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Motivation Precedes Goal Setting in Prediction of Cannabis Treatment Outcomes in Adolescents

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Abstract

Studies have shown that motivation to change is related to better substance use outcomes among treatment-seeking adolescents. Goal setting, which may be related to motivation, also has been shown to be associated with positive treatment outcomes. However, relationships between motivation and goal setting as mediators of change in cannabis use over time among treated youth have not been investigated. This study tested direct and indirect associations of motivation and goal setting with cannabis use frequency over 12 month follow-up among treated adolescents. A longitudinal study of 163 adolescents enrolled in intensive outpatient substance use treatment (mean age = 16.69, 34% female, 87% Caucasian) provided repeated assessment of motivation, goal setting, and cannabis use. Path analysis tested direct and indirect effects of motivation and goal setting on cannabis use. A comparison of two path models that tested motivation and goal setting independently showed that goal setting had better model fit and accounted for more of the variance in 6-month ($R^2 = .35$) and 12-month ($R^2 = .46$) cannabis use frequency than motivation ($R^2 = .28, .44$, respectively). When both mediators were included in the same model, better model fit was found for motivation preceding goal setting in the context of double mediation. Overall, results suggest that goal setting, or the combination of motivation preceding goal setting in a double mediation model, predicted lower cannabis use in treated adolescents.

Keywords

marijuana use; treatment outcomes; adolescents; goal setting

Adolescent cannabis use is associated with a range of negative health consequences (Dougherty et al., 2013; Harvey, Sellman, Porter, & Frampton, 2007; Meier et al., 2012; Bryan et al., 2012). In efforts to reduce problematic substance use behavior, motivation is one factor that has been suggested as a key determinant underlying positive behavior change (Miller & Rollnick, 2002). Motivation is a multidimensional construct that is part of the process to intentionally change or alter behavior (DiClemente, Doyle, & Donovan, 2009). Higher levels of motivation to change substance use behavior have been related to positive substance use treatment outcomes in both adults and adolescents (Dow & Kelly 2013; Hambley et al., 2010; Maisto et al., 2011; Wolfe et al., 2013; Black & Chung, 2014). Also, individuals who report a greater degree of motivation are more likely to engage in substance use treatment and attend treatment sessions (Connors et al., 2000; Joe, Simpson, & Broome, 1998). A higher rate of treatment attendance and a greater degree of treatment engagement

can aid in the development of a stronger therapeutic alliance, which also has been associated with better treatment outcomes (Meier, Barrowclough, & Donmall, 2005). Overall, motivation to change appears to be positively related to treatment outcomes.

Goal setting may be related to motivation and affect treatment outcomes. Conscious goal setting has been found to affect action, with more ambitious goals producing greater levels of effort and performance (Locke & Lantham, 2002). Specific goal setting is also related to better performance, by reducing ambiguity of what the individual is trying to achieve (Locke, 1996; Locke & Lantham, 2002). In contrast to the considerable literature on motivation to change substance use, however, only one study has investigated the role of goal setting in cannabis treatment outcomes. Lozano, Stephens, and Roffman (2006) showed that cannabis treatment outcomes (a composite measure of cannabis use, dependence symptoms, and cannabis related negative consequences) were associated with goal setting at the start of treatment. Specifically, individuals who set abstinence-based goals were more likely to have abstinent outcomes, whereas those who set moderation goals were more likely to engage in moderate use (but not abstinence) at the end of treatment.

Both motivation and goal setting may act as mediators of the reduction in cannabis use over the course of substance use treatment (Black & Chung, 2014). However, it is unknown which mediator, motivation or goal setting, is the “leading” or precedent factor. In Locke and Lantham’s (2002) Goal-Setting Theory, it is inferred that intrinsic motivation influences both goal setting and performance, with goal setting also predicting performance. This theory suggests that motivation precedes goal setting, and that both would independently predict a reduction in cannabis use. However, these possible patterns of associations have not been empirically tested.

The severity of substance use problems may also predict motivation or goal setting upon entry into treatment. For adults, there has been mixed support for this association. Greater substance use severity upon entry into treatment has been shown to positively correlate with setting more abstinent-related goals (Lozano et al., 2006) and higher levels of motivation (Ryan, Plant, O’Malley, 1995). However, research has also shown a negative association between substance use severity and motivation upon treatment entry among adults (Maglione, Chao, & Anglin, 2000). Although there are mixed results for adults, research with treated adolescents has shown a positive association between substance use severity and motivation to change (Breda & Heflinger, 2007; Friendman, Terras & Glassman, 2003; Slesnick et al., 2009), except for one study, which reported no relationship (Battjes, Gordon, O’Grady, Kinlock, & Carswell, 2003). Therefore, the positive association between substance use severity and motivation upon entry to treatment appears to be more consistent for adolescents than compared to adults.

The relations between substance use severity, motivation, and goal setting may change over follow-up. For example, adult cannabis users with greater cannabis-related problems and dependence symptoms at baseline were more likely to set an abstinence-related (rather than moderation-based) goal, which in turn was associated with more abstinent treatment outcomes (Lozano et al., 2006). Among treated adolescents, one study found a positive association between number of drug problems and motivation, but no association between

motivation and reduction in drug use over follow-up (Friendman, Terras & Glassman, 2003). However, Breda and Heflinger (2007) found a positive association between substance use severity and motivation to change, such that adolescents with greater substance use severity and motivation to change showed more rapid reduction of substance use during treatment. These studies suggest that severity of substance-related problems upon treatment entry is positively related to motivation and goal setting, and that the pattern of associations between substance use severity, motivation, and goal setting may change during treatment (Chung & Maisto, 2016), and over follow-up.

The purpose of this study was to test the direct and indirect associations of motivation and goal setting on cannabis use frequency over the course of 12 months among adolescents in outpatient substance use treatment. Specifically, we tested four competing models to determine a best fitting model that predicted treatment outcome. The first two models compared motivation (Model 1) and goal setting (Model 2) as independent mediators of cannabis treatment outcome. In accordance with prior research (e.g., Dow & Kelly 2013; Hambley et al., 2010; Maisto et al., 2011; Wolfe et al., 2013), we hypothesized that, compared to goal setting, motivation would be a better independent predictor of a reduction in cannabis use frequency. Next, two separate models with motivation preceding goal setting (Model 3) versus goal setting preceding motivation (Model 4) were compared to test whether motivation preceded goal setting or goal setting preceded motivation (and the relationship of both to treatment outcome). In combining the findings from Lozano, Stephens, and Roffman (2006) and the model proposed by Locke and Lantham (2002), we hypothesized that a higher frequency of cannabis use at baseline would predict higher levels of motivation and consequently a more abstinence-related goal, which in turn would be associated with greater reduction in the frequency of use at 6- and 12-month follow-up.

Method

Participants

Participants were recruited from a single community-based substance use treatment program that operated at local sites in an urban region in Western Pennsylvania. After admission to IOP, adolescents were approached for participation in a longitudinal study of substance use treatment outcome (Chung, Maisto, Cornelius, & Martin, 2004). Inclusion criteria were admission to IOP, ages 14–18, and lifetime alcohol or cannabis use at least once a month for at least six months. Youth in foster care or in court custody were excluded ($N = 43$), due to a lack of the resources required to obtain consent from parents or legal guardians of these youth. For those who were eligible ($N = 184$), the study was explained and written informed consent (from the parent of minors, and from youth who were age 18) and assent (from eligible minors) was obtained. Adolescents who did not complete the baseline assessment within the first two-weeks of entering treatment ($n = 12$) were not included in the study, due to the time sensitivity of key measures (e.g., motivation to change). Of the 172 adolescents who completed the baseline assessment within two weeks of treatment entry, nine adolescents did not provide any information on goal setting or motivation at any of the three assessment time-points, resulting in an analysis sample of 163 adolescents. However, for Model 1, one participant provided information on goal setting, but did not provide

information on motivation, therefore, the case was excluded from the first analysis because this data was required for inclusion in the path model, but this case was retained for the remaining analyses.

Of the 163 baseline participants who were included in all analyses, 140 participants (86%) completed the 6-month follow-up assessment, and 139 participants (85%) completed the 12-month follow-up assessment. To determine whether the participants who did not complete baseline or any follow-up differed from those who did, attrition analyses were conducted. Attrition analyses showed that adolescents who were included in the analyses ($n = 163$) were more likely to report cannabis as their primary drug and reported a higher frequency of cannabis use prior to treatment than those who were not included in the analyses ($n = 9$).

Procedure

After obtaining informed consent, study assessments were conducted by research staff at baseline, 6-, and 12-month follow-ups. Adolescents completed a comprehensive baseline assessment that covered, for example, alcohol and drug use and problem severity, psychopathology and psychosocial functioning, and motivation to change. Follow-ups at 6- and 12-months covered similar topics. Details of study procedures have been documented (Chung et al., 2004; King, Chung, & Maisto, 2009). Participants were compensated for completing assessments with debit cards as follows: baseline, \$100; 6-month: \$110; 12-month: \$110; 18-month: \$120; and 24-month, \$130. For minor youth, consent stated that parents would be responsible for monitoring use of the adolescent's card. All procedures were reviewed and approved by the local university and treatment program IRBs.

Measures

Demographic Characteristics—A demographic questionnaire assessed age, race (Caucasian = 1; others = 0), gender (male = 1; female = 0) and preferred drug (cannabis = 1; other drugs = 0) at baseline.

Motivation—The Readiness Ruler (Miller, 1995) was used as a measure of motivation. The terms “motivation” and “readiness to change” have been used interchangeably in the literature, with prior research using a readiness to change measure as a measure of motivation (DiClemente, Doyle, & Donovan, 2009). The Readiness Ruler was rated on a ten-point scale, ranging from 1–10, with higher ratings indicating greater readiness to change. Participants completed this measure at each assessment. The Readiness Ruler has demonstrated good concurrent and predictive validity in treated adolescents (Maisto et al., 2011).

Goal Setting—A single item regarding thoughts about abstinence was used to assess goals for changing cannabis use in the next 30 days (Hall et al., 1990; 1991). This item was administered at each assessment. Participants responded to the item using a 6-point scale (1 = no goal to limit use; 2 = controlled use; 3 = temporary abstinence; 4 = occasional use when urges are strong; 5 = total abstinence but realize that a slip is possible; 6 = total abstinence) with higher ratings indicating a more abstinence-related goal. This measure has

good predictive validity in substance using adults (Hall et al., 1990; 1991), and has demonstrated concurrent validity in treated adolescents (Chung et al., 2014).

Frequency of Drug Use—Frequency of cannabis use in the past 6-months was self-reported by adolescents at each assessment on a 9-point scale (0 = never, 1 = not in past 6 months, 2 = less than one time per month, 3 = one time per month, 4 = two to three times per month, 5 = once per week, 6 = two to three times per week, 7 = four to six times per week, 8 = daily). Prior research has shown that self-report of drug use is generally an accurate indicator of actual use among adolescents (Buchan, Dennis, Tims, & Diamond, 2002; Ramo & Brown, 2008).

Data Analysis Approach

Descriptive statistics including distribution characteristics and Pearson correlation coefficients were computed using *SPSS* version 21 (IBM Corporation, 2012). As main analyses, path analysis was conducted to test the hypothesized associations among frequency of cannabis use, motivation, and goal setting using *Mplus* version 6 (Muthén & Muthén, 1998–2011). Path analysis has several important strengths compared to traditional general linear modeling such as regression. Path analysis allows the testing of complicated multivariate relationships simultaneously. *Mplus* also accommodates missing data using Full Information Maximum Likelihood estimation. Finally, *Mplus* can handle variables that are not normally distributed (i.e., positively skewed variables of cannabis use frequency [skewness = -0.92 to 0.51 across time points] and platykurtic variables of motivation and goal setting [kurtosis = -1.36 to -0.78]), using the Maximum Likelihood Estimation with Robust Standard Errors.

The main purpose of the analyses was to contrast two sets of competing path models. These models were compared to each other to determine which model best fit the data using multiple criteria including chi-square values, the percent of outcome variance accounted for, and model fit indices. Multiple model fit indices were used to evaluate overall model fit, with good model fit determined following the cut-offs specified by Hu & Bentler (1999): Standardized Root Mean Square Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA) values less than .06; Comparative Fit Index (CFI) values greater than .90. In addition, each model's Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were compared, with small values indicating a better model fit.

Effects of age, race, gender, and preferred drug on all predictors, mediators, and outcomes were controlled for in all models. Significance testing of mediating effects of motivation and goal setting was conducted using the Sobel test (Sobel, 1982). In addition, 95% confidence intervals (Preacher & Hayes, 2008) were obtained based on 1,000 bootstrapped samples; if the confidence intervals (CIs) do not contain zero, then the mediation is determined to be statistically significant.

Results

Descriptive Statistics

Table 1 shows descriptive statistics and bivariate correlations for study variables. Participants were primarily male (66%) and Caucasian (87%). The mean age at baseline was 16.69 years ($SD = 1.23$). Frequency of cannabis use, on average, decreased over time, with the largest decrease occurring between baseline and 6-months. Correlations of demographics with other study variables were small ($r = .01$ to $.26$). Motivation and goal setting were moderately and significantly correlated with each other ($r = .42$ to $.76$) across assessment points. Correlations of frequency of cannabis use with motivation ($r = -.22$ to $-.71$) and goal setting ($r = -.18$ to $-.70$) were significant and small to moderate in magnitude.

Path Models

Testing motivation and goal setting independently as mediators (Model 1 and Model 2)—To test the independent role of motivation (Model 1, shown in Figure 1) and goal setting (Model 2, shown in Figure 2) in predicting a reduction in frequency of cannabis use over time, two separate models were compared on model fit indices and effect sizes (see Table 2). Compared to Model 1, which tested motivation as an independent predictor ($R^2 = .28$ and $.44$, respectively), Model 2 predicted more variance in cannabis frequency at both 6- and 12-months ($R^2 = .35$ and $.46$, respectively). In terms of model fit, although indices for both models were excellent, Model 2 had lower AIC and BIC values, indicating better model fit relative to Model 1. These results consistently suggest that goal setting is a better predictor of change in cannabis use frequency over time as compared to motivation.

In terms of a mediating effect of motivation, both Sobel test and 95% CIs indicated significant mediation by baseline motivation in the effect of baseline cannabis use frequency to 12-month cannabis use frequency (Sobel test $z = 2.44$, $p = .02$; $b = 0.06$ [bootstrapped 95% CI = $.019$, $.116$], $\beta = .02$). Specifically, lower baseline frequency of use was related to higher baseline motivation, with both being associated with a reduction in frequency of use at 6 months. However, 6-month motivation was not significantly associated with frequency of use at 12 months.

A similar pattern of mediation results was found for goal setting, but at a trend level. Both Sobel test and 95% CIs indicated a trend for mediation by baseline goal setting in the effect of the baseline frequency of use to 12-month frequency of use (Sobel test $z = 1.92$, $p = .055$; $b = 0.05$ [95% CI = $.006$, $.116$], $\beta = .02$). Specifically, lower baseline frequency of use was related to more abstinent related goals at baseline, which in turn was related to a greater reduction in cannabis use at 6 months. This relationship between goal setting and frequency of use continued to occur at 12 months.

Testing precedence of motivation and goal setting in mediation models (Models 3 and 4)—To determine whether motivation (Model 3, shown in Figure 3) or goal setting (Model 4, shown in Figure 4) preceded the other, competing models were tested on fit and proportion of variance accounted for in the outcome (see Table 2). Models 3 did not have a significant chi-square value and smaller AIC and BIC values, indicating a good

model fit, as compared to Model 4, which did have a significant chi-square value and larger fit indices. Model 3 and Model 4 predicted the same amount of variance in the cannabis outcome at both 6- and 12-months ($R^2 = .36$ and $.46$, respectively). Therefore, based on these two criteria, as well as having more significant paths and indirect effects, motivation preceding goal setting in the sequence of mediation (Model 3) better predicted a reduction in frequency of cannabis use over time.

Regarding mediation effects, both the Sobel test and 95% CIs indicated significant mediation by baseline motivation through goal setting in the reduction of cannabis use frequency from baseline to 12 months in Model 3 (Sobel test $z = 2.10$, $p = .04$; $b = 0.03$ [95% CI = $.009, .068$], $\beta = .01$). Specifically, less frequent use at baseline was associated with higher motivation at baseline, which was associated with more abstinent based goals at baseline, which was in turn associated with lower frequency of cannabis use over time. These results suggest that motivation preceded goal setting.

In contrast to the results found for motivation preceding goal setting in Model 3, there was no significant indirect effect found when goal setting preceded motivation in Model 4 (Sobel test $z = 1.15$, $p = .25$; $b = 0.01$ [95% CI $-.008 = .029$], $\beta = .00$).

Discussion

The purpose of this study was to examine the relationship between goal setting, motivation, and frequency of cannabis use in an adolescent outpatient sample. Results supported the hypothesis that motivation precedes goal setting in mediating changes in frequency of cannabis use over 12-month follow-up. This finding is consistent with Locke and Lantham's Goal-Setting Theory, which suggests that motivation influences goal setting, with both having an effect on performance (Locke & Lantham, 2002). These results suggest that individuals tend to require motivation to set a more ambitious goal, such as abstinence instead of moderate substance use, to achieve better cannabis use outcomes.

There was no support, however, for the hypothesis that motivation would be a better independent predictor of treatment outcomes than goal setting over 12-month follow-up in treated adolescents. In contrast to prior research (Dow & Kelly, 2013; Hambley et al., 2010; Maisto et al., 2011; Wolfe et al., 2013), the results showed that, although motivation was still negatively related to cannabis use in the first 6 months of follow-up, goal setting was a better predictor of cannabis use over 12-month follow-up in treated youth. These findings are consistent with a recent meta-analysis of college drinking intervention studies (Scott-Sheldon et al., 2014), which showed that interventions in which goal setting was encouraged tended to result in a greater reduction in frequency of heavy drinking among college students.

Results of this study regarding the association between severity of cannabis use and motivation and goal setting in treated youth differ from findings reported for adult cannabis users in treatment (Lozano, Stephens, and Roffman, 2006). Whereas Lozano and colleagues found that the number of DSM-IV cannabis dependence symptoms was positively related to setting abstinence (as opposed to moderation) goals, our findings suggest that adolescents

with lower frequency of cannabis use, and likely not diagnosed as cannabis dependent, are more likely to set abstinence-related goals. Developmental differences between adolescent and adult users, such as duration and severity of use, greater functional impairment due to cannabis use in adults, may explain differences in findings across the studies. Among adolescents, motivation to change may be more extrinsically based; in this regard, adolescents' substance use tends to be influenced predominantly by external factors such as parental monitoring and peer group influences (DiClemente et al., 2001; Steinberg, Fletcher & Darling, 1994). Therefore, it is possible that adolescents who have a greater degree of parental monitoring and a peer group with less substance use may be more motivated by these external factors to set a more abstinence-related goal. Future studies need to test these potential differences in the relationship between goal setting and substance use and abuse and potential mediating roles of parental and peer influences in adolescents' treatment outcomes.

Study findings have clinical implications regarding the roles of motivation and goal setting in efforts to improve youth treatment outcome. First, it appears that both motivation and goal setting predict treatment outcomes over a six-month period; however, over longer time periods, goal setting seems to be a better predictor of cannabis use frequency. Second, results suggest that setting abstinence goals predicts reduction in the frequency of cannabis use over time. Therefore, adolescents who report moderate use goals may be identified and given a brief intervention to enhance their motivation to set a more abstinence-oriented goal. In particular, self-set goals, versus externally set goals when commanded without explanation, are predictors of better performance (Latham, Erez, & Locke, 1988), and suggest the importance of interventions that encourage setting personal goals for abstinence. A review by Tevyaw and Monti (2004) showed that motivational enhancement interventions were associated with a decrease in substance use, particularly for individuals with heavier substance use and low motivation. Based on these findings, it would be beneficial to identify individuals who may benefit from an increase in motivation to set an abstinence goal in order to help them obtain better treatment outcomes.

There are several limitations to this study. Generalizability of results may be limited, as the sample consisted of adolescent substance users in treatment, who were primarily male, Caucasian, and reported cannabis use as the primary substance. Finally, this study examined only self-determined goals, and used a single item measure of motivation to change cannabis use. A topic for future research is to examine reasons for motivation to change or not change, which would provide useful information on what does and does not influence adolescents' changing their substance use behavior. Information on these factors would be useful in an intervention to address both motivation and abstinent goal setting in an adolescent population. As motivation is a multi-faceted construct, future research should consider use of psychometrically established measures that reflect this complexity. Examples of these types of measures include the University of Rhode Island Change Assessment Scale (URICA; DiClemente & Hughes, 1990), Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996), and the Readiness to Change Questionnaire (RCQ; Rollnick, Heather, Gold, & Hall, 1992). In addition, self-report of substance use may be subject to bias, but data were collected with use of

procedures that have been shown to maximize validity of self-reported data (e.g., assurance of confidentiality; L. C. Sobell, Toneatto, & Sobell, 1994).

In conclusion, this study's findings suggest that goal setting and motivation are both good predictors of frequency of cannabis use over 6-month follow-up, but that goal setting is a better long term predictor of cannabis use treatment outcomes over 12-month follow-up among treated adolescents. Results also indicate that motivation preceded goal setting in our path model of mediators of cannabis use outcome. Overall, this study's results emphasize the importance of goal setting in the treatment of cannabis use in adolescents, especially among youth with heavier patterns of cannabis use who may require more intensive work to set abstinence goals, in order to support better long-term treatment outcomes.

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Figure 1.

$N = 162$. Path analyses model of the association between motivation and treatment outcomes over time. Standardized estimates (unstandardized estimates in parenthesis) are shown.

Control variables: gender, age, race, preferred drug (cannabis). Bold arrows indicate significant path. d = disturbance. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2.

$N = 163$. Path analyses model of the association between goal setting and treatment outcomes over time. Standardized estimates (unstandardized estimates in parenthesis) are shown. Control variables: gender, age, race, preferred drug (cannabis). Bold arrows indicate significant path. d = disturbance. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 3.

$N = 163$. Path analyses model with motivation preceding goal setting and the association between the two mediators and outcomes over time. Standardized estimates (and unstandardized estimates in parenthesis) are shown. Control variables: gender, age, race, preferred drug (cannabis). Bold arrows indicate significant path. d = disturbance. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 4.

$N = 163$. Path analyses model with goal setting preceding motivation and the association between the two mediators and outcomes over time. Standardized estimates (unstandardized estimates in parenthesis) are shown. Control variables: gender, age, race, preferred drug (cannabis). Bold arrows indicate significant path. d = disturbance. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1
Means (Standard Deviations) and Bivariate Correlation Coefficients of Study Variables

	<i>N</i>	<i>M (SD)</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender (Male)	163	66%	1									
2. Age	163	16.69 (1.23)	.15	1								
3. Race (Caucasian)	163	87%	.04	-.09	1							
4. Preferred Drug (marijuana)	163	72%	.26**	-.10	.20*	1						
5. Marijuana Use Frequency at Baseline	154	5.4 (2.28)	.10	-.03	-.15	.20*	1					
6. Marijuana Use Frequency at 6-Months	135	3.76 (2.63)	.19*	.09	.05	.04	.31***	1				
7. Marijuana Use Frequency at 12-Months	135	3.46 (2.61)	.06	.08	.10	.03	.18*	.66***	1			
8. Motivation at Baseline	160	7.01 (3.00)	-.02	.07	-.12	-.14	-.22**	-.35***	-.28**	1		
9. Motivation at 6-Month	119	6.55 (3.33)	-.13	-.11	.02	-.03	-.22*	-.71***	-.48***	.46***	1	
10. Goal Setting at Baseline	161	4.16 (1.56)	.01	.07	-.05	-.05	-.18*	-.46***	-.44***	.56***	.42***	1
11. Goal Setting at 6-Month	141	4.04 (1.83)	-.12	-.09	-.06	-.03	-.31***	-.70***	-.56***	.46***	.76***	.53***

Note. Frequency = average frequency of cannabis use for prior year at baseline and prior six months at both follow-up assessments.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2Model Comparisons: Goodness of Fit and Total Variance (R^2)

	χ^2 (df)	p	RMSEA [90% CI]	CFI	SRMR	AIC	BIC	R^2 of cannabis use at	
								6 months	12 months
Comparison 1	Model 1	1.85 (3)	0.60	0.00 [0.00, 0.11]	1.00	0.01	4240.91	4238.49	28%
	Model 2	6.83 (3)	0.08	0.09 [0.00, 0.18]	0.98	0.02	4032.46	4030.22	35%
									46%
Comparison 2	Model 3	9.71 (7)	0.21	0.05 [0.00, 0.12]	0.99	0.02	5229.57	5225.97	36%
	Model 4	16.18 (7)	0.02	0.09 [0.03, 0.15]	0.98	0.02	5234.71	5231.10	36%
									46%

Note. RMSEA = Root-Mean Square Error of Approximation; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion, sample-size adjusted. Preferred models are bolded.