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Motivation and Substance Use Outcomes among Adolescents in a School-Based Intervention

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Abstract

The stages of change (Precontemplation, Contemplation, Preparation, Action, and Maintenance) have been well studied in adult populations. However, fewer studies have examined how the stages of change are related to adolescent substance use. Furthermore, there have been no studies that have examined how the stages of change relate to outcomes in a school-based intervention. To better capture adolescent motivation, we added an additional group to the Transtheoretical Model of Change, which we titled Coerced Action, to represent adolescents that made changes to their substance use despite low problem recognition (representing the internal motivation of Precontemplation and the change behaviors of the Action group). We then examined how the stages of change were related to a thorough assessment of substance use at baseline and corresponding treatment outcomes. Our sample consisted of 264 adolescents (mean age 16.1, 44.5% Caucasian, 37.5% female) who participated in an 8-week, school-based Motivational Enhancement intervention. Results indicated significant group differences across the stages of change in substance use patterns (alcohol use, negative consequences, affective dysregulation), as well as treatment outcomes (alcohol use and negative consequences). For instance, adolescents in the Action group demonstrated more negative consequences at 16 weeks follow-up than those in Precontemplation and Coerced Action, $F(1, 3) = 8.23$, $p = .000$. The Coerced Action group reported the most alcohol use at 16 weeks follow-up, although the finding was not significant when post-hoc tests were conducted. This study provides meaningful support for the assessment of motivation among adolescent substance users within school-based settings.

Keywords

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Introduction

Motivation to change, as outlined by the Transtheoretical Model of Change (TTM; Prochaska & DiClemente, 1982; DiClemente, 1999), has been linked to substance use treatment outcomes in adolescent populations (Broome, Joe, & Simpson, 2001; Callaghan et al., 2005; Slesnick et al., 2009); however, a comprehensive assessment of adolescent substance use (i.e., quantity, frequency, age of onset, reasons for use, previous treatment history) as related to the TTM is rare, and it has never been examined in a school-based treatment setting. High schools in particular allow for opportunities for identification of at-risk adolescents, therefore, clinicians and other responders may benefit by understanding how motivation is related to substance use in order to prevent the progression of substance use disorders.

The TTM breaks down motivation to change behavior into five stages of change: Precontemplation (not considering change), Contemplation (considering change), Preparation (developing change plan), Action (implementing change plan), and Maintenance (sustaining change). The TTM has been applied to adolescent populations (Kidd, Reed, Weaver, Westneat, & Rayens, 2003; Migneault, Pallonen, & Velicer, 1997; Pallonen, 1998) and is of clinical utility, as motivation to change substance use has been found to be a predictor of treatment-seeking behavior and achievement of sustained change (Broome et al., 2001; DiClemente, Schlundt, & Gemmell, 2004; Slesnick et al., 2009). Motivational Interviewing, in particular, has demonstrated efficacy in enhancing motivation and improving outcomes in adolescent populations (Barnett, Sussman, Smith, Rohrbach, & Sprujit-Metz, 2012; Jensen et al., 2011).

In the adult literature, the TTM has been associated with many indicators of treatment outcomes (DiClemente et al., 2004). The bulk of the research in this area has focused on facilitating advancement through the stages of change as a core process of treatment (Miller & Rose, 2009; Miller & Rollnick, 2012; Velazquez, Gaddy-Maurer, Crouch, & DiClemente, 2001). In adults, belonging to the Contemplation or Action stages of change has been associated with greater endorsement of symptoms of anxiety and depression (Willoughby & Edens, 1996). A meta-analysis of 39 studies found that the stages of change generally predict psychotherapy outcomes (with an effect size of $d = .46$). Surprisingly, there have been few studies that have examined how the stages of change are related to treatment outcomes in adolescent samples. One study found that adolescents in the Precontemplation stage at pre-treatment were at greater risk of treatment attrition (Callaghan et al., 2005). Because the TTM has showed relevance in adult substance use treatment, it is important to examine the TTM in adolescent samples as well.

Although the stages of change capture many facets of motivation, a subgroup of adolescents are not well represented within the model: adolescents who do not recognize that they have a problem with alcohol or drugs (congruent with the Precontemplation stage of change) and yet are pressured or coerced to make changes (consistent with an Action stage of change) in their substance use. A Coerced Action group is unique in that internal motivation is similar to Precontemplation, however dissimilar in that individuals in Precontemplation do not make changes to their behavior. A Coerced Action stage of change accounts for both. Those

in Coerced Action may have a different clinical course, and this distinction has never been formally investigated. Data on the effectiveness of coerced treatment has been inconsistent, with some evidence that coerced treatment promotes positive changes, and other evidence suggests that external pressure to change is not as powerful as internal motivation to change (Klag, O'Callaghan, & Creed, 2005; Knight, Hiller, Broome, & Simpson, 2000). Therefore, it is worth exploring how adolescents in Coerced Action compare to those within the traditional TTM stages of change.

Taken together, this study had three aims: The first was the creation of a unique stage of change (which we labeled as Coerced Action). Second, we examined pre-treatment substance use by the stages of change in a sample of adolescents participating in a school-based intervention. Third, we examined how the stages of change were associated with treatment outcomes. We hypothesized that adolescents classified in the Action stage would have more severe substance use at pre-treatment, consistent with the adult literature. We also hypothesized that adolescents classified as Coerced Action would have a similar clinical course as those in Precontemplation due to their self-reported low problem recognition.

Method

Participants and Procedure

We recruited participants from an ongoing substance abuse intervention program in high schools called project READY. Both the clinical intervention and research were conducted by clinical psychology doctoral students under the supervision of the principal investigator, a licensed clinical psychologist. School personnel (teachers, counselors, administrators and security officers) made referrals to the treatment intervention. Referral criteria were simply that a member of the school staff had concerns that a student was involved in substance use. This method was purposely broad to replicate typical school referrals to a drug and alcohol specialist. Common reasons for referral included students arriving to school intoxicated, being caught with drug paraphernalia, excessive absences, discipline problems, or self-reported substance use. Once referred, students were assigned to an interventionist from the clinical research team who provided a description of the intervention, a brief screening, and sought treatment and research consent (Stewart, Felleman & Arger, 2015). Students were invited to participate in the intervention if they met the eligibility requirement of having used alcohol, marijuana, or other drugs during the three months prior to referral.

The intervention consisted of four weeks of school-based Motivational Enhancement Therapy (MET) followed by four weeks of skills training. The school-based intervention took place during school hours in order to make treatment available for all students regardless of extracurricular activities and availability of after-hours transportation. We collected informed consent and assent from legal guardians, when applicable, and participants. The university's Institutional Review Board approved the study and participating school districts reviewed the procedures. The doctoral student interventionists received training in Motivational Interviewing and weekly supervision from the Principal Investigator (PI).

Participants were referred for more intensive treatment based on the clinical judgment of the PI. Participants were screened and randomized to receive either the treatment intervention or a waitlist control condition. Data were collected at pre-treatment, 4 weeks (mid-treatment), 8 weeks (post-treatment), 12 weeks (follow-up 1), and 16 weeks (follow-up 2).

Measures

Motivation to change—We used the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996) to assess motivation to change. It is a widely used measure that has demonstrated acceptable reliability and validity in adolescent samples (Maisto, Chung, Cornelius, & Martin, 2003). It contains 19 items that are rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The SOCRATES yields three factors: Problem Recognition, Ambivalence, and Taking Steps. Problem Recognition assesses an individual's recognition of problematic substance use, Ambivalence assesses the level of uncertainty if change is needed, and Taking Steps assesses the degree an individual has taken behavioral steps toward change. We administered the SOCRATES during weeks 1, 4, 8, 12, and 16. In our baseline sample, we found Cronbach's alphas of .86 for Problem Recognition, .78 for Ambivalence, and .92 for Taking Steps.

Substance use—The Customary Drinking and Drug Use Record (CDDR; Brown et al., 1998) is a structured interview containing 101 items that was designed to assess recent (past three months) substance use (e.g., alcohol, marijuana, cocaine, opiates). The measure also assesses confidence in abstaining and the number of previous treatments. The CDDR has been widely used in adolescent samples (Brown, D'Amico, McCarthy, & Tapert, 2001; Stewart & Brown, 1995). We administered the CDDR during sessions 1, 4, 8, 12, and 16. We used behavior counts of quantity and frequency of use, number of sessions, and a single Likert rating of confidence, therefore we are not reporting measures of internal consistency for the CDDR.

Negative consequences—We assessed negative consequences with the Alcohol and Drug Use Consequences Questionnaire (ADUCQ; Brown et al., 1998; White & Labouvie, 1989), which has also been used in adolescent samples (Ginzler, Garrett, Baer, & Petersen, 2007; Neal, Corbin, & Fromme, 2006). The ADUCQ is a self-report questionnaire that is a composite of the Rutgers Alcohol Problem Index (RAPI) and the substance use diagnostic criteria from the DSM-5. Participants rated the frequency of substance use consequences on the following scale: 0 (*never*), 1 (*one or two times*), 2 (*three to five times*), 3 (*six to ten times*) and 4 (*more than ten times*). We administered the ADUCQ during weeks 1, 4, 8, 12, and 16. We found acceptable internal consistency at week 1 for this measure ($\alpha = .97$).

Temptation coping—We used the Adolescent Temptation Coping Scale (Myers, Stice, & Wagner, 1999) to measure coping strategies. Adolescents were asked to endorse the frequency of using one of 11 coping strategies to cope with a high-risk drug use situation experienced during the treatment intervention. The authors of the TCQ have found a stable factor structure across a variety of substances and substance taking situations. The Cronbach's alpha for our sample was .89.

Affective, behavioral, and cognitive dysregulation—Trait affective, behavioral, and cognitive dysregulation was assessed using the Dysregulation Inventory (DI; Mezzich, Tarter, Giancola, & Kirisci, 2001). It is a 92-item questionnaire that has been widely used in adolescent and young adult populations. Participants were given a variety of statements regarding affective, behavioral, and cognitive dysregulation and asked to rate them on the following Likert scale: 0 (*never true)*, 1 (*occasionally true)*, 2 *(mostly true)*, and 3 (*always true).* We administered the DI at week 1, demonstrating adequate internal consistency in our sample for the total scale ($\alpha = .93$) and two subscales (affective dysregulation $\alpha = .88$ and behavioral dysregulation ($\alpha = .81$). The alpha of .63.

Data Analysis

We used the SOCRATES subscales to map onto the stages of change in the TTM, which was informed by a classification system previously outlined and validated by Vik, Culbertson, and Sellers (2000). The Maintenance stage of change was not included because all adolescents that participated in the intervention were in treatment to reduce substance use, despite not always seeking abstinence. We added a novel category to the classification system: Coerced Action. We classified participants that reported an average score of three or higher as *high* on the subscale, and those that reported an average score of less than three were classified as *low*. See Table 1 for an overview of this classification system.

We calculated the alcohol use composite score by multiplying quantity by frequency of alcohol (the average amount of Standard Drinks per drinking occasion by the number of days drinking per month). We used square root transformations to account for the skewness in the alcohol use variables. We calculated the estimated Blood Alcohol Content (BAC) using the average number of Standard Drinks per drinking occasion, total time estimated per drinking episode, and participant weight and sex from the CDDR.

We then compared baseline demographic and clinical variables (e.g., substance use, dysregulation) between the stages of change groups using chi-square analyses and ANOVAs. We used repeated measures ANOVAs to assess the association between stages of change and treatment outcomes. For the post-treatment outcomes we used repeated measures ANOVAs and compared intake with follow up (16 weeks). We used Bonferroni corrections to adjust for increased probability of Type I error due to multiple comparisons.

Results

Participants

Participants for this study included 264 adolescents from 7 high schools. All Participants were between the ages of 14 and 18 (*M* =16.1, *SD* =1.8), and 37.5% were female. Additionally, 44.5% identified as Caucasian, 18.5% as Hispanic, 14.7% as Asian or Pacific Islander, 9.2% as Black or African American, .4% as Native American, and 12.6% as multiracial. Overall, at pre-treatment, the sample reported drinking alcohol 4.2 days per month, with 5.9 standard drinks per occasion. They also reported 13 days per month of marijuana use, and using 1.9 other illicit drugs during the past year (e.g., cocaine, opiates, and club drugs). A frequency distribution indicated that 97 (36.7%) fell into the

Precontemplation group, 22 were in the Contemplation group (8.3%), 38 (14.4%) were in the Action group, and 107 (40.5%) were in the Coerced Action group.

Pre-treatment demographic and clinical variables

We compared the Precontemplation, Contemplation, Action, and Coerced Action groups across baseline demographic and clinical variables. There were a number of significant differences between groups, which are depicted in Table 2, along with means and standard deviations. Because the comparison groups had unequal sample sizes, we examined each variable for homogeneity of variance using Levene's test. The homogeneity assumption was violated for several variables, and we therefore used Welch's F-test as indicated in Table 2. We used Bonferroni-adjusted post-hoc comparisons to further understand the significant differences in variables meeting the homogeneity of variance assumption, and the Games-Howell post-hoc test where homogeneity could not be assumed. There were significant differences between the Precontemplation and Action groups regarding the alcohol use composite, with those in the Action group reporting more alcohol use. There was also a significant difference between the Action group and Coerced Action group, again with the Action group reporting greater alcohol use prior to treatment. Regarding total negative consequences, there were significant differences between the Precontemplation group and Contemplation group, Action group and Precontemplation group, and Coerced Action and Precontemplation groups, with the Precontemplation group reporting the lowest amount of negative consequences. Regarding affective dysregulation, there were significant differences between the Precontemplation group and the Contemplation group, as well as between the Precontemplation group and Coerced Action group, again with the Precontemplation group reporting the least amount of affective dysregulation. Although the Action group reported more alcohol use at pre-treatment, the Contemplation group reported more negative consequences and affective dysregulation.

Treatment outcomes

There were 211 participants that were retained for the follow-up assessments (79.92% of the intake sample). Participants with missing data at follow-up were equivalent on substance use measures but averaged twice as many absences from school, ($M = 22.08$, $SD = 24.13$) days, compared to treatment completers, ($M = 11.14$, $SD = 14.61$) days, $F(1,134)=5.34$, $p=.02$.

We compared the stages of change groups on three primary outcome measures: the alcohol use composite score, marijuana frequency, and total negative substance use consequences (see Table 3). We examined the homogeneity of variance in our repeated measures and found the assumption to be met except for the consequences variable (Levene's Test = 3.69, $p = .028$). Although repeated measures tests are robust to violations of homogeneity of variance, this finding should be interpreted cautiously. There was a main effect of time on the alcohol use composite score, such that alcohol use was reduced over the course of the study ($F(1, 207) = 39.32$, $p = .000$). There was also a significant interaction between time and the stages of change ($F(1, 3) = 4.95$, $p = .002$) on the alcohol use composite score. Post-hoc tests indicated significant differences between the Precontemplation and Action groups ($p = .012$) at follow-up, with participants that were in the Action group ($M = 11.18$, $SD = 21.44$) using alcohol more than those who were in the Precontemplation group ($M = 6.89$,

$SD = 12.62$). There was also a main effect of time on marijuana use, with marijuana use reduced over the course of the study ($F(1, 201) = 87.26$, $p = .000$). There was not, however, a significant interaction between time and stages of change on the frequency of marijuana use. For negative consequences, there was a significant main effect of time ($F(1, 135) = 79.07$, $p = .000$) and the interaction between time and the stages of change ($F(3, 135) = 8.23$, $p = .000$). Post-hoc tests with a Bonferroni adjustment indicated significant differences ($p = .000$) between the Precontemplation ($M = 34.33$, $SD = 33.2$) and Action groups ($M = 51.7$, $SD = 52.98$). There were also significant differences ($p = .001$) between the Action group and the Coerced Action group ($M = 32.75$, $SD = 33.16$). See Figure 1 for a depiction of treatment outcomes.

Discussion

This study examined the association between the stages of change in an adolescent sample ($N = 264$) and outcomes in a school-based, motivational enhancement treatment. We classified participants into four stages of change based on their scores on a motivation measure: Precontemplation, Contemplation, Coerced Action, and Action. The addition of the Coerced Action group ($n = 107$) was novel in that it captured the motivation of adolescents who reported low problem recognition, but were making changes to their substance use regardless.

At pre-treatment, the Action group demonstrated the highest alcohol composite score, and had attended more substance use treatment history prior to engaging in our intervention. Perhaps a higher level of alcohol use at intake prompted problem recognition to change behaviors upon treatment entry, or previous treatments instilled a sense of the importance of substance use treatment, as prior treatment history has been predictive of increased motivation (Boyle, Polinksy, & Hser, 2000). The Contemplation and Action groups demonstrated the greatest amount of total negative substance use consequences. Because the Contemplation and Action groups had higher problem recognition than the Precontemplation or Coerced Action groups, it could be that negative consequences prompted increases in problem recognition, as negative consequences have been associated with enhanced motivation to change (Barnett et al., 2002). This finding is supported by other research that has found that negative consequences are more predictive of higher motivation in adolescents, although substance use severity has been unrelated to motivation (Battjes, Gordon, O'Grady, Kinlock, & Carswell, 2003).

There were also differences between the groups for our primary treatment outcomes. We found a significant interaction between the alcohol composite score and the stages of change, with participants in the Action group reporting more alcohol use than those in the Precontemplation group. It is possible that participants in the Precontemplation group were referred to the intervention for comparatively normal substance use, with low problem recognition accounted for by low alcohol use severity. There was also a significant interaction between total time and stages of change for negative consequences, with the Action group reporting more consequences than the Precontemplation and Coerced Action groups. This finding is in contrast with some literature that has found the best outcomes for higher initial levels of motivation (Cady, Winters, Jordan, Solberg, & Stinchfield, 1996). It

appears that a higher stage of change may be related to a greater awareness of substance use problems and consequences.

The finding that the Coerced Action group reduced their substance use as a result of treatment joins a larger body of literature that has found that individuals that have been coerced into treatment often have similar outcomes (e.g., Burke & Gregoire, 2007). For instance, Kiluk and colleagues (2015) found that adults referred to treatment by the criminal justice system (external motivation) had similar substance use treatment outcomes as those who were not. Our results suggest that the low problem recognition characterizing the Coerced Action group may be reflective of less drug involvement and their coerced action may be an appropriate response to substance use. The Coerced Action group also had significantly fewer negative consequences at follow-up than the Action group. It may be that those in Coerced Action are receiving more monitoring from protective influences (e.g., parents, school staff) which has enhanced their treatment outcomes in this regard.

This study had several limitations. Our sample may not be equivalent to adolescents entering treatment in a specialty mental health or substance abuse treatment setting where a threshold of impairment would be presumably required for treatment entry. We recruited our sample from local high schools which represented the limited variability of age, gender, and ethnicity found in our participating schools. We also did not have a separate sample to cross-validate our addition to the TTM classification system previously validated by Vik and colleagues (2000). Lastly, we did not include a Maintenance stage of change in our classification and analysis, as individuals in our study reported recent use of substances, and the absence of this group fails to capture the breadth of stages of change.

Despite these limitations, this study demonstrated some clinical utility by providing evidence for four theoretically distinct groups in our adolescent sample. The Coerced Action group warrants further study, as it comprised a large portion of our sample and thus far has received little research attention. Further, we found that although all groups decreased their substance use as a result of treatment, there were significant differences between groups at follow-up.

Future research should examine this classification system (including the Maintenance stage) with long-term outcomes post-treatment. For instance, how do the stages of change during adolescence predict outcomes in young adulthood? Further, clinicians may enhance treatment by recognizing that just because an adolescent is making changes to his/her substance use does not necessarily reflect problem recognition, which may still need to be addressed within treatment. With evidence-based assessment and screening, more adolescents may be identified for substance use interventions with the hope of curtailing risky use before it progresses to disordered use.

Acknowledgments

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Highlights

- The Transtheoretical Model of Change was applied to an adolescent sample.

- A new group, Coerced Action, was added to the model.

- The Coerced Action group had a similar trajectory as those in Precontemplation.
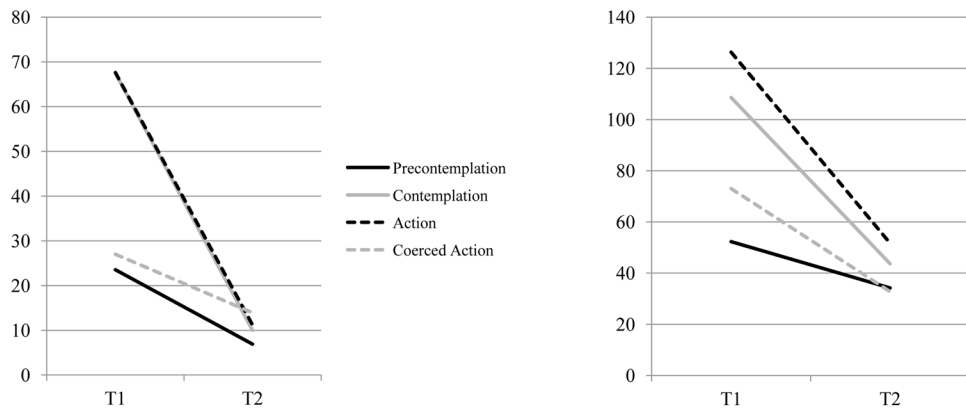
Figure 1.
Depiction of significant interactions of time by stages of changes for the alcohol use composite score (left) and total negative consequences (right).

Table 1

Classification system using motivation scores to map onto the stages of change.

	SOCRATES[1] Subscales		
	Problem Recognition	**Ambivalence**	**Taking Steps**
Precontemplation	Low	Low	Low
Contemplation	Low	High	Low
	High	Low	Low
	High	High	Low
Action	High	High	High
	High	Low	High
Coerced Action	Low	Low	High
	Low	High	High

Note.

[1] SOCRATES = Stages of Change Readiness and Treatment Eagerness Scale

Table 2

Stage of change and pre-treatment demographic and clinical variables.

Categorical Variables	Precontemplation n = 97 n (%)	Contemplation n = 22 n (%)	Action n = 38 n (%)	Coerced Action n = 107 n (%)	x^2 (df)	p
Alcohol Use Disorder (DSM-5)	49 (50.5)	19 (86.4)	30 (78.9)	72 (67.3)	16.68 (3)	*.001
Drug Use Disorder (DSM-5)	74 (76.3)	20 (90.9)	36 (94.7)	96 (89.7)	11.38 (3)	.01
Gender (Female)	29 (30.5)	5 (22.7)	21 (55.3)	44 (41.9)	9.91 (3)	.019
Ethnicity					19.93 (15)	.174
White/Caucasian	50 (54.3)	11 (61.1)	15 (42.9)	30 (32.3)		
Asian/Pacific Islander	13 (14.1)	2 (11.1)	5 (14.3)	15 (16.1)		
Hispanic	10 (10.9)	4 (22.2)	6 (17.1)	24 (25.8)		
Black/African American	6 (6.5)	-	3 (8.6)	13 (14)		
American Indian/Alaska Native	1 (1.1)	-	-	-		
Multiracial	12 (13)	1 (5.6)	6 (17.1)	11 (11.8)		
Continuous Variables	M (SD)	M (SD)	M (SD)	M (SD)	F (df)	p
Alcohol Use Composite Score[1]	22.53 (28.38)	61.17 (124.66)	78.18 (140.04)	25.79 (35.42)	7.56 (3, 260)	*.000
Estimated BAC[2]	.13 (.1)	.20 (.09)	.21 (.32)	.15 (.12)	2.51 (3, 226)	.06
Marijuana (Days per Month)	14.93 (11.39)	16.45 (12.14)	13.3 (9.45)	11.87 (10.52)	1.9 (3, 258)	.13
# of Drugs Used in Addition to Alcohol	2.59 (1.87)	3.67 (2.57)	3.49 (2.02)	2.84 (2.32)	2.33 (3, 235)	.075
Total Negative Consequences[3]	59 (46.92)	133.59 (67.77)	125.82 (61.11)	80.54 (50.96)	6.40[6] (3, 260)	*.008
Age of First Substance Use	13.05 (2.37)	12.67 (2.45)	12.69 (2.61)	13.24 (2.18)	.64 (3, 235)	.59
Affective Dysregulation	26.45 (11.42)	38.44 (13.64)	31.77 (12.06)	31.32 (12.49)	13.5[6] (3, 236)	*.002
Behavioral Dysregulation	42.04 (15.1)	51.8 (15.07)	39.32 (14.03)	40.68 (14.73)	2.68 (3, 197)	.048
Cognitive Dysregulation	35.08 (11.71)	41.75 (10.8)	38.77 (12.24)	34.57 (11.31)	1.87 (3, 167)	.136
Number of Coping Strategies Used	33.91 (15.44)	30 (7.79)	48.19 (12.63)	41.92 (12.16)	4.88 (3, 73)	.004
Average Confidence in Abstaining[4]	73.61 (20.05)	47.51 (25.42)	66.4 (25.02)	70.18 (19.85)	4.21 (3, 136)	.007
# Previous Substance Use Sessions[5]	.7 (2.53)	.5 (1.37)	3.93 (7.85)	1.95 (5.86)	3.32 (3, 196)	.021
# Previous Mental Health Sessions[5]	1.39 (3.26)	1 (2.03)	1.67 (3.17)	2.08 (4.17)	.72 (3, 200)	.544

Note.

[1] The alcohol composite score is calculated by taking into account both frequency and quantity of alcohol use as measured by the Customary Drinking and Drug Use Record.

[2] The estimated Blood Alcohol Content (BAC) during typical drinking taking into account quantity of alcohol use, time spent drinking, gender, and weight.

[3] The total number of negative consequences of alcohol and drug use as measured by the Alcohol and Drug Use Consequences Questionnaire.

[4] This is the average confidence rating in abstaining from hypothetical high-risk situations.

[5] The number of previous treatment sessions attended in the three months prior to study enrollment.

[6] Welch's robust F statistic for unequal variances.

[*] Significant with Bonferroni-Correction

Table 3

Stage of change and post-treatment primary outcomes.

	Precontemplation		Contemplation		Action		Coerced Action		Time		Time × Group	
	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)	n	F (df)	p	F (df)	p
Alcohol Use[1]	6.89 (12.62)	73	10 (23.5)	18	11.18 (21.44)	36	13.91 (26.32)	84	39.32 (1, 207)	*.000	4.95 (3, 207)	*.002
Marijuana Use[2]	7.08 (7.84)	72	3.34 (6.01)	17	4.32 (6.02)	34	5.32 (7.74)	82	87.26 (1, 201)	*.000	.81 (3, 201)	.491
Negative Consequences[3]	34.33 (33.2)	49	43.62 (21.61)	8	51.7 (52.98)	27	32.75 (33.16)	55	79.07 (1, 135)	*.000	8.23 (3, 135)	*.000

Note.

[1] The alcohol composite score is calculated by taking into account both frequency and quantity of alcohol use as measured by the Customary Drinking and Drug Use Record.

[2] Days per month.

[3] The total number of negative consequences of alcohol and drug use as measured by the Alcohol and Drug Use Consequences Questionnaire.

* Significant with Bonferroni-Correction