Validating a Five-Factor Marijuana Motives Measure: Relations With Use, Problems, and Alcohol Motives

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This study adapted and extended M. L. Cooper's (1994) Drinking Motives Measure to examine marijuana motives among 299 college students. An exploratory factor analysis supported the hypothesized 5-factor marijuana motives model, resulting in enhancement, conformity, expansion, coping, and social motives. Analyses supported the internal consistency and concurrent validity of the 5 marijuana motives. Marijuana motives were significant predictors of marijuana use and added to the prediction of use-related problems above and beyond the contribution of lifetime use. Motives and gender interacted in predicting use and use-related problems. Parallel regression analyses revealed that marijuana and alcohol motives predicted comparable amounts of variance in use and use-related problems. However, different patterns of relations emerged across drugs, supporting the discriminant validity of the marijuana and alcohol motives.

Young adults use alcohol and marijuana more often than any other abusable drug. According to the Monitoring the Future study (Johnston, O'Malley, & Bachman, 1994), 94% of adults between the ages of 18 and 29 years have used alcohol in their lifetimes, and 56% have used marijuana. As for recent use, 87% drank alcohol in the last year, and 25% used marijuana. Increases in abuse of both alcohol and marijuana have been observed in recent years (National Institute on Drug Abuse [NIDA] 1996). Also troubling is evidence that the perceived risk of marijuana use has recently decreased among young adults (NIDA, 1996). In light of these trends, increased attention to psychological factors influencing use of these drugs is clearly warranted.

Cooper (1994) noted that understanding the motives for drinking may provide insight into the circumstances in which the individual will drink, the amount likely to be consumed, possible consequences, and the ideal strategies for behavior change. Thus, understanding reasons for drug use and their relation to use behaviors may be an important aspect of assessment of drug use and development of effective interventions. Motives for alcohol use have been extensively researched among adolescents and young adults (e.g., Carey & Correia, 1997; Cooper, 1994; Cooper, Frone, Russell, & Mudar, 1995; Cooper, Russell, Skinner, & Windle, 1992; Newcomb, Chou, Bentler, & Huba, 1988; Stewart, Zeitlin, & Samoluk, 1996). Recent quantitative research on drinking motives has focused on four theoretically derived factors: enhancement motives, coping motives, social motives, and conformity motives (cf. Cooper, 1994; Cox & Klinger, 1988). These motives consistently predict

drinking behavior across different demographic groups (Cooper, 1994; Cooper et al., 1992, 1995). In addition, coping or negative reinforcement motives have been shown to predict use-related problems over and above measures of consumption (Carey & Correia, 1997; Cooper, 1994). Thus, use-related problems are not merely a function of how much one drinks, but one's motivation for drinking also influences the consequences of use. Empirical support for this motivational model of alcohol use has emerged from a diverse range of populations, including individuals with schizophrenia (Mueser, Pallavi, Tracy, & Molinaro, 1995), college students (Stewart et al., 1996), and large samples of adolescent and adult community members (Cooper, 1994; Cooper et al., 1992, 1995). In contrast, few researchers have examined motives for marijuana use (Newcomb et al., 1988; Stacy, Newcomb, & Bentler, 1991).

We conducted the present study to adapt and extend Cooper's (1994) four-factor alcohol motives measure to assess marijuana motives and to examine differences between motives for alcohol and marijuana use. We could have used a marijuana motives measure developed by Newcomb et al. (1988) in a large sample of adolescents; however, this measure merges enhancement of positive affect with items related to self-understanding and creativity into a single factor. It also merges items related to social conformity with social cohesion. We thus chose to use Cooper's (1994) Drinking Motives Measure as the basis for our marijuana motives measure because it better differentiates the above motives, was derived from a theory of substance use motivation, and has extensive empirical support.

Several reasons for using marijuana overlap with reasons for using alcohol (Newcomb et al., 1988). For example, both drugs are associated with tension reduction, mood enhancement, and social bonding. On the other hand, the psychedelic properties of marijuana suggest a motive that has not previously been identified with alcohol: enhancement of perceptual and cognitive experience. Psychedelic drugs such as marijuana are unique in their reported ability to provide

266   SIMONS, CORREIA, CAREY, AND BORSARI

the user with a new awareness of internal processes and a corresponding reinterpretation of their relationship with the environment, themselves, and others (Wells, 1974). This constellation of effects may be termed "expanded experiential awareness"; such effects may account for the significant association between marijuana and other psychedelics and mystical experiences (Leary, 1968; Palfai & Jankiewicz, 1991). Expectancies of perceptual and cognitive enhancement from marijuana use have been empirically verified (Schafer & Brown, 1991) and are presumably sought-after effects of psychedelics such as marijuana. Thus, we developed a fifth subscale that represents motives for seeking expanded experiential awareness to supplement the original four-factor model.

In this article, we provide evidence for the validity of the marijuana motives measure by assessing the factor structure, internal consistency, and construct validity of the motives scales. We assessed concurrent validity by regressing indexes of recent use and lifetime problems on marijuana motives. Corresponding analyses with the alcohol motives scales are included for three related purposes: First, a parallel factor analysis of the alcohol motives measure will determine the extent to which its factor structure is comparable to that of the marijuana motives measure in this sample. Second, we aim to establish that marijuana motives can predict use and problems at least as well as alcohol motives do. Third, distinct patterns of relationships between motives and use indexes across drugs will provide evidence for discriminant validity.

Previous research has found the factor structure of motives measures to be invariant across gender (Cooper, 1994; Newcomb et al., 1988). Thus, we conducted our factor analysis including both men and women. However, relations between motives and use indexes exhibit some differences across gender. For example, past research has found that conformity motives are more strongly related to alcohol use indexes in men (Cooper, 1994), whereas coping motives have been more strongly related to use of alcohol in women (Newcomb et al., 1988). Therefore, we examined gender effects in the regression analyses.

Research on motives, expectancies, and risk situations has revealed both convergence (Newcomb et al., 1988; Stacy et al., 1991) and divergence (Annis & Graham, 1994; Schafer & Brown, 1991) between alcohol and marijuana motives. We hypothesized that items representing the expansion motive constitute a distinct and internally consistent set of items and that the expansion motive will be predictive of marijuana use but not alcohol use. We further hypothesized a distinct pattern of relationships between motives, use indexes, and use-related problems for each drug, thus providing evidence for the discriminant validity of the marijuana motives measure.

Method

Participants

The sample consisted of 299 introductory psychology students at Syracuse University who participated in our research for partial fulfillment of course requirements. The sample was 55% female.

They ranged in age from 17 to 22 years ($M = 18.75$; $SD = 0.84$); 82% were White, 6% Black, 3% Hispanic, 7% Asian, and 3% other.

Measures

Use measures. Substance use behavior was assessed by self-report. We assessed both alcohol and marijuana use in the past 6 months with 9-point anchored rating scales: 0 (*no use*), 1 (*less than once a month but at least once in the last 6 months*), 2 (*once a month*), 3 (*2–3 times per month*), 4 (*once or twice per week*), 5 (*3–4 times per week*), 6 (*nearly every day*), 7 (*once a day*), and 8 (*more than once a day*). Lifetime experience using marijuana and alcohol was assessed by 9-point anchored rating scales (one for each drug): 0 (*no use*), 1 (*1–5 times*), 2 (*6–9 times*), 3 (*10–19 times*), 4 (*20–39 times*), 5 (*40–59 times*), 6 (*60–79 times*), 7 (*80–99 times*), and 8 (*100 or more times*). For further information regarding use, average use of each drug in the past 30 days was assessed by 9-point anchored rating scales (one for each drug): 0 (*no use*), 1 (*1 day*), 2 (*2 days*), 3 (*3 days*), 4 (*once a week*), 5 (*2–3 days a week*), 6 (*4–6 days a week*), 7 (*once a day*), and 8 (*more than once a day*). The questionnaire used a numeric coding scheme designed to ensure confidentiality; extensive evidence supports the validity of self-reported drug use when participants' confidentiality is assured (Johnston & O'Malley, 1985). Furthermore, Hays and Huba (1988) found adequate reliability of self-reported drug use frequency across a broad range of response formats.

Problem measures. We assessed alcohol-related problems using the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). The scale consists of 23 items assessing presence or absence of specified problems with alcohol over the individual's lifetime. This scale was designed for adolescents and is thus appropriate for this population. We used a parallel version of the RAPI to assess problems with marijuana use (Johnson & White, 1989). Sample items included the following: "Felt physically or psychologically dependent on marijuana/alcohol," "Neglected your responsibilities," and "Felt that you needed more alcohol/marijuana than you used to use in order to get the same effect." Predictive validity of these problem indexes is supported by their relationships with other use-related problems, such as driving while intoxicated and consumption of alcohol or marijuana while driving (Johnson & White, 1989). Cronbach's alphas for the marijuana and alcohol problem indexes in this sample were .86 and .89, respectively.

Motives. The Drinking Motives Measure (Cooper, 1994) is a 20-item questionnaire assessing four motives for drinking. Each item has a 5-point response option, ranging from 1 (*Almost never/never*) to 5 (*Almost always/always*). Participants are instructed to consider all the times they have drunk and to indicate how often they have drunk alcohol for each reason. The motives and representative items are as follows: enhancement ("I drink to get high"), coping ("I drink to forget my worries"), social ("I drink to be sociable"), and conformity ("I drink so that others won't kid me about not drinking"). This measure has demonstrated sound psychometric properties in large samples of adolescents and adults (Cooper, 1994; Cooper et al., 1995). The questionnaire was adapted for marijuana by substituting "use marijuana" for "drink" (e.g., "I use marijuana to be sociable"). In addition, we created a fifth expansion motives scale consisting of the following items: (1) "I use marijuana/drink so I can know myself better," (2) "I use marijuana/drink because it helps me be more creative and original," (3) "I use marijuana/drink so I can understand things differently," (4) "I use marijuana/drink so I can expand my awareness," and (5) "I use marijuana/drink to be more open to experiences." Items 1, 2, and 3 are adapted from Newcomb et al. (1988). Items 4 and 5 were generated by the authors. Appropriate

versions of the expansion motives items were placed at the end of both the alcohol and marijuana motives questionnaires.

Procedure

Participants provided written informed consent before completing the questionnaires. Questionnaires were coded by a unique number rather than by name. The motives measures preceded the problem indexes, and order was counterbalanced across drugs. Only those participants who reported using the target drug in their lifetimes completed the respective motive and problem measures. Use frequency measures were at the end of the questionnaire. After completion of all forms, participants' questions were answered, and anyone who had concerns about their substance use or who was interested in obtaining further information was provided a list of local resources.

Results

Substance Use Patterns

In the full sample, marijuana and alcohol use was common: 54% ($n = 161$) had tried marijuana in their lifetimes, and 47% ($n = 141$) had used marijuana in the past 6 months, whereas 94% ($n = 281$) had tried alcohol and 90% ($n = 267$) had used alcohol in the past 6 months. In the full sample, participants reported using marijuana an average of 10–19 times in their lifetimes (rating scale $M = 2.52$, $SD = 3.04$), and alcohol an average of 40–59 times (rating scale $M = 4.90$, $SD = 2.59$).

The 161 participants who had used marijuana in their lifetimes reported using marijuana an average of 2–3 times a month in the past 6 months, the key criterion variable (rating scale $M = 3.02$, $SD = 2.35$). Average use in the past month for this group was 3 days (rating scale $M = 2.68$, $SD = 2.61$). Participants who had tried marijuana reported an average of 4.91 ($SD = 4.44$) use-related problems on the marijuana problem index. Ninety-nine percent of participants who had used marijuana in the past 6 months also reported using alcohol in the past 6 months. There were 281 participants who used alcohol in their lifetime. Because of a clerical error in the initial questionnaire battery, we report results on 242 participants who had complete motives data. These participants used alcohol an average of 2–3 times per month in the past 6 months (rating scale $M = 3.37$, $SD = 1.54$). Average use of alcohol in the past month for this group was 3 days (rating scale $M = 3.48$, $SD = 2.02$). Participants who tried alcohol reported an average of 6.00 ($SD = 5.06$) use-related problems on the alcohol problem index. Fifty-two percent of participants who had used alcohol in the past 6 months also reported using marijuana in that same time period.

Motive Factor Structure

We conducted an exploratory factor analysis to examine the structure of the marijuana and alcohol motives scales. Only participants who had used the target drug in their lifetime were included in the factor and subsequent regression analyses (marijuana $n = 161$; alcohol $n = 242$; alcohol n less than total reported above because of incomplete data). We used this broad range to ensure that the results would be applicable to a wide range of individuals. Additional analyses not reported here demonstrated that the factor structure was invariant across a range of experience groups. We obtained the initial estimates of communalities from the squared multiple correlation coefficients, and we extracted factors using the principal factor method in Stata 4.0 (Stata Corporation, 1995). The number of retained factors was determined on the basis of the eigenvalue > 1 guideline and the scree test (Floyd & Widaman, 1995). Results of the marijuana motives factor analysis support a five-factor model. The five-factor solution for marijuana motives is supported by a 6% increment in variance accounted for above the four-factor model. A six-factor solution for marijuana motives was clearly not warranted on the basis of the eigenvalue and scree test. Eigenvalues for the first six unrotated factors were 8.50, 3.28, 2.30, 1.73, 0.99, and 0.34. Variance accounted for by these factors was .50, .19, .13, .10, .06, and .02.

Results of the alcohol analysis yielded a four-factor solution. Eigenvalues for the first six unrotated factors were 8.40, 3.09, 2.27, 1.59, 0.68, and 0.37. Variance accounted for by these factors was .53, .19, .14, .10, .04, and .02. A five-factor solution for alcohol motives was clearly not warranted on the basis of the eigenvalue and scree test. The fourth alcohol motives factor was associated with a 10% increment in variance accounted for above the three-factor solution.

We used a promax oblique rotation to allow the factors to correlate. We expected correlation between factors on the basis of previous research on drug use motives (Cooper, 1994; Stacy et al., 1991). Table 1 contains the factor loadings for the rotated five-factor solution for marijuana motives. Items are grouped according to the original factor structure of the Drinking Motives Measure to aid comparability. This table reveals that the pattern of factor loadings closely approximates those of the Drinking Motives Measure (Cooper, 1994), resulting in enhancement, coping, social, and conformity motives, in addition to the fifth expansion motive factor. There were only two notable differences in the pattern of factor loadings. First, Item 16 ("I use marijuana to celebrate a special occasion with friends") failed to load significantly on any factor (loadings < .27). Second, Item 15 ("I use marijuana because it helps me feel more self-confident and sure of myself") loaded on the social rather than coping factor. This item had the lowest loading on the coping scale in Cooper's (1994) study. Scales were reconstructed based on items loading > .40. The scale construction resulted in four 5-item scales and one 4-item scale (coping motives).

Table 2 contains the factor loadings for the rotated four-factor solution for alcohol motives. Items are grouped according to the original factor structure of the Drinking Motives Measure to aid comparability. This table reveals that the enhancement and social motives items loaded on a single factor. Thus, the four-factor solution results in enhancement–social, coping, conformity, and expansion motives. We also conducted the factor analysis with only the 20 original items to ensure that social and enhancement motives did not load on a single factor because of the presence of the

Table 1

Standardized Factor Loadings for the Marijuana Motives Five-Factor Model (N = 161)

Item	Enhancement	Conformity	Expansion	Coping	Social
3. Because it helps me enjoy a party	.18	.00	.00	−.10	−.60
5. To be sociable	−.19	.10	.01	−.00	−.69
11. Because it makes social gatherings more fun	.09	−.02	.07	.07	−.90
14. Because it improves parties and celebrations	.05	−.08	.05	.00	−.89
16. To celebrate a special occasion with friends	.19	.04	−.26	−.15	−.26
1. To forget my worries	.10	.09	.02	−.86	.17
4. Because it helps me when I feel depressed or nervous	−.02	−.06	−.00	−.86	−.07
6. To cheer me up when I am in a bad mood	.08	.01	.07	−.74	−.08
15. Because I feel more self-confident and sure of myself	−.09	.05	−.18	−.28	−.43
17. To forget about my problems	−.06	−.02	−.03	−.85	.02
7. Because I like the feeling	.94	.00	.02	−.09	.11
9. Because it's exciting	.51	.09	.03	.16	−.35
10. To get high	.76	−.05	−.03	.04	−.11
13. Because it gives me a pleasant feeling	.89	−.02	−.02	−.03	−.01
18. Because it's fun	.87	.04	−.09	.01	−.03
2. Because my friends pressure me to use marijuana	−.11	.74	−.08	.03	.11
8. So that others won't kid me about not using marijuana	−.03	.75	.09	.03	.04
12. To fit in with the group I like	.01	.77	.05	−.09	−.07
19. To be liked	.15	.84	.07	−.09	.03
20. So I won't feel left out	−.06	.77	−.09	.14	−.03
21. To know myself better	−.07	.04	−.78	−.05	−.00
22. Because it helps me be more creative and original	.04	−.01	−.86	−.03	.04
23. To understand things differently	−.01	−.04	−.95	.01	.03
24. To expand my awareness	.06	−.02	−.95	.07	.08
25. To be more open to experiences	.06	.01	−.76	.01	−.05

Note. Items are grouped according to the original factor structure of the Drinking Motives Measure to aid comparability.

additional expansion motive items. Factor analysis of the 20 original items resulted in a three-factor solution: enhancement–social, coping, and conformity. Thus, the difference in factor structure between this study and Cooper (1994) cannot be attributed to the additional items. The merging of social and enhancement motives is not surprising given the following two considerations: (a) Drinking behavior in college students occurs primarily in social and positive affect situations; for example, parties (Carey, 1993) and (b) these scales were highly correlated in earlier research ($r = .68$; Cooper, 1994). In addition to the merging of enhancement and social motives, there was one additional difference in factor loadings in comparison to Cooper (1994). As with the marijuana analysis, Item 15 ("I use alcohol because it helps me feel more self-confident and sure of myself") loaded with the social motive items rather than on the coping factor. Thus, the solution resulted in an 11-item enhancement–social scale, a 4-item coping scale, and two 5-item scales (conformity and expansion).

Table 3 contains means, standard deviations, correlations, and Cronbach's alphas for the marijuana and alcohol motive scales. After controlling for familywise error rate, we found no significant mean differences across gender. Mean scores for the alcohol scales are comparable with those of Cooper (1994), demonstrating considerable consistency in responses to these scales across samples. Cronbach's alphas indicated substantial internal consistency for the marijuana and alcohol motives scales; alphas ranged from .84 (alcohol expansion motives) to .94 (alcohol enhancement–social motives).

Relations Between Motives and Recent Substance Use

Marijuana. We conducted hierarchical regression analyses to examine relationships between motives and the use of marijuana and alcohol in the past 6 months. The analyses across drugs were conducted on overlapping groups, as a substantial proportion (54%) of the sample had used both

Table 2

Standardized Factor Loadings for the Alcohol Motives Four-Factor Model (N = 242)

Item	Enhancement–social	Conformity	Expansion	Coping
3. Because it helps me enjoy a party	.83	.10	.12	−.02
5. To be sociable	.72	.24	.05	.21
11. Because it makes social gatherings more fun	.91	.09	.03	.07
14. Because it improves parties and celebrations	.96	.04	.05	.10
16. To celebrate a special occasion with friends	.61	.09	.07	.00
1. To forget my worries	.02	.06	.08	−.84
4. Because it helps me when I feel depressed or nervous	−.04	.01	−.01	−.83
6. To cheer me up when I am in a bad mood	.11	−.03	−.04	−.72
15. Because I feel more self-confident and sure of myself	.43	.05	−.06	−.30
17. To forget about my problems	−.07	.05	.06	−.90
7. Because I like the feeling	.71	−.24	−.09	−.11
9. Because it's exciting	.70	.03	−.09	−.09
10. To get high	.53	−.05	.00	−.21
13. Because it gives me a pleasant feeling	.84	−.21	−.10	−.03
18. Because it's fun	.83	−.06	.01	−.07
2. Because my friends pressure me to use alcohol	.00	.67	.02	−.02
8. So that others won't kid me about not using alcohol	−.10	.83	.04	−.02
12. To fit in with the group I like	.08	.80	.01	.02
19. To be liked	.02	.64	−.20	−.05
20. So I won't feel left out	−.02	.80	−.01	−.07
21. To know myself better	−.19	.09	−.69	−.07
22. Because it helps me be more creative and original	.08	.02	−.64	−.12
23. To understand things differently	−.02	−.01	−.88	.06
24. To expand my awareness	−.03	−.02	−.89	.09
25. To be more open to experiences	.26	.03	−.55	.06

Note. Items are grouped according to the original factor structure of the Drinking Motives Measure to aid comparability.

drugs. To begin, we tested the predictive power of the motives, first without then with the expansion motive. Then, because previous research demonstrated some differences in substance use motives across gender as well as substances (Cooper, 1994; Newcomb et al., 1988), we conducted a backward stepwise regression procedure to test for interactions between gender and each motive. The stepwise analyses began with a full model, locking in all main effects. At each step, predictors were evaluated to be removed or entered into the model. The procedure, thus, alternated between forward selection and backward elimination. The criteria for terms entering the model were p values less than or equal to .10. The criteria for removing terms from the model were p values greater than or equal to .20. This procedure, although not guaranteeing the "best" model, provides a parsimonious, empirically determined model of the significant gender interactions (Stata Corporation, 1995). The criterion for the first model was marijuana use in the past 6 months. The gender and the four original motive scales were entered at Step 1, followed by expansion motives at Step 2. The reduced model accounted for 29% of the variance in marijuana use, $F(5, 155) = 12.96, p < .0001.$

Enhancement ($\beta = .36$, $p < .001$) and coping ($\beta = .26$, $p < .001$) motives were significant predictors. Expansion motives were associated with a 6% increment in variance predicted, $F(1, 154) = 13.93, p < .001$. Expansion ($\beta = .29$, $p < .001$), enhancement ($\beta = .27$, $p < .01$), and coping ($\beta = .19$, $p < .05$) motives were significant predictors at Step 2.

Gender × Motive interactions were entered at Step 3 using the stepwise procedure described above. Gender × Coping motives ($\beta = -.40, p < .05$) and Gender × Expansion motives ($\beta = .33$, $p < .10$) entered into the model, resulting in a 3% increment in variance predicted, $F(2, 152) = 3.44$, $p < .05$. Examination of the significant Gender × Coping interaction according to procedures described in Jaccard, Turrisi, and Wan (1990) revealed that the relationship between coping motives and marijuana use was higher in women ($\beta = .39$) than in men ($\beta = -.01$). The full model accounted for 38% of the variance in marijuana use, $F(8, 152) = 11.71, p < .0001$. In addition to the Gender × Coping interaction, enhancement ($\beta = .25$, $p < .01$) and coping ($\beta = .39$, $p < .001$) motives were significant predictors in the full model. Note that the

Table 3

Means, Standard Deviations, Reliabilities, and Correlations Among Motives and Use Indexes

Variables	M	SD	1	2	3	4	5	6	7
			Marijuana[a]						
1. Enhancement	3.53	1.23	.92						
2. Coping	1.82	1.01	.39**	.89					
3. Social	2.38	1.00	.57**	.49**	.86				
4. Conformity	1.32	0.61	−.11	.10	.16*	.86			
5. Expansion	2.02	1.16	.45**	.41**	.40**	.12	.93		
6. Marijuana use	3.02	2.35	.48**	.41**	.35**	−.09	.47**	—	
7. MPI (n = 158)	4.91	4.44	.33**	.39**	.47**	.10	.36**	.45**	.86
			Alcohol[b]						
1. Enhancement/social	3.20	1.06	.94						
2. Coping	1.94	1.00	.49**	.90					
3. Conformity	1.36	0.64	.23**	.22**	.86				
4. Expansion	1.36	0.64	.31**	.35**	.27**	.84			
5. Alcohol use	3.37	1.54	.54**	.38**	.01	.16*	—		
6. RAPI (n = 238)	6.00	5.06	.41**	.46**	.07	.20*	.59**	.89	

Note. Motive scales' ranges are 1–5; higher numbers indicate more frequent motives for use. Cronbach's alpha coefficients appear on the diagonal. Marijuana and alcohol use is for the past 6-month time frame. A score of 3 = 2–3 times a month on the marijuana or alcohol use rating scale. MPI = Marijuana Problem Index, range = 0–23; RAPI = Rutgers Alcohol Problem Index, range = 0–23.
[a]N = 161. [b]N = 242.
*p = .05. **p = .001.

combination of the expansion motive and its interaction with gender contributed 7% of the variance predicted in the full model, $F(2, 152) = 8.69, p < .001$. Thus, expansion motives contributed unique variance, not accounted for by the four original motives, to the prediction of marijuana use. Furthermore, testing the univariate relationship revealed that the expansion motive alone accounted for 22% of the variance in marijuana use, $F(1, 159) = 44.63, \beta = .48, p < .001, f^2 = 0.28$.

Cohen (1988) provides formulas for effect sizes in multiple regression analysis. The effect size index, f^2, has the following cutoffs: 0.02 = small, 0.15 = medium, and 0.35 = large. The effect size for the above reduced model was $f^2 = 0.41$, a large effect. The effect size for Step 2 (expansion motives) was $f^2 = 0.09$, a small-to-medium effect. The effect size for Step 3 (the gender interactions) was $f^2 = 0.05$, a small effect. The effect size for the expansion motives terms in the full model (i.e., the main effect and interaction term) was $f^2 = 0.11$, a small-to-medium effect. The full model accounted for 38% of the variance in use, $f^2 = 0.61$, a large effect size.

Alcohol. Parallel analyses were conducted predicting alcohol use by alcohol motives (n = 242). Gender and enhancement–social, conformity, and coping motives were entered at Step 1. The reduced model accounted for 36% of the variance, $F(4, 237) = 33.00, p < .0001, f^2 = 0.56$. All three motives and gender were significant predictors (enhancement–social $\beta = .47, p < .001$; coping $\beta = .18, p < .01$; conformity $\beta = −.16, p < .01$; gender $\beta = .18, p < .001$). Male gender was positively associated with alcohol use. Adding expansion motives at Step 2 did not increase the variance predicted, $F(1, 236) = 0.51, p < .48$.

Gender × Motive interactions were entered at Step 3.

Only Gender × Coping entered into the model ($\beta = .35, p < .01$). The nature of the interaction is the opposite of that seen in the marijuana use model. The relationship between coping motives and alcohol use was higher in men ($\beta = .40$) than in women ($\beta = .05$). The interaction increased the variance predicted by 2%, $F(1, 235) = 7.92, p < .01, f^2 = 0.03$. Thus, the full model accounted for 38% of the variance in alcohol use, $F(6, 235) = 24.01, f^2 = 0.61$.

Relations Between Motives and Lifetime Problems

Marijuana. The problem indexes were the criterion variables for the second set of models. A square-root transformation was used for the marijuana problem index, making it normally distributed. Marijuana problems were regressed on lifetime use of marijuana and gender at Step 1 (n = 158). Lifetime use is included because of consistent evidence linking high levels of substance use to use-related problems (Carey & Correia, 1997; Cooper, 1994; Johnson & White, 1989). At Step 2, enhancement, social, coping, and conformity motives were entered. Expansion motives were entered into the model at Step 3. At Step 4, we used the stepwise procedure to examine Gender × Motive interactions.

Lifetime use and gender accounted for 49% of the variance in marijuana problems, $F(2, 155) = 74.32, p < .0001, f^2 = 0.96$. Only lifetime use was a significant predictor ($\beta = .70, p < .001$). Adding the four motives scales at Step 2 resulted in an 8% increment in variance predicted, $F(4, 151) = 6.90, p < .0001, f^2 = 0.19$. Lifetime use remained a significant predictor ($\beta = .68, p < .001$), joined by social motives ($\beta = .22, p < .01$) and conformity

motives ($\beta = .14, p < .05$). Adding expansion motives into the model at Step 3 did not significantly add to the prediction of problems. At Step 4, Gender $\times$ Conformity, Gender $\times$ Expansion, and Gender $\times$ Social motives entered the model. None of the individual terms were significant. Collectively they resulted in a 2% increment in variance predicted, $F(3, 147) = 2.47, p < .10, f^2 = 0.05$. The full model accounted for 59% of the variance in marijuana problems, $F(10, 147) = 21.07, p < .0001, f^2 = 1.44$. Only social motives ($\beta = .34, p < .001$) and lifetime use ($\beta = .68, p < .001$) remained significant predictors in the full model.

Alcohol. In the analyses predicting alcohol-related problems ($n = 237$), lifetime use and gender were entered at Step 1, accounting for 35% of the variance, $F(2, 234) = 62.74, p < .0001, f^2 = 0.54$. Only lifetime use was a significant predictor ($\beta = .57, p < .001$). At Step 2, enhancement–social, coping, and conformity motives were added, accounting for an 8% increment in variance predicted, $F(3, 231) = 11.41, p < .0001, f^2 = 0.14$. Coping motives ($\beta = .28, p < .001$), lifetime use ($\beta = .46, p < .001$), and male gender ($\beta = .11, p < .05$) were significant predictors. As in the above analysis, expansion motives, entered at Step 3, did not significantly add to the prediction of alcohol problems, $F(1, 230) = 0.02, p < .90$. Again, Gender $\times$ Motive interactions were entered at Step 4 using the stepwise procedure. Only Gender $\times$ Coping entered into the model, resulting in 3% increment in variance predicted, $F(1, 229) = 9.72, p < .01, \beta = .38, f^2 = 0.06$. Coping motives were more related to alcohol-related problems in men ($\beta = .52$) than women ($\beta = .14$). In addition to the Gender $\times$ Coping interaction, lifetime use was a significant predictor in the full model ($\beta = .43, p < .001$), which accounted for 46% of the variance in alcohol problems, $F(7, 229) = 27.44, p < .0001, f^2 = 0.85$.

Discussion

Five notable findings emerge from this study. First, relationships between marijuana motives and marijuana use and use-related problems support the concurrent validity of the marijuana motives measure. Second, we demonstrate the construct validity of expansion motives. Factor analysis supported the uniqueness of expansion motives from motives for enhancing positive affect, social enhancement, coping, and social conformity. The expansion subscale also demonstrated a high degree of internal consistency. Furthermore, individuals use marijuana for some specific reasons that differ from reasons for alcohol use, namely the expansion of experiential awareness. Thus, we have demonstrated the discriminant validity of expansion motives in the following ways: (a) Expansion motives contribute unique variance to marijuana use after controlling for the influence of other types of motives, and (b) they add to the prediction of marijuana use but not alcohol use. Other differences across drugs emerged as well. For example, social and conformity motives were not significant predictors of marijuana use but were significant predictors of alcohol use. This pattern may be a reflection of the differences between a legal, socially accepted drug (alcohol) and an illegal, less socially accepted

drug (marijuana). Thus, social forces may exert a greater influence in determining the use of substances that are highly approved of in society. Regarding use-related problems, social motives were a significant predictor of marijuana-related problems in the full model, whereas coping motives predicted alcohol-related problems. These differences provide further evidence of discrimination between motives for marijuana and alcohol use. Differences found in this research are of particular interest because the significant overlap in the analysis groups suggests that these are within-subject differences.

Third, this study demonstrates that marijuana motives are useful constructs for understanding both marijuana use and consequences. Consistent with previous work on use-related problems, lifetime use of the drug was the single largest predictor of problems, accounting for nearly half of the variance in marijuana-related problems and 35% of the variance in alcohol problems (Carey & Correia, 1997; Cooper, 1994). However, both marijuana and alcohol motives contributed unique variance to the prediction of problems that is not accounted for by the consumption variables alone. Relative to the alcohol model, the marijuana model accounted for more variance in use-related problems. This finding supports the concurrent validity of the marijuana motives measure. In contrast to our findings, Stacy et al. (1991) reported that alcohol but not marijuana motives were significant predictors of drug problems. Stacy et al. represented drug problems by a latent variable that combined alcohol, cocaine, and marijuana problems. Although such composite indexes may be better indicators of the extent of drug use consequences, they lack the specificity needed to understand the functional relationships between motives for use of a drug and the consequences of use. Thus, our study demonstrates the utility of examining motives and problems specific to the use of marijuana so that the research community may better understand marijuana use behavior.

The fourth notable finding of the study concerns alcohol motives. We did not find evidence for the differentiation of social and enhancement motives in this sample. These two motives were the most highly correlated (rs .51–.68) in past research (Cooper, 1994; Cooper et al., 1992; Stewart et al., 1996). Thus, it appears that drinking for the purposes of socialization and enhancing positive affect is highly related among adolescents and young adults. Although we believe that social and enhancement motives are theoretically distinct constructs, we emphasize their close association in some samples. As in previous studies, we find coping motives contribute unique variance to the prediction of alcohol-related problems over and above the contribution of lifetime use. Thus, these data provide a close replication of the concurrent validity of the alcohol motives in yet another sample, demonstrating theoretically predicted relations between alcohol motives, use, and related problems.

Fifth, our results demonstrate some differences in relations between motives and use indexes across gender. Coping motives were more predictive of marijuana use in women than in men. In contrast, coping motives were more related to both alcohol use and problems in men than in women. A clear pattern of gender interactions in the

prediction of use and use-related problems is not evident in previous research (Cooper, 1994; Cooper et al., 1995; Newcomb et al., 1988). For example, Newcomb et al. found stronger relations between coping motives and alcohol use in women. However, consistent with our results, Cooper et al. (1995) reported that coping motives were more related to alcohol-related problems in men than in women. These variations may be attributed to the use of different measures as well as differences in sample demographic characteristics. Thus, conclusions regarding the gender effects exhibited in this study should be interpreted with caution.

Three limitations of this study deserve mention. Although prior research demonstrates relatively little variability in alcohol motives across demographic groups (cf. Cooper, 1994), our sample consisted exclusively of college students; thus, the generalizability of the results for marijuana motives remains to be established. Also, the factor structure of the marijuana motives measure remains to be replicated with more rigorous confirmatory techniques. However, our exploratory analysis in conjunction with the results of the regression analyses provides strong support for the correlated five-factor model. Finally, although previous research has demonstrated the prospective prediction of use and problems by cognitive motivations (Stacy et al., 1991), inferences about causal direction may not be derived from our cross-sectional design.

Negative consequences of heavy alcohol and marijuana use among young adults have become increasingly well documented (Block, Farnham, Braverman, Noyes, & Ghoneim, 1990; Pope & Yurgelun-Todd, 1996; Wecshsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). Understanding intrapersonal correlates of use and abuse can be an important focus of intervention. Although our study does not specifically address treatment, significant implications for counseling individuals with drug abuse problems may be derived from the results. Our results emphasize significant differences in motives for the use of alcohol and marijuana. Therefore, counseling that is specifically tailored to the drug or drugs being abused may be the most efficacious.

For example, data from the current sample suggest that individuals who use marijuana for social reasons, as well as those who use alcohol primarily for coping reasons, may be particularly at risk for suffering use-related negative consequences. An early assessment of motives may contribute to the construction of a "high-risk profile" for the early identification of and intervention with individuals likely to experience negative consequences related to use of alcohol or marijuana or both (Carey & Correia, 1997). For those individuals already experiencing negative consequences related to use, the assessment of motives may help clients and therapists identify more adaptive ways of meeting the needs served by drugs and alcohol (Cooper, 1994). For example, individuals who drink or use marijuana to cope with negative emotions may benefit from interventions designed to reduce stress or provide alternative ways of coping with stress. In contrast, providing alternative sources of pleasurable stimulation may be the more appropriate intervention for individuals who drink or use drugs to enhance emotional experience (Cooper et al., 1995).

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