



Changes in cigarette and alcohol use during cannabis abstinence



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ABSTRACT

Objective: Cannabis causes lower mortality and morbidity than alcohol and tobacco so it is clinically important if quitting cannabis is associated with substitution with these substances. This study tests if cannabis is substituted with alcohol and/or tobacco during cannabis abstinence, and factors predicting such substitution.

Method: A secondary analysis of a prospective community based study quantified cannabis, alcohol and tobacco use with Timeline Follow-back during a two-week voluntary cannabis abstinence and at one-month follow-up in non-treatment seeking cannabis users ($n=45$). Cannabis use was verified by urine THC-COOH levels.

Results: Alcohol use increased by 8 standard units (SU; $d=0.48$)/week and cigarette use by 14 cigarettes/week ($d=0.29$) during cannabis abstinence. Those using less of each substance at baseline had greater increases during cannabis abstinence (alcohol $P<0.0001$, tobacco $P=0.01$). There was a decrease in alcohol (-4.8 SU, $d=-0.29$) and tobacco (-13 cigarettes/week, $d=-0.26$) use at follow-up, when most participants (87%, $n=39$) had resumed cannabis use. Increased cigarette use was predicted by cannabis withdrawal related sleep difficulty (insomnia) ($P=0.05$), restlessness ($P=0.03$) and physical symptoms ($P=0.02$). Neither alcohol nor cigarette use increased significantly in those (13.3%, $n=6$) who remained abstinent from cannabis through to follow-up.

Conclusions: Abstaining from cannabis was associated with increases in alcohol and tobacco use that decreased with resumption of cannabis use; however there were no increases in individuals who remained abstinent from cannabis at one-month follow-up. Tobacco use did not increase in those experiencing milder cannabis withdrawal symptoms. Research on substitution in treatment seekers during outpatient cannabis abstinence is needed.

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1. Introduction

Substituting a problem drug for another during treatment is of clinical concern, especially if the substituted drug is more harmful than the original. Cannabis has been rated as less harmful than tobacco or alcohol by consensus among addiction experts (Nutt et al., 2007) and the comparative mortality and morbidity attributed to alcohol and tobacco is higher than for cannabis (Degenhardt et al., 2008, 2013a,b). Alcohol, tobacco and cannabis use, however, frequently co-occur (Kessler et al., 1997;

van Leeuwen et al., 2013), and are the most prevalent of all abused substances. Alcohol is the leading source of substance use disorder treatment seeking, responsible for around 40% of treatment episodes in the US, tobacco is the leading cause of preventable deaths (Danaei et al., 2009), and cannabis is responsible for around 16% of treatment episodes in the US (SAMHSA, 2010), and 20% in Australia (AIHW, 2012). Furthermore, cigarette smoking has been identified as a key predictor of relapse to cannabis use during a cannabis quit attempt (Haney et al., 2013), and comorbid cannabis and cigarette use is associated with greater cannabis dependence and harms that cannabis use alone (Peters et al., 2012).

The evidence for substitution during a period of cannabis abstinence is mixed for alcohol, and there is almost no data for tobacco. A study of treatment seeking cannabis users followed up in the community found increased alcohol consumption during cannabis

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abstinence related to low alcohol use at baseline (Kadden et al., 2009). However a study of a different treatment-seeking group showed no changes, or overall reductions in alcohol use, with no relationship to changes in cannabis use (which was not quantified biochemically; Stephens et al., 2000). A longitudinal cohort study of non-treatment seekers in Norway found reductions in alcohol use during cannabis abstinence, but there was no biochemical validation of cannabis use (Hammer and Vaglum, 1992). A phone survey of non-treatment seeking cannabis users found that when they reduced or quit cannabis there was no change in their alcohol use, again with no biochemical validation of cannabis use (Hughes et al., 2008). In another study of non-treatment seekers alcohol use increased, but the data were gathered retrospectively based on a previous quit attempt (Copersino et al., 2006b).

The most comprehensive prospective study of alcohol and cigarette substitution for cannabis to date was a study of 28 non-treatment seeking cannabis smokers going through an experimental 14-day biochemically verified cannabis abstinence (Peters and Hughes, 2010). Alcohol use increased significantly during cannabis abstinence among those with a previous alcohol dependence diagnosis, or those with low alcohol consumption at baseline (Peters and Hughes, 2010). There was also a significant correlation between overall cannabis withdrawal and increased alcohol use, but the study did not have enough power to explore the moderating effects of cannabis withdrawal. Cigarette smoking did not increase during cannabis abstinence (Peters and Hughes, 2010). However the study only focussed on substitution during the period of acute cannabis withdrawal, and did not explore the case when cannabis smokers voluntarily remain abstinent for longer than the period of acute cannabis withdrawal.

The current study uses a secondary analysis to extend previous work in this field in several ways. First this study tracks alcohol and cigarette use beyond the acute cannabis withdrawal period, comparing substitution between those who voluntarily remained abstinent through to one month follow-up and those who returned to cannabis use at follow-up. Second, this study is the first of its kind to explore tobacco substitution whilst taking into account the decreases in tobacco consumption experienced by abstaining cannabis smokers who mix their cannabis with tobacco to facilitate smoking (referred to as 'mulling' or 'chopping' in some countries when tobacco is added to cannabis joints, or the use of blunts: the act of rolling cannabis in cigar paper; Agrawal et al., 2012). Putative predictors of substitution are also tested, including a detailed exploration of the effects of cannabis withdrawal using DSM5 cannabis withdrawal symptoms extracted post-hoc from the cannabis withdrawal scale, which was validated during this study (Allsop et al., 2012, 2011).

2. Method

2.1. Study design

This study is a secondary analysis using prospective data on cannabis, alcohol and cigarette use collected in a community setting from non-treatment seeking dependent cannabis users ($N = 45$) during two weeks of experimental cannabis abstinence with a one month follow-up as part of a psychometric study to develop a cannabis withdrawal scale (Allsop et al., 2012, 2011).

2.2. Participants

Non-treatment seeking, DSM-IV dependent cannabis smokers recruited through advertisements in Sydney, Australia were enrolled from October, 2009 to August, 2010. Inclusion criteria included: (a) current DSM-IV cannabis dependence; (b) previous experience of cannabis withdrawal; and (c) willingness to quit cannabis for two weeks. Exclusion criteria included: (a) moderate or severe dependence on other substances except caffeine and nicotine; (b) substance-related treatment in the last three months; and (c) pregnancy. After complete description of the study to the subjects, written informed consent was obtained, approved by the University of New South Wales Human Research Ethics Committee (09152). Volunteers were compensated for participation (Allsop et al., 2012, 2011).

2.3. Procedures

Past or current alcohol abuse or dependence was assessed at baseline by Structured Clinical Interview (First et al., 2002) with a trained psychologist. Cannabis, alcohol and tobacco use data was collected using a modified Timeline Follow-back interview (Norberg et al., 2012) at four time points: (1) baseline (collecting data for the 1 month period prior to study entry), (2) after the first and second weeks of cannabis abstinence (data combined into a single cannabis abstinence time point for the main analyses of changes in alcohol and tobacco use), and (3) one month post cannabis abstinence. Abstinence was supported with a 1 h cognitive behavioural therapy (CBT) session on the last day of baseline/first day of cannabis abstinence. As the parent study was designed to verify cannabis withdrawal symptoms it was imperative that participants were encouraged to remain abstinent and so contingent payments (totaling AU\$450) were used to enhance compliance. Self-reported cannabis use/abstinence was verified with creatinine-normalised THC-COOH levels at each time-point described above (retaining abstinence weeks 1 and 2 as separate data points for this relapse analysis). Participants were considered to have used cannabis if they self-reported cannabis use or if their THC-COOH levels increased during abstinence relative to baseline (Mushoff and Madea, 2006).

2.4. Cannabis withdrawal

Cannabis withdrawal data was collected by self-report daily throughout the study using the 19 item cannabis withdrawal scale (CWS; Allsop et al., 2012, 2011). The CWS measures DSM5 (Allsop et al., 2014) withdrawal symptom severity on a 10-point Likert scale (Allsop et al., 2012, 2011). The CWS has high internal (Cronbach's $\alpha = 0.91$) and test-retest reliability (ICC = 0.95) (Allsop et al., 2011).

2.5. Data analysis

Overall, 5% ($n = 7$) alcohol and cigarette data points were missing from the 3 measured time intervals in the study, and data were imputed using multiple imputation (Schafer, 1999) generating five different plausible datasets allowing for the uncertainty in predictions (Zhang, 2003). To test the nature and extent of substitution for cannabis with alcohol and tobacco mixed models for repeated measures (MMRMs) were used with an AR1 covariance structure (Bell and Fairclough, 2013; Mallinckrodt et al., 2003; Rubin, 1976) with alcohol and tobacco use as behavioural outcomes. Time interval (baseline, cannabis abstinence and follow-up) was included as a categorical within subject's factor. Independent predictor variables tested for their effect on changes in alcohol and tobacco use included: extended cannabis abstinence (to follow-up) vs. short-term cannabis abstinence (initial 2 weeks only), baseline alcohol and cigarette use, alcohol dependence/abuse diagnoses (for alcohol outcomes), cannabis use, gender, age, and cannabis withdrawal (overall and DSM5 cannabis withdrawal symptom clusters; Allsop et al., 2013). Models were constructed with factors: time, putative predictor, and time x putative predictor, with separate models for each individual predictor to mitigate multicollinearity and to avoid overparameterizing the models with the large number of putative predictors in one model against the relatively small sample size (Harrell, 2001). Omnibus Type III tests were used to test for overall significance of the predictors before exploring significant interactions with planned comparisons: (1) baseline vs. cannabis abstinence, and (2) cannabis abstinence vs. follow-up. Effect sizes are reported using Cohen's- d (Hedges, 1981; raw difference between two means divided by standard deviation). Parametric statistics were used on Likert data as interval structure can be assumed if scales are presented as symmetrical (Norman, 2010). Residuals from the primary analyses were normally distributed.

To quantify how much tobacco participants mixed in with their cannabis participants weighed out the amount of tobacco mix using a set of scales during the modified TLFB and the weight was converted into number of cigarettes under the assumption that a standard Australian cigarette weighs 0.73 g (O'Connor et al., 2008). To generate the categorical predictor variable for testing substitution against extended vs. short-term cannabis abstinence, abstinence at follow-up was ascertained as recommended (Donovan et al., 2012) using a hybrid combination of self-report and urine toxicology data, with self reported cannabis abstinence needing to be verified with urine THC-COOH levels below 50 ng/ml at follow-up. Akaike's information criteria (Akaike, 1974) measures model fit. All analyses were carried out using SPSS version 20 with $\alpha = 0.05$.

3. Results

Forty-nine dependent cannabis users commenced the study, 48 completed the 1-week baseline phase and 47 completed the 2-week abstinence phase. Two participants were found to have relapsed during their attempted cannabis abstinence and were removed from the analysis. Forty-five non-treatment seeking cannabis users provided alcohol and tobacco use data during a two-week period of cannabis abstinence. Of those six people voluntarily remained abstinent though to the end of the one-month

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