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Factors Associated with Marijuana Use among Treatment-Seeking Adult Cigarette Smokers in the Criminal Justice Population

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Abstract

Objectives: Due to the elevated rates of cigarette use and marijuana use within the criminal justice system, it is critical to develop a stronger understanding of tobacco and marijuana co-use among this population to inform future interventions.

Methods: This study is a secondary analysis of baseline data from a smoking cessation randomized clinical trial of adults ($N = 500$) in a community correction program. Participants were classified as using cigarettes only or both cigarettes and marijuana through either self-report or positive urine drug screening. Demographics and measures regarding legal, drug use, smoking, mental health, and interpersonal histories were assessed. Logistic regression analyses were conducted to assess factors associated with co-use.

Results: Among adults who smoked cigarettes, 25% reported current marijuana use. Individuals who used both cigarettes and marijuana were more likely than those who only used cigarettes to be African American (80%), male (73.6%), and younger ($M = 32.4$ [$SD = 11.0$]). Increasing difficulties with last quit attempt was associated with a reduction in the likelihood of co-use ($OR = 0.75$, 95% $CI = 0.60–0.94$, $p < .05$) and benzodiazepine ($OR = 9.09$, 95% $CI = 1.25–65.94$, $p < .05$) and opioid ($OR = 8.17$, 95% $CI = 2.03–32.93$, $p < .01$) use was significantly associated with an increased likelihood of co-use.

Conclusions: This study identified several factors that are associated with an increased risk of cigarette and marijuana co-use among a community correction population. These findings will be valuable for informing targeted prevention and treatment interventions.

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Keywords

marijuana; cigarettes; criminal justice; adults

INTRODUCTION

Although cigarette smoking has significantly declined in the general population, it has remained disproportionately high among adults in the criminal justice system (i.e., pretrial and diversion settings, jails and detention centers, prisons and community supervision settings; Schroeder, 2016). Between 70–80% of individuals in the criminal justice system report a history of smoking cigarettes (Cropsey et al., 2008; Cropsey et al., 2010). Among a sample of formerly incarcerated men, individuals who smoked cigarettes reported smoking up to 40 cigarettes per day (cpd), with an average of 10.4 cpd (Valera et al., 2014). The high rates of cigarette use in this population are concerning, as cigarette smoking continues to be the leading cause of preventable disease and death in the United States (Hu et al., 2016). The high prevalence of smoking and the adverse health effects of cigarette use highlight a clear need for more studies that inform smoking cessation within the criminal justice system.

Although under-documented, another important need is treatment for the dual use of cigarettes and marijuana in community corrections. Approximately 50% of admissions to publicly-funded treatment for marijuana use are referred by the criminal justice system (Substance Abuse and Mental Health Services Administration, 2015). Heavy marijuana use has been linked to several adverse health outcomes, such as poor impulse control, memory impairment and an increased risk of legal troubles (Green et al., 2010; Volkow et al., 2014). Moreover, past-year marijuana use was positively associated with daily cigarette smoking among juvenile justice adolescents in a correctional center (Cropsey et al., 2008). Given the high rates of cigarette use and marijuana use in the criminal justice system, it is important to gain a stronger understanding of justice-involved individuals who use cigarettes and marijuana to inform future interventions.

In the general population, approximately 58% of individuals who reported lifetime cigarette smoking also reported ever using cannabis, and 90% of individuals who reported lifetime marijuana use also reported ever using tobacco (Agrawal et al., 2012). The clinical profile of individuals who co-use tobacco and marijuana differs from that of individuals who smoke tobacco or marijuana alone (Agrawal et al., 2012; Peters et al., 2012; Ramo et al., 2012; Schauer et al., 2017). For instance, the dual use of tobacco and marijuana is associated with a greater likelihood of CUD and psychosocial problems (i.e., psychiatric symptoms and social/interpersonal difficulties) relative to the sole use of marijuana (Peters et al., 2012). Studies have also demonstrated a higher rate of legal problems among individuals who smoke tobacco and marijuana relative to those who smoke marijuana only (Moore & Budney, 2001). No studies, to the authors' knowledge, have specifically focused on factors that are associated with cigarette and marijuana co-use among adults in the criminal corrections population.

The following study is the first to examine the dual use of cigarette and marijuana among treatment seeking criminal justice-involved adults. Previous studies have highlighted

treatment needs of individuals who smoke cigarettes (Eadie et al., 2012) and use marijuana (Carroll et al., 2006) in criminal justice settings, but none have focused on the prevalence of and factors associated with cigarette and marijuana co-use in this population. Based on previous studies (Agrawal et al., 2012; Peters et al., 2012; Ramo et al., 2012), we hypothesized that adults who use cigarette and marijuana would have a worse clinical profile (e.g., history of mental illness and other substance use) and may represent a population in need of more intensive services than individuals who smoke cigarettes only.

METHODS

Participants

Adults who were under criminal justice supervision in the community (i.e., probation, parole) were recruited for a 12-week clinical trial examining the effects of bupropion on smoking cessation via flyers at the community corrections office in Birmingham, Alabama. This study received approval by the University of Alabama at Birmingham and was registered with ClinicalTrials.gov (NCT01257490). In addition to prescreening and the baseline assessment, the trial consisted of weekly visits through week 4 and at weeks 8 and 12 (end of treatment). Long-term follow-up visits were also scheduled at months 6, 9 and 12. Participants could be compensated up to \$270 for completing the entire 1-year study. Participants were compensated \$20 for completing the baseline assessments, which is the focus of the current study. Additional details regarding the RCT are described elsewhere (Cropsey et al., 2015).

Of the 689 individuals screened for the study, 500 participants were eligible and randomized. Participants were excluded because they lost interest ($n = 45$), had medical ($n = 49$) or psychiatric ($n = 23$) contraindications or were no shows ($n = 72$). After the IRB-approved informed consent process, participants completed baseline assessments and were assessed for healthy physical functioning prior to receiving the study medication. Participants also received a physical exam within 1 week of consent to determine final study eligibility. Participants were included in the study if they (1) smoked at least five cigarettes per day, (2) had a urinary cotinine level ≥ 200 mg/mL, (3) were ≥ 19 years of age, (4) were currently under criminal justice supervision (e.g., drug court, probation), (5) did not anticipate being incarcerated over the next year, (6) lived in an environment that allowed smoking, (7) were ready to quit smoking, and (8) were willing to take bupropion and receive four sessions of behavioral counseling for smoking. Participants were excluded if they (1) had a history of bipolar disorder, seizure disorder or eating disorder, (2) had current suicidal ideation or a suicide attempt within the past 6 months, (3) were pregnant or nursing a child, (4) were non-English speaking, or (5) were cognitively impaired or medically unstable. This study is a secondary analysis of baseline data from adults who were deemed eligible for the trial.

Measures

Trained research staff conducted a baseline assessment which included informed consent, self-report measures of demographic and smoking history information, and semi-structured interviews on substance use, psychosocial factors and criminal history.

Demographic Information.—Participants were asked to report their race, age, gender and education level.

Smoking History.—Participants completed questionnaires that assessed age when first tried smoking, total number of years smoked, number of times attempted to quit, and menthol cigarette use. Additionally, participants rated the difficulties they experienced with their last quit attempt on a scale ranging from 1 (*very easy*) to 7 (*very difficult*).

Fagerstrom Test of Nicotine Dependence.—The Fagerstrom Test of Nicotine Dependence (FTND) is a six-item assessment tool for assessing the intensity of physical addiction to nicotine (Fagerstrom, 2012). Sample items include “How soon after you wake up do you smoke your first cigarette?” and “How many cigarettes per day do you smoke?” The responses differ for each item and are coded as 0 and 1 for some items and 0 to 3 on other items. Higher scores indicate a high level of dependence.

Questionnaire of Smoking Urges-Short Form.—The Questionnaire of Smoking Urges-Short Form (QSU-SF) is a ten-item measure of craving (Cox et al., 2001; Tiffany & Drobes, 1991). Sample items include “I crave a cigarette right now” and “I could control things better right now if I could smoke.” Participants were asked to indicate how strongly they agree or disagree with the statements on a Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate stronger urges.

Minnesota Withdrawal Scale.—The Minnesota Withdrawal Scale (MWS) is a nine-item measure of nicotine withdrawal symptoms (Shiffman et al., 2004). Each item is rated on a five-point scale ranging from 0 (not present) to 4 (severe). Higher scores indicate more severe withdrawal symptoms. Sample items include “irritability, frustration or anger” and “depressed or sad mood.”

Addiction Severity Index.—The Addiction Severity Index (ASI) is a structured interview that assesses psychosocial functioning across seven domains: General Information, Medical Status, Employment/Support Status, Drug/Alcohol Use, Legal Status, Family/Social Relationships and Psychiatric Status (McLellan et al., 2006). Data from items assessing interpersonal conflicts in the past 30 days among family and friends, history of substance use and mental illness and criminal offenses, including person, property, substance use, and court, were used in the current study. All responses were coded in a dichotomous fashion (yes/no). The responses to the individual ASI items were used in the analysis.

Center for Epidemiological Studies Depression Scale-Revised.—The Center for Epidemiological Studies Depression Scale-Revised (CESD) is a 20-item scale assessing depressive symptoms in the past week (Eaton et al., 2004). Sample items include “I was bothered by things that usually don’t bother me” and “I felt lonely.” The items range from 0 (rarely or none the time, less than 1 day) to 3 (most or all of the time, 5–7 days). Higher scores indicate the presence of more depressive symptomatology.

Urine Drug Screen.—Urine Drug Screens were collected and analyzed at baseline using the Olympus 640AU Chemistry Immuno Analyzer. Drugs of use that were analyzed

included alcohol (detecting ethyl glucuronide metabolites) as well as amphetamines, barbiturates, benzodiazepines, marijuana, cocaine, opioids, and methadone. The Emit® II Plus Opiate Assay was used to detect opioid metabolites. The opioid metabolites detected by this assay included morphine (e.g., hydrocodone, oxycodone, etc.), morphine-3 glucuronide (metabolites of heroin), and codeine. Methadone was detected through a separate assay. Participants who had a positive urine drug screen for marijuana and/or self-reported past month marijuana use at baseline were categorized as marijuana users.

Data Analysis

For the purposes of the current study, only data from the baseline assessments of participants who were deemed eligible were included in the analyses ($N = 500$). Individuals were divided into two groups based on those who endorsed cigarette use only relative to those who reported cigarette and marijuana use (i.e., co-use). Analyses were also conducted to determine differences among individuals by frequency of marijuana use or frequency of criminal offenses. There were no significant differences between frequencies of use or criminal offenses, therefore all individuals remained categorized as either using cigarettes only or using cigarettes and marijuana. Chi-square analyses were conducted to determine demographic differences between the two groups. The prevalence of cigarette and marijuana use was calculated via descriptive statistics. Logistic regression analyses were conducted to assess factors (e.g., smoking history) associated with dual cigarette and marijuana use. The significance level was set at .05. All analyses were conducted via SPSS Version 23.

RESULTS

As shown in Table 1, the average age of participants in the sample was 37.4 years ($SD = 11.3$). Participants were of African American (68%) and White (32%) race, and most were men (67%). The majority of participants had at least a high school diploma or GED credential (37.3%). Most participants had never been married (54.2%) or were divorced/separated (31.5%). There were several differences between participants who reported smoking cigarettes only versus those who used cigarettes and marijuana. Relative to individuals who only smoked cigarettes, (64% African American, 64.8% male, and 39.1 [$SD = 10.9$] years of age), those who used cigarettes and marijuana were more likely to be African American (80%), male (73.6%), and younger (32.4 [$SD = 11.0$]).

Overall, 25% of the sample reported smoking both cigarettes and marijuana. Demographic variables, including significant variables from the chi-square analyses, were included in the logistic regression model. As shown in Table 2, increasing age was associated with a reduction in the likelihood of smoking cigarettes and marijuana ($OR = 0.87$, 95% Confidence Intervals [CI] = 0.81 – 0.95, $p < .01$). Further, African Americans were 9.18 (95% $CI = 2.84 – 29.69$) times more likely to use cigarettes and marijuana than their White counterparts, $p < .001$. However, gender and education were not associated with cigarette and marijuana use in the model.

Regarding smoking characteristics, increasing difficulties with last quit attempt was associated with a reduction in the likelihood of using cigarettes and marijuana ($OR = 0.75$, 95% $CI = 0.60–0.94$, $p < .05$). Other smoking characteristics, including age when first tried

smoking, total number of years smoked, number of times attempted to quit and menthol cigarette use were not associated with cigarette and marijuana co-use. Further, there was also a lack of an association between FTND, QSU, and MNWS scores and cigarette and marijuana co-use.

ASI characteristics, including conflicts with friends and family and criminal offenses, were not significantly associated with cigarette and marijuana co-use. However, other drug use was significantly related to cigarette and marijuana co-use. Specifically, benzodiazepine ($OR = 9.09$, 95% $CI = 1.25 - 65.94$, $p < .05$) and opioid ($OR = 8.17$, 95% $CI = 2.03 - 32.93$, $p < .01$) use was significantly associated with an increased likelihood of cigarette and marijuana co-use.

DISCUSSION

Among adults in a community corrections setting who smoked cigarettes, 25% of the sample reported current marijuana use. The rates of current marijuana use among individuals who smoke cigarettes in the criminal justice population is slightly higher than that found in the general population (17.8% among individuals who use tobacco; Schauer et al., 2015), suggesting a need for prevention and treatment interventions for marijuana and tobacco co-use in this population. It is also plausible that the rates of co-use are even higher among the community corrections population. Among adults with a marijuana-negative urine screen, some participants may have been reluctant to self-report any current marijuana use to avoid additional legal repercussions associated with possessing, using or distributing marijuana (e.g., violation of probation). Second, previous studies have assessed tobacco use overall (e.g., Singh et al., 2016), rather than cigarette use. It is highly likely that the rates of marijuana use are much higher when the use of all tobacco products are considered, such as little cigars and cigarillos (LCCs). This is especially plausible given the high prevalence of LCC use among young African American males (Corral et al., 2013; Sterling et al., 2016), who are disproportionately represented in the criminal justice population. Approximately 79% of adults in the current sample reported LCC use, suggesting a need to examine marijuana use among adults who smoke both cigarettes and LCCs. Third, this study excluded individuals who had psychiatric disorders (e.g., history of bipolar disorder). Previous studies have found that tobacco and marijuana co-use are associated with an increased likelihood of psychiatric disorders (Peters et al., 2014). Therefore, it is possible that higher rates of co-use would have been found in a sample that included individuals from the criminal justice system who have a psychiatric disorder.

This study extends the literature by assessing factors that are associated with cigarette and marijuana use. Similar to previous work in the general population (Montgomery, 2015; Ramo et al., 2014; Ramo et al., 2012), we found that cigarette and marijuana co-use is higher among African American adults and younger individuals in community corrections. Compared to other racial/ethnic groups, African Americans, especially males, are more likely to use marijuana overall (Wu et al., 2016), use marijuana before tobacco (Kennedy et al., 2016) and to also consume marijuana through blunts (i.e., partially or fully hollowed out LCC shells that are filled with marijuana; Montgomery, 2015; Schauer et al., 2017). The aggressive marketing of LCC products in African American communities (Cantrell et al.,

2013), especially those with a large proportion of adolescents and young adults, promotes the use of LCC products. The tobacco industry has increased the appeal of LCCs by adding flavors (Hinds et al., 2017) and product features that facilitate marijuana use among cigarillo users (e.g., perforated lines or wrappings that unroll easy; Giovenco et al., 2016). Moreover, African American marijuana smokers have higher rates of marijuana-related arrests than their White counterparts (Golub et al., 2007; Ramchand et al., 2006), which is another likely explanation for the high rates of marijuana use found among African American adults who smoke cigarettes in the criminal justice population.

Similar to previous studies, other drug use was associated with cigarette and marijuana co-use (Creamer et al., 2016; Peters et al., 2014). In a study examining adults in prison in southeast Iran, researchers found that 75.3% of adults reported consuming at least one substance (74.4%, 73.3% and 19.3% smoked cigarettes, used a narcotic substance and reported drinking alcohol, respectively) and 42% reported using two or more drugs (Khalooei et al., 2016). The current study mirrors and extends those findings by suggesting that the dual use of cigarettes and marijuana, in particular, are associated with an increased risk of using at least one other drug, specifically benzodiazepines or opioids. One plausible explanation for the higher rates of benzodiazepine and opioid use among adults who use cigarettes and marijuana is that individuals may have used or are currently using marijuana as a substitute for prescription drugs. An anonymous online survey revealed that approximately 46% of adults reported using marijuana as a substitute for prescription drugs, with the most common classes including narcotics/opioids (35.8%) and anxiolytics/benzodiazepines (13.6%) (Corroon et al., 2017). Further, these findings did not differ among individuals who reported non-medical use versus those who used medical marijuana. Another plausible explanation is that involvement in the illegal marijuana market might also expose users to other illicit drug markets, thereby increasing their chances of engaging in other illicit drugs. Additional studies are needed to further examine the use of multiple drugs among adults in the criminal justice system who smoke cigarettes.

Although this study has several strengths, a few limitations should be noted. First, this study was conducted in a community corrections population in the Southern United States and only included African American and White adult participants. Although the racial breakdown is reflective of the regional demographics, findings from this study do not generalize to individuals in geographically or racially diverse settings or to non-criminal justice populations. Second, data on smoking characteristics, interpersonal conflicts and criminal offenses were self-reported by participants. It is possible that this information may have been minimized or difficult to recall. Given the high medical costs and other harmful consequences associated with addiction in the criminal justice population, additional research is especially needed on one individuals who use multiple substances.

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Table 1.

Demographic Characteristics of Adults in the Criminal Justice Population who Use Cigarettes Only or Marijuana and Cigarettes

Variable	Cigarettes Only (<i>N</i> = 375)	Marijuana and Cigarettes (<i>N</i> = 125)	Total (<i>N</i> = 500)	Analyses	
	%	%	%	χ^2	<i>p</i>
Race					
White	36.0	20.0	32.0	11.03	<0.01
African American	64.0	80.0	68.0		
Gender					
Male	64.8	73.6	67.0	3.28	0.07
Female	35.2	26.4	33.0		
Marital Status					
Never Married	51.3	62.9	54.2	6.12	0.11
Married	11.0	10.5	10.8		
Divorced/Seperated	33.7	25.0	31.5		
Widow	4.0	1.6	3.4		
Education Level					
Less than high school	32.4	29.6	31.7	0.33	0.85
High school diploma/GED	36.9	38.4	37.3		
More than high school	30.7	32.0	31.1		
Other Tobacco Use					
Cigars/Cigarillos	72.4	88.6	79.4	4.84	0.18
Smokeless Tobacco	22.4	11.4	17.6		
Hookah	1.7	0.0	1.0		
Other	3.4	0.0	2.0		
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>F</i>	<i>p</i>
Age	39.1 (10.9)	32.4 (11.0)	37.4 (11.3)	35.40	<0.01
Baseline Cigarettes Per Day	15.2 (9.72)	14.1 (8.8)	14.8 (9.5)	1.13	0.29
Baseline CO Level	17.1 (10.93)	17.9 (11.80)	17.3 (10.1)	0.62	0.43

Table 2.

Logistic Regression Analysis of Factors Associated with Cigarette and Marijuana Co-Use among Adult Smokers in the Criminal Justice Population

Variable	B	S.E.	OR	95% C.I.	P-value
Gender	0.08	0.50	1.09	0.41 – 2.90	.867
Age	−0.13	0.04	0.87	0.81 – 0.95	.001
Race	2.20	0.60	9.18	2.84 – 29.69	<.001
Education	0.16	0.17	1.18	0.85 – 1.63	.329
History of substance use	−0.59	0.45	0.56	0.23 – 1.34	.192
History of mental illness	0.03	0.50	1.03	0.38 – 2.76	.956
CES-D	0.02	0.02	1.02	0.97 – 1.06	.520
Smoking Characteristics					
Difficulties with last quit attempt	−0.29	0.11	0.75	0.60 – 0.94	.011
Age when first tried smoking	0.01	0.06	1.01	0.89 – 1.15	.856
Total number of years smoked	0.05	0.04	1.05	0.98 – 1.13	.177
Number of times attempted to quit	−0.14	0.10	0.87	0.71 – 1.07	.182
Menthol Use	0.71	0.57	2.03	0.66 – 6.23	.218
MNWS	0.02	0.04	1.02	0.95 – 1.20	.539
FTND	0.16	0.13	1.17	0.91 – 1.50	.217
QSU	0.01	0.02	1.01	0.98 – 1.04	.505
Interpersonal Conflicts					
Friends	−0.11	0.47	0.90	0.36 – 2.24	.816
Family	0.33	0.50	1.39	0.53 – 3.70	.506
Criminal Offenses					
Person	−0.48	0.34	.62	0.32 – 1.21	.160
Property	0.15	0.09	1.16	0.98 – 1.38	.084
Substance	0.08	0.07	1.08	0.94 – 1.25	.258
Court	0.03	0.10	1.03	0.85 – 1.25	.773
Urine Drug Screen					
Benzodiazepines	2.21	1.01	9.09	1.25 – 65.94	.029
Opioids	2.10	0.71	8.17	2.03 – 32.93	.003
Cocaine	0.37	0.60	1.45	0.45 – 4.70	.539
Alcohol	0.24	0.48	1.27	0.49 – 3.26	.627

Note: Gender = males (1), females (2); Race = White (1), Black (2); Education= <HS, HS/GED, > HS; FTND=Fagerstrom Test for Nicotine Dependence; QSU=Questionnaire of Smoking Urges; MNWS=Minnesota Withdrawal Scale; CES-D=Center for Epidemiological Studies of Depression. For all dichotomous variables, positive responses are coded higher.