Depressive Symptoms, Ruminative Thinking, Marijuana Use Motives, and Marijuana Outcomes: A Multiple Mediation Model Among College Students in Five Countries

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Acknowledgements:
Dr. Bravo is supported by a training grant (T32-AA018108) from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in the United States. Data collection was supported, in part, by grant T32-AA018108. NIAAA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication. Data collection in Spain was also supported by grants UJI-A2017-18 and UJI-B2017-74 from the Universitat Jaume I and grant PSI2015-67766-R from the Spanish Ministry of Economy and Competitiveness (MINECO). Data collection in Argentina was also supported by grants from the National Secretary of Science and Technology (FONCYT, grant number #PICT 2015-849) and by grants from the Secretary of Science and Technology- National University of Córdoba (SECyT-UNC).

Abstract

Background: Previous studies have evidenced that rumination and drinking motives may mediate the association between depressive symptoms and alcohol outcomes. The present study cross-culturally examined whether a similar mediation model may extend to marijuana. Specifically, we tested distinct rumination facets (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts) and marijuana use motives (social, coping, expansion, conformity, enhancement) as double-mediators of the paths from depressive symptoms to marijuana outcomes (use and consequences). **Method**: A comprehensive mediation path model was tested in a cross-sectional sample of college student marijuana users (n = 1,175) from five countries (U.S., Argentina, Uruguay, Spain, Netherlands). Multi-group models were tested to determine if the proposed mediational model was invariant across sex and different cultures/countries. **Results**: Depressive symptoms and marijuana outcomes were indirectly associated through ruminative thinking and marijuana motives. Specifically, higher depressive symptoms were associated with higher problem-focused thoughts; which in turn were associated with: a) higher endorsement of coping motives which in turn was associated with higher marijuana use and related consequences and b) lower endorsement of enhancement motives which in turn was associated with lower marijuana use and related consequences. The multi-group analyses showed that the model was invariant across sex and the five countries. **Conclusions**: The present research supports the existence of a universal (i.e., cross-national invariant) negative affect regulation pathway to marijuana use/misuse similar to those previously found with alcohol. Additional research is needed to confirm the role of enhancement motives in the associations of depression, rumination and marijuana outcomes.

Keywords: depression; rumination; marijuana use motives; marijuana; cross-cultural

1. Introduction

Depressive symptoms are prevalent in college student populations worldwide (Auerbach et al., 2018; Auerbach et al., 2016; Bruffaerts et al., 2017; American College Health Association, 2017; Vera et al., 2014; Vázquez & Blanco 2008), and previous research has linked depression to marijuana consumption (Esmaeelzadeh et al., 2018; Guzmán Facundo et al., 2011; Keith et al., 2015) and negative marijuana-related consequences within this population (Bravo, Villarosa-Hurlocker, et al., 2018; Phillips et al., 2018). Negative affect regulation models (Baker et al., 2004; Sher et al., 2005; Mezquita, Bravo et al., 2018) suggest that substances are used to alleviate unpleasant or distressing emotions. In support of these models, multiple studies have found that depressive symptoms are associated with marijuana use motives (for a review of marijuana use motives, see Cooper et al., 2016), particularly coping motives (Zvolensky et al., 2007; Moitra et al., 2015). Noteworthy, coping motives for marijuana use have been previously found to be a robust risk factor for marijuana-related problems (Buckner, 2013; Bravo, Weinstein, et al., 2019; Cooper et al., 2016). However, and to the best of our knowledge, the specific aspects of depression that might increase a person's vulnerability to using marijuana to cope have not yet been examined.

Drawing from the college student alcohol literature, and in support of Response Styles Theory (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008), ruminative thinking has been consistently associated with alcohol use/misuse (Ciesla, Dickson, Anderson, & Neal, 2011; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Specifically, ruminative thinking has been found to link depressive symptoms with drinking to cope motives, which in turn are associated with a higher probability of negative alcohol-related consequences

(Bravo et al., 2017). This conceptualization is consistent with social learning models that posit cognitions to be a critical pathway by which more distal psychosocial influences, such as affect, may exert an influence on substance outcomes (Maisto et al., 1999; Read et al., 2003; Wiers et al., 2004). In this model, relevant cognitions (in this case, affect-content cognitions and cognitions about how drinking may ameliorate this affect) lead in a sequenced fashion to drinking and related consequences. Consistent with this, Bravo, Pilatti and colleagues (2018) recently tested the proposed mediation model (i.e., depressive symptoms → ruminative thinking → drinking to cope → alcohol-related problems) to be invariant across college students from three different countries (U.S., Spain, and Argentina), suggesting that, across different countries/cultures, "rumination is relevant to understand the increased vulnerability of college drinkers to exhibit greater alcohol consumption and negative consequences via drinking to cope motives when dealing with depressive symptoms" (p. 319). Although ruminative thinking encompasses different facets (e.g., problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts; Tanner et al. 2013), previous evidence cited above suggests that problem-focused thoughts is a relevant link between depression and nonproductive coping strategies (e.g., drinking to cope). This association may arise from the distinctive features of this cognitive response style, namely consistent thinking of causes, consequences, and symptoms of negative affect, which may reflect a problem-solving deficit (Tanner et al., 2013). However, the extent to which these pathways characterize risk across substances different than alcohol has not yet been examined.

The purpose of the present study was to provide a cross-cultural examination as to whether a similar mediation model explaining the relationship between depressive

symptoms and alcohol-related outcomes via rumination and drinking motives may extend to marijuana. Specifically, we tested distinct rumination facets (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts) and marijuana use motives (social, coping, expansion, conformity, enhancement) as double-mediators of the paths from depressive symptoms to marijuana outcomes (use and consequences) among college student marijuana users from five countries (U.S., Argentina, Uruguay, Spain, Netherlands). Multi-group models were tested to determine if the proposed mediational model (depressive symptoms → rumination facets → marijuana use motives → marijuana use/consequences) is invariant across sex and different cultures/countries. Based on previous findings in the alcohol literature (Bravo et al., 2017; Bravo, Pilatti, et al., 2018), we expected that depressive symptoms and marijuana outcomes would be indirectly linked by rumination (particularly problem-focused thoughts) and marijuana coping motives, such that higher depressive symptoms would relate to higher rumination. In turn, higher rumination would be related to higher marijuana use coping motives, which would relate to higher marijuana use and negative-related consequences.

2. Method

2.1. Participants and Procedures

College students (N = 3,482) from the U.S., Argentina, Uruguay, Spain and the Netherlands participated in an online cross-sectional survey study regarding personal mental health, personality traits, and marijuana use behaviors (for more information of study procedures and sample, see Bravo, Pearson, et al., 2019). For the present study only data from students that reported past month (i.e., past 30-day) marijuana use (n = 1,175) were included in the final analysis from each country (U.S., n = 698; Argentina, n = 153;

Spain, *n* = 178; Uruguay, *n* = 79; Netherlands, *n* = 67). Women were over-represented in our sample (total sample, 62.9%; U.S., 64.5%; Argentina, 60.1%; Spain, 54.5%; Uruguay, 81.0%; Netherlands, 60.6%), likely as a result of recruiting from psychology department participant pools at the majority of the sites. About 89.3% of the sample were between the ages of 18 and 25 years old (*M* = 20.96, Median = 20.00, *SD* = 3.95). Although the modal student was a first year (45.1%), second years (20.2%), third years (16.6%), and fourth years (9.7%) were also represented. The study was approved by the institutional review boards (or their international equivalent) at each participating university.

2.2. Measures

It is important to highlight that invariance testing of all the measures demonstrated metric invariance across the countries, which is necessary when examining associations between study constructs across different groups (analyses available upon request).

2.2.1. Depressive Symptoms

Past 2-week depressive symptoms were assessed using the depression domain of the DSM-5 Self-Rated Level 1 Cross-Cutting Symptoms Measure-Adult (American Psychiatric Association [APA], 2013). For Spanish-speaking students, the Spanish version was administered (APA, 2014). For Dutch-speaking students, the measure was translated into Dutch (see Roozen et al., 2019 for more details). Items were averaged such that higher scores indicate greater endorsement of depressive symptoms. A score of 2 or higher is suggestive of clinically relevant mental health problems (Narrow et al., 2013). Within our total sample, 42.40% (U.S., 40.25%; Argentina, 44.70%; Spain, 54.20%; Uruguay, 32.80%; Netherlands, 37.2%) of participants met the threshold (the percentages of the multiple items of the depression domain were averaged) for psychopathology symptom criteria and may

warrant further investigation regarding the symptom presentation (Narrow et al., 2013). While these rates may seem high, we must stress that this is not a clinical diagnosis and that these presentations fall along a spectra of severity.

2.2.2. Rumination Facets

Rumination facets were measured using a 15-item version (Tanner et al., 2013) of the Ruminative Thought Style Questionnaire (Brinker & Dozois, 2009). For Spanish-speaking students, the Spanish version was administered (Bravo, Pearson, et al., 2018). For Dutch-speaking students, the measure was adapted into Dutch (see Appendix A). Items were averaged for each rumination facet such that higher scores indicate greater endorsement of a specific rumination facet.

2.2.3. Marijuana Use Motives

Past 30-day marijuana motives were measured using the Marijuana Motives Measure Short Form (MMM-SF; Simons et al., 1998). For Spanish-speaking students, the Spanish version was administered (Mezquita, Ruiz-Valero, et al., 2018). For Dutch-speaking students, the measure was adapted into Dutch (see Appendix A). Items were averaged for each motive such that higher scores indicate greater endorsement of a specific motive.

2.2.4. Marijuana Use

Past 30-day typical marijuana use quantity was assessed using the Marijuana Use Grid (MUG; Pearson & Marijuana Outcomes Study Team, 2019). Participants were presented with a visual guide (the same guide in all countries) showing different amounts of marijuana in grams. Participants estimate the amount of grams they use in each 4-hour time period of each day of a typical week (12p-4p on Monday, 4p-8p on Monday, etc.). By

summing all values, we obtained an estimate of typical quantity of marijuana use reflecting total number of grams used in a typical week. To address outliers, we Winsorized quantity estimates >3SDs above the mean.

2.2.5. Negative Marijuana-related Consequences

Past 30-day negative marijuana-related consequences were measured using the Brief Marijuana Consequences Questionnaire (Simons et al., 2012). For Spanish- and Dutch-speaking students, the measure was adapted into Spanish and Dutch (see Bravo et al., 2019 for more details). The total score reflects the total number of consequences that the individual has experienced in the past month.

2.3. Statistical Analysis

To fulfill study aims, a comprehensive mediation path model (see Figure 1) was tested using M*plus* 7.4 (Muthén & Muthén, 1998-2018). Specifically, a fully saturated path model (CFI = 1.00; TLI = 1.00; RSMEA = 0.000; SRMR = 0.000) was estimated in which depressive symptoms were examined as a statistical predictor of rumination facets, marijuana use motives, and marijuana outcomes (i.e., marijuana use/consequences). Further, the rumination facets were modeled as predictors of marijuana use motives and marijuana outcomes. Last, marijuana use motives were modeled as predictors of marijuana outcomes. Thus, potential double-mediated paths were examined for each subcomponent of rumination and marijuana motive (e.g., depressive symptoms → problem-focused thoughts → marijuana coping motives → negative marijuana-related consequences).

We examined the total, direct, and indirect effects of each predictor variable on marijuana outcomes using bias-corrected bootstrapped estimates (Efron & Tibshirani, 1993) based on 10,000 bootstrapped samples, which provides a powerful test of mediation

(Fritz & MacKinnon, 2007) and is robust to small departures from normality (Erceg-Hurn & Mirosevich, 2008). Given our large sample size (i.e., large statistical power), statistical significance was determined by 99% bias-corrected bootstrapped confidence intervals that do not contain zero.

To test for structural invariance of the model, we conducted χ^2 difference tests comparing a freely estimated multi-group model to a constrained multi-group model (i.e., constraining the paths of the mediation model) to determine whether constraining the paths to be equivalent across countries and sex resulted in a worse fitting model. Given that the χ^2 test statistic is sensitive to sample size (Brown, 2015), a more stringent alpha level was used, with non-invariance determined if $p < .01$.

3. Results

Bivariate correlations, descriptive statistics, and internal consistency of all study variables are presented in Table 1. It is important to note that all four rumination facets were significantly associated with depressive symptoms, marijuana coping motives, and negative marijuana-related consequences (see Table 1). The total, indirect, and direct effects for the mediation model are summarized in Table 2 (marijuana motives as outcomes), Table 3 (marijuana outcomes), and Figure 1 (direct effects). Constrained multi-group models compared to the freely estimated model indicated model invariance across countries (CFI = .990; TLI = .983; RSMEA = 0.029; SRMR = 0.070; $p = .028$) and sex (CFI = .995; TLI = .987; RSMEA = 0.025; SRMR = 0.030; $p = .046$). Taken together, we present results of our model within the total sample.

In predicting marijuana use motives, problem-focused thoughts was the only rumination facet evidenced as potentially mediating the effects of depressive symptoms on

motives. Specifically, higher depressive symptoms were associated with higher problem-focused thoughts; which in turn were associated with higher endorsement of coping and conformity motives and lower endorsement of enhancement motives (see Table 2). In predicting marijuana outcomes, coping motives indirectly related depressive symptoms to marijuana use/consequences, such that higher depressive symptoms were associated with higher coping motives; which in turn were associated with more marijuana use and related consequences (see Table 3).

Moreover, there were four significant pathways that were evidenced as double-mediated associations: (1) depressive symptoms → problem-focused thoughts → coping motives → marijuana use (positive indirect effect), such that higher depressive symptoms were associated with higher problem-focused thoughts; which in turn were associated with higher endorsement of coping motives which in turn was associated with higher marijuana use; (2) depressive symptoms → problem-focused thoughts → coping motives → negative marijuana-related consequences (positive indirect effect), such that higher depressive symptoms were associated with higher problem-focused thoughts; which in turn were associated with higher endorsement of coping motives which in turn was associated with more negative consequences; (3) depressive symptoms → problem-focused thoughts → enhancement motives → marijuana use (negative indirect effect), such that higher depressive symptoms were associated with higher problem-focused thoughts; which in turn were associated with lower endorsement of enhancement motives which in turn was associated with lower marijuana use; and (4) depressive symptoms → problem-focused thoughts → enhancement motives → negative marijuana-related consequences (negative indirect effect), such that higher depressive symptoms were associated with higher

problem-focused thoughts; which in turn were associated with lower endorsement of enhancement motives which in turn was associated with less negative consequences. It is important to note that even when controlling for all other predictors, depressive symptoms was still significantly positively associated with negative marijuana-related consequences (see Table 3 and Figure 1).

4. Discussion

The present study cross-culturally tested, in a cross-sectional sample of college student marijuana users from five countries, distinct rumination facets and marijuana use motives as double-mediators of the association between depressive symptoms and marijuana outcomes. Consistent with previous work from the alcohol literature (Bravo et al., 2017; Bravo, Pilatti, et al., 2018), elevated depressive symptoms were associated with higher problem-focused thoughts which, in turn, were associated with greater coping motives that were tied to greater marijuana involvement. These results add to the growing body of research highlighting the mediational role of cognitive variables in the relationship between internalizing symptoms and cannabis disorders in college students (Ecker & Buckner, 2018) and adolescents (Adrian et al., 2014).

Consistent with previous evidence from the alcohol literature (Bravo et al., 2017), the present findings indicate that problem-focused thoughts is a key facet of ruminative thinking, that helps disentangle the mechanisms that put college students with high levels of depressive symptoms at greater risk of marijuana misuse. This more prominent role of problem-focused thoughts is possibly associated with core elements of this ruminative facet. This facet encompasses consistently thinking of the problem but, different to other cognitive response styles such as problem solving (Hilt et al., 2010; Smith & Alloy, 2009),

does not involve advancing in the resolution of the problem. These distinctive features may have strengthened the associations involving problem-focused thoughts compared to the other rumination facets. Passively thinking about causes and consequences of the problem may increase negative affect (i.e., depressive symptoms) and, in turn, the risk of engaging in substance use to deal with depressive symptoms. Taken together, the present findings suggest that college students who exhibit maladaptive response styles (i.e., problem-focused thoughts) when dealing with depressive symptoms might be at increased risk to experience negative-related marijuana consequences, via a higher endorsement of using marijuana for coping motives.

Importantly, these findings were invariant across different countries/cultures and gender, suggesting this explanatory model might be culturally universal. In other words, the association between distal variables (i.e., depression symptoms) with marijuana outcomes, via cognitive variables (i.e., rumination and motives for marijuana use) is relatively stable and similar across countries. These findings suggest that the underlying mechanisms for greater marijuana use might apply to diverse countries/cultures despite differences in marijuana use and other related variables.

The results additionally evidenced that two other paths may have been double-mediated. Specifically, higher depressive symptoms were associated with lower marijuana use and less negative consequences via a negative association between problem-focused thoughts and enhancement motives. A statistical explanation could be plausible to explain the negative associations between problem-focused thoughts and enhancement motives. Correlation analysis (Table 1) showed that enhancement motives were weakly associated with depression and rumination facets ($-.03 < r\text{s} > .06$) but were moderately-strongly

associated with the other marijuana motives and marijuana outcomes (.18 < *r*s > .44). Comparably, rumination facets were highly correlated with each other and with depressive symptoms (.32 < *r*s > .68). Taken together, the negative correlation found between problem-focused thoughts and enhancement motives could be due to collinearity of variables in the path model (Petraitis et al., 1996), suggesting that the motives that may play a relevant role in this internalizing pathway to the marijuana use and marijuana negative-related consequences are coping motives. However, previous work from the alcohol literature reported a positive association between ruminative thinking and enhancement motives on the pathway from depressive symptoms to alcohol use and problems (Bravo, Pilatti et al., 2018). The fact that enhancement motives are also relevant in the case of alcohol, could be due to the physiological effects that alcohol produce in the organism compared with marijuana (i.e., higher stimulant effects). Additional studies examining the role of subjective effects or expectancies in these pathways are needed to confirm this hypothesis. Therefore, findings involving enhancement motives should be considered with caution, and further work is needed to elucidate/replicate these findings.

4.1. Limitations

These findings should be interpreted considering a number of limitations. First, due to the cross-sectional study design, it is not possible to infer cause-consequences relationships between the variables, as well as delineate temporal ordering among variables. Although associations were consistent with a risk pathway posited by negative reinforcement and response style theories, other directions of association are possible. Experimental and longitudinal data, particularly ecological momentary assessment or daily diary designs are needed to further investigate rumination facets and their effects on

marijuana use motives among college student marijuana users dealing with depressive symptoms. Future work should also attempt to have a more balanced proportion of men and women and more students from careers different from psychology. There is also a need to examine vulnerability factors for substance abuse in other non-college emerging adults, including clinical samples. Moreover, our measure of marijuana use quantity was self-report and given difficulties in accurately estimating quantity of marijuana use (Hindocha et al., 2017; Prince et al., 2018) future research is needed exploring our study constructs with alternative methods of estimating marijuana use quantity. Finally, rumination is a complex construct and, since there are other theoretical models to measure it, future work should test for potential double-mediation in similar paths with other rumination facets.

4.2. Conclusions and Future Directions

In light of our findings, primary prevention efforts may benefit from a focus on screening for the identification of those students with elevated depressive symptoms and ruminative thinking (predominately problem-focused thoughts). Cognitive variables, such as biased thinking style or cognitive bias, have been successfully targeted in some interventions to reduce depressive symptoms (Newby et al., 2014; Williams et al., 2013), and also to facilitate successful substance outcomes (Rinck et al., 2018). Similarly, data from the alcohol literature suggest that adaptive coping skills can protect against harmful substance use patterns (Walker & Stephens, 2014). Our findings regarding the risk associated with coping motivated marijuana use suggest that interventions that encourage more adaptive coping skills may be a beneficial approach to reducing marijuana risk as well. The fact that the results were generalizable to five different countries support the universality of a negative affect regulation pathway, and suggest that similar programs

could be useful to prevent and treat marijuana-related problems in youths from the U, S., Argentina, Uruguay, Netherlands and Spain. The present research also highlights the need of new research addressing the role of enhancement motives in the associations of depression, rumination and marijuana-related variables.

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Table 1
Bivariate correlations among study variables in total sample

	1	2	3	4	5	6	7	8	9	10	11	12	M	*SD*	Potential Range
1. Depressive Symptoms	.78												2.80	2.07	0-4
2. Problem-focused Thoughts	**.45**	.90											3.27	1.44	1-7
3. Counterfactual Thinking	**.32**	**.63**	.86										4.42	1.54	1-7
4. Repetitive Thoughts	**.44**	**.66**	**.68**	.93									4.38	1.61	1-7
5. Anticipatory Thoughts	**.34**	**.65**	**.60**	**.60**	.75								4.11	1.56	1-7
6. Social Motives	.03	.05	.04	.02	.05	.86							2.53	1.19	1-5
7. Coping Motives	**.38**	**.31**	**.23**	**.27**	**.19**	**.33**	.88						2.17	1.19	1-5
8. Enhancement Motives	-.00	-.02	.06	.05	.04	**.44**	**.22**	.79					3.68	1.13	1-5
9. Conformity Motives	**.08**	**.12**	.03	.02	.01	**.39**	**.27**	.07	.89				1.36	0.77	1-5
10. Expansion Motives	.06	**.09**	.05	.06	.05	**.35**	**.38**	**.35**	**.23**	.89			2.43	1.29	1-5
11. Marijuana Use Quantity	.01	-.02	-.03	-.06	-.06	**.15**	**.18**	**.20**	.06	**.22**	---		6.12	11.26	No range
12. Negative Marijuana-related Consequences	**.22**	**.14**	**.11**	**.12**	**.13**	**.13**	**.30**	**.15**	**.10**	**.17**	**.25**	.86	3.61	3.92	0-21

Note. Significant correlations ($p < .01$) are bolded for emphasis. Cronbach's alphas are underlined and shown on the diagonals.

Table 2
Summary of total, indirect, and direct effects of depressive symptoms and rumination facets on marijuana use motives

Marijuana Use Motives:	*Social*		*Enhancement*		*Coping*		*Conformity*		*Expansion*	
Predictor: *Depressive Symptoms*	β	99% CI	β	99% CI	β	99% CI	β	99% CI	β	99% CI
Total	.031	-0.05, 0.11	-.004	-0.09, 0.08	**.375**	**0.30, 0.45**	**.084**	**0.000, 0.17**	.058	-0.02, 0.14
Total indirect[a]	.013	-0.03, 0.06	.006	-0.04, 0.05	**.085**	**0.04, 0.13**	.025	-0.02, 0.07	.034	-0.01, 0.08
Problem-focused Thoughts	.018	-0.04, 0.07	**-.067**	**-0.12, -0.01**	**.070**	**0.02, 0.13**	**.099**	**0.04, 0.16**	.043	-0.01, 0.10
Counterfactual Thinking	.010	-0.03, 0.05	.027	-0.01, 0.07	.011	-0.02, 0.05	-.003	-0.04, 0.03	-.003	-0.04, 0.04
Repetitive Thoughts	-.025	-0.08, 0.03	.030	-0.02, 0.08	.025	-0.02, 0.07	-.039	-0.09, 0.01	-.003	-0.06, 0.05
Anticipatory Thoughts	.011	-0.03, 0.05	.016	-0.02, 0.05	-.021	-0.06, 0.01	-.032	-0.07, 0.001	-.003	-0.05, 0.04
Direct	.017	-0.08, 0.11	-.010	-0.10, 0.08	**.290**	**0.20, 0.38**	.059	-0.04, 0.16	.024	-0.07, 0.12

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. [a] Reflects the combined indirect associations within the model.

Table 3
Summary of total, indirect, and direct effects of comprehensive mediation path model

Marijuana Outcome Variables:	*Use Quantity*		*Negative Consequences*	
Predictor Variable: *Depressive Symptoms*	β	99% CI	β	99% CI
Total	.044	-0.42, 0.55	**.403**	**0.25, 0.56**
Total indirect[a]	.056	-0.26, 0.37	**.158**	**0.06, 0.27**
Problem-focused Thoughts	.123	-0.18, 0.43	-.006	-0.11, 0.10
Counterfactual Thinking	.000	-0.19, 0.21	-.001	-0.07, 0.06
Repetitive Thoughts	-.237	-0.55, 0.02	-.029	-0.12, 0.06
Anticipatory Thoughts	-.132	-0.35, 0.08	.044	-0.02, 0.11
Social Motives	.002	-0.02, 0.06	.000	-0.01, 0.01
Coping Motives	**.212**	**0.08, 0.39**	**.110**	**0.05, 0.18**
Enhancement Motives	-.007	-0.08, 0.06	-.002	-0.02, 0.01
Conformity Motives	-.009	-0.08, 0.03	.002	-0.01, 0.02
Expansion Motives	.017	-0.05, 0.10	.003	-0.01, 0.02
Problem-focused Thoughts – Social Motives	.002	-0.01. 0.04	.000	-0.01, 0.01
Problem-focused Thoughts – Coping Motives	**.051**	**0.01, 0.12**	**.027**	**0.01, 0.06**
Problem-focused Thoughts – Enhancement Motives	**-.047**	**-0.11, -0.01**	**-.011**	**-0.03, -0.001**
Problem-focused Thoughts – Conformity Motives	-.015	-0.09, 0.05	.003	-0.02, 0.03
Problem-focused Thoughts – Expansion Motives	.031	-0.01, 0.10	.005	-0.002, 0.02
Counterfactual Thinking – Social Motives	.001	-0.01, 0.02	.000	-0.01, 0.003
Counterfactual Thinking – Coping Motives	.008	-0.02, 0.04	.004	-0.01, 0.02
Counterfactual Thinking – Enhancement Motives	.019	-0.004, 0.06	.004	-0.001, 0.02
Counterfactual Thinking – Conformity Motives	.001	-0.01, 0.02	.000	-0.01, 0.002
Counterfactual Thinking – Expansion Motives	-.002	-0.04. 0.03	.000	-0.01, 0.01
Repetitive Thoughts – Social Motives	-.003	-0.04, 0.01	.000	-0.01, 0.01
Repetitive Thoughts – Coping Motives	.018	-0.02, 0.07	.009	-0.01, 0.03
Repetitive Thoughts – Enhancement Motives	.021	-0.01, 0.07	.005	-0.002, 0.02
Repetitive Thoughts – Conformity Motives	0.01	-0.02, 0.04	-.001	-0.01, 0.01
Repetitive Thoughts – Expansion Motives	-.002	-0.05, 0.04	.000	-0.01, 0.01
Anticipatory Thoughts – Social Motives	.001	-0.01, 0.03	.000	-0.01, 0.003
Anticipatory Thoughts – Coping Motives	-.015	-0.05, 0.01	-.008	-0.03, 0.01
Anticipatory Thoughts – Enhancement Motives	.011	-0.01, 0.05	.003	-0.003, 0.01
Anticipatory Thoughts – Conformity Motives	.005	-0.01, 0.04	-.001	-0.01, 0.01
Anticipatory Thoughts – Expansion Motives	-.002	-0.04, 0.03	.000	-0.01, 0.01
Direct	-.012	-0.54, 0.56	**.245**	**0.07, 0.42**

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. [a] Reflects the combined indirect associations within the model.

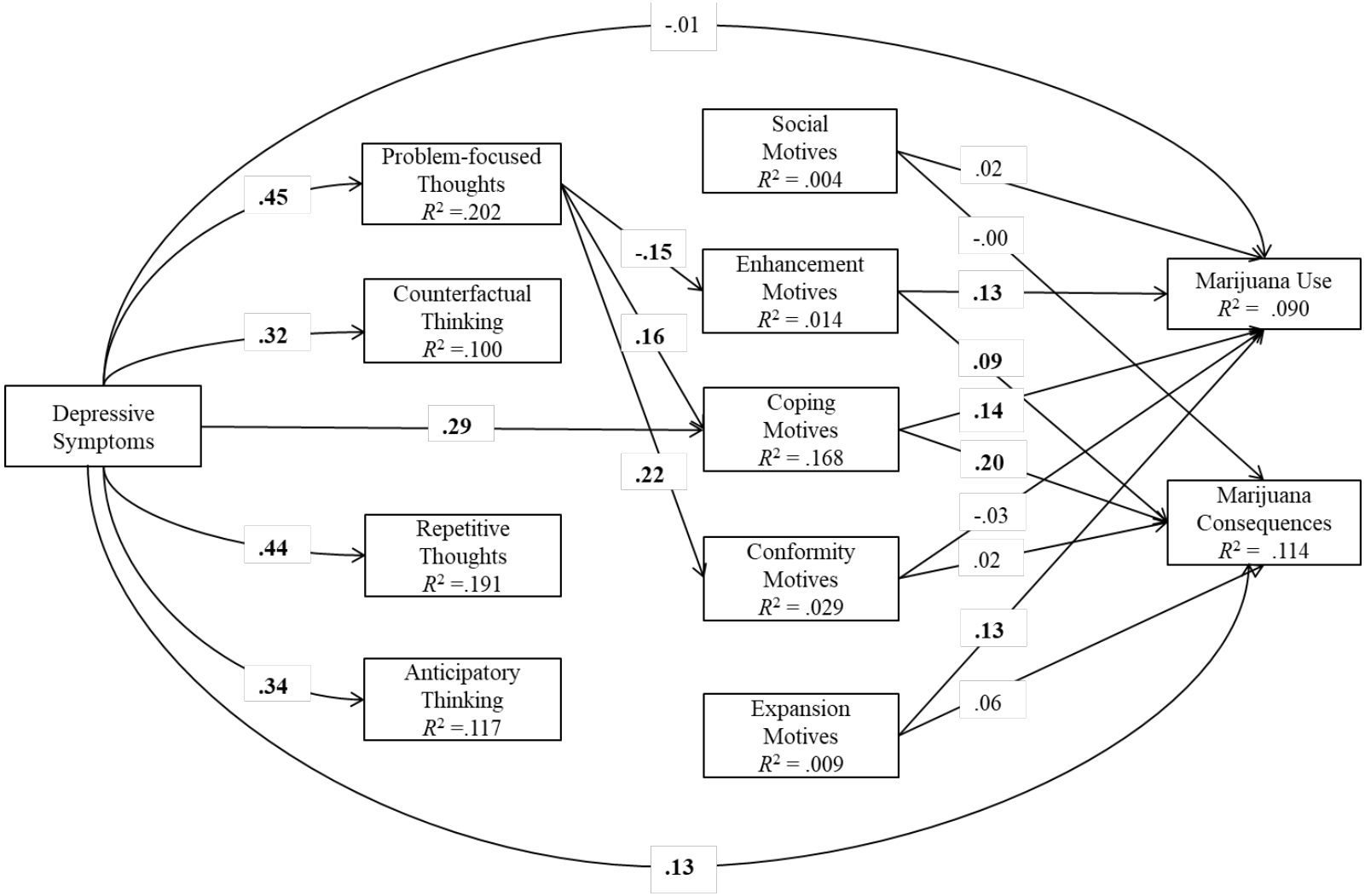

Figure 1. Depicts the standardized effects of the comprehensive mediation path model (n = 1,175). Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. The disturbances among rumination subcomponents (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts), marijuana use motives (social, enhancement, coping, conformity, and expansion), and marijuana outcomes were allowed to correlate. Non-significant path coefficients between rumination facets and marijuana motives/outcomes as well as depressive symptoms and marijuana use motives are not shown in the figure for reasons of parsimony but are available upon request.

Appendix A

Dutch Version of the Ruminative Thought Style Questionnaire

Subscale:	Items
Problem-Focused Thoughts	Wanneer ik een gecompliceerd probleem probeer op te lossen, voel ik dat ik steeds weer terugkom bij het begin zonder ooit een oplossing te vinden
	Ik kan mezelf nooit losmaken van ongewilde gedachten
	Zelfs als ik uren nadenk over een probleem heb ik nog steeds moeite om duidelijk begrip te krijgen
	Het is erg moeilijk voor mij om tot een duidelijke conclusie te komen over sommige problemen, ongeacht hoelang ik er over na heb gedacht
	Soms realiseer ik me dat ik urenlang heb zitten denken over iets
Counter-factual Thinking	Wanneer ik anticipeer op een interactie probeer ik me elk mogelijk scenario of elk mogelijke conversatie voor te stellen
	Ik heb de neiging om eerdere gebeurtenissen in mijn hoofd te herhalen zoals ik gewild had dat ze zouden zijn gegaan
	Ik dagdroom over dingen waarvan die ik zou willen dat ik had gedaan
	Wanneer ik voel dat ik niet op een goede manier met iemand ben omgegaan probeer ik me scenario's voor te stellen waarin ik anders had gehandeld
Repetitive Thoughts	Ik merk dat steeds weer dezelfde gedachten in me opkomen
	Wanneer ik een probleem heb, blijft dat aan me knagen voor een lange tijd
	Ik ervaar dat dezelfde gedachten meerdere malen per dag in mij opkomen
	Ik kan het niet stoppen over sommige dingen na te denken
Anticipatory Thoughts	Wanneer ik uitkijk naar een spannend moment, interfereren er gedachten waar ik op dit moment mee bezig ben
	Soms, zelf tijdens een gesprek, word ik me bewust van gedachten die er niets mee te maken hebben

Dutch Version of the Marijuana Motives Measure Short Form

Subscale:	Items
Social Motives	Omdat het mij helpt om te genieten van een feestje
	Omdat het sociale gelegenheden plezieriger maakt
	Omdat het feestjes leuker maakt
Coping Motives	Om mijn zorgen te vergeten
	Omdat het mij helpt wanneer ik mij depressief of nerveus voel
	Om mij op te vrolijken wanneer ik in een slechte bui ben
Enhancement Motives	Omdat ik het gevoel aangenaam vind
	Om high te worden

	Omdat het leuk is
Conformity Motives	Om bij de groep te horen die mij aanspreekt
	Om meer geliefd te zijn
	Zodat ik mij niet buitengesloten voel
Expansion Motives	Omdat het mij helpt om meer creatief en origineel te zijn
	Om dingen anders te begrijpen
	Om mijn bewustzijn te verbreden