Title

Positive expectancies mediate the association between sensation seeking and marijuana outcomes in at-risk young adults: A test of the acquired preparedness model

Journal

American Journal on Addictions, 27(5)

ISSN

1055-0496

Authors

Curry, Inga
Trim, Ryan S
Brown, Sandra A
et al.

Publication Date

2018-08-01

DOI

10.1111/ajad.12754

Peer reviewed

HHS Public Access

Author manuscript

Am J Addict. Author manuscript; available in PMC 2019 December 06.

Positive Expectancies Mediate the Association between Sensation-Seeking and Marijuana Use in At-risk Young Adults: A Test of the Acquired Preparedness Model

Inga Curry, Ph.D[1,2], **Ryan S. Trim, Ph.D**[1,2], **Sandra A. Brown, Ph.D**[2], **Christian J. Hopfer, MD**[3], **Michael C. Stallings, Ph.D**[4], and **Tamara L. Wall, Ph.D**[1,2,*]

[1]V.A. San Diego Healthcare System, La Jolla, United States.

[2]Department of Psychiatry, University of California, San Diego, United States.

[3]Department of Psychiatry, University of Colorado, Denver, United States.

[4]Institute for Behavioral Genetics, University of Colorado, Boulder, United States.

Abstract

Background and Objectives: The acquired preparedness model (APM) integrates personality trait research and psychosocial learning, which are theorized to ultimately increase risk for problematic substance use outcomes.

Methods: The present study uses the APM to examine the potential mediational role of positive and negative expectancies on the relationship between impulsivity and two marijuana outcomes (i.e. frequency of use and marijuana use disorder [MUD] symptom count) among an at-risk sample of young adults with history of antisocial behavior and substance use in adolescence and their siblings (n = 312).

Results: Results suggest a significant indirect effect of sensation seeking on recent marijuana use through positive marijuana expectancies. There also was a significant indirect effect of sensation seeking on past-year MUD symptoms through positive expectancies. No significant indirect effects through negative expectancies were found for either outcome.

Discussion and Conclusions: Our findings are consistent with the APM and suggest that higher sensation seeking is related to increased positive beliefs about marijuana outcomes, which is related to higher marijuana use and more MUD symptoms.

Scientific Significance: These findings suggest that positive expectancies are an important risk factor for marijuana use and misuse, particularly for at-risk individuals with elevated rates of sensation seeking. Positive marijuana expectancies may be important to address in interventions for at-risk individuals.

Keywords

Marijuana; Sensation Seeking; Expectancies; At-risk; Young Adults

[*]**Corresponding author:** Correspondence should be addressed to Tamara L. Wall, Ph.D., University of California, San Diego, 3350 La Jolla Village Drive (116B), San Diego, CA 92161; Tel: (858) 552-8585 ×2485; twall@ucsd.edu.

Marijuana is one of the most commonly used drugs worldwide.[1] In the U.S., 47% of adults report lifetime marijuana use and 13% endorse past-year use. [2] It is estimated that 30% of those who use marijuana may have some degree of marijuana use disorder.[3] The acquired preparedness model (APM)[4] has been theorized to explain substance use behaviors, wherein individuals who are high on risky personality traits are predisposed (prepared) to learn (acquire) certain beliefs and expectations regarding substance use, which in turn influence their substance use behavior.[5] Therefore, the APM proposes a mediational model in which high-risk traits influence specific patterns of psychosocial learning and ultimately increase risk for problematic substance use outcomes.

Most of the literature supporting the APM comes from studies on alcohol behavior among college students [(e.g. 6, 7, 8, 9, 10)], although a few studies have begun to apply this model to other substances, including marijuana [(e.g., 11, 12,13,14)]. Two of the previous studies focused on marijuana[(13,14)] found evidence for a mediating role of negative expectancies between personality traits and marijuana outcomes. The direction of the effect differed in these studies. Hayaki and colleagues (2011) found that individuals with high impulsivity had more negative expectancies, which in turn, led to reduced frequency of use, while Vangness and colleagues (2005) found that individuals with high impulsivity had fewer negative expectancies and used marijuana more frequently. Furthermore, the former study [(13)] found a direct mediational role of negative expectancies in the associations between impulsivity and marijuana problems, as well as between impulsivity and marijuana dependence. Two of the three prior studies found a mediating role of positive expectancies in the association between impulsivity and marijuana use among samples of adult marijuana users from the community. [11, 13] Due to the inconsistent findings in the few studies that have evaluated the APM for marijuana outcomes, additional research is needed to parse out the role of positive and negative expectancies.

Although the three studies discussed above have tested the APM for marijuana outcomes, all used non-clinical samples. It is important to evaluate these associations in more severe populations as findings from such studies can be particularly helpful in informing prevention and intervention efforts for individuals at-risk. Prior research demonstrates greater impulsivity in individuals with substance use disorders than healthy controls [(15, 16, 17)], as well as a link between impulsivity and later cannabis use and abuse [(18)]. In addition, research shows greater impulsivity among adolescents in treatment for serious substance and conduct problems than community controls.[19]

The present study expands on the APM literature by evaluating two marijuana outcomes, i.e. frequency of use and marijuana use disorder (MUD) symptom count, in an at-risk sample of young adults with a history of both substance use and conduct disorder symptoms (probands) and their siblings. The siblings are considered lower risk than the probands, but higher risk than community counterparts[21]. We hypothesized that marijuana expectancies would mediate the relationship between impulsivity and marijuana outcomes among this at-risk sample. However, given the discrepancy in the past literature, we had no a priori hypotheses regarding whether positive and/or negative expectancies would be significant mediators.

Method

Data were drawn from a longitudinal study on the genetics of antisocial behavior and substance use (for more detailed information, see [20]). Probands were originally identified via treatment programs and schools in San Diego County, CA and had to have one or more lifetime substance use disorder symptom and at least one conduct disorder symptom. Siblings of probands also were recruited, but did not need to meet the previously mentioned criteria. Overall, the siblings have been shown to be at higher risk for substance use and antisocial behavior than community samples, but symptom counts were not as high as those of the probands.[21] At the time of original recruitment, probands were between 14 and 19 years old, and their siblings were between 14 and 27 years old. A follow-up assessment, which included self-reported measures of impulsivity and marijuana expectancies, was conducted approximately six years after the original assessment. As the impulsivity measure was not administered at baseline, the present study only used data collected on probands and siblings at the follow-up assessment. Participants older than 30 years of age (n = 8, all siblings) were excluded from the study to maintain the focus of the study on a sample of young adults. The final study sample (n = 312) consisted of 48% probands, was 54% male, 36% white, 42% Hispanic, and had an average age of 23.5 years (sd = 2.63).

Measures

Impulsivity.—A 35-item, modified version of the UPPS-P Impulsive Behavior Scale [22, 23] was used to measure the five facets of impulsivity. The five facets of impulsivity measured were sensation seeking (7 items; α = .76), lack of premeditation (8 items; α = .80), lack of perseverance (6 items; α = .68), negative urgency (7 items; α = .76), and positive urgency (7 items; α = .82). Sample items include: “I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional” (sensation seeking), “I usually make up my mind through careful reasoning” (lack of premeditation), “I tend to give up easily” (lack of perseverance), “I often make matters worse because I act without thinking when I am upset” (negative urgency), and “When I get really happy about something, I tend to do things that can have bad consequences” (positive urgency). For all items, response options ranged from 1 (Strongly Disagree) to 4 (Strongly Agree).

Marijuana expectancies.—Marijuana use expectancies were measured using an investigator-adapted 18-item Marijuana Effect Expectancies Questionnaire (MEEQ).[24] The investigator-adapted version of the MEEQ is a short-version of the original questionnaire[24] which included 48 items. Items from the original scale were evaluated based on the strength of their factor loadings. The top three items were chosen from each of the six subscales of the MEEQ for a total of 18 items. The original MEEQ scale has sound psychometric properties, including acceptable reliability and convergent/discriminant validity among adolescents and youth.[25] The MEEQ assesses three positive (relaxation and tension reduction, social and sexual facilitation, and perceptual and cognitive enhancement) and three negative subscales (cognitive and behavioral impairment, global negative effects, and craving and physical effects), which were combined to create two higher-order Positive and Negative Expectancy subscales (α = .84 and α = .81, respectively). Each item is scored on a 5-point Likert scale (from 1 = disagree strongly to 5 = agree strongly).

Marijuana outcomes.—Marijuana use in the 180 days prior to the interview and MUD symptoms in the prior year were measured using the Composite International Diagnostic Interview – Substance Abuse Module (CIDI-SAM).[26] Marijuana use was captured with the item, "How many total days did you use marijuana in the last 6 months (180 days)?" Participants reported their past-year marijuana abuse and dependence symptoms consistent with the DSM-IV.[27] For the purpose of this study, marijuana abuse and dependence symptoms were combined into a single continuous MUD variable consisting of 11 total symptoms.

Statistical analyses

The nested structure of these data (individuals within families) presents a potential analytic challenge because related individuals share common family influences with a potential for interdependence among observations. Researchers traditionally measure the degree of interdependence by the intraclass correlations (ICCs) among the observed variables (the ICCs for MUD symptoms and marijuana use were .14 and .24, respectively). However, it has been argued that the "design effect," which takes into account the average cluster size, is more important in determining the extent of interdependence in the data.[28] In the current sample (n=312), 94% of the 180 families had only one proband with no sibling (58 families) or a proband and one sibling (112 families); there were 10 families with a proband and two siblings. The average cluster size, therefore, was small (1.73 individuals/family). This resulted in small design effects for marijuana use (1.41) and MUD symptoms (1.23), suggesting that clustering did not pose a problem for a single-level analysis (a design effect of 2.0 is considered a meaningful threshold). As such, the use of multilevel modeling was not warranted, and instead within-family correlation on the outcomes was controlled for using a standard error correction (TYPE=COMPLEX in MPlus).

Indirect effects from sensation seeking to MUD symptoms via positive and negative marijuana expectancies were evaluated using a product-of-coefficients test known as the distribution of the product.[29] The values at the 2.5th and 97.5th percentile reflect the lower and upper limits of the 95% confidence interval; mediation can be said to occur if this confidence interval does not contain zero. Age, gender, and proband status were correlated with marijuana use and therefore included as covariates in the models, which were run separately for marijuana use and MUD symptoms. Descriptive analyses were conducted using SPSS (version 23). All indirect analyses were conducted in MPlus version 7.31[(30)] using the MLR estimator (maximum likelihood with robust standard errors).

Results

Descriptive Statistics

Most participants (90%) reported using marijuana in their lifetime. On average, participants reported using marijuana on 54.1 (sd = 73.77) of the past 180 days and endorsed an average of 3.3 (sd =3.23) MUD symptoms in the past year. Descriptives of all UPPS-P impulsivity facets, marijuana expectancies and marijuana outcomes are shown in Table 1. There were several significant correlations between demographic variables and marijuana outcomes: males reported a higher frequency of marijuana use (65.4 vs. 38.9 days; r =.18) and more

MUD symptoms (4.2 vs. 2.3; r =.29) than females; probands endorsed more MUD symptoms than siblings (4.1 vs. 2.5; r =.24); and there was a negative correlation between age and MUD symptoms (r = −.22) with younger participants having more MUD symptoms. Bivariate correlations of UPPS-P impulsivity facets, positive and negative expectancies, and marijuana outcomes are presented in Table 1.

Because sensation seeking was the only UPPS-P impulsivity facet that was directly related to marijuana use in the past 180 days, the mediation models described below were only performed using this facet as the independent variable. Indirect effects using the other four UPPS-P facets also were tested, but did not provide good model fit or explain substantial variance in marijuana outcomes.

Mediation Models

Table 2 shows the model results examining the direct and indirect effects of sensation seeking on marijuana outcomes through both positive and negative expectancies. There was a significant indirect effect of sensation seeking on marijuana use through positive marijuana expectancies (*indirect effect* 95% CI [9.10, 21.28]). Similarly, there was a significant indirect effect of sensation seeking on MUD symptoms through positive expectancies (*indirect effect* 95% CI [.16, .52]). The indirect effects through negative expectancies were not significant in either model. Models also were tested for the probands (n = 150) and siblings (n = 162) separately and the overall pattern of results was similar to the results obtained for the total sample (data not shown).

Discussion

This study evaluated the ability of the APM to account for marijuana outcomes in an at-risk sample of young adults. Preliminary analyses showed that sensation seeking was directly associated with higher marijuana use in the past 180 days and more symptoms of MUD. Other impulsivity facets, such as lack of perseverance, negative urgency, and positive urgency, were directly associated with MUD symptoms, but not with marijuana use in the past 180 days. Given that we wanted to evaluate both marijuana outcomes, the following discussion of the APM only refers to sensation seeking as the independent variable. We hypothesized that we would find a significant mediating relationship of marijuana expectancies on the relationship between impulsivity and marijuana outcomes. However, given the discrepancy in the prior APM literature regarding marijuana outcomes as well as the use of different measures of impulsivity [13, 14], we had no a priori hypotheses on which facets of impulsivity and which type of marijuana expectancies would be significant in mediational models. Results indicated that only positive marijuana expectancies mediated the associations between sensation seeking and marijuana outcomes in this at-risk sample. Our findings suggest that higher sensation seeking is related to increased positive beliefs about marijuana outcomes, which is related to higher marijuana use and more MUD symptoms. In this way, our findings are consistent with the APM, which theorizes that certain “risky” traits (e.g., impulsivity) predispose individuals to acquire certain beliefs, such as positive expectancies, which, in turn, lead to risky behaviors and negative consequences. This finding is particularly relevant for the sample used in this study, as individuals with a

childhood history of antisocial behaviors and substance use tend to show increased levels of impulsivity.[31, 32, 33]

This study adds to the existing literature, which has been inconsistent regarding the role of positive and negative marijuana expectancies as mediators.[11,13,14] The current study replicates the findings of two prior studies [(11,13)] that demonstrated a mediating role of positive expectancies in the association between impulsivity and marijuana use among samples of adult marijuana users from the community. On the other hand, the current study did not find a mediating role of negative expectancies in the association between sensation seeking and marijuana use, which was previously demonstrated.[13, 14]

In the present study, only positive marijuana expectancies mediated the association between sensation seeking and MUD symptoms. It is possible that this inconsistency relates to the at-risk nature of our sample and that in our sample, 90% of the participants reported lifetime use of marijuana. For example, a study using an at-risk young adult sample (i.e. participants with parents who had a substance use disorder) found that negative expectancies in adolescence prevented marijuana use in young adulthood; however, 82% of the young adults reported never using marijuana.[34] On the other hand, a research study using a clinical sample (i.e. individuals in treatment for MUD) found that positive cannabis outcome expectancies, but not negative outcome expectancies, were a direct predictor of marijuana use.[35] This is consistent with other research with individuals endorsing substance misuse, which shows that positive expectancies seem to play a more salient role in substance use behavior than negative expectancies.[36, 37, 38] The literature has shown negative expectancies primarily play a role in preventing tobacco use, as well as influencing positive changes in alcohol treatment.[39] It also is possible that we used a more nuanced measure of impulsivity than used in prior studies. That is, our study used the UPPS-P framework [(40)], which identifies five separate, though related, impulsivity facets. A recent meta-analysis [(41)] of various UPPS-P impulsivity facets and marijuana-related outcomes found that marijuana use was associated with all impulsivity-related facets except lack of perseverance and that negative marijuana consequences (marijuana-related problems and marijuana use disorder) were only significantly related to sensation seeking, lack of planning, and positive urgency. This meta-analysis also found small effects for marijuana use and medium effects for marijuana consequences [(41)]. Because our analyses tested a mediational model that included marijuana expectancies, it is noteworthy that only the facet of sensation seeking, the tendency to seek sensory pleasure and excitement, was a significant impulsivity facet in the mediational model which also included positive expectancies and marijuana outcomes.

The current study has several limitations. First, as neither the impulsivity nor the expectancy measures were administered at baseline, we utilized cross-sectional data collected at the follow-up assessment. Impulsivity is a more distal, stable, trait-like construct, whereas expectancies are more proximal and fluid, and therefore, a mediational model is acceptable, but not ideal. Future research would benefit from longitudinal designs, capturing changes in expectancies, marijuana use, and negative consequences. Second, marijuana use was measured using a single item, which is prone to self-report and recall biases. Although using single items to capture specific substance use behaviors is a common practice [(e.g., 11, 42)],

utilizing a method such as the timeline followback (TLFB[43]) may provide a more nuanced and accurate assessment of substance use.

Despite these limitations, the findings suggest that positive expectancies are a potentially important risk factor for marijuana use and misuse, particularly for at-risk individuals with elevated rates of sensation seeking. There is extensive empirical support for interventions that challenge expectancies of alcohol use [(i.e. 44, 45, 46)]. As such, challenging expectancies about marijuana's positive effects may be an effective intervention for reducing marijuana-related problems among at-risk individuals.

Acknowledgements:

This material is based on support from the Office of Academic Affiliations and with resources and the use of facilities at the V.A. San Diego Healthcare System., as well as support by National Institute of Drug Abuse grants R01 DA035804 (PIs: Hopfer, Stallings, & Wall), R01 DA021905 (PIs: Brown & Wall), R01 DA012845 (PI: Hewitt), and P60 DA011015 (PI: Hewitt). The content of this manuscript is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The sponsoring agencies were not involved in the design, analyses, or development of this manuscript, or the decision to submit this paper for publication.

References

1. Winstock AR, Barrett M, Ferris J, & Maier L. (2016). What we learned from Global Drug Survey, 2016: An overview of our findings. Retrieved from: https://www.globaldrugsurvey.com/wp-content/uploads/2016/06/TASTER-KEY-FINDINGS-FROM-GDS2016.pdf
2. Substance Abuse and Mental Health Services Administration (SAMHSA; 2015). Center for Behavioral Health Statistics and Quality National Survey on Drug Use and Health, 2013 Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. Retrieved from http://doi.org/10.3886/ICPSR35509.v3
3. Hasin DS, Saha TD, Kerridge BT, Goldstein RB, Chou P, Zhang H, …, Grant BF. (2015). Prevalence of Marijuana Use Disorders in the United States Between 2001–2002 and 2012–2013. JAMA Psychiatry, 72*(*12*),* 1235–1242. [PubMed: 26502112]
4. Smith GT, & Anderson KG (2001). Personality and learning factors combine to create risk for problem adolescent drinking: A model and suggestions for intervention In Monti PM, Colby SM, & O'Leary TA (Eds.), Adolescents, alcohol, and substance abuse: Reaching teens through brief interventions (pp. 109–141). New York: Guilford.
5. McCarthy DM, Kroll LS, & Smith GT (2001). Integrating disinhibition and learning risk for alcohol use. Experimental and Clinical Psychopharmacology, 9, 389–398. [PubMed: 11764015]
6. Anderson KG, Smith GT, & Fischer SF (2003). Women and acquired preparedness: Personality and learning implications for alcohol use. Journal of Studies on Alcohol, 534, 384–392.
7. Corbin WR, Iwamoto DK, & Fromme K (2011). A comprehensive longitudinal test of the acquired preparedness model for alcohol use and related problems. Journal of Studies on Alcohol and Drugs, 72*(*4*),* 602–610. [PubMed: 21683042]
8. Fu A, Ko H, Wu JY, Cherng B, & Cheng C (2007). Impulsivity and expectancy in risk for alcohol use: Comparing male and female college students in Taiwan. Addictive Behaviors, 32, 1887–1896. [PubMed: 17287091]
9. McCarthy DM, Miller TI, Smith GT, & Smith JA (2001). Disinhibition and expectancy in risk for alcohol use: Comparing black and white college samples. Journal of Studies on Alcohol, 62, 313–321. [PubMed: 11414341]
10. Settles RF, Cyders M, & Smith GT (2010). Longitudinal validation of the acquired preparedness model of drinking risk. Psychology of Addictive Behaviors, 24*(*2*),* 198–208. [PubMed: 20565146]
11. Bolles JR, Earleywine M, & Gordis E (2014) Acquired preparedness model and impulsivity moderated expectancies: Examining predictors of marijuana use. Addiction Research & Theory, 22.6, 490–497. doi: 10.3109/16066359.2014.892929.

12. Doran N, Khoddam R, Sanders PE, Schweizer CA, Trim RS, & Myers MG (2013). A prospective study of the Acquired Preparedness Model: The effects of impulsivity and expectancies on smoking initiation in college students. Psychology of Addictive Behaviors, 27, 714–722. doi: 10.1037/a0028988. [PubMed: 22686965]
13. Hayaki J, Herman DS, Hagerty CE, de Dios MA, Anderson BJ, & Stein MD (2011). Expectancies and self-efficacy mediate the effects of impulsivity on marijuana use outcomes: an application of the acquired preparedness model. Addictive Behaviors, 36, 389–396. doi: 10.1016/j.addbeh.2010.12.018. [PubMed: 21216536]
14. Vangsness L, Bry BH, & LaBouvie EW (2005). Impulsivity, negative expectancies, and marijuana use: A test of the acquired preparedness model. Addictive Behaviors, 30, 1071–1076. doi:10.1016/j.addbeh.2004.11.003 [PubMed: 15893107]
15. Allen TJ, Moeller FG, Rhoades HM, & Cherek DR (1998). Impulsivity and history of drug dependence. Drug and Alcohol Dependence, 50, 137–145. [PubMed: 9649965]
16. Moss HB, Yao JK, & Panzak GL (1990). Serotonergic responsivity and behavioral dimensions in antisocial personality disorder with substance abuse. Biological Psychiatry, 28, 325–338. [PubMed: 2397249]
17. Patton JH, Stanford MS, & Barratt ES (1995). Factor structure of the Barratt Impulsiveness Scale. Journal of Clinical Psychology, 51, 768–774. [PubMed: 8778124]
18. Elkins IJ, McGue M, & Iacono WG (2007). Prospective effects of attention deficit/hyperactivity disorder, conduct disorder, and sex on adolescent substance use and abuse. Archives of General Psychiatry, 64, 1145–1152. [PubMed: 17909126]
19. Thompson LL, Whitmore EA, Raymond KM, & Crowley TJ (2006). Measuring impulsivity in adolescents with serious substance and conduct problems. Assessment,13, 3–15. [PubMed: 16443715]
20. Derringer J, Corley RP, Haberstick BC, Young SE, Demmitt BA, Howrigan DP…. McQueen MB (2015). Genome-wide association study of behavioral disinhibition in a selected adolescent sample. Behavior Genetics, 45, 375–381. [PubMed: 25637581]
21. Stallings MC, Corley RP, Dennehey B, Hewitt JK, Krauter KS, Lessem JM, …Crowley TJ (2005). A genome-wide search for quantitative trait loci that influence antisocial drug dependence in adolescence. Archives of General Psychiatry, 62, 1042–1051. [PubMed: 16143736]
22. Whiteside SP, & Lynam DR (2001). The Five Factor Model and impulsivity: using a structural model of personality to understand impulsivity. Personality and Individual Differences, 30, 669–689.
23. Lynam DR, Smith GT, Whiteside SP, Cyders MA (2006). The UPPS-P: Assessing five personality pathways to impulsive behavior Technical Report. West Lafayette: Purdue University.
24. Schafer J, & Brown SA (1991). Marijuana and cocaine effect expectancies and drug use patterns. Journal of Consulting and Clinical Psychology. 59*(4),* 558–565. [PubMed: 1918560]
25. Aarons GA, Brown SA, Stice E, & Coe MT (2001). Psychometric evaluation of the marijuana and stimulant effect expectancy questionnaires for adolescents. Addictive Behaviors, 26, 219–236. [PubMed: 11316378]
26. Robins LN, Coltler LB, & Barbor T (1990). WHO/ADAMHA Composite International Diagnostic Interview – Substance Abuse Module (SAM). St. Louis, MO: World Health Organization (WHO) and United States Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA).
27. American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC: Author.
28. Muthén B, & Satorra A (1995). Complex sample data in structural equation modeling. In Marsden PV (Ed.), Sociological Methodology (pp. 267–316). Washington, DC: American Sociological Association.
29. MacKinnon DP, Warsi G, Dwyer JH (1995). A simulation study of mediated effect measures. Multivariate Behavioral Research, 30, 41–62. [PubMed: 20157641]
30. Muthén LK and Muthén BO (1998–2012). *Mplus User's Guide.* Seventh Edition Los Angeles, CA: Muthén & Muthén.
31. Elam KK, Wang FL, Bountress K, Chassin L, Pandika D, & Lemery-Chalfant K (2016). Predicting substance use in emerging adulthood: A genetically informed study of developmental transactions

between impulsivity and family conflict. Development and Psychopathology, 28(3), 673–688. [PubMed: 27427799]

32. Luengo MA, Carrillo-de-la-Peña MT, Otero JM, & Romero E (1994). A short-term longitudinal study of impulsivity and antisocial behavior. Journal of Personality and Social Psychology, 66(3), 542–548. [PubMed: 8169763]
33. Vitacco MJ, Neumann CS, Robertson AA, Durrant SL (2002). Contributions of impulsivity and callousness in the assessment of adjudicated male adolescents: A prospective study. Journal of Personality Assessment, 78(1), 87–103. [PubMed: 11936214]
34. Kristjansson SD, Agrawal A, Lynskey MT, & Chassin LA (2012). Marijuana expectancies and relationships with adolescent and adult marijuana use. Drug Alcohol Dependence, 126, 102–110. doi: 10.1016/j.drugalcdep.2012.04.024 [PubMed: 22682980]
35. Connor JP, Gullo MJ, Feeney GFX, Kavanagh DJ, & Young RM (2013). The relationship between cannabis outcome expectancies and cannabis refusal self-efficacy in a treatment population. Addiction, 109, 111–119. https://doi.org/10.1111/add.12366 [PubMed: 24112822]
36. Galen LW, & Henderson MJ (1999). Validation of cocaine and marijuana effect expectancies in a treatment setting. Addictive Behaviors, 24, 719–724. [PubMed: 10574312]
37. Guillem E Notides C., Vorspan F., Debray M., Nieto I., Leroux M., & Lepine JP. (2011). Cannabis expectancies in substance misusers: French validation of the Marijuana Effect Expectancy Questionnaire. The American Journal on Addictions, 20(6), 543–554. [PubMed: 21999501]
38. Pedersen ER, Myers US, Browne KC, Norman SB (2014). The role of alcohol expectancies in drinking behavior among women with alcohol use disorder and comorbid posttraumatic stress disorder. Journal of Psychoactive Drugs, 46(3), 178–187. [PubMed: 25052876]
39. Kouimtsidis C, Stahl D, West R, & Drummond C (2014). How important are positive and negative outcome expectancies in the treatment of addiction: a narrative review of the literature. Drugs and Alcohol Today, 14, 137–149, https://doi.org/10.1108/DAT-11–2013-0051.
40. Whiteside SA, & Lynam DR (2001). The five factor model and impulsivity: using a structural model of personality to understand impulsivity. Personality and Individual Differences, 30, 669–689.
41. VanderVeen JD, Hershberger AR, & Cyders MA (2016). UPPS-P model impulsivity and marijuana use behaviors in adolescents: A meta-analysis. Drug and Alcohol Dependence, 168, 181–190. https://doi.org/10.1016/j.drugalcdep.2016.09.016 [PubMed: 27682358]
42. Walden N, & Earleywine M (2008). How high? Quantity as a predictor of cannabis-related problems. Harm Reduction Journal, 5, 20. [PubMed: 18510745]
43. Sobell LC, & Sobell MB (1995). Alcohol timeline followback users' manual. Toronto, Canada: Addiction Research Foundation.
44. Darkes J & Goldman MS (1993). Expectancy challenge and drinking reduction: Experimental evidence for a mediational process. Journal of Consulting and Clinical Psychology, 61(2), 344–353. [PubMed: 8473588]
45. Fromme K, Kivlahan DR, & Alan Marlatt G (1986). Alcohol expectancies, risk identification, and secondary prevention with problem drinkers. Advances in Behaviour Research and Therapy, 8(4), 237–251.
46. Wood MD, Capone C, Laforge R, Erickson DJ, & Brand NH (2007). Brief motivational intervention and alcohol expectancy challenge with heavy drinking college students: A randomized factorial study. Addictive Behaviors, 32(11), 2509–2528. [PubMed: 17658696]

Table 1

Descriptives and Bivariate Correlations among UPPS-P Facets, Marijuana Expectancies, and Marijuana Outcomes

	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Sensation Seeking	2.72	0.69	-								
2. Lack of Premeditation	1.82	0.48	.02	-							
3. Lack of Perseverance	1.80	0.51	-.16	.56**	-						
4. Negative Urgency	2.40	0.64	.05	.28**	.24**	-					
5. Positive Urgency	2.13	0.61	.32**	.30**	.19**	.60**	-				
6. Positive Marijuana Expectancies	9.32	2.72	.30**	.02	.04	.05	.11*	-			
7. Negative Marijuana Expectancies	8.38	2.38	.09	.08	.22**	.03	.03	.34**	-		
8. Marijuana Use (past 180 days)	53.4	73.52	.25**	-.02	-.02	.04	.02	.40**	-.20**	-	
9. MUD Symptoms (past year)	3.24	3.22	.22**	.11	.20**	.16**	.23**	.30**	.11	.19**	-

Note. SD = standard deviation; MUD = Marijuana Use Disorder.

* $p < .05$

** $p < .01$.

Table 2

Standardized Regression Estimates for Direct and Indirect Effects on Marijuana Outcomes (n = 312)

	Model 1: Frequency of Marijuana Use			**Model 2: MUD Symptoms**		
	b	**s.e.**	***p***	**b**	**s.e.**	***p***
Age	.00	.06	.942	**-.11**	**.05**	**.020**
Male	.03	.06	.616	**.20**	**.06**	**.001**
Proband	.07	.05	.121	**.16**	**.05**	**.002**
Sensation Seeking	**.13**	**.06**	**.017**	.04	.06	.532
Positive MJ Expectancies	**.44**	**.04**	**.000**	**.23**	**.05**	**.000**
Negative MJ Expectancies	**-.30**	**.04**	**.000**	.04	.05	.428
SS > Positive MJ Expectancies	**.31**	**.05**	**.000**	**.31**	**.05**	**.000**
SS > Negative MJ Expectancies	.09	.06	.121	.09	.06	.123
SS > Positive MJ Expectancies > Outcome	**.14**	**.03**	**.000**	**.07**	**.02**	**.000**
SS > Negative MJ Expectancies > Outcome	-.03	.02	.136	.00	.00	.471

Note. b= beta; s.e.= standard error; SS= Sensation Seeking; MJ= marijuana; MUD= marijuana use disorder.