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The Standard Joint Unit

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ABSTRACT

Objective: Reliable data on cannabis quantities is required to improve assessment of cannabis consumption for epidemiological analysis and clinical assessment, consequently a Standard Joint Unit (SJU) based on quantity of 9-Tetrahydrocannabinol (9-THC) has been established.
Methodology: Naturalistic study of a convenience sample recruited from February 2015–June 2016 in universities, leisure spaces, mental health services and cannabis clubs in Barcelona. Adults, reporting cannabis use in the last 60 days, without cognitive impairment or language barriers, answered a questionnaire on cannabis use and were asked to donate a joint to further determine their 9-THC and Cannabidiol (CBD) content.
Results: 492 participants donated 315 valid joints. Donators were on average 29 years old, mostly men (77%), single (75%), with at least secondary studies (73%) and in active employment (63%). Marijuana joints (N = 232) contained a median of 6.56 mg of 9-THC (Interquartile range − IQR = 10,22) and 0.02 mg of CBD (IQR = 0.02); hashish joints (N = 83) a median of 7.94 mg of 9-THC (IQR = 10,61) and 3.24 mg of CBD (IQR = 3.21). Participants rolled 4 joints per gram of cannabis and paid 5€ per gram (median values).
Conclusion: Consistent 9-THC-content in joints lead to a SJU of 7 mg of 9-THC, the integer number closest to the median values shared by both cannabis types. Independently if marijuana or hashish, 1 SJU = 1 joint = 0.25 g of cannabis = 7 mg of 9-THC. For CBD, only hashish SJU contained relevant levels. Similarly to the Standard Drink Unit for alcohol, the SJU is useful for clinical, epidemiological and research purposes.

1. Introduction

Cannabis is the third most used psychoactive substance worldwide (after alcohol and tobacco) (United Nations Office on Drugs and Crime, 2016) and accumulated evidence on its health and social risks has led to the consideration of cannabis as a relevant public health problem (Fischer et al., 2016; Hall, 2015; Volkow et al., 2014; World Health Organization, 2016). The latest World Drug Report highlights that the number of people requiring treatment for cannabis use globally is increasing (United Nations Office on Drugs and Crime, 2015). Although being one of the oldest and most consumed drugs worldwide (Gowing et al., 2015), it remains unknown which cannabis use patterns and which quantities of drug intake result in risky and harmful levels of use. This issue has been identified as an area needing research by the WHO (WHO, 2016).

Exploring associations between cannabis use and health outcomes faces several difficulties. One example is the complex composition of cannabis and the variety in cannabis potencies. Other difficulties arise from differing consumption habits and administration forms, including co-consumption with tobacco, quantities used, and frequency used.

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Although quantities have shown to influence cannabis-related outcomes (Asbridge et al., 2014; Hall and Degenhardt, 2015; Walden and Earleywine, 2008; Zeisser et al., 2012), cannabis use is mainly assessed by frequency of use (Casajuana et al., 2016a; Coffey et al., 2000; Mariani et al., 2011; Norberg et al., 2012; van der Pol et al., 2013a). One example is the EMCDDA definition of risky cannabis use (cannabis use on more than 20 days per month) (European Monitoring Centre for Drugs and Drug Addiction, 2012). Based on this definition, it is not possible to evaluate the overall risk of suffering cannabis-related consequences. Based on the experience with other drugs as alcohol, frequency alone may lead to an underestimation of the risks and harms. An example is occasional heavy drinking instances (more than 60 g of pure ethanol/day) (National Institute on Alcohol Abuse and Alcoholism, 2015), which have been linked to higher risks and harms (Gmel et al., 2011).

Limitations related to measurement and quantification are common. Alcohol, for instance, is characterized by an enormous variety of alcoholic beverages with different alcohol content (ranging from less than 2% to more than 50% of alcohol). In the 90's, the first "Standard Drink Unit" was established (Turner, 1990; Rodríguez-Martos Dauer et al., 1999). Afterwards, its methodological approach was used to adapt the unit to different contexts, maintaining grams of pure alcohol as a common denominator (Gual et al., 1999). Standardization facilitated registering alcohol quantities consumed and contributed to epidemiological research. Currently, the "standard drink" is widely used by health professionals and researchers and appears as a reference unit in most recommendations to the public to minimize hazardous alcohol use.

Working on a homogenization of cannabis use assessment could lead to equivalent benefits and has been requested recently by several authors (Solowij et al., 2016; Zeisser et al., 2012). By now, few attempts to develop cannabis units have been published (Norberg et al., 2012; Zeisser et al., 2012) and show several weaknesses. One example is accounting for grams of cannabis, which has a high variability in its composition (EMCDDA, 2008a). In contrast, quantity of cannabis' main psychoactive cannabinoid, 9-Tetrahydrocannabinol (9-THC) (Gaoni and Mechoulam, 1964), in the previously proposed units remains unidentified. As well as the "standard drink" accounts for grams of alcohol, a standardized unit for cannabis should consider the quantity of its main psychoactive constituent (Hall, 2015; Hall and Degenhardt, 2009; Casajuana et al., 2017). In addition, in order to increase its applicability, a standard unit should be based on the most used administration form and products, which for cannabis is to smoke self-prepared joints that result from rolling a cigarette with cannabis (mostly marijuana or hashish) mixed or not with tobacco (EMCDDA, 2008b).

The Spanish Ministry of Health, through its National Plan on Drugs, approved a project to establish a "Standard Joint Unit" (SJU) based on cannabinoid quantity present in joints. The present paper discusses its main results and proposes a SJU that converts to quantities of 9-THC information used by cannabis consumers to describe their habits of consumption. Detailed descriptions of the methodological approach are given in order to facilitate replication or adaptation to further context and settings.

2. Material and methods

2.1. Sample

From February 2015 to June 2016, cannabis users were recruited by convenience in four different settings of Barcelona (Spain): universities campuses, out-patient mental health service, leisure/night clubs and cannabis associations (associations than enable legal distribution of cannabis for adults).

Participant's eligibility criteria were: (1) having consumed cannabis at least once in the last 60 days, (2) being able to decide to participate and (3) being adult. Participants were excluded if they (1) did not declare their agreement to participate, (2) had cognitive impairment to answer the questionnaire, (3) presented language barrier. As few similar studies have been published neither had been performed in our milieu, sample size was adjusted considering the variance obtained in the worst case scenario of the Spanish Standard Drink Unit project, resulting in a necessary sample of 328 joints (82 joints in each setting), with 15% of attrition.

2.2. Procedure

2.2.1. Field study preparation, participant recruitment and sample collection

Prior to the beginning of the field study, the local police were notified and interviewers trained. The study procedure had been previously checked in a pilot test (Casajuana et al., 2016b). All participating interviewers were provided with a personalized certificate identifying them as research staff and that specified the study objectives, transport, and destination of the samples.

Volunteer participants were informed by a trained interviewer about the study objective, anonymity, and confidentiality of their data. Once accepted, they were administered a questionnaire and asked for a joint they would usually consume. For the mental health sample, patients were invited to participate by their psychiatrist, and those who accepted were administered the questionnaire and asked for the donation by a trained interviewer. Again, no personal or identifying characteristics were retrieved.

Participants were requested to prepare the joints with their own cannabis kit and material. Interviewers collected them as a whole joint with tobacco. Compensation was only handed over in case of full participation in the study, including the donation, and consisted of a USB Stick with preventive information about cannabis. For the SJU calculation, only samples linked to a questionnaire, containing tobacco and presenting only one cannabis type (marihuana or hashish), were used.

2.2.2. Analytical procedure to determine joint's composition

Donated joints, submitted as a whole joint with tobacco, were identified with a numeral code and linked to the correspondent user's questionnaire. Joints were individually stored in plastic bags, classified by sample type (marihuana or hashish) and kept in dark and stable temperature. The whole submitted joint with the cannabis-tobacco mixture were weighted and analyzed according to the *Recommended Methods for the Identification and Analysis of cannabis and cannabis products* by the United Nations Office on Drugs and Crime (United Nations Office on Drugs and Crime, 2009) using High Pressure Liquid Chromatography and Ultra Violet (HPLC-UV). Method was validated, and resulted in acceptable results for selectivity, instrumental repeatability (< 1.9%), reproducibility (< 8.8%), asymmetry (< 1.1), efficiency (> 16.171), resolution (13.8) and linearity (R2 > 0.9993). Although 9-THC is cannabis main cannabinoid, quantities of Cannabidiol (CBD), the second most prevalent cannabinoid in cannabis products (ElSohly et al., 2016), were analyzed in order to explore potential differences. 9-THC and CBD extraction in both cannabis types proceeded through a methanol: chloroform solution (9:1 v/v) and further heat driven decarboxylation (210C, 15 min). Solid reminder was dissolved again in methanol: chloroform (9:1 v/v) to a prepare a 1/10 and 1/100 solution with methanol: chloroform (90:10) and sent through the HPLC encompassed with UV (Column type: Phenomenex Luna 250 × 4 mm (5 μm); pre-column C18 4 × 3 mm (5 μm), Mobile phase: Acetonitrile: water (8:2 v/v), Flow: (1 ml/min); Detection: (220 nm, 240 nm), Injection volume (10 microL/min). Valid donation was defined as having detectable quantities of either 9-THC or CBD (detection limit 20 micrograms/gr).