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Self-change: A pathway to cannabis abuse resolution

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Abstract

Long-term daily cannabis abusers ($N=25$) who without treatment stopped using cannabis for at least one year were interviewed about their past substance use, antecedents to change, and factors supportive of change. Respondents' cannabis problems decreased in the year prior to their recovery compared to their lifetime use. Respondents described their successful quit attempts through structured interviews and autobiographical narratives. The narratives were content analyzed for factors related to recovery. The reports indicated that marijuana cessation was motivated more by internal than external factors, and the most common precipitants of quit attempts were cognitive anti-cannabis factors. The major reason reported by respondents for stopping cannabis was a change in how they viewed their cannabis use, followed by negative personal effects. The most common reported maintenance factors were avoidance of situations in which cannabis was used, changes in lifestyle, and the development of non-cannabis-related interests. Cognitive and respiratory functioning were also assessed. Lastly, more than 75% of respondents reported not seeking treatment because they believed it was not needed or because they wanted to quit on their own. Directions for future research are offered.

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Over the past decade, considerable evidence has accumulated showing that self-change (i.e., recovery without treatment) is a major pathway to change for individuals with addictive behaviors (Klingemann et al., 2001; Sobell, Ellingstad, & Sobell, 2000). Research on recovery from cannabis use, whether through

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treatment or self-change, has been a neglected area relative to other addictive behaviors (Ellingstad, Sobell, Sobell, & Planthara, 2002; Klingemann et al., 2001; Sobell et al., 2000). In a review of 40 self-change studies, Sobell et al. (2000) found that only one included cannabis abusers. Further, a 25-year follow-up study of Vietnam veterans found that the majority (82.5%) of their most recent cannabis quit attempts were without treatment. Of those untreated attempts, 88.3% were successful (Price, Risk, & Spitznagel, 2001).

In contrast to other illicit drugs like heroin and cocaine (27.8 and 3.1 million estimated lifetime users, and 1.7 and 0.1 million estimated past monthly users, respectively; Substance Abuse and Mental Health Services, 2003), the use of cannabis is very widespread (i.e., 83.3 million estimated lifetime users; 14.3 million estimated past monthly users; Substance Abuse and Mental Health Services, 2003, 2004). Further, there are 7000 new cannabis users a day (Substance Abuse and Mental Health Services, 2003, 2004).

In a recent review of studies that assessed reasons why naturally recovered substance abusers did not seek treatment, the majority reported concerns related to the stigma of entering treatment (Sobell et al., 2000). Other reasons included negative beliefs about treatment, and the belief that treatment was not necessary for their problem (reviewed in Sobell et al., 2000).

Several reasons appear to be associated with the self-change process among substance abusers. In one study of alcohol, heroin, and cocaine abusers, the major reason was a cognitive evaluation of the positives and negatives of using substances (Sobell, Sobell, Toneatto, & Leo, 1993). Other major reasons reported by substance abusers include health concerns, followed by negative personal events, and financial motivations (Sobell et al., 2000). The most commonly cited reasons in self-change studies of substance abusers for what helped maintain their quit attempts were social support and the development of non-substance use interests (Sobell et al., 2000).

Because research suggests that people organize information about themselves, their worlds, and their lives into narratives (Baumeister, Stillwell, & Wotman, 1990; Gergen & Gergen, 1998), it has been recommended that narrative accounts be used to supplement traditional data collection approaches (Baumeister et al., 1990; Klingemann, 1992). While behavior change can be studied using full accounts of people's lives (Rosenberg, 1988; Sloan & Marx, 2004; Smyth, 1998), a less laborious strategy uses micronarratives or written disclosures and asks people to write a short statement about a specific behavior change (e.g., drug abuse) or major life event (e.g., childbirth) rather than describing the totality of one's life experiences. Over the last 20 years, the use of autobiographical micronarratives has greatly increased. In social psychology, micronarratives have been used to explore subjective perceptions of many behaviors (e.g., anger, masochism, failed relationships: Baumeister et al., 1990; McAdams, 1994). Although narrative accounts provide an opportunity for people to describe how they perceive they have changed (i.e., by recognizing, organizing, making sense of the change process), they have a potential for bias (e.g., misattributions; distortions, self-aggrandizing, responding to demand characteristics, reducing dissonance). On balance, however, micronarratives are thought to be accurate representations of people's subjective perceptions (Baumeister, 1996; McAdams, 1994).

In the addiction field, micronarratives have been increasingly used to understand processes of behavior change and relapse (Bottorff, Johnson, Irwin, & Ratner, 2000; Burman, 1997; Hanninen & Koski-JûÊnnes, 1999; Heatherton & Nichols, 1994; Humphreys, 2000; Klingemann, 1992; McIntosh & McKeganey, 2000; Sobell et al., 2001). In a cross-cultural study, the narratives of alcohol, heroin, and cocaine abusers were used to evaluate the behavior change process common to three different substances (Sobell et al., 2001). The major reason that drove the recovery process across all three studies and three substances was engaging in a cognitive appraisal process of the pros and cons before changing.

1. Effects of cannabis use

Two major health concerns about long-term use of cannabis are cognitive and respiratory impairment. While numerous studies have addressed these concerns, many have been methodologically weak, with ambiguous outcomes (Block & Ghoneim, 1993; Earleywine, 2002; Tashkins et al., 1987). Some have found evidence for cognitive declines among current cannabis users in the areas of (a) focused attention (Pope & Yrugelun-Todd, 1996; Solowij, 1995), (b) perceptual motor tasks (Varma, Malhotra, Dang, Das, & Nehra, 1988), (c) reaction time, speed, and accuracy tests (Mendhiratta, Verma, Dang, & Malhotra, 1988), and (d) tests of mathematics and verbal expression (Mendhiratta et al., 1988). In a study comparing chronic cannabis abusers (i.e., light to heavy users for >two years) who were not under the influence of cannabis to non-users, impairments in mathematics and verbal expression were found for heavy cannabis abusers (i.e., used on >seven occasions per week) compared to non-heavy users and non-users (Block & Ghoneim, 1993).

Another study of current long-term cannabis abusers found “impaired ability to focus attention and filter out irrelevant information” (Solowij, Michie, & Fox, 1991). In a subsequent study, current abusers and ex-users (i.e., abstinent for six weeks) showed reductions in accuracy but not reaction time in response to auditory cues compared to non-users (Solowij, 1995). While there continued to be deficits in terms of filtering irrelevant information compared to non-users, among ex-users such deficits were lower compared to current users. This suggests that impairment begins to recover upon cessation and that with a longer cessation period (i.e., \geq six weeks) impairments might continue to lessen.

The second area of concern, the effects of long-term cannabis use on respiratory functioning, is difficult to evaluate because a high percentage of cannabis abusers also smoke cigarettes (i.e., as many as 75% of cannabis smokers are cigarette smokers; *Substance Abuse and Mental Health Services, 2000*). In one study, Tashkins et al. (1987) evaluated respiratory symptoms of regular cannabis only users, tobacco and cannabis users, tobacco users only, and non-smokers. Results indicated that regardless of cannabis use, tobacco smokers performed significantly poorer than non-cigarette smokers on measures of small airway function, while cannabis smokers, regardless of cigarette smoking, performed worse on measures of large airway function. While many cannabis abusers report respiratory problems such as chronic cough, phlegm, and wheezing, they do not appear to be at any greater risk for a debilitating respiratory disease (e.g., emphysema, bronchitis; Earleywine, 2002; Taylor, Poulton, Moffit, Ramankutty, & Sears, 2000; Zimmer & Morgan, 1997), possibly because such diseases are associated with small airway inflammation.

Because of the dearth of studies on the self-change process with cannabis abusers, this exploratory study examined factors that are associated with and maintain the self-change process. Barriers to seeking treatment were explored. In addition, this study evaluated possible gross respiratory and cognitive impairments in this population.

2. Method

2.1. Participants

Using advertisements in local newspapers, volunteers were recruited from two sites (South Florida, $n = 12$; San Diego, CA $n = 13$). Respondents met the following criteria: (a) daily cannabis use for ≥ 12 consecutive months prior to their self-change date; (b) abstinence from cannabis use for ≥ 12 months; (c)

≥18 years of age; (d) never received formal help or treatment for cannabis abuse (i.e., treatment program, counseling, or self-help groups); (e) no reported history of head injury with loss of consciousness or other significant neurological problem; and (f) ability to understand and write English. One eligible respondent was excluded because of acute cocaine intoxication when interviewed. This study was approved by the Institutional Review Boards of Nova Southeastern University (FL), the University of California, San Diego, and the Veterans Administration Medical Center in La Jolla (CA).

2.2. Measures

All respondents completed the following two self-report measures: (a) Drug Abuse Screening Test (DAST-10), an assessment of drug problem severity (Skinner, 1982); and (b) demographic and substance use history questionnaire (e.g., past and current drug use, cigarette smoking, health status, age, education). When respondents were asked about current drug and alcohol use, it related to the year prior to their interview date.

In addition, each participant was administered a timed spirometry test, with calculations of Forced Expiratory Volume in one second (FEV1) as a measure of lung function (Enact Health Management Systems, 1996). An airway obstruction is the principal abnormality detected by spirometry and can be associated with an obstructive lung disease such as emphysema or chronic bronchitis. The FEV1 values were converted into percentages of predicted levels that were based on age and height (Crapo, Morris, & Gardner, 1981). Impairment was defined as a percentage below 80% of predicted levels (American Thoracic Society, 1991).

Three brief tests of cognitive functioning were administered: (a) Digit Span (Heaton, Grant, & Matthews, 1991); (b) Trail Making Test-B (Heaton et al., 1991); and (c) Stroop Color and Word Test (Golden, 1978; Stroop, 1935). The measures assessed areas shown/thought to be affected by cannabis use (i.e., auditory memory and retrieval, mental alertness, visual sequencing, visual attention and discrimination, ability to filter irrelevant information). The Trail Making Test-B and Digit Span were scored using age adjusted scaled scores, and age and education corrected *t*-scores (Heaton et al., 1991). Raw scores from the Stroop Color Naming Test were converted into interference scores, and translated into *t*-scores (Golden, 1978).

2.3. Design and procedure

Participants responding to advertisements were screened by phone for eligibility. Eligible participants were interviewed individually at Nova Southeastern University, La Jolla VA Medical Center, or a location of their choosing. Participants were paid \$15 for their time. After obtaining informed consent, participants were administered a breath-alcohol test (to rule out current alcohol use), a timed spirometry breath tests, and three cognitive measures. Participants were asked to complete an autobiographical narrative to describe their process of change related to cannabis cessation. All participants were given one sheet of lined paper (8 1/2" × 11") with the following instructions: "In as much detail as possible, describe the time you successfully quit smoking marijuana, including what led up to your decision to quit."

2.4. Content analysis of narratives

Respondents' narratives about their decision to quit using cannabis were evaluated using dichotomous ratings of the presence or absence of different events/factors. The dichotomous rating procedures were

similar to those in previous studies using narratives to evaluate the behavior change process (Baumeister et al., 1990; Heatheron & Nichols, 1994; Helvig, Sobell, Sobell, & Simco, in press). Change factors were the four categories (i.e., social support, cognitive, affective, physical health) in a recent self-change study (Helvig et al., in press). A fifth factor (motivation to quit) was added to capture descriptions of change attempts related to motivation (DiClemente, 1999; Miller & Rollnick, 2000).

As in two previous studies (Heatheron & Nichols, 1994; Helvig et al., in press), two independent raters coded each participant's narrative for the presence or absence of statements related to each change factor. Dichotomous ratings are the preferred way of evaluating micronarratives because they are more objective and yield higher inter-rater agreement compared to ratings on a continuum (Baumeister et al., 1990). The two raters attended a training session to learn how to evaluate the narratives with respect to whether the words in a particular change factor were present or absent. As in previous studies (Baumeister et al., 1990; Heatheron & Nichols, 1994; Helvig et al., in press), discrepancies between the two raters were reviewed by a third rater who made the final coding determination. This study's 84.9% inter-rater agreement rate is similar to that in other studies using autobiographical narratives (Baumeister et al., 1990; Heatheron & Nichols, 1994; Helvig et al., in press). Because this study looked at the percentage of participants whose narratives were judged to contain words representative of each change factor, each participant was counted a maximum of once per change factor.

3. Results

3.1. Data integrity check

Data integrity checks were used to evaluate the same information obtained twice, once during the eligibility screening and once when participants completed their study questionnaires. Paired *t*-tests for the three cannabis use variables assessed suggests that respondents' self-reports were reliable: (a) *number of joints smoked per day during the last year of use* [mean (S.D.): Screen: 2.9 (2.2); Interview: 3.1 (3.0); $t(24) = -.379, p = .708$]; (b) *days per week used during the last year of use* [mean (S.D.): Screen: 5.8 (1.7); Interview: 5.8 (1.8); $t(24) = -3.27, p = .746$]; and (c) *years cannabis reported as a problem* [mean (S.D.): Screen: 6.1 (6.7); Interview: 5.2 (5.7); $t(24) = .900, p = .377$].

The mean (S.D.) age of participants when interviewed and when recovered was 35.6 (10.6) and 29.6 (7.9) years, respectively. Almost two-thirds were male (64%), and all had completed high school or its equivalent. They had a mean (S.D.) of 15.4 (2.4) years of education and were primarily Caucasian (84.0%). When interviewed, 28% were married compared to 16.0% at the time of their recovery. At the time of the interview and recovery, 68.0% and 60.0%, were employed either full or part-time, respectively. At the time of their interview and recovery, 20% and 16%, respectively, held white-collar jobs.

Respondents reported that they started using cannabis at a mean (S.D.) age of 16.4 (4.1) years and they continued using for a mean (S.D.) of 13.7 (7.6) years before stopping. In terms of lifetime use and year of last use, respondents reported using cannabis for a mean (S.D.) of 5.0 (1.4) and 5.8 (1.8) days per week, respectively, and using a mean (S.D.) of 2.8 (1.8) and 3.1 (3.0) joints on days when they used, respectively. Neither quantity [$t(24) = -.75, p = .460$] nor frequency of use [$t(24) = -.96, p = .346$] differed significantly between lifetime and year last used. On average [mean (S.D.)], respondents were 30.0 (7.9) years of age when they quit using cannabis and had stopped for a mean (S.D.) of 6.0 (6.1)

years. Although three-quarters (72%) had a lifetime cannabis dependence diagnosis (American Psychiatric Association, 2000), significantly [$\chi^2(24)=12.37, p<.001$] fewer (56%) met this diagnosis in the year prior to their recovery. Similarly, mean (S.D.) DAST-10 scores (Skinner, 1982), which reflect drug problem severity, were significantly higher [$t(24)=3.57, p=.002$] for lifetime use [5.4 (2.2)] than in the year prior to recovery [4.5 (2.2)]. These two findings suggest that the severity of the respondents' cannabis problems decreased in the year prior to their quitting. In terms of years of heavy cannabis use and years a problem, respondents reported a mean (S.D.) of 8.8 (6.7) and 6.1 (6.7) years, respectively. Very few respondents reported cannabis-related arrests [mean (S.D.)=0.7 (1.02)], and only 4% reported cannabis-related hospitalizations. A majority of respondents reported experiencing consequences from their cannabis use. Lifetime consequences reported by over half of all respondents included memory/thinking problems (88%), loss of interest (76%), social/interpersonal problems (68.0%), and emotional/psychological problems (64%). In terms of tobacco use, only 20% ($n=5$) were smoking cigarettes when interviewed, and 32% ($n=8$) reported being ex-smokers. Lastly, respondents reported a mean (S.D.) of 2.1 (5.2) past cannabis quit attempts and three-quarters (76%) reported one or more quit attempts before stopping.

3.2. Lifetime and past year alcohol and drug use

In terms of lifetime use, all respondents reported alcohol use. The next two most commonly used drugs over the lifetime were hallucinogens (72.0%) and cocaine/crack (64.0%). The two drugs respondents reported least using over their lifetime were inhalants (12%) and heroin (16%). Other lifetime drug use ranged from 28% to 40% (i.e., sedative/barbiturates, amphetamines, methamphetamines, benzodiazepines, other opioids). A quarter (24.0%; 6/25) of all respondents reported using drugs other than alcohol in the year prior to their interview. Except for alcohol (96%), the most commonly used drug was cocaine (16%), followed by hallucinogens (8%), benzodiazepines (8%), amphetamines (4%), and heroin (4%).

Except for alcohol use [mean (S.D.) days=67.0 (63.0)], the mean number of days drugs were used in the past year (maximum=365 days) was low ranging from a mean (S.D.) of 28.0 (31.1) days in the past year for hallucinogens to 25.0 (7.1) days for benzodiazepines to 20.0 (0.0) days for amphetamines to a mean of 5 or fewer days for all other drug classes.

3.3. Reasons for cannabis cessation

The most common reason (76%) respondents reported for stopping cannabis use on their own was that they changed their view of cannabis to be less positive. Two-thirds (64.0%) reported that their cannabis use had a negative effect on them, and 52% reported a social influence to quit (i.e., friends, family, spouse). Other reasons reported by less than half of the sample included health (44%), legal problems/fears (32%), and too costly (24%).

3.4. Factors that helped avoid relapse

Three factors were reported by almost three-quarters (72%) of respondents as helping them maintain change (i.e., avoid a relapse): (a) development of or return to interests or activities not related to cannabis; (b) avoidance of triggers to use; and (c) lifestyle changes (e.g., diet, exercise). More than half

reported support from a significant other/family member (60.0%) and changes in social groups/support (56%). Work factors (48%) and religion/faith/beliefs (24%) were reported by less than half of the sample.

3.5. Reasons for not seeking treatment

Respondents reported that the most significant barrier to entering treatment was the belief that cannabis use was not a problem or not enough of a problem to warrant treatment (80%). Three-quarters (76.0%) reported that they had wanted to quit on their own. Slightly less than half (48%) listed the stigma or being labeling a drug abuser as a barrier to treatment. Other reasons for not seeking treatment included negative feelings about treatment (44%), concerns about confidentiality (36%), unwilling to share problems (36%), unaware of treatment options/availability (32%), monetary costs (28%), and embarrassment (24%).

Table 1 shows the results [mean (S.D.); percent impaired] of cognitive and physiological tests. On the Trail Making Test-B, using age and education adjusted *t*-scores (Heaton et al., 1991) the group scored within normal limits (0.5 standard deviations below predicted). On the Stroop Color and Word Test that measures skills such as basic reading speed (word score), high speed information processing (color score), and speed of naming with background interference (color–word score), several respondents fell within the impaired range (Golden, 1978). For the Digit Span, the age and education adjusted scaled scores for the group fell within normal limits (4 participants scored in the impaired range). On the timed

Table 1
Mean (S.D.), range, and percent impaired on Trail Making Test-B, Stroop Color and Word Scores, Digit Span Score, and Forced Expiratory Volume-1 for naturally recovered cannabis abusers ($n=25$)

Variable	Mean (S.D.)	Range	Percent impaired
<i>Cognitive tests</i>			
Trail Making Test-B scaled-score ^a	9.6 (1.9)	6–15	12.0
Trail Making Test-B <i>t</i> -scores ^a	44.7 (7.4)	30–59	28.0
Stroop <i>T</i> -score ^{b,c}	50.2 (5.8)	41–63	0.0
Stroop Word score ^c	71.0 (12.2)	46–92	17.0
Stroop Color score ^c	55.6 (6.8)	40–72	21.0
Stroop Color–Word score ^c	31.2 (6.8)	21–50	50.0
Stroop interference score ^c	0.2 (5.8)	12–10	25.0
Digit Span scaled-score ^a	10.2 (2.3)	6–14	16.0
Digit Span <i>t</i> -score ^a	47.2 (9.8)	32–67	28.0
<i>Forced Expiratory Volume (FEV1)</i>			
FEV1 ^{d,e}	3.5 (0.9)	2.1–5.5	16.4 ^f
Predicted FEV1	3.8 (0.7)	2.1–4.8	NA ^g
Percentage of predicted FEV1	91.5	NA ^g	NA ^g

^a Age adjusted scaled scores and age and education adjusted *t*-scores based on Heaton et al. (1991).

^b *T*-scores based on Golden (1978).

^c $n=24$: one subject was excluded due to color-blindness.

^d Values based on Crapo et al. (1981).

^e $n=24$: one subject was excluded due to equipment failure.

^f Impairment defined as <80% predicted level levels (American Thoracic Society, 1991).

^g NA=not applicable.

Table 2

Percentage of naturally recovered cannabis abusers' ($n=25$) narrative stories judged to contain different change factors

Change factors and text examples	Percentage of narratives judged to contain the change factor ^a
Social support (words/phrases involving family or peer relations)	
<i>Anti-cannabis</i> ("My friends urged me to give it up.")	8.0
<i>Pro-cannabis</i> (none)	0.0
Cognitive (words/phrases with references to thoughts and ideas)	
<i>Anti-cannabis</i> ("With my kid getting older, and more people coming over to the house, I figured I should just get rid of it.")	88.0
<i>Pro-cannabis</i> ("I never thought I had any reason to give up pot.")	20.0
Affective (emotionally laden words/phrases)	
<i>Anti-cannabis</i> ("I enjoy not smoking as much or more now.")	48.0
<i>Pro-cannabis</i> ("I still feel the desire to use.")	24.0
Physical health (words/phrases relating to health)	
<i>Anti-cannabis</i> ("Adverse effects on my memory.")	20.0
<i>Pro-cannabis</i> (none)	0.0
Motivation to quit (words/phrases relating to internal or external factors)	
<i>Intrinsic/Internal</i> ("I realized I needed to grow up and become a man.")	80.0
<i>Extrinsic/External</i> ("Law and legal problems became a concern.")	56.0

^a Because the study was looking at the number of participants reporting different change factors, each change factor was coded as positive irrespective of the number of statements per change factor.

spirometry test (FEV1; [Enact Health Management Systems, 1996](#)), while the group scored in the normal range, two participants scored in the mildly impaired range (i.e., between 65% and 80% of predicted values), and two scored in the moderately impaired range (i.e., between 50% and 65% of predicted values).

3.6. Content analysis of narratives

Table 2 shows the percentage of the cannabis abusers' narratives judged to contain different change factors. For four of the change factors, statements were evaluated with respect to their pro- and anti-cannabis sentiments. For the fifth factor, motivation to quit, statements were divided into intrinsic and extrinsic reasons. To help readers understand the content area, examples of respondents' narratives are in the table. Over three-quarters of all respondents' narratives were judged to contain cognitively focused anti-cannabis (88.0%) and intrinsic motivation to quit (80.0%) statements. Although a minority of cases included pro-cannabis positive cognitive and affective statements, these were few in comparison to anti-cannabis statements. The lack of positive social support statements is notable.

4. Discussion

In the present study, three-quarters of cannabis abusers said they stopped using because their view of cannabis use changed to be less positive and two-thirds reported experiencing negative personal consequences. These results parallel those of other studies showing that one of the major reasons for self-change is a cognitive appraisal of one's use ([Klingemann et al., 2001](#); [Sobell et al., 2000](#)). Although

health-related reasons for recovery have been frequently reported by naturally recovered cigarette smokers and some substance abusers (Sobell et al., 2000), only 44% of current cannabis abusers reported health reasons. This suggests that this sample may have experienced fewer or less intense physical consequences compared to other substance abusers that recover on their own. The strong role for a cognitive appraisal process suggests that using a decisional balance exercise to highlight the pros and cons of cannabis use may help to motivate cannabis abusers in treatment (Klingemann et al., 2001; Sobell et al., 2001).

In past self-change studies (Klingemann et al., 2001), social support has been reported as an important maintenance factor. In contrast, the most commonly reported maintenance factors in this sample were avoidance of trigger situations, lifestyle changes, and the development of non-substance use interests. These findings parallel studies with naturally recovered drug abusers showing that avoidance of drug cues is important to recovery (Klingemann et al., 2001).

The two main reasons respondents gave for not seeking treatment (i.e., their problem did not require treatment; wanted to change on their own) were consistent with past self-change studies with substance abusers (Klingemann et al., 2001). Participants' written narratives included more intrinsic than extrinsic statements of motivation to quit, a finding consistent with the reason given by cannabis abusers at treatment entry (Stephens, Roffman, & Simpson, 1993).

As a group, respondents in the present study who stopped using cannabis on their own scored below average, but in the unimpaired range, on a test to measure airway obstruction (i.e., an indicator of pulmonary diseases). This suggests that despite long-term cannabis abuse, gross lung capacity was largely unimpaired following cannabis cessation.

A surprising finding was that half of all respondents never smoked cigarettes. This is in contrast to a national household drug survey (Substance Abuse and Mental Health Services Administration, 2000) showing that 75% of current cannabis abusers smoke cigarettes and studies reporting that a majority (i.e. 78%) of substance abusers smoke cigarettes (Hughes, 1995; Kalman, 1998). The absence of gross lung capacity impairment among respondents in the current study may reflect that marijuana's effects on the pulmonary system primarily relates to cannabis abusers who smoke cigarettes (Earleywine, 2002).

Some of the recovered cannabis abusers in the present study showed current cognitive impairments as reflected by their Trail Making Test-B (i.e., visual sequencing, visual attention and discrimination) and Digit Span (i.e., auditory memory and retrieval, mental alertness) scores. When scores were adjusted for age and education level, over a quarter of respondents showed impairment on these tests. Interestingly, no impairment was found on the Stroop Color Naming Test, a test that measures ability to filter irrelevant information, and an area that has been shown to elicit deficits with regular cannabis abusers who had been abstinent for six weeks (Solowij, 1995). In the present study, as in many studies of cognitive impairment, it is difficult to make assertions of causality because it was not possible to assess premorbid functioning.

The present study has several limitations. First, the accuracy of participants' long-term recall of events can be questioned. However, several studies have found that naturally recovered substance abusers' self-reports are generally accurate (Gladsjo, Tucker, Hawkins, & Vuchinich, 1992; Klingemann et al., 2001). Further, in the present study a data integrity check showed that respondents' answers were highly reliable. Alternative validation sources (e.g., collateral reports, urinalysis) were not used because of cost, invasiveness, and the exploratory nature of the study. With regard to the possibility that recall of reasons for change is biased, such bias can only be evaluated by

a prospective longitudinal study. Although such a study would be valuable, it would be costly and take several years to complete. In the meantime, retrospective reports remain the best available data source. Limitations to external validity include that the sample was primarily Caucasian, well educated, and recruited through media advertisements.

In summary, although the sample size is small, this is the first evaluation of the process of self-change by long-term daily cannabis abusers who stopped using. As suggested elsewhere (Koski-Jännes & Turner, 1999) and as demonstrated in this study, there may be important differences between cannabis and other illicit substances with respect to what initiates and maintains natural recoveries.

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