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The Nature of Coping in Treatment for Marijuana Dependence: Latent Structure and Validation of the Coping Strategies Scale

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Abstract

The Coping Strategies Scale (CSS) was designed to assess adaptive changes in substance-use specific coping that result from treatment. The present study sought to examine the latent structure of the CSS in the hope that it might shed light on the coping processes of drug users, and guide the development of a brief version of the CSS. Respondents on the CSS were 751 men and women treated in three clinical trials for marijuana dependence. Posttreatment CSS data were analyzed to determine the nature of coping responses in patients who have been trained to use specific strategies to deal with substance use disorders. Exploratory factor analysis yielded two factors, categorized as problem-focused and emotion-focused coping, but confirmatory factor analysis did not support this structure. When infrequently endorsed items were removed, however, confirmatory factor analysis revealed a good fit to the data. Contrary to expectations, practical strategies that often form the basis for coping skills training, such as avoiding those who smoke, were not frequently endorsed. Problem focused items reflected cognitive commitments to change. Emotion-focused items included cognitive reinterpretations of emotions, to help manage emotional reactions. Brief versions of the CSS based on these factors showed good convergent and discriminant validity. The CSS, and the brief versions of the CSS, may prove useful in future treatment trials to evaluate effects of treatment on coping skills acquisition and utilization in substance dependent individuals.

Keywords

coping scales; coping styles; marijuana; substance abuse treatment

Marijuana is the most commonly used illicit drug in the United States. According to the 2009 National Survey on Drug Use and Health (NSDUH), an estimated 4.3 million Americans aged 12 or older were dependent on marijuana (Substance Abuse and Mental

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Health Services Administration, 2010). Given the extent of the problem, the need for effective treatment is evident.

Coping and Coping Skills in Treatment for Substance Abuse

Copings skills based treatments are among the most effective interventions for marijuana dependence (Budney, Roffman, Stephens, & Walker, 2007). Coping refers to the cognitive and behavioral efforts a person makes in the process of managing taxing circumstances so as to master, reduce or tolerate stress (Lazarus & Folkman, 1984). Inability to cope adaptively with stressors is presumed to play a significant role in problematic drug use; use of drugs or alcohol may become a general coping response for some persons (Cooper, Russell, & George, 1988). Absence of alternative adaptive coping skills may perpetuate drug use. Drug abusers in treatment, for example, often show deficits in social and coping skills (Lindquist, Lindsay, & White, 1979; Marlatt & Gordon, 1980).

In the context of drug treatment, situations that present high-risk for relapse act as significant stressors. Learning to cope with high risk situations in order to stay abstinent or to better manage substance use is a fundamental aspect of much treatment for substance abuse and dependence, including for marijuana. Whereas the teaching of coping skills is an explicit aim of cognitive-behavioral treatments, it is implicit in virtually all treatments. For example, 12-step based programs offer basic cognitive and behavioral prescriptions for helping to avoid relapses, including advocating avoidance of substances, adopting short-term goals (“one day a time”), and seeking social support.

In order to determine if a treatment is delivering appropriate coping skills training, however, we need to be able to measure coping skills. However, there are few validated instruments for measuring coping skills that are learned or acquired in treatment, particularly in the context of treatment for marijuana dependence. As a consequence, our ability to determine the effectiveness of efforts to train coping is compromised: it is difficult to determine success if a valid measure is not available. The purpose of the present study is to explore the reliability, validity and latent structure of the Coping Strategies Scale (CSS; Litt, Kadden, Cooney, & Kabela, 2003), an instrument designed to assess coping skills that are trained in the course of treatment.

Measurement of Coping and Coping Skills Acquisition

General Measures of Coping

The drug and alcohol abuse literature has for some time focused on the lack of adaptive coping skills as a determinant of drug use. Much of the work in this area, however, has employed general self-report coping measures. General coping measures are intended to assess the characteristic ways in which one copes with stress. These measures are not substance-use specific, or situation-specific, nor are they designed to measure gains that might be made in treatment. One revision of the Ways of Coping Checklist (Folkman & Lazarus, 1980; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985), for example, consists of over 60 items comprising five empirically-derived coping subscales: Problem-Focused, Wishful Thinking, Seeks Social Support, Blamed Self, and Avoidance. In general, problem-focused strategies have been considered to be more effective than other strategies in managing drug abuse. In one study using the Ways of Coping Scale, Majer and colleagues (Majer, Jason, Ferrari, Olson, & North, 2003) noted that problem-focused coping strategies were related to higher self-efficacy and optimism, but no attempt was made to relate coping to substance use.

Moos et al. (Moos, Brennan, Fondacaro, & Moos, 1990) classified coping actions along two dimensions: the orientation of coping (i.e., approach versus avoidance), and the means of coping (cognitive versus behavioral). They combined these two dimensions to develop the Coping Response Inventory (CRI; Moos, 1993), comprising four sets of coping responses: approach-cognitive (characterized by logical analysis, positive reappraisal), approach-behavioral (seeking guidance and support, problem solving), avoidance-cognitive (cognitive avoidance, resigned acceptance), and avoidance-behavioral (seeking alternative rewards, emotional discharge). The CRI has since been widely used in the context of substance use. In general, active, problem-oriented coping strategies have proven themselves more effective than avoidant strategies in the long run for control of substance abuse (Chung, Langenbucher, Labouvie, Pandina, & Moos, 2001; Moser & Annis, 1996; Rosenberg, 1983; Suls & Fletcher, 1985).

In the context of substance use treatment, Avants, Warburton, and Margolin (2000) assessed coping using the CRI in methadone-maintained patients. The authors reported that patients who achieved abstinence following a 12-week coping skills training intervention decreased their use of avoidant coping strategies, suggesting that coping became more active with treatment. Similarly, Forys, McKellar and Moos (2007) reported that higher levels of general approach coping on the CRI, more alcohol-specific coping (e.g., staying away from “people who remind me of drinking or using”), and lower levels of general avoidance coping, were associated with less alcohol and drug use and fewer drinking problems at a 1-year follow-up.

Another general coping measure that has been used in this context is the COPE (Carver, Scheier, & Weintraub, 1989). The COPE was developed as a multidimensional coping inventory to assess the characteristic ways in which people respond to stress. Thornton et al. (2003) used a version of the COPE to measure general coping in mixed substance abusers in treatment. They derived four coping factor scales: Positive Reinterpretation (positive reinterpretation, religion, active coping, and planning), Avoidance Coping (denial, behavioral disengagement, mental disengagement, and alcohol/drug use), Support Seeking (seeking emotional support, seeking instrumental support, and venting emotions), and Restraint/Acceptance (restraint coping or limiting action, acceptance, and suppressing competing activities). None of the coping scales was correlated with treatment outcome, including the Avoidance Coping subscale, which is somewhat surprising, given the item content of the scale (which actually included alcohol or drug use as a coping skill).

On the basis of the studies cited here, it would appear for the most part that “active” coping is to be encouraged whereas “avoidant” coping should generally be discouraged. These studies highlight some of the difficulties with general coping measures, however. Examination of the items that make up avoidant coping subscales in general coping measures indicates that they may not be relevant to substance using populations.

For example, Avoidance Coping is assessed in the CRI using four subscales, each consisting of six items: Cognitive Avoidance (item example: “Did you try to forget the whole thing?”); Resigned Acceptance (item example: “Did you think the outcome would be decided by fate?”); Emotional Discharge (item example: “Did you take it out on other people when you felt angry or depressed?”); and Alternative Rewards (item example: “Did you get involved in new activities?”). Many of these items seem to represent reactions to stressors, rather than coping per se. Additionally, these items tell us little about coping with high-risk situations or with the pressures to relapse to substance use. Indeed, some items that might be considered avoidant coping (and thus undesirable in the conventional scheme), such as avoiding or leaving a threatening situation, are the very skills we hope to teach in treatment. Likewise, two of the subscales of the Revised Ways of Coping Scale (Vitaliano, et al., 1985) that are

predictive of poor substance use outcomes are “Blame Self” and “Wishful Thinking” (Tapert, Ozyurt, Myers, & Brown, 2004). It is debatable whether these constructs actually represent coping at all (i.e., intentional effort), rather than simply maladaptive responses to drug-related stressors.

Substance-specific coping measures

Substance use specific measures have the virtue of being relevant specifically to drug and alcohol patients and their problems. The Drug Risk Response Test (DRRT; Kiluk, Nich, Babuscio, & Carroll, 2010), for example, is a role-play based evaluation of coping efforts made in response to imagined high risk situations. In the Kiluk et al. study, results indicated that coping skills based treatment led to significant increases in ratings of the quality of participants’ coping responses relative to treatment as usual. Moreover, the quality of coping responses mediated the effect of treatment on participants’ duration of abstinence during the follow-up period. Although the DRRT was predictive of substance use following treatment, the role-play procedure requires skilled raters to evaluate recorded behaviors. As such it is not easy to use either in research or clinical settings.

Monti and Rohsenow have used a self-report strategy that was specifically intended to measure acquisition of skills learned in treatment for coping with alcohol urge situations (Monti et al., 2001) and urges to use cocaine (Rohsenow, Martin, & Monti, 2005). For each study they developed an Urge-Specific Strategies scale (USS). Each USS was based on patients’ baseline reports of all strategies they employed to keep from drinking or from using cocaine, respectively, and could include items such as “thought about negative consequences of use” and “relaxing or meditating.” In each study, those who reported using more strategies more often had better outcomes. The USS requires that lists of coping behaviors be created and categorized for every study, making widespread use difficult. Furthermore, given that the lists of skills are generated before treatment, it is not clear that this approach adequately captures all of the skills that might be taught during treatment.

Assessing coping skills acquisition in treatment

In summary, general coping measures are often not appropriate for evaluating substance abuse treatment or the acquisition or use of coping skills that are specific to relapse prevention. Nor are they very good guides to the *types* of coping that should be encouraged in our patients. Other measures developed have been substance use specific, but have other practical shortcomings. In particular, role-play based measures are difficult to implement, and person-based lists of strategies require trained staff to categorize open-ended responses.

The Coping Strategies Scale (CSS; Litt, et al., 2003) was developed to address some of these issues. The CSS was based on the Processes of Change Questionnaire (Prochaska, Velicer, DiClemente, & Fava, 1988) that was developed to assess 10 key change processes related to modifying cigarette smoking behavior (e.g., consciousness raising, stimulus control). Items of the Processes of Change questionnaire were reworded to assess coping strategies that a person might use to stay abstinent from marijuana. Eight items were added to reflect specific skills taught in coping skills treatment, such as problem solving and dealing with urges to smoke marijuana (e.g., “Just wait and know that the urge to smoke will go away”). Repeated administrations of this questionnaire over time can assess the impact of treatment on the use of coping strategies during follow-up periods.

Unlike general coping instruments that assess characteristic *responses* to a stressful event, the CSS was intended specifically to examine strategies acquired in the course of treatment that would be useful for achieving and maintaining abstinence from marijuana (i.e., measure treatment gains). However, the CSS has presented something of a problem. At 48 items it is

long and somewhat tedious to complete, so a short form would be welcome. Rationally derived subscales have been computed and, while internally reliable, they have been highly correlated with each other (e.g., *r*s > .70). In at least one study (Litt, Kadden, Kabela-Cormier, & Petry, 2008), the type of coping skills that clients reported using made little difference in outcome. Type of coping was less important than sheer quantity-frequency of coping actions reported (i.e., number of coping actions X frequency of their use).

The CSS has been used in three studies of coping skills based treatments for marijuana dependence, including the Marijuana Treatment Project (MTP; Stephens, Babor, Kadden, Miller, & The Marijuana Treatment Project Research Group, 2002), and two subsequent studies by our group: MTP2 (Kadden, Litt, Kabela-Cormier, & Petry, 2007) and MTP3 which is currently concluding follow-ups. A total of 901 patients were treated in these trials, and 751 provided posttreatment CSS data. This combined sample size provides an opportunity to do an adequately powered analysis of the CSS.

By exploring the latent structure of the CSS as administered to patients following treatment, we hoped to gain a better understanding of the nature of the coping responses that can be expected to be acquired in CBT treatment for marijuana dependence, as well as information that would enable development of shorter versions of the CSS. A reliable and valid version of the CSS would be a useful tool by which to evaluate and understand treatment for marijuana dependence.

Method

Participants

Participants were 901 patients treated in one of three clinical trials for marijuana dependence. Of these 751 (83.4%) provided posttreatment data. All participants were recruited from the community through the use of newspaper and/or radio advertisements offering outpatient treatment. In the first trial, the Marijuana Treatment Project (MTP; Stephens, et al., 2002), participants were recruited from the greater metropolitan areas of Seattle, Hartford, and Miami. For the second and third trials that provided data for this study (MTP2 and MTP3), participants were recruited only from the greater Hartford area. For all trials, participants were eligible if they were 18 years of age or older and met DSM-IV diagnostic criteria for cannabis dependence during the 90 days prior to intake. Persons were excluded if they were dependent on other drugs or alcohol, unwilling to accept random assignment to treatment, currently receiving therapy or regularly attending a 12-Step group, or unable to provide a contact person who would be able to locate the individual for future follow-ups. Table 1 shows the demographic and baseline characteristics of the samples drawn from the three marijuana treatment trials. Analyses of missing data indicate that those persons not represented at posttreatment were not different on any characteristic from those who did provide data. Examination of Table 1 indicates that the samples were highly comparable, with the possible exception of that from Miami in MTP, which was significantly older, more likely to be male, and higher in proportion of Hispanics than the other samples.

Treatments Received

All patients randomized to treatment in each of the three trials were included in analyses of the CSS, even if they did not receive coping skills based treatment. The reasons for this are that all patients in these trials, regardless of treatment assignment, (1) had the experience of being in a treatment trial, and (2) for the most part improved from pre- to posttreatment. This was true even for those in the delayed treatment control condition in MTP, during the period in which they received no treatment.

MTP recruited 450 patients who were assigned randomly to either a 2-session motivational enhancement therapy (MET) condition, a 9-session treatment that combined MET with CBT and case management, or delayed treatment in which participants completed assessments at baseline and at the 4- and 9-month follow-ups, but received no treatment during the first 4 months. In MTP2, 240 participants were randomly assigned to one of four conditions: (1) Case Management that focused on life issues such as occupational, social, psychiatric, or educational concerns, (2) MET+CBT, which included the teaching of skills for coping with high risk situations, (3) Contingency Management (ContM) which provided reinforcement (vouchers redeemable for goods and services) contingent upon submitting drug-free urine samples; and (4) MET+CBT+ContM.

MTP3 was designed to test the efficacy of monitoring the completion of between-session homework assignments, as a means of enhancing coping skills acquisition. Participants (n=213) were assigned randomly to (1) MET+CBT+ContM-Homework, which paralleled MET+CBT treatment but with added delivery of reinforcements contingent upon engaging in homework activities, (2) MET+CBT+ContM-Abstinence, which was structured like the first treatment but with reinforcements delivered contingent upon submitting drug-free urine samples, or (3) Case Management, a control condition.

Measures and Instruments

Patients in all three trials were administered a number of instruments that were used in the present study to evaluate the construct validity of CSS subscales and of brief versions of the CSS. Posttreatment assessments were administered at the completion of the treatment period in each trial: at 4 months in MTP, and at 3 months in the other two trials.

Coping Strategies Scale (CSS)—The CSS is comprised of 48 items intended to tap potential coping strategies that might be used by patients in to remain abstinent. Respondents rate the frequency (from 1 = never to 4 = frequently) of using specific strategies in the past 3 months. Patients in all three trials received the same 48-item version of the CSS. The internal reliability of the total CSS exceeded α=.90 across all trials. The test-retest reliability of the CSS is difficult to interpret because treatment or other events intervened between administrations. Nevertheless, the average correlation between posttreatment CSS total score and later CSS total scores (approximately 6 months later) is r = .66. Brief versions of the CSS, and subscales tapping different types of coping, were also created using the results of exploratory and confirmatory factor analyses (to be described).

Total coping on the CSS was calculated by taking the mean across all 48 items. In addition, two independent raters in our laboratory sorted the CSS items into four subscales based on two dimensions of coping actions, as suggested by Moos (1977), and as operationalized by Moser and Annis (1996). The two dimensions were active versus avoidant coping, and behavioral versus cognitive. The four resulting subscales were as follows: active–behavioral (e.g., “I engage in some physical activity when I get the urge to smoke marijuana”); active–cognitive (e.g., “I stop to think about how my marijuana use is hurting people around me”); avoidant–behavioral (“I leave places where people are using marijuana”); and avoidant–cognitive (e.g., “I try to remind myself of the good things I have accomplished”). The interrater reliability of the process of sorting the items into subscales was κ= .76. The internal reliability of each of these subscales exceeded α =.90.

The *Brief Symptom Inventory* (BSI; Derogatis & Melisaratos, 1983), a widely-used 53-item self-report scale, was used to assess gross changes in psychological functioning and distress. The BSI total score was used here as a Global Severity Index. It was administered at baseline and at all follow-ups in all three trials. The Global Severity Score had an average internal reliability of α =.95.

The *Marijuana Problems Scale* assesses marijuana-related problems in functioning, and in life in general. It was based on items from the Drug Abuse Screening Test, with marijuana-specific items added (Stephens, Wertz, & Roffman, 1993). Subsequently, the instrument was revised to better assess domains likely to be affected by marijuana use (e.g., family, social, legal, employment, physical health, memory/cognitive) and common complaints of heavy marijuana users (e.g., procrastination, feeling bad about using). There is also a rating of problem severity. In our samples this 20-item scale had an internal reliability $\alpha = .81$.

Self-efficacy for marijuana abstinence was assessed using a 20-item modification of a smoking cessation self-efficacy questionnaire (Curry, Marlatt, Gordon, & Baer, 1988) developed by Stephens, Wertz, and Roffman (1993; 1995). Participants were asked to indicate on a 7-point scale their confidence in their ability to resist the temptation to smoke in a variety of interpersonal and intrapersonal situations. In our samples the internal consistency reliability exceeded $\alpha = .90$.

The *Readiness to Change Questionnaire* (Rollnick, Heather, Gold, & Hall, 1992) was designed to assess stages of change in substance abusers, in terms of the Prochaska and DiClemente stages of change model (Prochaska, et al., 1988). In the current study Readiness to Change at posttreatment was calculated by subtracting the Precontemplation score from the sum of the scores for Contemplation and Action (internal consistency reliability $\alpha = .66$).

We assessed quantity and frequency of marijuana use using the Time Line Follow-Back (TLFB) interview (Sobell & Sobell, 1992), which employed calendars and memory prompts to reconstruct substance use for each of the 90 days prior to the baseline and follow-up interviews. The TLFB was modified to identify four time periods (i.e., 12:00 a.m.– 6:00 a.m.; 6:00 a.m.– 12:00 p.m.; 12:00 p.m.– 6:00 p.m.; 6:00 p.m.–12:00 a.m.) during which the participant may have smoked marijuana, to assess smoking across the day. Urine specimen results and collateral informant interview data both suggested that participants did not systematically underreport their use of marijuana (The Marijuana Treatment Project Research Group, 2004). Total number of standard marijuana units ("joints") consumed during the 90 days prior to each assessment was determined by multiplying the number of days of any use by the typical number of units per day. Two substance use variables were computed: continuous abstinence during the period (yes – no), and proportion of days abstinent in the period (PDA).

Data Analysis

In all analyses the CSS items were treated as interval-scaled variables. Frequency analyses indicated that the CSS variables were normally distributed, with minimum values of 1 and maximum values of 4. Skewness of items ranged from −1.009 to 0.917, with a mean of 0.027. This distribution of the item variables allowed us to use procedures for continuously scaled data, without need for transformation of the items.

Exploratory factor analysis (EFA)—Exploratory factor analysis was conducted following the recommendations of Costello and Osborne (2005). A principal axis factoring approach with maximum likelihood extraction and an oblique rotation (oblimin method) was used to explore the latent structure of the 48 CSS items reported at the posttreatment point in each of these trials. A total of 751 subjects was available for these analyses.

In order to test for similarity of factor structure across the multiple trials, separate analyses were conducted for MTP (N=360) and for the combined samples of MTP2 and MTP3 (N=291), both of which were recruited in the Hartford, CT area. These were followed by analyses employing the complete dataset.

Because of the large number of items and the different samples that were used in the complete dataset, the EFA was conducted 10 times on random samples of 50% of the subjects (i.e., N=375, or 7.8 subjects per item per analysis) in order to establish stable parameter estimates. The decision as to the number of factors to retain was determined using scree tests. The pattern matrix coefficients, used to interpret the analyses (Rummel, 1970), were averaged over the 10 iterations of the analysis.

Confirmatory factor analysis (CFA)—Confirmatory factor analyses were conducted using MPlus 6.11 with the entire sample of 751 to confirm the factor structure yielded by the EFA, as well as competing factor structures suggested by theory. As per Muthen (2002), a structural equation modeling approach was used, employing maximum likelihood estimation of parameters with bootstrapping. Competing models were evaluated using established criteria (Bentler, 1990; Marsh & Hocevar, 1985): model chi-square, chi-square divided by the degrees of freedom (adequate fit denoted by a value less than 5.0), Comparative Fit Index (CFI) of greater than .90, and root mean square error of association (RMSEA) of less than .08. In order to test for measurement invariance in model structure attributable to sample differences, a multiple group approach was taken (Muthen & Muthen, 1998–2007), whereby the MTP trial sample was tested against the combined samples of MTP2 andMTP3. A failure to find a significant difference in chi-square values between an unconstrained model, in which the different samples would be allowed to have different factor loadings, and a constrained model that treated the samples as being model equivalent, would show invariance of factor loadings over samples and would justify combining the samples.

Establishing convergent and discriminant validity—Pearson correlations were used to evaluate convergent and discriminant validity of CSS subscales and of brief versions of the CSS, created using results from the factor analyses. Several variables were considered convergent with coping skills use. It was hypothesized that use of coping skills should be positively correlated both with concurrent abstinence from marijuana and proportion days abstinent (PDA), and should predict abstinence and PDA at the succeeding follow-up point. Conversely, use of coping skills should be negatively associated with marijuana problems and should be correlated negatively with marijuana problems at the succeeding follow-up point.

On the other hand, although coping skills use and self-efficacy are complementary constructs, they are conceptually distinct (Bandura, 1986), and should have no strong relation to each other. Neither should coping be related to readiness to change; one may be ready to make changes without necessarily having the skills to do so. Finally, use of coping skills was not expected to be strongly correlated with global distress, as measured by the BSI.

Results

Exploratory factor analyses

Results by trial subgroups—Separate principal axis factor analyses conducted for MTP and for the combined MTP2 and MTP3 samples were compared for number of factors, variance accounted for by factors, and consistency of factor loadings. In both analyses results were characterized by the retention of two factors, the first of which accounted for roughly 50% of the variance, and the second 5%, and correlated with each other at r=.65 to r=.68. Factor loadings in both sets of analyses were similar, with the first factor containing 35 to 38 variables and the second factor containing 10. The results were seen as similar enough to justify the combining of all samples for analysis.

Results for combined samples (N=751)—Repeated principal axis factor analyses using random halves of the full sample consistently led to the retention of two factors, the first accounting for an average of 51.8% of the variance, the second accounting for an average of 4.9%. The two factors were highly correlated with each other; over the 10 iterations the average between-factor correlation was $r = .66$. The matrix of average pattern coefficients is presented in Table 2. Items in the table are presented in order of magnitude of pattern coefficients. Items (in shaded areas in the table) were considered constituents of a factor if their coefficient on that factor exceeded 0.3, and if they did not cross-load on the other factor. Factor 1 is dominated by action-oriented items related directly to the problem of staying abstinent. This corresponds to the Lazarus & Folkman (1984) concept of problem-focused coping. Factor 2 is characterized by items aimed at maintaining emotional stability, or emotion-focused coping. The 35 problem-focused items have an internal reliability of α=.98. The 10 emotion-focused items have an internal reliability of α=.93.

Confirmatory Factor Analyses

The initial CFA evaluated the coherence of each of the two factors produced by the EFA, while adopting a multiple groups design. The difference between an unconstrained model and a model in which factor loadings were made equal across the groups was $\chi^2 = 41.455$ (df=43); $p = .538$, indicating that the factor loadings were invariant across samples. Thus the data structures between the two sets of trials were so similar that we considered it justifiable to combine all samples.

With all samples combined, an initial 2-factor CFA yielded fit indices as follows: model χ^2=5214.87 (df=944, $p < .001$); χ^2/df = 5.524; CFI=.847; RMSEA=.071. The two latent factors, problem-focused coping and emotion-focused coping were correlated at r=.77. By the fit criteria adopted here, this model was considered a poor fit to the data.

We then reevaluated the EFA results, and retained only those items whose average score was 2.0 or greater. That is, we wished to eliminate those items that were almost never used for coping. Results of this CFA, using 19 items, are shown in Table 3. This simplified model proved to be a better fit to the data than the other models examined. Fit indices were as follows: Model χ^2= 844.83 (df=151, $p < .001$); χ^2/df = 4.99; CFI=.943; RMSEA=.074. The between-factor correlation was $r = .78$. Examination of modification indices did not result in a better-fitting model. According to conventional criteria this model was an adequate, though not excellent, fit to the data. Examination of the items generally supports the problem-focused versus emotion-focused coping classification seen earlier. However, given the high correlation between factors, it would appear that these factors are less distinct than those modeled using the 45 items retained in the initial EFA. These 19 items were averaged to create a CSS Brief Total scale (internal reliability $\alpha = .96$). The ten problem-focused items were combined to create a CSS Brief Problem-Focused scale ($\alpha = .95$), and the nine emotion-focused items were combined to create a CSS Brief Emotion-Focused scale ($\alpha = .93$). These brief scales were also evaluated for validity.

Validity Testing

Table 4 shows the correlations between the various CSS scales discussed thus far and variables present in all three trials that should either converge (i.e., be correlated) with the scales or which should be discriminant (i.e., have no relation to the scales). The top line in the table shows the correlations of the CSS Total score, made up of all 48 items. In terms of convergence, the Total score was correlated with both concurrent and subsequent consumption variables. It was also somewhat predictive of future marijuana problems, though it was not related to concurrent problems. In addition, the Total score was only weakly correlated with the discriminating variables.

The correlations of the rest of the CSS-based scales with the converging and discriminating variables looked very much like those of the CSS Total score. All of the scales examined performed particularly well in predicting future marijuana consumption. Prediction of marijuana problems was less robust. All subscales were also for the most part uncorrelated with the discriminating measures examined here. As with the Total score correlations, the Readiness variable seemed to be modestly correlated with some of the scales. Interestingly, the brief scales performed comparably to those scales that were based on more items. The Brief Problem-Focused scale performed as well as, or better than, most of the other scales evaluated here.

Discussion

The acquisition and performance of coping skills is presumed to be one of the chief mechanisms by which substance abuse treatments work, yet relatively little research has evaluated whether patients actually have coping deficits when they enter treatment, or whether they acquire or use new coping skills when they leave treatment (cf., Carroll, Nich, Frankforter, & Bisighini, 1999).

The purpose of the present study was to explore the validity, and evaluate the latent structure, of the CSS, a measure that was designed expressly for the purpose of assessing the use of coping skills that were the focus of training during the course of marijuana treatment. By evaluating the latent structure of this rich set of items it was hoped that we could learn more about how drug users thought about coping, and which strategies were most effective. Because the CSS contained so many items, a proper evaluation of its structure has been delayed until such a time as enough treated drug users have completed it. The only study that has examined a potential latent structure of the CSS items failed to show convincing evidence that a multifactorial structure existed (Litt, et al., 2008).

The present study, with data from a large number of participants, indicates that marijuana users conceptualize coping both in terms of addressing the threat directly (problem-focused coping), and in terms of altering oneself (emotion-focused coping). This distinction was most apparent in the results of the exploratory factor analysis, which indicated that both factors were viable and coherent, even if they were rather highly correlated. When removing rarely endorsed items this two factor structure was confirmed, leading to a brief, valid version of the CSS.

A number of items that were dropped because of their infrequency of use by the participants are among those most stressed in treatment, including, “leave places where people use marijuana,” “ask people not to offer marijuana,” “avoid places or situations associated with marijuana,” “remove marijuana related items from the home,” and “avoid people associated with marijuana.” Despite our efforts over three studies to train such seemingly basic and fundamental skills, a number of participants indicated that they almost never used these to try to stay abstinent. What they did report using was rather less specific: cognitive distraction (“think about other things, not marijuana”) and cognitive commitment (“make commitment to myself to not smoke,” “remind myself I can choose to overcome marijuana”). Indeed, a number of the most-used responses appear to reflect a cognitive commitment to change behavior, not unlike the process said to be occurring in motivational interviewing (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003).

These results may suggest that, rather than spending time and effort having patients enact and rehearse environmental and social changes such as removing drug-related stimuli and avoiding other drug users, it may be more worthwhile to try to effect cognitive commitment. This has yet to be substantiated, however. Motivational Interviewing per se, for example,

has not shown notable efficacy in treatment of marijuana dependence (Budney, Higgins, Radonovich, & Novy, 2000; Walker et al., 2006), although some exceptions have been noted (McCambridge & Strang, 2004). When used in combination with CBT, however, motivational interviewing may prove worthwhile for this population (Kadden, et al., 2007; Olmstead, Sindelar, Easton, & Carroll, 2007).

The current study has some limitations. Of particular concern is that marijuana dependent patients who were also dependent on other drugs were excluded, thus limiting the generalizability of the findings. Thus the results presented here will have to be viewed cautiously. Additionally, the factor structure of the CSS was not tested among patient subgroups. We do not know if the same structure would hold for men versus women, or for different ethnicities. Future studies of the CSS should test for factor invariance across different groups.

The CSS itself also has limitations. There are no items assessing maladaptive coping actions (e.g., isolating oneself, seeking drug-using friends). Thus the CSS cannot be used to determine if patients are doing *fewer* of the bad things they used to do. Neither does the CSS ask about participants' proficiency at using the skills endorsed, or about the effectiveness of the skills in forestalling relapse. The CSS is best used to assess the use of adaptive strategies. The CSS also shares with traditional coping scales the limitation of requiring participants to recall their coping strategies. Several studies have found only modest correspondence between retrospective and contemporaneous coping reports (e.g., Ptacek, Smith, Espe, & Raffety, 1994; Schwartz, Neale, Marco, Shiffman, & Stone, 1999; Todd, Tennen, Carney, Armeli, & Affleck, 2004). Despite this, pre-posttreatment changes in the CSS total score, based on retrospective recall, do predict later treatment outcomes.

The present study succeeded in validating the CSS, shedding light on its structure, and hints at strategies that marijuana users might be using to stay abstinent. Contrary to much theory and several empirical studies, coping in these patients could not be neatly categorized. Although problem-focused and emotion-focused factors did emerge, the distinction was not useful or predictive. Instead, it appeared that some rather global cognitive changes reflecting commitment, or an orientation toward coping (as opposed to not considering any efforts to change), may be among the most useful habits to train. These may be adequately captured by a short version of the CSS, as shown here. It is hoped that this version, or the longer CSS, will prove to be useful for assessing coping changes in other trials, and thus advance our understanding of coping in treated marijuana users.

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Table 1

Background Characteristics of Samples Used in Analyses.

Variable	Trial					
	MTP (n=386)			MTP 2 (n=199)	MTP3 (n=166)	Total (N=751)
	Hartford (n=145)	Miami (n=112)	Seattle (n=129)			
	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %
Sex (% Male) *	61.4	80.0	66.7	69.8	66.5	68.4
Age (Years) **	35.83 (8.18)	37.52 (8.49)	35.86 (8.23)	33.23 (9.77)	33.55 (10.40)	34.89 (9.30)
Married or Cohabitating (%)	40.7	41.8	34.9	42.7	35.5	39.3
Employed Full or Part Time (%)	82.8	89.1	80.6	74.9	77.1	80.0
Education (Years)	13.45 (2.10)	14.19 (1.84)	14.57 (2.06)	13.02 (1.83)	13.32 (2.24)	13.61 (2.09)
Ethnicity (%) ***						
White	72.7	54.1	87.5	63.7	73.7	70.3
African American	21.7	6.4	7.8	16.9	12.0	13.6
Hispanic	5.6	39.4	3.9	13.4	11.4	13.6
Other	0.0	0.0	0.8	6.0	3.0	2.4
Proportion Days Abstinent (Baseline)	.11 (.17)	.10 (.14)	.15 (.17)	.11 (.15)	.10 (.17)	.11 (.16)

Note:

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 2

Final Pattern Matrix for Analyses of CSS Items. Pattern Coefficients Shown are the Means of Scores from 10 Separate Runs, Each Employing a Random 50% of the Sample.

Item	Label	Factor 1	Factor 2	Mean	SD
19	leave places where people use marijuana	0.8824	−0.1021	1.45	1.198
11	ask people not to offer marijuana	0.8766	−0.1233	1.50	1.287
22	avoid places/situations assoc. w/marijuana	0.8540	−0.0813	1.66	1.217
06	remove marijuana related items	0.8034	−0.0650	1.71	1.344
03	avoid people assoc. w/marijuana	0.8028	−0.0777	1.81	1.249
12	think about other things-not marijuana	0.7970	0.0498	2.04	1.210
16	use reminders not to use marijuana	0.7871	0.0178	1.57	1.225
32	say 'no' to marijuana offers	0.7715	0.0069	1.81	1.387
07	calm myself down	0.7695	0.0250	1.82	1.184
33	receive marijuana offers/suggest other options	0.7660	−0.0128	1.41	1.187
17	deal with tension other ways	0.7601	0.0838	2.03	1.197
24	spend time w/others/reward for not using marijuana	0.7488	−0.0564	1.15	1.103
13	encourage people to keep after me about marijuana	0.7401	−0.0705	1.17	1.141
47	tell myself urges will go away	0.7397	0.0887	1.97	1.301
25	make commitment to myself	0.7347	0.0662	2.24	1.268
20	find social situations OK not to use marijuana	0.7325	0.0111	1.70	1.235
48	think about actions leading to marijuana use	0.7309	0.0092	1.49	1.192
02	think about bad experiences	0.7055	−0.0367	1.57	1.209
46	develop plan to deal w/urges	0.7016	0.1379	1.91	1.238
14	seek someone who listens	0.7010	0.0151	1.36	1.152
08	reward myself	0.6895	0.0285	1.50	1.187
21	find people/increase awareness/marijuana probs.	0.6848	−0.0309	1.06	.976
10	use willpower	0.6686	0.1146	2.22	1.273
35	adopt a positive outlook	0.6653	0.1815	2.17	1.230
04	think about use hurting others	0.6652	−0.0087	1.74	1.259
09	find someone to talk to	0.6587	0.0278	1.41	1.154
18	tell myself I can keep from using marijuana	0.6567	0.1209	2.27	1.243
15	remind myself I can choose to overcome marijuana	0.6399	0.1552	2.37	1.195

Item	Label	Factor 1	Factor 2	Mean	SD
27	remember physical reactions w/marijuana use	0.6110	0.0822	1.89	1.254
23	do other things/substitute for marijuana	0.6077	0.1561	2.31	1.200
05	change marijuana behavior/feel good about myself	0.5878	0.1219	2.47	1.188
36	remind myself about accomplishments	0.5482	0.2672	2.47	1.153
01	perform physical activity	0.5208	0.1318	1.91	1.160
26	think about probs. w/marijuana use & driving	0.4792	0.1385	1.56	1.224
38	tolerate frustration w/out marijuana	0.4655	0.3142	2.27	1.186
31	find enjoyment w/other people	0.4514	0.3233	2.31	1.169
39	challenge negative self-talk	0.3793	0.3679	2.12	1.165
28	express emotions w/out using marijuana	0.3091	0.3727	2.41	1.249
29	when angry-calm myself down	0.2865	0.4175	2.34	1.162
43	when criticized-don't use marijuana	0.2856	0.4447	2.31	1.180
34	engage daily in enjoyable/relaxing activities	0.2466	0.4216	2.28	1.103
45	try problem solving before action	0.1664	0.5601	2.49	1.077
44	think of difficulties as challenges	0.1566	0.5294	2.55	1.092
37	tell others directly-when bothered	0.1067	0.4700	2.11	1.114
30	talk about what makes me angry	0.0415	0.4819	1.78	1.157
40	tell others what is on my mind	−0.0102	0.5951	2.26	1.111
42	express appreciation	−0.0914	0.6414	2.81	1.021
41	show interest in others thoughts/feelings	−0.1403	0.7034	2.51	1.044

Table 3

Results of CFA on 2-Factor Solution Using Items Scored at 2.0 or above. Values shown are Standardized Regression Weights.[a]

Item	Label	Problem-Focused	Emotion-Focused
05	change marijuana behavior/feel good about myself	.70	
10	use willpower	.82	
12	think about other things-not marijuana	.84	
15	remind myself I can choose to overcome marijuana	.83	
17	deal with tension other ways	.83	
18	tell myself I can keep from using marijuana	.82	
23	do other things/substitute for marijuana	.77	
25	make commitment to myself	.81	
35	adopt a positive outlook	.85	
36	remind myself about accomplishments	.81	
29	when angry-calm myself down		.73
34	engage daily in enjoyable/relaxing activities		.69
37	tell others directly-when bothered		.68
40	tell others what is on my mind		.74
41	show interest in others thoughts/feelings		.78
42	express appreciation		.74
43	when criticized-don't use marijuana		.78
44	think of difficulties as challenges		.80
45	try problem solving before action		.84

[a] All weights significant at $p < .001$.

Fit Indices: Model $\chi^2 = 844.83$ (df=151, $p < .001$); $\chi^2/df = 4.99$; CFI=.943; RMSEA=.074. Between-factor correlation $r = .78$.

Table 4

Table of Correlations Between Various CSS Scales and Theoretically Convergent and Discriminant Measures. Ns = 439 to 751.

Coping Scale	Internal Reliability (α)	Convergent Measures						Discriminant Measures		
		Abstinence Post	Abstinence 5 Mo	PDA Post	PDA 5 Mo	MPS Post	MPS 5 Mo	Self-Efficacy Post	Readiness Post	BSI Total Score Post
Total Scale[a]	.98	.253***	.296***	.411***	.405***	−.011	−.240***	−.103**	.246***	.065
Scales Derived from Factor Analyses										
Problem Focused[b]	.98	.266***	.314***	.429***	.422***	.002	−.232***	−.116**	.292***	.115*
Emotion Focused[b]	.93	.168**	.194***	.284***	.284***	−.055	−.227***	−.030	.039	−.123*
Brief Problem-Focused[c]	.95	.256***	.305***	.436***	.436***	−.029	−.269***	−.082	.035	.093
Brief Emotion-Focused[c]	.93	.181***	.202***	.297***	.288***	−.063	−.227***	−.011	.047	−.129*
Brief Total[c]	.96	.237***	.278***	.402***	.401***	−.047	−.272***	−.055	.059	−.013

Note:

* $p < .05$;

** $p < .01$;

*** $p < .001$

[a] Scale based on all 48 items of CSS;

[b] Scale based on 45 items of the CSS;

[c] Scale based on 19 items of the Brief CSS.

PDA=Proportion Days Abstinent in previous 90 days; MPS=Marijuana Problems Scale; BSI=Brief Symptom Inventory.