Published in final edited form as:

Addict Behav. 2016 January ; 52: 83–90. doi:10.1016/j.addbeh.2015.08.010.

Marijuana consequences in a motivational context: Goal congruence reduces likelihood of taking steps toward change

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Abstract

This study tested a model of marijuana use, problems, and motivation and barriers to change among a sample of 422 undergraduate students ages 18 – 25 ($M = 19.68$, $SD = 1.60$) who used marijuana at least once in the past 6 months. We tested a structural equation model (SEM) with use motives (i.e., coping, enhancement, and expansion), perceived use utility, and gender as exogenous variables predicting marijuana use behavior (i.e., use and problems), motivation to change (i.e., problem recognition and perceived costs and benefits of change), and the ultimate outcome, taking steps to reduce marijuana use. Controlling for level of use and problems, expansion motives had a direct effect on increased perceived costs of change and enhancement motives had direct inverse effects on problem recognition and perceived benefits of change. However, the total effect of expansion motives on taking steps was not significant. The perceived role of marijuana in achieving personal strivings (i.e., use utility) was inversely associated with problem recognition, perceived benefits of change, and taking steps toward change. In contrast, coping motives, despite being associated with greater perceived costs of change, were positively associated with taking steps. Problem recognition was positively associated with both increased perceived costs and benefits of reducing marijuana use, reflecting individuals' ambivalence about change. As expected, perceived benefits and costs of reducing use were positively and negatively associated with taking steps toward changing marijuana use, respectively. The results identify individual difference factors that contribute to motivation for change and are consistent with motivational models of change readiness. These results highlight the extent to which integration of marijuana use with personal goal achievement may interfere with taking steps to change use patterns despite associated negative consequences.

Keywords

marijuana; motives; problem recognition; personal goals

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Contributors

All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare they have no conflicts of interest.

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Marijuana is the most common illicit drug used on college campuses and a sizeable minority experience significant negative consequences (Simons, Dvorak, Merrill, & Read, 2012a; Simons, Gaher, & Wray, 2012b). For example, 9 – 10% of marijuana users (i.e., at least monthly) report marijuana use has resulted in poorer academic performance, 3–9% report negative consequences related to interpersonal conflict (e.g., arguments, physical fights, insults), 4–6% report sexual risk behaviors, and more than 50% report driving under the influence of marijuana (Simons et al., 2012a). As is true with other drugs of abuse, many individuals continue use despite the associated negative consequences. Continued use despite negative consequences is a hallmark symptom of substance use disorder (American Psychiatric Association, 2013). Identifying factors that contribute to this, or conversely, the likelihood of taking steps toward change, is an important research goal. In this regard, problem recognition and the perceived costs and benefits of reducing use are central determinants of motivation for change (Connors, Diclemente, Velasquez, & Donovan, 2013a). Marijuana use is a goal-directed activity that has functional significance for individuals (Elliott & Carey, 2013; Simons, Gaher, Correia, Hansen, & Christopher, 2005a). Rates of marijuana use are associated with its perceived utility in achieving important ongoing goals, personal strivings (Simons & Carey, 2003, 2006). Similarly, use motives are associated with patterns of use and the likelihood of experiencing problems (Simons et al., 2005a). Hence, motives and perceived use utility may affect individual's evaluations of their use and associated consequences (i.e., problem recognition) as well as the perceived costs and benefits of making change. The goal of this paper is to test a model of the motivational context of marijuana consequences and how this context influences individual perception of consequences and potential behavioral change.

We hypothesize that the motivational context of marijuana use is not only associated with problem recognition and change readiness indirectly via effects on use and problems, but rather has direct effects on the perceptions of problems and motivation for change. Evaluation of a self-directed behavior necessarily entails considering the behavior within a personal context. That is, evaluation of behavior likely entails consideration of whether the behavior is compatible with personal goals and values, consideration of relevant risks, costs, and benefits, and evaluating potential behavioral alternatives. Substance use motives, perceived use utility of substances in achieving personal strivings, religiosity, and a host of other social-cognitive variables have been associated with individual differences in substance use behavior (Simons, Gaher, Correia, Hansen, & Christopher, 2005b; Walker, Ainette, Wills, & Mendoza, 2007). We theorize that these factors are relevant not only to the development of substance use and problems, but also to understanding individual differences in variables related to motivation for change. That is, the motivation for using a drug and its perceived effects on important life goals should have effects on the evaluations of potential consequences as well as perceived costs and benefits of changing use behavior. Figure 1 presents the conceptual model. In the following sections we present the background and rationale for our specific hypotheses.

Substance use motives

Motives for substance use can be broadly delineated along two axes reflecting (1) positive and negative reinforcement and (2) internal and external sources (Cox & Klinger, 1990).

Cooper (1994) developed the drinking motives measure to assess these dimensions, operationalized as coping motives (internal, negative reinforcement), conformity motives (external, negative reinforcement), social motives (external, positive reinforcement) and enhancement motives (internal, positive reinforcement). Following this model, Simons and colleagues (1998) developed the marijuana motives measure, which adapted these four motives to marijuana use and added a fifth factor (expansion motives) to capture unique effects of the psychedelic drug.

Use motives have unique effects on consumption patterns and importantly, the likelihood of problems. Coping motives, in particular, account for unique variance in substance-related problems that is not accounted for by levels of use (Mezquita, Stewart, & Ruiperez, 2010; Simons et al., 2005a; Willem, Bijttebier, Claes, & Uytterhaegen, 2012). Coping, enhancement, and expansion motives share a common focus on internal sources of reinforcement and are central to this paper. Coping motives account for unique variance in problems over and above the effects of use level, and we therefore expect that motives will predict problem recognition and perceived benefits and costs of change, over and above the effects of negative consequences. Hence, the experience of negative consequences is a necessary but not sufficient predictor of problem recognition and motivation for change (Borsari, Murphy, & Carey, 2009; Connors, DiClemente, Velasquez, & Donovan, 2013b; Qi, Pearson, & Hustad, 2014). We hypothesize that enhancement and expansion motives will be inversely associated with problem recognition. Individuals who endorse enhancement motives are broadly stating that they use marijuana “just for fun” and hence we hypothesize that enhancement motives will be inversely associated with both problem recognition as well as perceived benefits of reducing use. Expansion motives are similarly expected to be inversely associated with problem recognition, given that the individual is endorsing using marijuana for personal growth. However, we posit that expansion motives represent use for relatively unique psychedelic drug effects and hence will be positively associated with perceived costs of reducing use. Finally, we hypothesize direct positive effects of coping motives on perceived costs of cutting down, owing to the fact that the individual is utilizing the drug to cope with ongoing problems.

Personal strivings

Personal strivings are ongoing goals that affect a broad range of behavioral choices (Emmons, 1989). Intrapersonal congruence of personal strivings is related to positive affect and well-being (Emmons & King, 1988). In contrast, individuals who hold personal strivings that are in conflict with each other report higher levels of negative affectivity and physical health problems (Emmons & King, 1988). Marijuana use may be perceived as facilitating some types of strivings. For example, strivings related to affect regulation goals (e.g., “to be happy”) are positively associated with marijuana use (Simons, Christopher, Oliver, & Stanage, 2006). In contrast, interpersonal strivings are inversely associated with marijuana use (Simons et al., 2006). Irrespective of type of striving, individuals’ perceived utility of marijuana use in striving attainment is associated with rates of use (Simons & Carey, 2003, 2006). In this regard, perceived utility of marijuana in achieving personal strivings is representative of the psychological context within which marijuana use and its consequences (both positive and negative) are perceived. We hypothesize that congruence between

personal strivings and marijuana use will be inversely associated with problem recognition and perceived benefits of change, over and above the effects of reported consequences.

Problem recognition and taking steps

As discussed above, negative consequences in and of themselves do not necessitate the recognition of marijuana use as problematic. Individuals use substances and incur negative consequences for years before recognizing their use as problematic (Simpson & Tucker, 2002). Similarly, even after recognizing use as problematic, individuals differ in the likelihood of taking steps towards change. Indeed, research has questioned the validity of construct of problem recognition as an indicator of readiness to change, suggesting that it reflects awareness of problems severity but not readiness to change (Maisto et al., 2011b). Just as use motives and perceived utility in achieving strivings predict use behavior, perceived benefits and costs of *change* may predict the likelihood of taking steps toward change once the problematic use pattern has been recognized (Carey, Maisto, Carey, & Purnine, 2001). Perceived costs of changing use patterns reflect potential barriers to change and are inversely associated with motivation for change, treatment engagement, and reduction of use (Cunningham, Wild, Koski-Jännes, Cordingley, & Toneatto, 2002; Share, McCrady, & Epstein, 2004). Conversely, perceived benefits of reducing use represent potential reinforcers of change and promote use reduction (Korcha, Polcin, Bond, Lapp, & Galloway, 2011). Hence, we hypothesize that problem recognition will exhibit both direct and indirect (via perceived costs and benefits of reducing use) effects on our ultimate outcome, taking steps to reduce marijuana use.

Method

Participants

Participants were 422 undergraduate students at a midwestern university, who reported using marijuana at least once in the past 6 months. The sample ranged from 18–25 years of age ($M = 19.68$, $SD = 1.60$) with 61% of respondents being female. Ninety-two percent of participants were White, 1% Black, 1% Asian, 2% Native American, and 4% multiracial. Two percent were Hispanic.

Procedure

Participants were recruited through announcements in classes and postings on the university's subject pool online system between 2006 and 2012. Participants completed anonymous questionnaires online and were compensated with partial course credit. All procedures used in this study were reviewed and approved by the university's Institutional Review Board.

Measures

Marijuana motives—The 25 item Marijuana Motives Measure (Simons et al., 1998) was used to assess marijuana motives. Items assess the extent to which the person uses marijuana for each reason and are rated on 5-point scales ranging from (1) Almost never/never to (5) Almost always/always. This study used three of the five subscales. Enhancement motives (5

items, $\alpha = .93$) assess using marijuana “because it is fun.” Expansion motives (5 items, $\alpha = .91$) assess using marijuana “to expand awareness.” Coping motives (5 items, $\alpha = .85$) assess using marijuana to “forget about worries.”

Marijuana use utility—Perceived utility of marijuana use in achieving ongoing goals (i.e., personal strivings) was assessed following the procedure of (Simons & Carey, 2003). Personal strivings are “goals that lie directly behind individuals’ behavioral choices” (Emmons & King, 1988). Example of personal strivings include “to do well academically”, “be true to myself”, and “enjoy life.” Personal strivings are fairly stable in college students, with 82% of reported strivings remaining the same when measured a year later (Emmons & King, 1988). Participants rated the extent to which marijuana use would help them to achieve each of their top 5 personal strivings using a 5-point scale (−2=harmful effect to +2=very helpful effect) with higher scores representing a belief that marijuana is helpful in reaching personal goals. Hence, there are 5 items ($\alpha = .87$). A score of zero indicates the individual believes their current level of use of marijuana has no impact on the achievement of their personal strivings. Previous research demonstrates expected associations between the assessment and marijuana and alcohol use, supporting the criterion validity of the assessment (Simons & Carey, 2003, 2006; Simons, Christopher, & Mclaurry, 2004)

Marijuana use—Marijuana use was a latent variable with 3 indicators: (1) Lifetime use frequency (7-point scale measuring lifetime use of marijuana: 0 = never, 6 = more than 300 days), (2) 30-day use frequency (9-point scale indicating marijuana use over the past 30 days: 0 = not at all, 8 = more than once a day), (3) 30-day use intensity (number of time periods (4 per day) used marijuana in a typical week (Williams, Adams, Stephens, & Roffman, 2000).

Perceived costs and benefits of reducing use (i.e., change)—The Outcome Expectancy Questionnaire is a 40-item measure that assesses the costs ($\alpha = .94$) and benefits ($\alpha = .97$) of reducing or stopping marijuana use (Stephens, Roffman, Fearer, Williams, & Burke, 2007). Example items include “I would expect to feel more tense and anxious (a cost)” and “I would expect to express my feelings to others more easily” (a benefit). Each item is measured on a 5-point scale that ranges from (1) *Strongly Disagree* to (5) *Strongly Agree*. Higher scores indicate more benefits (or costs) of reducing marijuana use (referred to as “change” in the figure). Costs and benefits were latent variables each with 3 indicators created from parcels of the respective subscales of the Outcome Expectancy Questionnaire.

Marijuana problems—Marijuana problems was a latent variable with 3 indicators: (1) the Marijuana Problem Index (Johnson & White, 1989), a 23- item scale measuring problems associated with marijuana use in the past 30 days ($\alpha = .89$), (2) marijuana abuse symptoms, and (3) marijuana dependence symptoms. DSM-IV (American Psychiatric Association, 2000) abuse and dependence symptoms in the past 12 months were measured by checklists adapted from knight and colleagues’ (Knight et al., 2002) alcohol use and dependence checklists. The abuse checklist consists of 10 items that assesses each abuse symptom of the DSM-IV-TR using multiple items. Responses to this checklist yield a summary score ranging from 0–4 indicating the number of abuse symptoms endorsed. The dependence

checklist consists of 7 items and similarly determines the number of dependence symptoms met according to the DSM-IV-TR. Previous research supports the criterion validity of the scales for alcohol (Knight et al., 2002; Simons, Carey, & Wills, 2009).

Readiness for change—Taking steps and problem recognition were assessed by the SOCRATES (Miller & Tonigan, 1996), worded for marijuana. Items are rated on a 5-point scale ranging from (1) *Strongly disagree* to (5) *Strongly agree*. Higher scores indicate greater recognition of problems and taking more steps toward change. We utilized a revised 2-factor structure (Maisto et al., 2011a; Maisto et al., 2011b). The Taking Steps subscale consists of 8 items ($\alpha = .93$) and measures efforts to reduce marijuana use. Example item “I have already started making some changes in my use of marijuana.” The Problem Recognition subscale consists of 7 items ($\alpha = .89$) and measures the extent to which one’s marijuana use is perceived as a problem. Example item, “I have a marijuana problem.” Research on clinical samples of adolescents with marijuana use disorder supports the predictive and concurrent validity of the Taking Steps subscale (Maisto et al., 2011b). However, Problem Recognition may reflect individuals’ awareness of severity rather than readiness to change per se (Maisto et al., 2011b). In the latent variable model, each factor had 3 indicators derived from item parcels of the scales.

Analysis Plan

Models were tested in Mplus 7.1 with full information maximum likelihood estimation and maximum likelihood robust standard errors (Muthén & Muthén, 2012). We first tested the measurement model of the latent constructs. Due to the limited sample size, the exogenous variables (i.e., motives, striving utility, gender) were treated as observed variables. After fitting the measurement model, we proceeded to the SEM. We first fit a model whereby the effects of motives and personal strivings were indirect via their effects on marijuana use and problems. Motives and strivings each had direct effects on marijuana use. In addition, coping motives had a direct effect on marijuana problems. Marijuana problems had a direct effect on problem recognition. Problem recognition had direct and indirect (via perceived costs and benefits of reducing use) effects on taking steps. Gender was a covariate with direct paths to all endogenous constructs. After estimating this indirect model, we added the additional hypothesized direct effects of motives and strivings on the problem recognition and perceived costs and benefits of reducing use constructs and conducted a chi-square difference test following procedures appropriate for the MLR estimator (Muthén & Muthén, 2007). Finally, we calculated indirect effects with bias-corrected bootstrapped confidence intervals to determine their significance (MacKinnon, Lockwood, & Williams, 2004). Model fit was determined by inspection of the fit indices and modification indices were examined to determine potential changes. Incremental fit indexes (e.g., comparative fit index [CFI]) greater than or equal to .95 represent acceptable fit (Hu & Bentler, 1999). Standardized root-mean-square residual (SRMR) values less than or equal to .08 and root-mean square error of approximation (RMSEA) values less than or equal to .06 represent acceptable fit (Hu & Bentler, 1999). These fit indices are a recommended group of indices (Hu & Bentler, 1999; Kline, 2010). The CFI is an incremental fit index and indicates the extent the model fits better than a baseline independence model (Kline, 2010). The SRMR is the mean of the absolute correlation residuals (Kline, 2010). The RMSEA is an approximate fit index that

measures the discrepancy between the model χ^2 and a noncentral chi-square distribution (Kline, 2010).

Results

Descriptive statistics

Participants reported using marijuana an average of approximately 2 days in the past month (rating scale $M = 2.06$, $SD = 2.48$). Approximately 46% endorsed at least 1 DSM-IV abuse symptom and 13.30% endorsed 3 or more symptoms of dependence. The checklists do not incorporate clinical judgment of impairment and thus these should not be interpreted as synonymous with substance use disorder diagnosis. Nonetheless these figures indicate a moderate degree of use related problems in the sample. The mean scores of use utility was close to the neutral point, indicating that, on average, participants did not view their use as impacting their ability to achieve personal strivings. However, the full range of the scale is represented and hence some view marijuana use as strongly facilitating and some strongly inhibiting their ability to achieve personal strivings. Consistent with previous research coping and expansion motives were less strongly endorsed, on average, than enhancement motives (Simons et al., 1998). Consistent with the relatively low mean level of use in the sample, the mean of problem recognition was at the low end of the scale, indicating a disagreement with statements of participants' marijuana use being problematic. However, the problem recognition exhibited moderate positive correlations with marijuana use and problems and thus, heavier users were more likely to recognize problems associated with their marijuana use. Interestingly, participants tended to score higher on the taking steps variable than the problem recognition variable. This suggests that participants may be reluctant to label their use as a "problem" but still be interested in making positive changes to the behavior. Gender was largely not associated with the other variables. However, male gender was modestly positively associated with perceived use utility, marijuana use and problems, and problem recognition. At the bivariate level, costs of change (i.e., reducing use) were positively associated with each motive, though more strongly with the coping and expansion motives. Thus, the more strongly one endorses use motives, the greater the perceived costs of reducing use. In contrast, benefits of change were inversely correlated with use utility and enhancement motives, and to a lesser extent expansion motives. This suggests that the more participants find use to be compatible with personal strivings or to "merely" use to have a good time, the less they perceive benefits for reducing use. Interestingly, whereas greater marijuana use was associated with greater costs and fewer benefits of change, marijuana problems were associated with greater costs of change and not associated with perceived benefits at the bivariate level. This suggests that the existence of use related negative consequences are not necessarily accompanied by perceived benefits of reducing use. See Table 1 for descriptive statistics and Table 2 for correlations.

Measurement model

The initial measurement model did not fit optimally $\chi^2 (120, N = 422) = 470.95$, $p < .0001$, CFI = .93, RMSEA = 0.083 95% CI [0.075, 0.091], SRMR = 0.058. Error term covariances with modification indices greater than .20 were sequentially freed and the model re-estimated. This resulted in three correlated errors (abuse with dependence, use intensity with

marijuana problem index, two parcels of the problem recognition construct). The fit of the final measurement model was $\chi^2 (117, N = 422) = 372.39, p < .0001, CFI = .95, RMSEA = 0.072$ 95% CI [0.06, 0.08], SRMR = 0.059. Standardized factor loadings ranged from .71 – .96, p 's < .001.

Structural model

The model whereby motives and personal strivings were indirectly associated with problem recognition and perceived costs and benefits of reducing use via marijuana use and problems did not fit well $\chi^2 (207, N = 422) = 647.76, p < .0001, CFI = .92, RMSEA = 0.071$ 95% CI [0.07, 0.08], SRMR = 0.097. Adding the hypothesized direct effects resulted in improved fit to the data $\chi^2 (200, N = 422) = 538.36, p < .0001, CFI = .94, RMSEA = 0.063$ 95% CI [0.06, 0.07], SRMR = 0.065. Inspection of the modification indices suggested adding a specific effect from the taking steps construct to the 30-day use frequency indicator. This reciprocal effect reflects the effects of taking steps to change use on reducing recent use frequency. The final model fit well $\chi^2 (199, N = 422) = 498.51, p < .0001, CFI = .95, RMSEA = 0.060$ 95% CI [0.05, 0.07], SRMR = 0.063. This final model (see Figure 2) fit significantly better than the mediated model Satorra-Bentler Scaled $\chi^2 (8, N = 422) = 165.18, p < .0001$. Indirect effects are presented in Table 3. Though not depicted in the figure, gender is a covariate with paths to all endogenous variables. Male gender had significant positive direct paths to marijuana use and problem recognition (p 's < .01), but was not significantly directly associated with the other constructs (p 's > .42).

Discussion

Research has identified problem recognition and the perceived costs and benefits of reducing use as key elements of motivation for change and likelihood of taking steps toward reducing substance use (Rice, Hagler, & Tonigan, 2014; Walters, Lee, & Walker, 2012). Hence, the current study tested a model predicting these outcomes from the motivational context of marijuana use to determine how use motives and perceived utility of use in achieving goals are related to motivation for change. Overall, the results were consistent with our proposed hypotheses. Enhancement motives and perceived use utility were directly inversely associated with problem recognition and perceived benefits of change, over and above the effects of self-reported problems. Conversely, coping and expansion motives exhibited direct positive effects on the perceived costs of cutting down. The effects of marijuana problems on taking steps to change were mediated via recognition of problems. Problem recognition, in turn, exhibited direct and indirect effects on taking steps via the perceived costs and benefits of cutting down. Of the use motives, only coping motives exhibited a significant positive total effect on taking steps. This positive association owes largely to the substantial direct effect on marijuana problems, a robust predictor of motivation for change. In contrast, perceived use utility had an inverse total effect on taking steps, suggesting that the integration of marijuana with important life goals may deter therapeutic change. These aspects of the model are discussed below.

Problem recognition

Identifying and acknowledging problems associated with one's marijuana use are crucial first steps toward making health-promoting change. As expected, individuals who self-report more negative consequences stemming from use are more likely to perceive their overall pattern of use as reflecting a potential substance use disorder. However, these data indicate that, controlling for self-reported negative consequences, enhancement motives and use utility are inversely associated with negatively evaluating their pattern of use, i.e., labeling their use as a "problem." This suggests that problem recognition incorporates not simply an awareness of associated negative consequences, but rather a broader evaluation of use behavior that includes reasons for use and perceived personal benefits. The inverse effect of enhancement motives may reflect cultural stereotypes about individuals with substance use disorder as being immoral and exhibiting severe physiological dependence and functional impairment. Using a drug "just for fun" is incompatible with the social construction of the "addict" and hence individuals who highly endorse enhancement motives may be less likely to view themselves as having a substance use disorder despite accumulating negative consequences.

In addition, the inverse effect of perceived benefits of use in achieving personal goals may reflect the fact that individuals weigh both the costs and benefits of use when evaluating their use behavior and whether it is a problem warranting change. Irrespective of number of associated consequences, marijuana use that is perceived to facilitate the attainment of highly valued personal goals is unlikely to be viewed as a "problem".

This pattern of results is consistent with basic tenets of motivational interviewing. Individuals are ambivalent about their use, viewing both positive and negative aspects (Miller & Rollnick, 1991; Miller & Rollnick, 2012). Furthermore, individuals may acknowledge negative consequences but may be reluctant to accept labels (for themselves or their substance use) that they associate with relatively severe negative stereotypes, reflecting a lack of control or severe impairment.

Ambivalence was observed not only in the pattern of predictors of problem recognition, but also in the effects of problem recognition. Although problem recognition was positively associated with taking steps toward change, problem recognition predicted an increase in *both* perceived costs as well as benefits of change. The positive association between perceived problem severity and the perceived benefits of resolving it requires little explanation. However, the data show that not only do perceived benefits of change increase with problem severity, but perceived costs do as well.

Costs and Benefits of Change

As expected, there was a positive linear association between marijuana problem recognition and benefits of reducing use, which partially mediated the association with taking steps. Consistent with the pattern of effects predicting problem recognition, use utility and enhancement motives also exhibited inverse associations with perceived benefits of reducing use. Thus, controlling for extent of negative consequences, use utility and enhancement motives predict both less problem recognition and fewer benefits of change. The direct

effects use utility and enhancement motives on perceived benefits of use may reflect similar mechanisms as described in the previous section.

More interestingly, perceived problem severity also predicted higher barriers to change, i.e., greater perceived costs of reducing use. This may, in part, reflect anticipated withdrawal symptoms and difficulties stopping (e.g., sleeping problems, urges to use, substituting other drugs). However, the outcome expectancy questionnaire is substantially broader and also includes perceived social effects (e.g., losing support of drug using peers, difficulties socializing when not high), boredom, lack of enjoyment, and increased negative affect (also a potential withdrawal symptom). Thus, the positive association between problem recognition and perceived costs of change may reflect the extent to which marijuana use has become an integral part of students' lives, tied to their social networks, recreation patterns, and perceived ability to regulate emotion. Indeed, both coping and expansion motives exhibited positive effects on perceived costs of reducing use as well. This is consistent with the premise that individuals perceive important benefits of use that they may be unable to obtain without marijuana. Though some may argue that perceived costs of change may be little more than self-serving justifications to continue use, the pattern of results suggests that they reflect a potentially complex acknowledgement of the difficulties of behavioral change due to anticipated withdrawal, disruption of social networks, and reliance on marijuana for self-regulation. Indeed, problem recognition has shown poor predictive validity following treatment among adolescent marijuana users (Maisto et al., 2011b). This may reflect, in part, perceived barriers to change among more individuals with more severe problems.

Taking steps

Problem recognition and perceived costs and benefits of change, mediated the effects of all other variables on the ultimate outcome, taking steps. The model is thus consistent with a cognitive framework in which the individual evaluates their use behavior, considers both costs and benefits of change, and then decides on a course of action. In this regard, level of use and associated problems, problem recognition, and perceived costs and benefits of change each had significant total effects on taking steps. In addition, coping motives, enhancement motives, and use utility exhibited significant total effects on taking steps. Though coping motives was associated with increased costs of reducing use, the overall effect on taking steps was positive, likely due to the substantial positive effect via increased negative consequences. Individuals who use marijuana to cope with emotional distress may require additional assistance to reduce perceived barriers to reducing use but overall, may be aware of and motivated to change their problematic use patterns.

Perceived use utility and enhancement motives, in contrast, had significant inverse total effects on taking steps. These effects reflect a form of suppression given the non-significant bivariate associations. In contrast to coping motives, perceived use utility (and enhancement motives) do not exhibit direct effects on substance-related problems (Simons & Carey, 2003, 2006). The multivariate model indicates that once extent of negative consequences is partialled out, use utility exhibits inverse associations with problem recognition, benefits of change, and taking steps. Perceived use utility in this model reflects the extent to which marijuana use is perceived to facilitate personal strivings. Personal strivings are core

ongoing goals that underlie a wide range behavioral choices (Emmons, 1986, 1989). Personal strivings, by definition, are important and personally relevant. Understanding how marijuana use is integrated into the achievement of these ongoing goals may facilitate interventions to increase motivation for change.

Limitations

The present study has a number of limitations. First, the population for this study was comprised of young adult college students who were predominantly non-Hispanic White. Future research is needed to test the generalizability of the results to samples with different demographic characteristics. In addition, the cross-sectional design precludes inferences about the temporal ordering of relationships depicted in the model. Longitudinal research that examines these relationships over time is needed. This is particularly relevant as variables such as marijuana problems, problem recognition, and taking steps likely have complex dynamic associations over time. For example, increasing problems should increase the likelihood of problem recognition, as seen in the current data. However, recognition of a problem may be viewed as a first step toward change and thus should ideally be inversely associated with level of problems in the future. This element is modeled by the negative feedback loop between taking steps and recent use frequency in the analysis. Finally, though the sample included a substantial percentage of individuals who may meet diagnostic criteria for a marijuana use disorder, it is not a clinical sample and research is needed focusing on young adults with cannabis use disorder. In addition, the DSM-IV (American Psychiatric Association, 2000) rather than the current DSM-5 (American Psychiatric Association, 2013) criteria were used in the model. However, given that symptoms counts were used there should be only minor differences with the current system, most notably the absence of craving in the current data set.

Despite these limitations, this study demonstrates that problem recognition reflects a complex integration of experienced consequences, perceived value of, and reasons for, use, and potential social perceptions associated with substance use disorder. Moreover, the likelihood of taking steps toward change is affected not only by perceived severity of the substance problem, but perceived costs and benefits of reducing use. In summary, the experience of negative consequences associated with marijuana use is an important, but limited, factor contributing to problem recognition and taking steps toward healthy change. Use motives and the integration of use into personal goal strivings may be important factors contributing to individual differences in motivation for change that warrant consideration in treatment.

Acknowledgments

Role of Funding Sources

This research was supported in part by National Institute on Alcohol Abuse and Alcoholism Grant R01AA020519 to Jeffrey S. Simons.

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Highlights

- Motivational context of marijuana use predicts problem recognition
- Motivational context of marijuana use predicts costs and benefits of change
- Concordance between personal strivings and use may be a barrier to treatment
- Marijuana problems are associated with increased costs and benefits of change
- Cost and benefits of change mediate problem recognition effect on taking steps

Figure 1.

Conceptual indirect model is depicted in Panel A. Motives and use utility are only associated with problem recognition and change factors indirectly via level of use and problems. Panel B depicts a conceptual hypothesized direct effects model whereby use utility and use motives have direct effects on problem recognition and change factors over and above level of use and problems. MJ = Marijuana

Figure 2.

Final structural model ($N = 425$). Gender was excluded from this model for visual clarity.

The path from Taking Steps to the marijuana use indicator is a specific effect of taking steps on use frequency in the past 30 days. The disturbance terms of costs and benefits were allowed to covary. MJ = marijuana * $p < .05$, ** $p < .01$, *** $p < .001$

Table 1

Descriptive statistics

	Mean	SD	Range	Skew
Age	19.68	1.60	18 – 25	1.15
Use utility	0.11	0.84	–2 – 2	–0.10
Enhancement motives	2.61	1.36	1 – 5	0.26
Coping motives	1.49	0.72	1 – 4.4	1.81
Expansion motives	1.57	0.90	1 – 5	2.00
30 – day marijuana use	2.06	2.48	0 – 8	1.02
Lifetime marijuana use	3.40	1.60	1 – 6	0.31
Marijuana intensity	3.44	5.41	0 – 28	2.17
Marijuana problem index	3.98	7.15	0 – 59	3.42
Marijuana abuse symptoms	0.71	0.92	0 – 4	1.30
Marijuana dependence symptoms	0.85	1.41	0 – 7	1.89
Costs of change	2.24	0.86	1 – 5	0.21
Benefits of change	2.84	1.11	1 – 5	–0.00
Problem recognition	1.52	0.69	1 – 5	1.77
Taking steps	2.24	1.15	1 – 5	0.52

Note. Use intensity and the marijuana problem index were log transformed in the SEM.

Table 2

Correlation matrix of observed and latent constructs in model

Variables	1	2	3	4	5	6	7	8	9	10
1. Gender	1.00									
2. Use utility	.13 [*]	1.00								
3. Enhancement motives	.07	.21 ^{***}	1.00							
4. Coping motives	-.02	.16 ^{**}	.50 ^{***}	1.00						
5. Expansion Motives	.03	.16 ^{**}	.56 ^{***}	.49 ^{***}	1.00					
6. Marijuana use	.15 ^{**}	.31 ^{***}	.60 ^{***}	.43 ^{***}	.41 ^{***}	1.00				
7. Marijuana problems	.11 [*]	.22 ^{***}	.63 ^{***}	.64 ^{***}	.47 ^{**}	.82 ^{***}	1.00			
8. Costs of change	.06	.04	.11 [*]	.31 ^{***}	.24 ^{***}	.19 ^{**}	.36 ^{***}	1.00		
9. Benefits of change	-.02	-.22 ^{***}	-.23 ^{***}	-.02	-.10 [*]	-.18 ^{***}	-.02	.43 ^{***}	1.00	
10. Problem recognition	.16 ^{**}	-.06	.06	.23 ^{***}	.05	.23 ^{***}	.41 ^{***}	.32 ^{***}	.33 ^{***}	1.00
11. Taking steps	.10	-.07	.06	.18 ^{***}	.03	.05	.24 ^{***}	.14 [*]	.39 ^{***}	.57 ^{***}

Note. N = 422. Gender, use utility, and motives are observed exogenous variables.

Marijuana problems, cost of change, benefits of change, problem recognition, and taking steps are latent constructs.

^{*} $p < .05$,

^{**} $p < .01$,

^{***} $p < .001$.

Table 3
Standardized Indirect and Total Effects in Predicting Marijuana Problems, Problem Recognition, Perceived Costs and Benefits of Reducing Use, and Taking Steps

Predictor	Marijuana Problems		Problem recognition		Perceived benefits of reducing use		Perceived costs of reducing use		Taking Steps	
	Ind.	Tot.	Ind.	Tot.	Ind.	Tot.	Ind.	Tot.	Ind.	Tot.
Gender	0.15	0.17	0.11	0.39	0.13	0.05	0.11	0.14	0.20	0.26
Use utility	0.11	0.11	0.07	-0.11	-0.04	-0.20	-0.03	-0.03	-0.11	-0.11
Enhancement motives	0.30	0.30	0.19	-0.05	-0.02	-0.20	-0.02	-0.02	-0.08	-0.08
Coping motives	0.12	0.47	0.30	0.30	0.10	0.10	0.08	0.25	0.15	0.15
Expansion motives	0.03	0.03	0.02	-0.05	-0.02	-0.02	-0.02	0.13	-0.05	-0.05
Marijuana use		0.67	0.42	0.42	0.14	0.14	0.12	0.12	0.25	0.25
Marijuana problems				0.63	0.22	0.22	0.18	0.18	0.36	0.36
Problem recognition						0.34		0.28	0.05	0.58

Note. N = 422. Gender is coded 0 = female, 1 = male. Ind. = Indirect effect. Tot. = Total effect.

Indirect effects are all of the indirect effects. Bias-corrected bootstrapped confidence intervals were used to determine the significance of effects (MacKinnon, Lockwood, & Williams, 2004). Bold font = Significant effect based on 95% confidence interval.