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Behavioral treatment for marijuana dependence: Randomized trial of contingency management and self-efficacy enhancement

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HIGHLIGHTS

- Marijuana is the most used drug in the US, and achieving abstinence is difficult.
- Contingency management and self-efficacy based treatments have been most effective.
- We sought to enhance self-efficacy by reinforcing completed treatment assignments.
- Results showed that a treatment reinforcing abstinence was slightly more effective.
- Analyses indicated that initial abstinence and self-efficacy best predicted outcome.

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ABSTRACT

Objective: The purpose of the present study was to develop a treatment for marijuana dependence specifically designed to enhance self-efficacy.
Method: The participants were 215 marijuana-dependent men and women randomized to one of three 9-week outpatient treatments: a condition intended to enhance self-efficacy through successful completion of treatment-related tasks (motivational enhancement plus cognitive-behavioral treatment plus contingency management reinforcing completion of treatment homework; MET + CBT + $CM_{Homework}$); a condition that controlled for all elements except for reinforcement of homework (MET + CBT + contingency management reinforcing drug abstinence; MET + CBT + $CM_{Abstinence}$); or a case management control condition (CaseM). Participants in the two MET + CBT conditions were also asked to complete interactive voice recordings three times per week during treatment to confirm homework completion.
Results: All patients showed modest improvements over time through 14 months, with few between-treatment effects on outcomes. Latent Class Growth Models, however, indicated that a subsample of patients did extremely well over time. This subsample was more likely to have been treated in the $CM_{Abstinence}$ condition. In turn, this treatment effect appears to have been accounted for by days of continuous abstinence accrued during treatment, and by pre-post increases in self-efficacy.
Conclusions: The most effective treatments may be those that elicit abstinence while increasing self-efficacy.

1. Introduction

1.1. Impact of heavy marijuana use

Marijuana is the most commonly used illicit drug in the US. Both marijuana tolerance and a withdrawal syndrome have been documented as a result of chronic, heavy use (Budney, Hughes, Moore, & Novy, 2001; Budney, Novy, & Hughes, 1999; Compton, Dewey, & Martin, 1990; Haney, Ward, Comer, Foltin, & Fischman, 1999; Wiesbeck et al., 1996). The multi-site Marijuana Treatment Project (MTP) found that participants reported multiple problems in living related to regular use (Stephens, Babor, Kadden, Miller, & The Marijuana Treatment Project Research Group, 2002). Similarly, Budney, Roffman, Stephens, and Walker (2007) reported that marijuana users seeking treatment had more than 6 prior quit attempts and perceived themselves as unable to stop.

Long-term heavy use of marijuana increases the likelihood of depression and anxiety (Troisi, Pasini, Saracco, & Spalletta, 1998), high risk sexual behavior (Bell, Wechsler, & Johnston, 1997), and aggressive behavior during withdrawal (Kouri, Pope, & Lukas, 1999). Heavy cannabis use also results in cognitive impairments characterized by diminished memory and impaired executive functioning

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(Bolla, Brown, Eldreth, Tate, & Cadet, 2002); reduced reasoning ability (Block & Ghoneim, 1993; Lundqvist, 1995); impaired ability to focus attention and filter out irrelevant information (Solowij, 1995); lower achievement motivation (Musty & Kaback, 1995); impairments in memory and learning (Solowij, Stephens, Roffman, & Babor, 2002); and declines in productivity and potential (e.g., Lehman & Simpson, 1992). There is thus considerable justification for the development of improved methods for achieving marijuana abstinence.

1.2. Treatment record for marijuana dependence

Marijuana dependence has proven difficult to treat effectively. The largest controlled trial of treatment for marijuana dependent adults to date is MTP, which treated 450 dependent men and women in three sites. The highest abstinence rate achieved was 23% of participants at the 4-month follow-up in a motivational enhancement therapy + cognitive-behavioral treatment (MET + CBT) condition, declining to 15% at 9 months (Marijuana Treatment Project Research Group, 2004). Budney, Moore, Rocha, and Higgins (2006) combined MET-CBT with contingency management: 37% of participants reported abstinence at a 12-month follow-up. Similar results were obtained in a comparable study by Kadden, Litt, Kabela-Cormier, and Petry (2007)); a combination of MET + CBT plus contingency management for abstinence yielded 14-month abstinence rates of 35%.

Similarly, the Cannabis Youth Treatment project (CYT; Dennis et al., 2004) treated some 600 mostly white, male adolescents with a variety of cognitive-behavioral, motivational, and family-based methods. The overall percentage of adolescents in recovery (no use or abuse/dependence problems and living in the community) was about 25%, regardless of treatment condition. Thus, despite the rather intense treatments that have included cognitive-behavioral interventions and contingent reinforcement for abstinence, achieving and maintaining abstinence from marijuana has been difficult.

1.3. Mechanisms of treatment for marijuana dependence

1.3.1. Coping skills and self-efficacy

The most effective treatments to date, CBT, MET, and contingency management, presumably employ different, though complementary, mechanisms to achieve treatment gains. The aim of CBT is to provide the skills necessary to gain abstinence and to cope with life stressors and high-risk situations in more adaptive ways (Marlatt & George, 1984; Marlatt & Gordon, 1985). According to social learning theory (Bandura, 1986) successful coping experiences should lead to increased self-efficacy for abstinence. In turn, increased self-efficacy is expected to result in greater use of, and persistence at, coping with further drug-related situations, all resulting in greater abstinence over time (Larimer, Palmer, & Marlatt, 1999; Marlatt, 1985).

Recent studies on mechanisms of change in the treatment of addictive behaviors have raised questions, however, about how CBT effects long-term change. Litt, Kadden, and Stephens (2005), for example, explicitly examined the role of coping skills and cognitive constructs as mediators of treatment outcome in the MTP trial. Results indicated that marijuana outcomes out to 15 months were predicted by the use of coping skills, but that the coping skills-oriented MET-CBT treatment did not result in greater coping skill acquisition than did the MET comparison treatment in which no skills were explicitly taught.

A study conducted by Litt, Kadden, Kabela-Cormier, and Petry (2008) looked at mechanisms of treatment specifically for their power to predict changes in the short term and in the long term.

The patients were 240 adult marijuana smokers assigned to one of four 9-week treatment conditions: a case management control condition, MET/CBT coping skills training, contingency management (ContM), or MET/CBT + ContM. Results indicated that, regardless of treatment condition, abstinence *in near-term follow-ups* was best predicted by abstinence during treatment, but *long-term abstinence* was predicted by posttreatment self-efficacy for abstinence, which in turn was predicted by an increase in coping skills. Thus self-efficacy in particular appears to be important mechanism of behavior change in marijuana treatment, particularly in the long term.

1.3.2. Motivation and commitment to change

MET is a non-confrontational approach that seeks to help patients resolve ambivalence about their drug use, and thereby develop motivation to change the behavior (Miller & Rollnick, 2002). Here, too, actual mechanisms of action are not known. So far few studies have evaluated increases in motivation as a function of MET, and some investigators have suggested that, rather than motivation per se, MET succeeds by enhancing a cognitive shift toward *commitment* to behavior change (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Miller, Moyers, Amrhein, & Rollnick, 2006; Walker, Stephens, Rowland, & Roffman, 2011). It may be this change in orientation toward drug use that leads the individual to reduce drug use and to seek out ways to stop using.

1.3.3. Positive reinforcement

Contingency management (CM) procedures treat abstinence behavior as an operant that is susceptible to reinforcement, such that the probability of abstinence increases with reinforcement for abstinent behavior. Short-term efficacy of CM procedures appears to be the result of two occurrences: increased retention in treatment, and enhanced periods of abstinence during treatment (see Petry, 2000; Petry & Simcic, 2002, for reviews). It is surmised that increasing exposure to the treatment environment, and achieving abstinence, increase the possibility of the patient gaining other benefits of treatment (e.g., coping skills; Moos, 2007). There is evidence that continuous abstinence during treatment is one of the best predictors of longer term outcomes (Carroll et al., 2006; Higgins, Badger, & Budney, 2000; Petry, Alessi, & Hanson, 2007). It is not clear, however, whether CM procedures alone result in long-term changes in outcomes.

1.4. Self-efficacy enhancement in treatment

According to Bandura (1977) there are four primary sources of self-efficacy: enactive mastery, verbal persuasion, vicarious experience (e.g., seeing others succeed), or physiological state (one's monitoring of one's own internal state in stressful situations). Of these, mastery experiences, i.e., experiencing success, are the most powerful determinants of self-efficacy for behavior change. According to this model, treatment is effective and durable to the extent that it increases expectations of personal efficacy, which occurs when patients have successful coping experiences (Annis & Davis, 1988b; Bandura, 1977; DiClemente, Carbonari, Zweben, Morrel, & Lee, 2001). Therefore a promising strategy for enhancing self-efficacy is one in which behavioral homework assignments are used to practice skills for coping with high-risk situations (Annis & Davis, 1988a, 1989; Curry & Marlatt, 1987). As patients practice and master their skills, their self-efficacy should increase.

CBT generally includes homework exercises to practice skills learned in treatment, and to generalize these skills to the real world (e.g., Blagys & Hilsenroth, 2002; Burns & Spangler, 2000; Kazantzis, 2000). Recent research has indicated, however, that coping skill acquisition often does not occur as expected in CBT for addictions (e.g., Morgenstern & Longabaugh, 2000). Research across a variety of populations suggests that compliance with homework exercises is generally low (e.g., Woody & Adessky, 2002), perhaps explaining why CBT so often seems to fail to teach coping skills.