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## The Association Between Impulsivity and Alcohol/Drug Use Among Prison Inmates

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### Abstract

**Background**—Few studies have examined the relation between impulsivity and drug involvement with prison inmates, in spite of their heavy drug use. Among this small body of work, most studies look at clinically relevant drug dependence, rather than drug use specifically.

**Method**— $N=242$  adult inmates (34.8% female, 52% White) with an average age of 35.58( $SD=9.19$ ) completed a modified version of the 15-item Barratt Impulsivity Scale (BIS) and measures assessing lifetime alcohol, opiates, benzodiazepines, cocaine, cannabis, hallucinogens, and polysubstance use. Lifetime users also reported the frequency of use for the 30 days prior to incarceration.

**Results**—Impulsivity was higher among lifetime users (versus never users) of all substances other than cannabis. Thirty day drug use frequency was only related to impulsivity for opiates and alcohol.

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#### Author Disclosures

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**Discussion**—This study extends prior work, by showing that a lifetime history of nonclinical substance use is positively associated with impulsivity among prison inmates. Implications for drug interventions are considered for this population, which is characterized by high rates of substance use and elevated impulsivity.

### Keywords

impulsivity; alcohol; drugs; prison; inmates; substance use

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## 1. Introduction

Prison inmates are especially vulnerable to substance use and misuse. Over half (56%) of state prison inmates have used at least one illicit substance in the month before their offense (Mumola & Karberg, 2006) whereas less than 25% of the general adult population reports past month illicit drug use (Johnston et al., 2013). Moreover, 32% of inmates were under the influence of drugs when committing their crime (Mumola & Karberg, 2006).

Since 1980, the number of U.S. inmates has risen drastically (Harrison & Beck, 2003), and there are currently more than 2.2 million adults held in federal prisons, state prisons, or local jails (Glaze & Herberman, 2013). The late 20<sup>th</sup> century increase is partly due to more punitive sentences for drug-related crimes and high rates of substance use disorders (SUD) (Belenko & Peugh, 1998; Blumstien & Beck, 1999), which is estimated at around 50% among prison inmates (Mumola & Karberg, 2006).

### 1.1 Impulsivity and Substance Use

The relation between personality and substance use disorders is well established (e.g., Caspi et al., 1997; Sher, Trull, Bartholow, & Veith, 1999). Of note, impulsivity, a personality construct indicative of sensation seeking, perseverance, lack of premeditation, and urgency (Whiteside & Lyman, 2001), is related to alcohol and drug abuse (Perry & Carroll, 2008). Impulsivity is a risk factor for drug experimentation and people who use drugs are typically more impulsive than those who do not (de Wit, 2009). Similarly, impulsivity is positively associated with alcohol and illicit drug use frequency (Hanson, Luciana, & Sullwood, 2008), while the related trait of novelty-seeking is prospectively associated with an increased likelihood of developing an SUD (Sher, Bartholow, & Wood, 2000).

A small body of research has examined the relation between impulsivity and substance use/dependence among an incarcerated population. In two studies, impulsivity was related to a global assessment of drug use severity among male (Ireland & Higgins, 2013) and female (Mooney et al., 2008) adult inmates. Although these studies are informative, both used the Drug Abuse Screening Test, which only assesses general drug dependence, rather than asking about specific substances (i.e. “Have you ever felt bad or guilty about your drug abuse” versus “Have you ever felt bad or guilty about your alcohol abuse”). However, in a recent study, Hopley and Brunelle (2012) examined the relation between drug use and impulsivity with greater specificity by assessing alcohol, cannabis, opioid, stimulant, and hallucinogen dependence separately. For each of these substances, inmates with probable dependence scored higher on impulsivity than those without probable dependence. Among

adolescents mandated to substance abuse treatment, those in the top 50 percentile of impulsivity, measured with the Millon Adolescent Clinical Inventory (MACI) Impulsivity Scale, reported more past 3-month alcohol and marijuana use relative to those who scored on the bottom half of impulsivity (Devieux et al., 2002). Although not statistically significant, cocaine was also more prevalent in the high impulsive group.

Impulsivity has been identified as a risk factor for substance use/abuse generally, but it has rarely been examined among incarcerated adults despite their high rates of substance use, and the need for tailored interventions to keep prisoners from relapsing upon their release. The few studies that have examined the impulsivity – substance use/abuse relation among this population often use general assessments of drug dependence (or probable dependence) among male- or female- only inmates (e.g. Hopley & Brunelle, 2012; Ireland & Higgins, 2013; Mooney et al., 2008). Only one of these studies (Devieux et al., 2002) has looked at substance use frequency (as opposed to dependence symptoms), but did so with a narrow range of substances (alcohol, marijuana and cocaine) among adolescents only. Although many prisoners do meet criteria for substance abuse or dependence, others have a history of drug involvement below those thresholds (Mumola & Karberg, 2006). There is currently a gap in the literature addressing this broader population, which the current study sought to fill. Accordingly, the present study was designed to examine the relation between impulsivity and the use of several substances in a mixed-gender sample of adult inmates. We hypothesized that impulsivity would be higher among participants with a lifetime history of drug use. We also expected a positive relation between impulsivity and the frequency of substance use.

## 2. Method

### 2.1. Participants and Procedures

This study is a secondary data analysis using baseline data from a randomized controlled trial (RCT) that has been reported elsewhere (Clarke et al., 2011; Clarke et al., 2013). In brief, the RCT examined the effectiveness of a six-session smoking cessation intervention using cognitive-behavioral therapy enhanced with motivational interviewing in comparison to a general wellness video control condition. The study was conducted in a large tobacco-free state correctional facility located in the northeastern U.S. All study procedures were approved by a variety of relevant IRBs.

Both men and women inmates who were interested in participating were screened for eligibility and met inclusion criteria if they were: 18 years of age or older, smoked at least ten cigarettes per day prior to incarceration, able to speak English, and scheduled to be released within eight weeks of study enrollment. In total, 84% of participants who were screened met eligibility criteria and participated in the study at baseline. After providing informed consent, participants completed a baseline assessment via Audio Computer-Assisted Self-Interview. Although 247 participants completed this study, the sample used here is comprised of  $N=242$  inmates due to missing data for five participants. See Table 1 for a description of the sample.

## 2.2. Measures

The independent variable of interest for all analyses was impulsivity, which was assessed with a modified version of the BIS15 (Spinella, 2007) from the 30 item Barratt Impulsiveness Scale (BIS-11; Patton, Stanford, & Barratt, 1995). It is a valid measure of impulsivity, constructed by taking items with the highest loadings from the BIS-11 (Spinella). Due to experimental error, however, one item “I am restless at lectures or talk” was not administered to participants, so the measure used here is comprised of the remaining 14 items. All items were on a 4-point Likert scale, with potential scores ranging from 1 to 4. We observed a co-efficient alpha of .779.

Substance use was assessed with a modified version of the Addiction Severity Index (ASI; McLellan, Luborsky, O’Brien, & Woody, 1980). Participants were asked to indicate if they had ever used a particular substance (*yes/no*), and if so, how many days they used that substance in the 30 days prior to incarceration. Specific substances included: alcohol, heroin, methadone, other opiates/pain killers, barbiturates, sedatives or benzodiazepines, cocaine, amphetamines, cannabis, hallucinogens, inhalants, and more than one substance per day (including alcohol). For alcohol, participants were also asked “How many drinks do you have on a day when you are drinking?” For other opiates/pain killers, barbiturates, and sedatives or benzodiazepines, participants were only asked to report their use that was “non-prescribed, or taken not as prescribed.”

An alcohol quantity/frequency variable was created by multiplying the number of days alcohol was used in the past 30 by the average number of drinks per drinking day. We also created a composite opiate variable to include: heroin, methadone, and pain killers or other opiates. As such, lifetime opiate use entails anyone who used at least one of those substances, while opiate frequency entails the 30 day sum of heroin, methadone, and pain killers or other opiates.

Prior to conducting analyses, frequencies were run to determine the number of participants who had endorsed ever using each substance. Due to potential floor effects, we excluded substances from all analyses when less than 20% of participants reported lifetime use, which was the case for barbiturates (10.5%), amphetamines (16.0%), and inhalants (11.3%). We also excluded alcohol from analyses comparing lifetime users to never users due to a ceiling effect (94% reported lifetime use).

## 2.3. Analytic Plan

To determine the relation between impulsivity and drug use, we ran a series of regression models. Logistic Regression (LR) was used to compare impulsivity between ever- and never- substance users. We examined the relation between substance use frequency (or quantity/frequency in the case of alcohol) and impulsivity among participants who reported ever having used the substance. For normally distributed variables, we used ordinary least squared regression (OLS). Alcohol quantity/frequency and hallucinogen frequency, however, were highly zero-inflated, and thus unsuitable for OLS (skewness>|2|, kurtosis>|4|). As such, we used Poisson regression to determine the relation between these variables and impulsivity.

For logistic and OLS regression, all analyses were conducted in two steps with gender and age entered as covariates on step 1, and impulsivity entered on step 2. These covariates were selected because they were related to drug use (outcome), but unrelated to impulsivity (independent variable of interest). In LR analyses, a binary outcome of ever having used a drug was entered as the dependent variable (DV). In OLS analyses, the outcome was frequency of use during the 30 days prior to incarceration. Poisson regression analyses were conducted by simultaneously including age, gender, and impulsivity into one model.

### 3. Results

Across the total sample, the mean impulsivity score was 2.50 ( $SD=2.46$ ). Impulsivity was higher among ever-users (versus never-users) for all drugs other than cannabis. However, for most of these substances, frequency of use during the 30 days prior to incarceration was unrelated to impulsivity. Notable exceptions include opiate frequency and alcohol quantity/frequency. See Table 2 for a full description of these results.

### 4. Discussion

The purpose of this study was to examine the relation between impulsivity and alcohol/drug use among prison inmates. We found that impulsivity was related to the likelihood of having used all substances other than marijuana. With the exception of alcohol and opiates, however, it was unrelated to the frequency of substance use. This study expands upon previous work showing the relation between substance use and drug dependence in an incarcerated population (Hopley & Brunelle, 2012; Ireland & Higgins, 2013; Mooney et al., 2008) by looking at the relation between impulsivity and non-clinical use of a variety of substances. Although Devieux and colleagues (2002) examined this association among incarcerated adolescent, results were restricted to alcohol, marijuana, and cocaine. The current study, by contrast, included a variety of illicit drugs among adult inmates. Of note, Devieux et al found that marijuana and impulsivity were related, while no association was observed here.

#### 4.1. Limitations and Future Directions

Due to the cross-sectional design, we are unable to examine directionality. Although this study conceptualized impulsivity as a risk factor for drug use, it is possible that drug use caused impulsivity, as has been found in other research (see de Wit, 2009 for a review). However, studies looking at drug use as an antecedent of impulsivity typically analyze the acute effect of drug administration on immediate impulsive behavior. Since participants in this study were imprisoned, they were presumably not experiencing acute drug effects at the time of answering survey items assessing impulsivity. As such, it seems unlikely that the directionality would go in the opposite direction as hypothesized.

While the timing of measures minimizes concern about the directionality of effect, it raises concern about the accuracy of reporting. Participants were asked to reflect upon drug use for the 30-day period prior to incarceration, which was an average of 1.2 years ago. This time lag could result in bias reporting due to memory lapses. Finally, these data were only

collected in one New England correctional facility, so the extent to which the results generalize to a broader inmate population is unclear.

Relative to the general population, inmates are at an elevated risk of substance use (Mumola & Karberg, 2006) and are more impulsive (Patton et al., 1995). Since our study, as well as other work (Hopley & Burnelle, 2012; Ireland & Higgins, 2013; Mooney et al., 2008), suggests impulsivity and drug involvement are positively related in this population, future research could consider tailoring prison interventions to reduce both impulsivity and substance use. Doing so might improve post-release outcomes, since most fatalities among inmates soon after re-entry are drug related (Merrall et al., 2010), and inmates who report substance use after release face greater unemployment (Visher, Debus, & Yahner, 2008).

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Michael Bernstein wrote the results section and ran all analyses. He also made substantial contributions to the introduction and discussion sections. Savannah McSheffrey helped draft the introduction. Jacob van den Berg was the primary author for the method section. Jamie Vela helped draft the discussion. Jacob van den Berg, LAR Stein, Mary Roberts, Rosemarie Martin, and Jennifer Clarke read through all parts of the manuscript and provided significant guidance for later drafts of the paper. Additionally, Mary Roberts, LAR Stein, Jennifer Clarke, and Rosemarie Martin helped with data analysis and interpretation. LAR Stein, Mary Roberts, Rosemarie Martin, and Jennifer Clarke (Principle Investigator) were also involved in the NIDA grant which funded data collection. All authors have approved the final manuscript draft.

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### Highlights

- Examine association between impulsivity and substance use
- Use large, mixed-gender inmate sample
- Analyze non-clinical drug use

**Table 1**

## Study Characteristics

Demographic	Percent of Sample
<i>Age (M=35.58, SD=9.19)</i>	
19–28	26.9
29–38	35.1
39–48	28.3
49+	9.1
<i>Gender</i>	
Male	65.2
Female	34.8
<i>Race/Ethnicity</i>	
Non-Hispanic White	52.0
Hispanic White	8.2
Non-Hispanic Black	17.6
Hispanic Black	3.7
Hispanic Other	8.2
Native American/Alaskan Native	4.9
Asian or Pacific Islander	0.8
Bi-racial or multi-racial	1.6
Other	2.9
<i>Highest level of Education Completed</i>	
Did not complete High School	64.6
Completed 12 <sup>th</sup> grade	20.2
Completed 1 year of college	8.2
<i>Time Incarcerated<sup>a</sup> (M=1.20, SD=1.58 years)</i>	
Less than 6 months	42.7
6–12 months	26.2
13–24 months	14.7
25+ months	16.4

<sup>a</sup> Participants were asked: “How long has it been since you smoked daily?” We used these responses as a proxy for time incarcerated, since all participants were daily smokers prior to incarceration, but unable to smoke in the Rhode Island correctional facility.

**Table 2**  
 Logistic, Ordinary Least Squares (OLS), and Poisson Regressions relating drug use to BIS15 scores.

Drug	% Ever User	Logistic Regression			OLS regression			Poisson Regression				
		B	SE B	OR (95% CI)	B	SE B	B	R <sup>2</sup>	B	SE B	Wald $\chi^2$ (df=1)	QIC
Alcohol <sup>a</sup>									0.46	0.20	5.05*	656
Opiates	60.9	0.91**	0.32	2.49 [1.33, 4.65]	7.89*	3.24	0.20	.040				
Benzodiazepines	42.3	0.63*	0.30	1.87 [1.03, 3.38]	-0.22	2.42	-0.01	<.001				
Cocaine	70.8	1.24**	0.38	3.46 [1.66, 7.22]	1.83	2.24	0.06	.004				
Cannabis	85.1	0.35	0.45	1.42 [0.59, 3.43]	-2.94	2.08	-0.1	.010				
Hallucinogens	47.5	0.54 <sup>+</sup>	0.30	1.71 [0.94, 3.10]					0.52	0.63	0.67	-116
>1 sub. per day	80.1	1.33**	0.41	3.78 [1.69, 8.44]	-1.81	1.88	-0.07	.005				

<sup>+</sup>  $p < .10$ , two-tailed  
 \*  $p < .05$ , two-tailed  
 \*\*  $p < .01$  two-tailed

Note: A separate logistic regression was conducted for each drug (other than alcohol due to a ceiling effect), with gender and age entered as covariates (step 1), and impulsivity entered as step 2. As such, ORs reflect the increased likelihood of being an ever-user for a one-unit increase in BIS15 scores. Variables with a normal drug use frequency distribution were analyzed with a hierarchical OLS regression, by entering gender and age in step 1, and BIS15 in step 2. For these models, change in R<sup>2</sup> reflects the difference between step 1 and step 2, which corresponds to the additional contribution of BIS15 scores in predicting frequency of drug use. Variables with a non-normal drug use frequency distribution were analyzed with a Poisson regression, by simultaneously entering gender, age and BIS15. For each of the Poisson regressions, a separate model was also computed with gender and age only to derive the change in QIC score. Change scores are calculated as QIC in covariate model (age and gender only) minus QIC in full model (age, gender, and BIS15). All results shown above reflect BIS15 scores.

QIC=Quasi-likelihood criterion. OR=Odds Ratio. LR=Logistic Regression. OLS=Ordinary Least Squares. BIS15= The fifteen item version of the Barratt Impulsivity Scale

<sup>a</sup> Alcohol is computed as a quantity/frequency score, rather than quantity only.