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Heroin transition risk among daily and non-daily cannabis users who are non-injectors of heroin

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Abstract

Aims—Non-injecting heroin use (NIU) has been identified as a potential precursor for the transition to injecting drug use (IDU). This paper examines and compares heroin transition risks between two groups of Mexican American cannabis users (daily (DU) vs. non-daily (NDU)) who are NIUs.

Methods—Data for this analysis are from structured interviews with 300 street-based recruited male and female NIUs in San Antonio, Texas using an adaptive sampling methodology. Three variables (being a former injector, daily heroin use, and being dependent on heroin) were used to create a summative scale measuring heroin transition risk and dichotomized into “no attributes” and “1–3 attributes”.

Results—Initial univariate logistic regression analysis indicated an association between heroin transition risk and the cannabis user groups with three fourths of the NDU having transition risk attributes. In the multivariate model, three factors were found to be independently associated with heroin transition risk. Heroin transition risk was positively associated with having used heroin for a longer period of time. An inverse relationship was found with DU of cannabis and those reporting alcohol use in the past month being less likely to be associated with heroin transition risks.

Conclusions—Findings tentatively indicate that DU of cannabis may be interpreted as a form of self-regulation and potentially deterring problematic heroin use among Mexican American NIUs and possibly other polydrug users in similar social environments. However, the authors discuss alternative interpretations of these findings. Nevertheless, findings may be used to inform specific policies and intervention strategies to prevent transitions to injecting and other harmful health consequences among NIUs.

Keywords

Heroin transition risks; Non-injecting heroin use; Cannabis use; Mexican Americans

Introduction

The rapid growth of non-injecting heroin use (NIU) through such routes of administration as sniffing and smoking has been identified as a potential precursor for the transition to injecting drug use (IDU) (Chitwood et al., 2000; Neaigus et al., 2006; Neaigus et al., 2001). Behaviours associated with IDU have been linked to serious social and health consequences including HIV/AIDS and Hepatitis B and C (Des Jarlais, Casriel, Friedman, & Rosenblum, 1992; Neaigus et al., 2006; van Ameijden, van den Hoek, Hartgers, & Coutinho, 1994). However, not all NIUs make the transition to injecting, evolve into problematic drug users, acquire infectious diseases or become addicted. Nevertheless, little is known about variations in drug use patterns that deter or facilitate risks to injecting and other deleterious behaviours among NIUs. This is important because a common trend found among diverse populations of NIUs is high levels of polydrug use including cannabis, cocaine, other illegal drugs and prescription pills (Kaufman, Chitwood, Comerford, & Koo, 2004; Sanchez, Comerford, Chitwood, Fernandez, & McCoy, 2002).

The role of other drugs as either increasing or deterring risks associated with NIU will be explored among Mexican Americans in a South Texas, disadvantaged, urban context with a high prevalence of heroin use (Valdez, 2005). Among this non-injecting heroin population, cannabis, among several other drugs, is the most prevalent illegal drug reported, as it is among other NIUs in the U.S. and Europe (Hall & Hando, 1994; Kaufman et al., 2004; Kelley & Chitwood, 2004; Sanchez et al., 2002). Only alcohol and tobacco have a higher frequency of use among this group. As such, the interaction of cannabis use with non-injecting heroin use is of pertinent interest, given the discourse about cannabis use as being a gateway into problem drug use (Kandel, 2002) or as a protective factor in preventing hard-drug use and addiction as well as other serious risk behaviours (Sifaneck & Kaplan, 1995; van Vliet, 1990). The focus of this paper is to examine and compare heroin transition risks between two groups of cannabis users (daily vs. non-daily users) who are Mexican American non-injecting users of heroin.

Risks, attitudes and behaviours of non-injecting heroin users

Past research has delineated an inevitable trajectory from non-injecting to injecting drug use. More recently, however, research has discovered that non-injecting drug use does not necessarily lead to injection in such a unidirectional manner (Andrade, Sifaneck, & Neaigus, 1999; Darke, Kaye, & Ross, 1999; Kaufman et al., 2004; Neaigus et al., 2006; Sotheran, Goldsmith, Blasco, & Friedman, 1999; Strang, Griffiths, Powis, Abbey, & Gossop, 1997). Rather, NIU may represent a stable form of heroin use, especially for those who are occasional users and perceive this practice as a safe, socially acceptable alternative to injecting with minimal risks (Casriel, Rockwell, & Stepherson, 1988). For example, studies have found that heroin sniffers without drug injection histories avoid injecting for fear of changes in income, family problems, collapsed veins, scars from abscesses, fear of needles and overdosing (Casriel et al., 1990; Neaigus et al., 1998; Sotheran et al., 1999).

Nonetheless, researchers are beginning to discover that there are concealed health consequences and risks associated with non-injecting drug using populations. Chitwood, Comerford, & Sanchez (2003) and Sanchez et al. (2002) found a high prevalence of HIV among NIUs who had no history of injection. Similarly, among a sample of non-injecting heroin users in New York City, researchers found that a history of syphilis infection was associated with HBV infection (Gyarmathy, Neaigus, Miller, Friedman, & Des Jarlais, 2002). These findings imply that the etiology of HIV and possibly other infectious diseases among the NIU population lies in risky sexual behaviours and/or sex with infected partners (Neaigus et al., 2006).

Furthermore, risks associated with heroin sniffing are related to the situational context of street based drug subcultures. Previous studies have found that heroin sniffing is consumed in polydrug use settings with cohorts who may include former and current injectors (Casriel et al., 1988; Kaufman et al., 2004). These other drug using groups may be involved in high-risk behaviours, including unprotected sex, exchanging sex for drugs or money, and the use of contaminated injecting equipment. For instance, among a sample of heroin sniffers in South Florida, findings revealed that HIV related sex risk behaviours increased among those subjects who used crack (Sanchez et al., 2002). NIUs' association with these types of drug use networks may influence individual behaviour (directly or indirectly) through communication and exposure to network members that engage in risk behaviours (Neaigus et al., 2006).

Cannabis use and non-injecting heroin use

There is limited research that has focused on the role of cannabis in increasing or diminishing drug use related risk behaviours among this population. This is an especially salient issue given the high prevalence of cannabis use among heroin using populations (Amaro, Whitaker, Coffman, & Heeren, 1990; McQueen, Getz, & Bray, 2003; Vega, Alderete, Kolody, & Aguilar-Gaxiola, 1998). The few studies that do exist have been conducted with heroin treatment populations and have shown no association between cannabis use and other drug use. For instance, 70 patients in a methadone maintenance program were classified into four groups of cannabis users (Nirenberg, Liepman, Celluci, Swift, & Sirota, 1996). Findings revealed no differences between the four groups of users for testing positive for other drugs. In contrast, Saxon and colleagues' found that "consistent" cannabis users compared to "intermittent" were less likely to test positive for other drugs and that current cannabis use was a positive predictor of ongoing treatment (Saxon et al., 1993). Other studies have found that there were no adverse correlations between cannabis use and methadone maintenance outcomes and concluded that heroin intervention can be successful without abstinence from cannabis (Budney, Bickel, & Amass, 1998; Seivewright, 2003). Epstein and Preston (2003) found, in their study on cannabis use, that it was not associated with retention, use of cocaine or heroin or any other treatment outcome measure. An important shortcoming of the previous studies is the focus on treatment populations rather than the relationship between cannabis and heroin use behaviour among non-treatment populations. Studies among these groups may begin to explore whether cannabis use has the same regulatory component among more street-based populations. Investigation of the consequences of increases in Mexican American non-injecting heroin use is especially important, given its well-documented association with health and social risk behaviours. A specific hypothesis assessed in this analysis is that current daily cannabis users will be less likely to have heroin transition risk attributes than non-daily users of cannabis.

Methods

Design and sampling

Data for this analysis are from baseline-structured interviews with 300 Mexican American non-injecting heroin users in San Antonio. The purpose of the overall study was to investigate the incidence and risk factors for making a transition to injecting and the prevalence and incidence for infection with blood borne and sexually transmitted infections (HIV, HBV and HCV). The prospective cohort study design consists of a baseline interview with two follow up interviews at 6-month intervals. Interviews were conducted face-to-face, using a structured questionnaire. The baseline interview ranged from 2 to 3 hours in duration.

Inclusion criteria for the baseline cohort were: respondent 16 years of age through 40 for females, and 16 through 35 years of age for males; self-reported and biological evidence of heroin use in the past 30 days; absence of drug injection history or no recent injection in the 6 months prior to enrollment; Mexican American ethnic background; no participation in formal drug treatment in the 30 days prior to enrollment; and resident of the San Antonio metropolitan area. Trained outreach specialists conducted informal eligibility screening of potential subjects in the field, which was followed by a formal eligibility screening process at the research office, which was located in the area of recruitment.

The study used an adaptive sampling methodology that includes a combination of several techniques that the authors have employed in prior studies of non-treatment populations. It combines elements of a field-intensive outreach methodology (Yin, Valdez, Mata, & Kaplan, 1996) and a targeted respondent-driven sampling design (Carlson, Wang, Siegal, Falck, & Guo, 1994; Clatts, Davis, & Atilasoy, 1995; Heckathorn, 1997; Ten Houten, 1992; Watters & Biernacki, 1989).

Variables

For the purpose of the present analysis, the primary independent variable, cannabis use, was obtained using self-reported data on how frequently the respondent used cannabis in the last 30 days. Given that it would be highly unlikely for subjects to provide the precise number of times they had smoked cannabis in the past 30 days, 11 fixed categorical choices were provided, ranging from “none” to “10 or more times a day, almost everyday”. Respondents who reported no lifetime use of cannabis ($n = 8$) were excluded from the analysis, which provided a total sample of $n = 292$. Based on responses to the 11 fixed categorical choices, two groups of cannabis users were derived based on the frequency of cannabis use in the past month: (1) daily cannabis users (DU); and (2) non-daily cannabis users (NDU) (use one or more times weekly, but not daily and no current use in past 30 days). As shown in Table 1, the sample was evenly distributed, with half of the sample reporting daily use (48%) and the other half (52%) non-daily use of cannabis.

Differences between DU and NDU of cannabis were compared on selected variables. The first group of variables included selected demographic characteristics including age, gender, education, marital status, children, income, illegal activities, lifetime (ever) on parole/probation and employment status. Gang membership was determined by the respondent's self-identification along with specific gang affiliation. Reliability of this information was based on project staff's extensive experience with gangs in this community gained through work on a previous study (Yin et al., 1996). The second group of variables included substance use in the past 30 days for tobacco, alcohol, cocaine, crack, other opiates, tranquilizers/barbiturates and several other drugs. Third, selected heroin use variables (practices and dependence) were examined. A duration of heroin use variable was constructed by subtracting the age at which heroin was first used from the current age. Mean age of initiation of heroin use was also used as a measure for a prior history of heroin use. Use of heroin with someone who had injected in the past was dichotomized into “ever” and “never”. Two groups representing drug injecting history were developed and coded as 0 = never injector and 1 = former injector (former IDU who reported injecting one or more times during their lifetime). Current frequency of heroin use was coded to represent those individuals that are 0 = monthly/weekly or 1 = daily heroin users. Lastly, perceived severity of heroin dependence was measured in the month prior to the baseline using the Severity of Dependence Scale (SDS) and dichotomized using the cut off of 6 or above to indicate heroin dependence (Gossop, Griffiths, Powis, & Strang, 1992). The SDS consists of five items, measured on a 4-point scale, ranging from 0 to 3. The items are explicitly concerned with psychological components of dependence, including feelings of impaired control and anxiety about heroin use. The scale sums responses with higher scores of 6 or greater

indicating greater dependence. Moreover, the latter three variables (being a former injector, daily heroin use, and being dependent on heroin) were used to create a summative scale measuring heroin transition risk, based on the findings of a recent New York study of transitions to injecting that found a high volume of heroin use and exposure to IDUs were risk factors for initiating injecting (Neaigus et al., 2006). The scale identified the number of transition risk attributes ranging from 0 to 3. For the purposes of this analysis, the primary dependent variable of “heroin transition risk” was developed and coded as 0 = no attributes (32%) and 1 = one to three attributes (68%).

Analysis

Frequencies were calculated to compare sociodemographics, substance use, and heroin use characteristics, stratified by frequency of cannabis use in past 30 days. Selected analyses were used to determine bivariate statistical differences. Significant associations between frequency of cannabis use, heroin transition risk and selected categorical variables of interest were determined by Pearson chi square test. A Fisher's exact test was used when an expected count was less than 5. Independent sample *T*-tests were used to examine differences between the means of continuous variables. All statistical tests used a <0.05 level of significance. To test independent factors associated with heroin transition risk, multiple logistic regression analysis was conducted. Independent variables included in the model were those associated ($p < 0.05$) with heroin transition risk. Gender was only associated with frequency of cannabis use, but was included in the final model because it may be associated with other independent variables and may influence their relationship with heroin transition risk. For each independent variable entered in the multivariate logistic regression model, odds ratios (OR) were adjusted (AOR) for all other variables included. In the final analysis, 95% confidence intervals (CI) are reported for both univariate and multivariate logistic regression analyses.

Results

Socio-demographic characteristics

Table 1 presents selected socio-demographic characteristics associated with the frequency of cannabis use in the past 30 days. Among the 292 in the analysis sample, 139 (48%) were DU of cannabis and 153 (52%) NDU. The median age of the overall sample was 22 years, with DU significantly younger (about 2 years) than NDU. There was a significant difference by gender; DU were more likely to be male than female. DU were significantly more likely than NDU to self identify as being gang members (22% vs. 10%). No other significant differences in socio-demographic characteristics were found.

Current drug use behaviour

Table 1 also compares current substance use behaviours by cannabis frequency groups. While no significant differences are observed, there appears to be a distinct pattern of polydrug use between the two cannabis groups with DU reporting a higher frequency of use, with the exception of tranquilizers/barbiturates. For instance, more than half of the sample of DU reported use of substances including tobacco, alcohol, and cocaine. Somewhat more DU (34%) reported crack use in the past month than NDU (28%), but this was not significant. Among DU, 10% reported using other drugs, such as hallucinogens, amphetamines, etc. Similarly, a small proportion (8%) of NDU reported other current polydrug use.

Heroin use practices and dependence

By definition, all participants had to be current users of heroin through non-injecting methods. Table 2 examines the relationship between selected heroin use behaviours and the

two cannabis use groups. With the exception of duration of heroin use and use with an ever injector, all heroin variables were found to have a significant association with the two cannabis user groups. DU initiated heroin use 2 years earlier than NDU. Fewer DU (27%) than NDU (40%) reported a score of 6 or more (indicating greater heroin dependence) on the heroin dependency scale. Similarly, fewer DU (14%) compared to NDU (25%) reported prior injecting histories. More NDU (59%) than DU (47%) used heroin on a daily basis. Finally, NDU (74%) were more likely than DU (59%) to have anywhere from 1 to 3 heroin transition risk attributes. The mean score for the Heroin Transition Risk Scale for DU was 0.88 (S.D. = 0.85) and for NDU 1.26 (S.D. = 0.95), but no significant differences were found.

Factors associated with heroin transition risk

Univariate analyses were conducted examining the relationship of heroin transition risk with cannabis groups (DU vs. NDU), socio-demographic characteristics and past 30 days substance use (non-heroin) patterns (variables in Table 1), age of heroin initiation, duration of heroin use and use of heroin with an ever injector. In the univariate analyses, heroin transition risk was significantly associated with older age, having children, higher income, reporting illegal activities as their primary income, and using heroin for four or more years (Table 3). Using alcohol in the last 30 days and being a DU of cannabis were protective, with an inverse association with heroin transition risk.

In the multivariate model, three variables were found to be independently associated with heroin transition risk. Respondents who had been using heroin for four or more years were nearly two and one-half times more likely than those using for a shorter duration to be at greater risk for transitioning. Those who drank alcohol in the last 30 days were less likely than those who did not drink alcohol to be at risk for transitioning. Finally, respondents who were DU of cannabis were less likely than NDU to be at risk for transitioning to injecting.

Discussion and conclusion

There are several important implications that can be drawn from the findings presented here. First, the results indicate that high risk heroin use practices known to be related with transitioning to injecting are associated with the frequency of cannabis use, particularly among those who are NDU of cannabis. These high-risk heroin behaviours and characteristics were reported more frequently among NDU than DU. That is, NDU of cannabis reported higher perceived heroin dependence, former injecting history, and daily use of non-injecting heroin. Second, an association was found between the composite variable measuring heroin transition risk and the cannabis user groups. Approximately, three-fourths of the NDU of cannabis had at a minimum one transition risk attribute compared to less than half of the DU. This further reinforces the finding of a pattern towards lower heroin related transition risk associated with DU of cannabis. Third, three factors were found to be independently associated with heroin transition risk. A longer period of heroin use was found to be associated with a risk for transitioning. This is particularly important, given that a longer duration of heroin use was associated with being a former injector. Thus, the risk among longer-term users of heroin is a risk of resuming or relapse to injecting (Neaigus et al., 2006). Two protective factors emerged. The first of these was that DU of cannabis were less likely than NDU to be associated with heroin transition risks thus reducing the DU transition risk. Second, an inverse relationship between use of alcohol in the past month and heroin transition risk was found. Those respondents who reported drinking alcohol were less likely to have any of the three heroin transition risk attributes. Further investigation on the role alcohol plays in the risk for transitioning is needed.

These findings suggest that there are two subgroups of Mexican American NIUs that may be involved in distinct heroin transition risk behaviours. The first are the non-daily cannabis users who are slightly older, have a higher perceived severity of heroin dependence and tend to be former injectors. The second subgroup is comprised of daily cannabis users, who while they are polydrug users, are less likely to engage in high risk heroin transition behaviours (no history of prior injecting, lower heroin dependency, and less frequent heroin use.) We surmise that the first group may have lifestyles that reflect the more well-established heroin street subculture networks in this community (Valdez, 2005). These subcultures are characterized by injecting heroin use, criminality, incarceration and dependence. NIUs participation in this subculture may expose them to specific risk behaviours associated with higher-risk networks of heroin users. Even though there are differences between the groups, both pose a public health problem in that they may function in varying degrees as transmission bridges (of higher-risk drug use behaviours and possible pathogen transmission) between the injecting heroin subculture and non-injector population in this community. In this sense, the findings are similar to previous research that found NIUs engaging in high-risk behaviour (Chitwood et al., 2003; Neaigus et al., 2006).

Regardless of these risks, previous research and the present analysis reveal that the daily cannabis user group may be less likely to transition to injecting, given that they are less apt to engage in heroin transition risk behaviours that may eventually be associated with the spread of HIV/AIDS and other infectious diseases. As a result, among this population, daily cannabis use may suggest a form of self-regulation and desistence from more detrimental heroin use behaviours. The concept of self-regulation implies that the drug user is consciously controlling different aspects of drug usage rather than portraying it as out of one's control, leading to problematic use or addiction (Sotharan et al., 1999). On the other hand, the relevancy of the self-regulation concept on this population may be limited because of the relatively young age of the daily cannabis users. Thus, to conclude that daily cannabis use is a form of self-regulation of heroin use is tentative. An alternative interpretation is that DU are at an earlier stage in their drug use careers, and that for some of these DU, high-frequency cannabis use is a possible "gateway" into more intense and higher-risk drug use patterns and drug user social networks (Kandel & Yamaguchi, 2002; Neaigus et al., 2006).

The findings from the analysis suggest that daily cannabis use may, for some NIUs, be a deterrent to harder and more lethal drug use, as well as other severe substance use problems among this polydrug use population. Sifaneck and Kaplan (1995) found this in a study of Dutch cannabis users that cannabis use was "a means of stepping off" from the more deleterious hard drugs, especially in the absence of available treatment programs. Moreover, the present analysis allows us to begin to untangle how a specific polydrug use pattern involving frequent cannabis use may influence the potential risk for transitioning among NIUs. However, understanding the effects of varying patterns of other drugs or polydrug use on the risk of making a transition to injecting among different NIU populations requires further research since these risks may be influenced by other factors. Nevertheless, findings may be used to inform specific policies and intervention strategies to prevent transitions to injecting and other harmful health consequences among NIUs.

Several methodological limitations of our study need to be acknowledged. The sample was street recruited using established methods for sampling and recruiting "hidden" populations. In as much, findings cannot be generalized to other non-injecting heroin populations. Thus, the generalizability of the results may be limited by the characteristics of the population from which the sample was drawn. While frequency of cannabis use in the past 30 days was based on self-report data, there remains the possibility that some individuals may have misreported their use. However, self reports of drug use behaviours are likely to have good reliability and validity (McElrath, Chitwood, Griffin, & Comerford, 1994; Neaigus et al.,

2001). Moreover, while the two subgroups identified in the discussion are categorized by overall similarity, we recognize that these groups are permeable and may overlap with each other if the frequency of cannabis use is measured over a period longer than 30 days (Bailey, 1994).

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Table 1

Socio-Demographics and past 30-day substance use patterns by frequency of cannabis use (past month) among Mexican American non-injecting heroin users ($N = 292$)

Socio-demographics	% Daily use ($N = 139$)	% Non-daily use ($N = 153$)
Sex**		
Female	24	41
Male	76	59
Mean age***	20.9 (S.D. = 3.9)	22.8 (S.D. = 5.4)
Graduated high school	15	13
Marital status		
Single/divorced	64	63
Married/common law	36	37
Respondent has children	57	65
Unemployed status	73	77
Income last 30 days		
\$0–999	60	66
\$1000 or more	40	34
Illegal activities primary income	26	24
Current member gang**	22	10
Lifetime parole/probation	64	57
Substance use past 30 days	% Daily use ($N = 139$)	% Non-daily use ($N = 153$)
Tobacco	93	88
Alcohol	83	74
Cocaine	65	57
Crack	34	28
Other opiates (excluding heroin)	29	28
Tranquilizers/barbiturates	48	51
Other drugs ^a	10	8

^aDrugs include: Hallucinogens Inhalants Amphetamines Street Methadone Ketamine Ecstasy.

**
 $p < 0.01$.

 $p < 0.001$.

Table 2

Heroin risk behaviours by frequency of cannabis use (past month) among Mexican American non-injecting heroin users ($N=292$)

Heroin risk behaviours	% Daily use (mean $\pm$ S.D.) ($N=139$)	% Non-daily use (mean $\pm$ S.D.) ($N=153$)
Heroin age of initiation ***	17 $\pm$ 3.1	19 $\pm$ 5.0
Duration of heroin use (years)	4 $\pm$ 3.4	4 $\pm$ 3.9
Used heroin with ever injector		
No	76	74
Yes	24	26
Severity of dependence on heroin (past 30 days) *		
SDS score $\leq$ 5	73	60
SDS score $\geq$ 6	27	40
Former drug injector history **		
Never injector	86	75
Prior injector	14	25
Frequency of NIU heroin use *		
Monthly/weekly	53	41
Daily	47	59
Heroin Transition Risk Scale (overall) ^a [(1.09 $\pm$ 0.93), median: 1.0, range: 0–3]		
Mean difference	0.88 $\pm$ 0.85	1.26 $\pm$ 0.95
Heroin transition risk (dichotomized) *		
No attribute (score = 0)	41	26
1–3 attributes (score = 1 to 3)	59	74

^aThe “Heroin Transition Risk Scale” is the sum of responses (no = 0, yes = 1) to: being a former injector; daily heroin user; and being dependent on heroin (SDS score $\geq$ 6).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 3

Univariate and multivariate logistic regression models of factors associated with heroin transition risk among Mexican American non-injecting heroin users ($n = 292$)

	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Gender		
Female	1.00	1.00
Male	0.76 (0.45, 1.29)	0.53 (0.26, 1.09)
Age		
≤20	1.00	1.00
≥21	2.63 *** (1.58, 4.37)	1.78 (0.94, 3.35)
Respondent w/children		
None	1.00	1.00
Yes	2.18 ** (1.32, 3.59)	1.55 (0.82, 2.91)
Income last 30 days		
0-\$999	1.00	1.00
>\$1000	1.76 * (1.04, 2.99)	1.71 (0.89, 3.27)
Illegal activities primary income		
No	1.00	1.00
Yes	2.08 * (1.08, 3.99)	1.43 (0.66, 3.10)
Duration of heroin use		
<3 years	1.00	1.00
≥4 years	2.91 *** (1.71, 4.94)	2.33 ** (1.22, 4.44)
Alcohol use last 30 days		
No	1.00	1.00
Yes	0.33 ** (0.15, 0.68)	0.33 ** (0.14, 0.77)
Cannabis frequency group		
Non-daily	1.00	1.00
Daily	0.51 ** (0.31, 0.84)	0.55 * (0.30, 0.98)

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.