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# Quantification and Comparison of Marijuana Smoking Practices: Blunts, Joints, and Pipes

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## Abstract

The quantification method for collecting self-reported marijuana use data is not standardized as it is for alcohol or cigarettes, which presents a methodologic challenge for marijuana use disorder treatment studies. Serum and urine markers of marijuana use have a long half-life, limiting their utility as a clinical trial outcome measure. Structured calendar-based interview procedures can accurately measure the frequency of self-reported marijuana use, but are unable to reliably address issues such as quantity of use or potency. This study compared the quantity and assigned-dollar value among users of blunts, joints, and pipes enrolled in two clinical trials testing pharmacotherapies for marijuana dependence. The timeline follow-back method was modified to incorporate using a surrogate substance to represent marijuana to enable participants to estimate the amount and value used. Blunt users were mostly black and Hispanic, while users of joints and pipes were primarily white. Participants reported that they placed 50% more marijuana in blunts than in joints and placed more than twice the amount of marijuana in blunts than in pipes. These findings demonstrate the feasibility of using a surrogate weight estimation procedure to augment calendar-based methods of measuring self-reported marijuana use. Individual variability in use practices limits the utility of this method to estimating within-subject comparisons, rather than between subject comparisons.

### Keywords

Marijuana; clinical trial methods; measurement

## 1. Introduction

Marijuana use is difficult to quantify because the serum or urine markers of marijuana use have a long half-life and the methods for measuring individual use practices (e.g., joint, blunt or pipe) are not standardized. Recent marijuana use in a previously abstinent individual can be detected by testing for biological markers. However, biological methods are imprecise at detecting changes in use patterns or in measuring the recent achievement of abstinence in individuals regularly using marijuana, since biological markers of marijuana

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use can persists for several weeks (Huestis and Cone, 1998a; Huestis et al., 1996). It may be possible to measure changes in marijuana use behavior by utilizing quantified measurements of biological markers of marijuana use, as has been developed for cocaine use (Preston et al., 1997), but such methods are still being developed for marijuana use (Huestis and Cone, 1998a). Therefore, the scenario for marijuana use disorders is similar to alcohol use disorders; biological methods for measuring substance use behavior are imprecise (Buchan et al., 2002) and the optimal method for measuring substance use intake is self-report confirmed by biological methods (Lennox et al., 2006a; Lennox et al., 2006b).

Calendar-based methods of collecting self-report substance use data, such as the timeline follow-back method (Litten and Allen, 1992), have been standardized and validated for collecting alcohol and other substance use data (Fals-Stewart et al., 2000). Alcohol and cigarette use is easily quantifiable because the substances are legal and the potency and standardized quantity of these commercially available products is known. With marijuana, there is variability in the potency and cost (Johnson and Golub, 2007). How much marijuana is typically placed in a blunt, joint or pipe has not been described.

Since substance use disorder clinical trials frequently use the change in substance use behavior (i.e., amount used per using day) as the primary outcome measure, relying on imprecise measurements of use can introduce noise and obscure treatment effects. In order to improve the methodology of self-reported marijuana use, we developed a modification of the timeline follow-back method (Litten and Allen, 1992) for marijuana use, using not only a calendar procedure to record when marijuana use occurred, but also incorporating a measurement procedure using a surrogate substance (oregano) to represent marijuana, with which participants estimate the weight of marijuana used for each day of the study period, much like the “bar set” of glassware commonly used for estimating the volume of alcoholic beverages for the alcohol timeline follow-back procedure. Our pilot use of this procedure describes the baseline use patterns for 251 marijuana-dependent individuals for the 30 days prior to clinical trial enrollment.

## 2. Methods

### 2.1. Participants

Participants were 251 individuals enrolled in two marijuana dependence pharmacotherapy trials at a university-based treatment clinic between December 1, 2004 and March 31, 2009. Both trials were randomized double-blind pharmacotherapy trials; one was directed at co-occurring cannabis dependence and major depression or dysthymia (n=90) and the other was directed at cannabis dependence alone (n=161). Recruitment methods for both of the clinical trials were similar and consisted primarily of paid advertisements, internet sources, and clinical referrals. Research protocols were approved by the Institutional Review Board (IRB) of New York State Psychiatric Institute. All participants provided written informed consent prior to study entry and were provided with reimbursement for travel expenditures and for completing study measures.

### 2.2. Data Collection

Demographic information, including age, gender, ethnicity, race, marital status, education, and employment, was collected during the screening assessment for potential clinical trial participation.

At the time of study enrollment participants were asked to complete a structured timeline follow-back interview designed to evaluate self-reported marijuana use. The initial phase of the interview asked participants: 1) their preferred method of use (e.g., joints, blunts, pipe, or ingestion); the pipe category included water pipes (i.e., “bongs”), small portable linear

pipes (i.e., “one-hitters” or “bats”), and other variations of pipes. 2) To estimate the amount of marijuana used in the preferred method, by using a surrogate substance (oregano); and 3) to estimate the dollar value they would assign to the amount of marijuana measured in question 2. Rolling paper and the leaf cigar wrappers (Phillies Blunt) were available for assisting in estimating the amount typically used. Pipe users used oregano to estimate the typical amount of marijuana placed in the pipe for each episode of use. The amount of surrogate substance, oregano, was weighed to the hundredth gram and recorded.

The second phase of the interview was to complete a calendar procedure for the 30 days prior to study entry where an amount in grams was entered for each day. As part of the structured interview, if marijuana was shared with others, the amount estimated was divided by the number of individuals in order to attribute only the proportion used by the study participant.

### 2.3. Data Analysis

All data were entered into SPSS (SPSS for Windows, 2009). Differences among groups in categorical variables (race, gender, marital status, and employment status distributions) were analyzed using the Chi-Square test for independent samples. Differences among groups on measures with continuous variables (age and education) were analyzed using independent sample t-tests. The weight in grams per unit of use, the value in US dollars assigned to the quantity of marijuana used, and the cost per gram in US dollars were found to have a high degree of skewness and a high ratio of skewness to standard error of skewness, indicating a non-normal distribution and therefore Kruskal-Wallis test was performed. Alpha = 0.05 was set as the level of significance for all 2-tailed analyses.

## 3. Results

Characteristics of participants by preferred method of marijuana use are in Table 1. These data were collected at a single time point for each participant prior to clinical trial entry. No participants reported ingestion (i.e., eating or drinking as tea) as the primary method of use. Users of joints were older and had a greater proportion of women and whites. Pipes were used primarily by whites and rarely by blacks. Users of blunts were primarily black and Hispanic. Pipe users reported the highest education level and had a greater proportion of married and employed individuals. Blunts contained 1.5 times the amount of marijuana compared to joints and 2.5 times compared to pipes. Pipe users reported a higher value per gram in dollars than blunt or joint users.

Because the different method of use categories had an uneven racial distribution, in particular that blunt users were primarily black, the possibility that the results were due to the demographic distribution was investigated. A linear regression model tested in 2 steps the effects of use method and race. The method of use had a significant effect on the dollar value estimated ($r^2 = 0.09$; $F(2,247) = 11.9$; $p < 0.001$). After accounting for method of use, black racial status did not have a significant effect on the results ($r^2 = 0.001$; $F(1,246) = 0.28$; $p = 0.601$).

## 4. Discussion

These data provide previously unavailable information about marijuana use practices among marijuana-dependent clinical trial participants, including important demographic differences among the different methods of marijuana use. Additionally, the feasibility of using a surrogate substance as a marker of self-reported marijuana use in a timeline follow-back procedure is demonstrated. These data call into question the assumptions made in the Global Appraisal of Individual Needs (GAIN) (Dennis et al., 2006), which suggests that one blunt is

equivalent to two to six joints. The results of this study suggest that in treatment-seeking marijuana users the correct ratio is closer to 1.5 joints per blunt. However, the large reported variance suggests that any strict formula is unlikely to be a useful predictor. Assuming an individual participant consistently estimates their cannabis use and tends to buy marijuana of similar potency, within-subject comparisons of self-report data over time arguably have face validity. However, given the expected variability in potency, and taking into account the variance in estimating standard use units of marijuana (e.g., joints or blunts) and dollar-value reported in this study, the validity of using the self-reported amount of marijuana as a basis for between subject comparisons is questionable. That is to say, measuring the change in the self-reported amount of marijuana used over time (e.g., change in amount “joints” used per using day) within a subject appears to be a more appropriate approach to data analysis than making comparisons between subjects (e.g., comparing treatment group mean amount of “joints” used per using day).

The modification of the timeline follow-back procedure described in this study addresses some of the methodological challenges of accurately measuring self-reported marijuana use, but important problems remain unsolved. One critical issue is that there is no way to standardize potency among participants or even for the same participant at different points in time. It is known that marijuana potency and cost in the community varies greatly (Johnson and Golub, 2007; Sifaneck et al., 2007). A logical approach would be to measure the THC potency of marijuana used by participants, but legal and ethical considerations make this unfeasible. Using cost as a proxy for potency is arguably the most feasible option.

The role of urine toxicology testing for measuring changes in marijuana use is not fully developed. Detecting THC or other biological markers of marijuana use in the serum, saliva, urine or hair (Huestis et al., 2007) is most accurate in determining that a participant has not recently been abstinent from marijuana use. These biological measurements are less useful for detecting reductions or cessation of use. Urine cannabinoid measurement can remain positive for several weeks in regular marijuana users (Huestis and Cone, 1998b). A possible use of the surrogate marijuana timeline follow-back procedure described here is to provide data for developing a method to correlate urine cannabinoid metabolite data and marijuana use patterns.

An important limitation of this study is that no biological or other method of measurement was used to confirm the self-report data. However, there were no contingencies based on the outcome of the self-reported data, so a directional bias is unlikely. Another important limitation is that the study population consisted of marijuana-dependent clinical trial participants, which is not necessarily representative of marijuana-dependent individuals in the community or presenting for treatment in other settings. The two clinical trials required a minimum amount of marijuana use per week for study entry, which is likely to have selected for a more heavily using population, which in turn influenced the results. The relationship between the density of oregano used in the study and the density of marijuana in the community is unknown. For this reason, the weight data collected can only be used as a relative unit of measure for making comparisons among study participants.

Further research is required to develop the optimal methods for conducting clinical trials for marijuana use disorders, and further refinement of the procedure for measuring the primary outcome of clinical trials, marijuana use, are needed. Future studies should attempt to correlate self-report data with biological markers and, ideally, include methods of assessing marijuana potency. Given the differences among users of joints, blunts, and pipes, balancing the proportion of these different methods of marijuana administration among treatment conditions within a clinical trial should be considered.

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**Table 1**

**Characteristics by Preferred Method of Marijuana Use**

| | Blunt (N=98) | Joint (N=80) | Pipe (N=73) | Statistics | P value |
|---|---|---|---|---|---|
| | Mean (SD) | Mean (SD) | Mean (SD) | F or $X^2$ | |
| **Age (SD)** | 30.9 (8.4) | 41.4 (9.1) | 38.5 (9.7) | 32.2 | <0.0001 |
| **Gender** | **n** (%) | **n** (%) | **n** (%) | | |
| **Male** | 85 % | 71 % | 85 % | 3.2 | 0.04 |
| **Race** | | | | | |
| **Black** | 47 % | 14 % | 1 % | 99.5 | <0.0001 |
| **White** | 13 % | 49 % | 83 % | | |
| **Hispanic** | 36 % | 28 % | 13 % | | |
| **Others** | 4 % | 10 % | 3 % | | |
| **Years of Education (SD)** | 13.5 (2.5) | 14.6 (2.5) | 15.6 (2.6) | 14.5 | <0.0001 |
| **Married** | 15 % | 33 % | 38 % | 18.9 | 0.004 |
| **Employed** | 53 % | 71 % | 73 % | 23.2 | 0.11 |
| **Weight in grams per unit of use (SD)** | 0.97 (0.47) | 0.66 (0.45) | 0.39 (0.64) | 100.7 [a] | <0.0001 |
| **Value in US dollars per unit of use(SD)** | 9.0 (8.4) | 6.5 (4.0) | 4.5 (3.4) | 46.5 [a] | <0.0001 |
| **Value per gram in US dollars (SD)** | 10.9 (7.4) | 12.9 (11.0) | 18.2 (11.0) | 16.1 [a] | <0.0001 |

[a] Kruskal-Wallis test