & 3-month Follow-up.

			Overall	Non-Completers	Completers	Independent <i>t</i> -test or χ^2 and significance between groups
Baseline Features of Cocaine Use	1 st route of cocaine use ^a	Intranasal	64	28	36	$\chi^2(2) = 3.67, p = 0.16$
		Smoking	14	4	10	
		Intranasal & Smoking simultaneous	14	9	5	
	Number of years intranasal route used until switched to smoking route ^b		3.75 (4.71) <i>n</i> = 92	4.41 (5.60) <i>n</i> = 41	3.22 (3.83) <i>n</i> = 51	<i>t</i> (90) = 1.21, <i>p</i> = 0.23
	Total years of cocaine use ^b		20.81 (5.71) <i>n</i> = 95	22.40 (5.14) <i>n</i> = 42	19.55 (5.87) <i>n</i> = 53	<i>t</i> (93) = 2.49, <i>p</i> = 0.02
Cocaine \$ used/week	Baseline ^b		376.10 (307.88) <i>n</i> = 89	360.98 (278.75) <i>n</i> = 41	389.01 (333.14) <i>n</i> = 48	<i>t</i> (87) = 0.43, <i>p</i> = 0.67
	1-month follow-up ^b		214.58 (240.30) <i>n</i> = 59	222.86 (342.26) <i>n</i> = 21	210.00 (164.74) <i>n</i> = 38	<i>t</i> (57) = 0.20, <i>p</i> = 0.85
	3-month follow-up ^b		134.08 (123.94) <i>n</i> = 49	129.38 (148.29) <i>n</i> = 16	136.36 (112.78) <i>n</i> = 33	<i>t</i> (47) = 0.18, <i>p</i> = 0.86
Alcohol # of drinks ^c used/day	Baseline ^b		3.44 (2.65) <i>n</i> = 57	3.75 (2.92) <i>n</i> = 27	3.17 (2.40) <i>n</i> = 30	<i>t</i> (55) = 0.82, <i>p</i> = 0.42
	1-month follow-up ^b		3.27 (2.91) <i>n</i> = 37	3.43 (3.95) <i>n</i> = 12	3.19 (2.36) <i>n</i> = 25	<i>t</i> (35) = 0.23, <i>p</i> = 0.82
	3-month follow-up ^b		3.76 (5.86) <i>n</i> = 25	6.57 (9.95) <i>n</i> = 8	2.44 (1.54) <i>n</i> = 17	<i>t</i> (7.16) = 1.17, <i>p</i> = 0.28
Marijuana \$ used/week	Baseline ^b		35.03 (32.94) <i>n</i> = 32	39.33 (31.05) <i>n</i> = 15	31.24 (35.01) <i>n</i> = 17	<i>t</i> (30) = 0.69, <i>p</i> = 0.50
	1-month follow-up ^b		24.41 (16.38) <i>n</i> = 17	25.83 (17.44) <i>n</i> = 6	23.64 (24.41) <i>n</i> = 11	<i>t</i> (15) = 0.26, <i>p</i> = 0.80
	3-month follow-up ^b		29.09 (21.07) <i>n</i> = 11	33.75 (30.38) <i>n</i> = 4	26.43 (16.00) <i>n</i> = 7	<i>t</i> (3.98) = 0.45, <i>p</i> = 0.68
Tobacco # of cigarettes used/day	Baseline ^b		11.08 (7.50) <i>n</i> = 77	9.69 (6.09) <i>n</i> = 35	12.23 (8.39) <i>n</i> = 42	<i>t</i> (75) = 1.50, <i>p</i> = 0.14
	1-month follow-up ^b		10.11 (6.94) <i>n</i> = 56	9.11 (8.56) <i>n</i> = 19	10.62 (6.01) <i>n</i> = 37	<i>t</i> (54) = 0.77, <i>p</i> = 0.44
	3-month follow-up ^b		9.00 (6.78) <i>n</i> = 43	6.64 (2.82) <i>n</i> = 14	10.14 (7.82) <i>n</i> = 29	<i>t</i> (39.01) = 2.14, <i>p</i> = 0.04 ^d

^a Frequencies are reported. *n* = 92 for overall, *n* = 41 for non-completers & *n* = 51 for completers. *n*'s represent available data.

^b Raw mean, standard deviation, and *n* are reported. *n*'s represent available data.

^c One alcoholic drink = One standard drink

^d Mann-Whitney *U* = 229.50, *z* = 0.70, *p* = 0.49.

Table 3

Urine Toxicology Results at Baseline, 1-month & 3-month Follow-up*.

		Total	Non-Completers	Completers	χ^2 or Fisher's exact test and significance between groups
Cocaine+	Baseline ^a	94 (100%)	41 (100%)	53 (100%)	Not applicable
	1-month Follow-up ^b	43 (65.2%)	16 (72.7%)	27 (61.4%)	$\chi^2(1) = 0.83, p = 0.36$
	3-month Follow-up ^c	33 (63.5%)	13 (72.2%)	20 (58.8%)	$\chi^2(1) = 0.91, p = 0.34$
Marijuana+	Baseline ^a	16 (17%)	8 (19.5%)	8 (15.1%)	$\chi^2(1) = 0.32, p = 0.57$
	1-month Follow-up ^b	15 (22.7%)	8 (36.4%)	7 (15.9%)	$\chi^2(1) = 3.49, p = 0.06$
	3-month Follow-up ^c	10 (19.2%)	4 (22.2%)	6 (17.6%)	$p = 0.72$, Fisher's exact test, two-tailed

* Frequencies are reported. *n*'s represent available data. No participants were amphetamine-positive. One completer was opiate-positive at baseline. Two completers were methamphetamine-positive at baseline, one non-completer was methamphetamine-positive at 1-month follow-up, and one completer was methamphetamine-positive at 3-month follow-up.

^a *n* = 94 for overall, *n* = 41 for non-completers & *n* = 53 for completers. All participants were required to have a baseline cocaine -positive urine toxicology.

^b *n* = 66 for overall, *n* = 22 for non-completers & *n* = 44 for completers.

^c *n* = 52 for overall, *n* = 18 for non-completers & *n* = 34 for completers.