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Development of a Decisional Balance Scale for Young Adult Marijuana Use

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Abstract

This study describes the development and validation of a decisional balance scale for marijuana use in young adults. Scale development was accomplished in four phases. First, 53 participants (70% female, 68% freshman) provided qualitative data that yielded content for an initial set of 47 items. In the second phase, an exploratory factor analysis on the responses of 260 participants (52% female, 68% freshman) revealed two factors, corresponding to pros and cons. Items that did not load well on the factors were omitted, resulting in a reduced set of 36 items. In the third phase, 182 participants (49% female, 37% freshmen) completed the revised scale and an evaluation of factor structure led to scale revisions and model respecification to create a good-fitting model. The final scales consisted of 8 pros ($\alpha = 0.91$) and 16 cons ($\alpha = 0.93$), and showed evidence of validity. In the fourth phase ($N = 248$, 66% female, 70% freshman), we confirmed the factor structure, and provided further evidence for reliability and validity. The Marijuana Decisional Balance Scale enhances our ability to study motivational factors associated with marijuana use among young adults.

Keywords

marijuana; young adults; decisional balance; scale development; factor analysis

Marijuana is the most commonly used illegal drug in the United States; 16.5% of young adults (ages 18 to 25) have used marijuana within the past month (Substance Abuse and Mental Health Services Administration [SAMHSA], 2008). Despite its image as a relatively benign substance, some users experience negative consequences. As many as 9.4% of college freshman may have a marijuana use disorder (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008), and approximately 35% of users meet at least one criterion for marijuana dependence (Nocon, Wittchen, Pfister, Zimmerman & Lieb, 2006). Moreover, heavy marijuana use compromises cardiovascular health (Aryana & Williams, 2007), increases susceptibility to cancer (Hashibe, Straif, Tashkin, Morgenstern, Greenland, & Zhang, 2005), and impairs short- and long-term memory functioning (Pope and Yurgelun-Todd, 1996; Kouri, Pope, Yurgelun-Todd, & Gruber, 1995).

Given the relatively high prevalence, young adults may consider marijuana use as having benefits as well as consequences. Better understanding of user-identified benefits and

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consequences of using marijuana may inform prevention efforts. Due to the relative stability of marijuana use over time (Perkonig, Goodwin, Fiedler, Behrendt, Beesdo, Lieb et al., 2008), prevention efforts targeted to adolescents and young adults may avert establishment of long-term use patterns. Therefore, the purpose of this multi-phase study was to identify young adults' perceptions of the benefits and consequences of marijuana use and to develop and refine a reliable and valid measure of the pros and cons (i.e., *decisional balance*) of marijuana use.

Decisional balance (DB) provides a motivational framework for understanding use (Janis & Mann, 1977). Janis and Mann outline four content domains of pros and cons that are typically addressed during this process: (a) gains/losses for oneself, (b) gains/losses for significant others, (c) self-approval or -disapproval, and (d) approval or disapproval from significant others. DB is often simplified into two categories of pros and cons, which may be anchored with respect to either continuing or changing a target behavior.

Pros and cons not only provide information about positive and negative attitudes toward a behavior, but together may serve as a marker for readiness to change. Specifically, individuals further along a change process tend to report more pros and fewer cons of change and more cons and fewer pros of the problem behavior. These patterns emerge with a range of problem behaviors (Prochaska et al., 1994), including young adult alcohol and cigarette use (Migneault, Velicer, Prochaska, & Stevenson, 1999; Migneault, Pallonen, and Velicer, 1997; Pallonen, 1998). Yet, no formal measure of DB specific to marijuana currently exists.

Pros and cons resemble other cognitive-motivational constructs, including motives and expectancies, but are distinct in important ways. Scales measuring motives for marijuana use have been developed (e.g. Simons, Correia, Carey, & Borsari, 1998; Lee, Neighbors, & Woods, 2007). Although motives may parallel the pros of DB, motivational assessments do not address the perceived costs or undesirable aspects of marijuana use, a dimension known to be predictive of behavior change (Prochaska, 1994). Outcome expectancies for marijuana use (Schafer & Brown, 1991) may also be related to pros and cons. Expectancies address generalized cognitions about likely outcomes of use behavior, whereas pros and cons address motivational factors specific to an individual's decisions regarding future behavior (e.g. expectancies weighted by personal values). These conceptual differences suggest that a DB scale for marijuana may have unique predictive ability regarding marijuana use patterns. Pros and cons for using marijuana would describe what enhances or reduces interest in using marijuana, thus providing information on what features of marijuana are viewed as appealing versus aversive in young adults. For example, young adults may view enhanced relaxation as a motivator, or pro, and personality change as a deterrent, or con. Yet, no scale of this nature has yet been developed.

The purpose of this study was to create a DB scale for marijuana use targeted to young adults, and provide evidence for its factor structure, reliability, and validity. We accomplished this in four steps, all of which involved surveying undergraduates enrolled in introductory psychology courses in 2007–2008 attending a large urban private university in the northeastern United States. First, we obtained qualitative information about the perceived pros and cons of marijuana use. We transformed these responses into distinct statements for the scale, using the empirical literature as a secondary guide. Second, we administered these items to a new sample, conducted an exploratory factor analysis (EFA) on their responses to detect the underlying factor structure, and removed items with insufficient loadings. Third, we administered the reduced item pool to a new sample, and conducted confirmatory factor analyses of the measurement model. We assessed related

constructs to provide evidence of validity. Finally, we administered the final scale to an independent sample to confirm its factor structure and extend validity testing.

Phase I: Item Generation

In phase I, young adults generated pros and cons of marijuana use, through unstructured and structured exercises. Items for our initial measure were derived from the responses provided.

Phase I Method

Participants—Fifty-three students (M age = 19, SD = 0.91; 70% female, 62% White, 68% freshman) completed the study for credit toward an undergraduate psychology class. Of the 53 participants, 30 (57%) reported lifetime marijuana use. Marijuana users were similar to abstainers in age, gender, and year, but were more likely to be White ($\chi^2 = 9.26, p < 0.01$). Of the 30 lifetime users, their first experience with marijuana occurred at about age 15 (SD = 1.81, range: 12 – 19) and they reported using marijuana an average of 12 days (SD = 10.66, range: 0 – 30) in the last month. A sub-sample of lifetime marijuana users volunteered to complete an additional interview. This sub-sample (n = 10) was mostly male (60%), White (80%), and freshman (80%). They reported a similar age of first use (M = 14.70, SD = 2.00) and frequency of recent use (M = 15.60, SD = 12.49) to lifetime users who declined to be interviewed (age: M = 15.85, SD = 1.63; frequency: M = 10.35, SD = 9.47), all $ps > 0.10$.

Procedure—Participants assembled in small groups (of approximately ten) in a classroom. Written informed consent was obtained, and participants were informed of the protection of their data, including the Certificate of Confidentiality obtained from the National Institutes of Health (NIH). Participants completed questionnaires regarding (a) demographics (gender, age, ethnicity, year in school) and (b) their non-prescription use of legal and illegal drugs during the last 30 days and in their lifetime. Next, participants were asked to generate pros and cons of marijuana use, considering their own experiences and observations of others' experiences, along with speculations. Finally, participants were prompted to think about personal gains/losses from marijuana use, gains/losses for others, issues regarding self-approval and –disapproval, and approval and disapproval from others, consistent with Janis and Mann's (1977) framework. Participants recorded responses on a worksheet.

Participants who had used marijuana were invited to provide additional information via individual interviews. Ten volunteers (out of 12 participants who expressed interest) completed a half-hour interview, consisting of further elaboration of their reported pros and cons, along with structured prompts regarding possible domains of pros and cons (e.g. academic, social, health). We used this information to aid in item writing.

Phase I Results

All pros and cons generated by participants were reviewed and written in item form, following recommended principles for item writing (Clark & Watson, 1995). Comprehensive lists of pros and cons were constructed, with frequency counts (available from the first author upon request). Responses that appeared multiple times or that converged on a theme were retained as items. Responses that were vague (e.g. "I enjoy doing it"), obscure (e.g. "I heard it's good for your eyes"), or did not qualify as pros/cons (e.g. "There are no taxes on it") were excluded. Other responses were excluded because they contradicted more common responses (e.g. "It smells wonderful") or were more relevant for a medical population (e.g. "medicinal"). Items that occurred only once were not retained unless they reflected themes present in empirical articles on motivation for marijuana use. In total, 47 items were selected for our initial scale.

All items were reviewed and edited for clarity and conciseness. Items were phrased as statements regarding the positive and negative aspects of marijuana use. To assess the importance of each statement to participants' decision of whether to use marijuana, items were formatted to conform to a 5-point response option (1 = not at all important; 5 = very important). A 5-point response option was selected to maximize variability within responses.

Phase II: Scale Development

In phase II, we elicited responses to the initial set of 47 items for the purposes of discerning factor structure and refining items based on feedback. Our objective was to retain a smaller number of items with interpretable factor structure for the DB scale.

Phase II Method

Participants—Students ($N = 260$; M age = 19, $SD = 0.93$; 52% female, 62% White, 68% freshman) participated in exchange for credit toward their undergraduate psychology class. Sample size was determined *a priori* to exceed a five to one participant to item ratio (Gorsuch, 1983).

Procedure and Measures—Small groups of participants (up to 20 participants per session) provided written informed consent and were reminded of confidentiality protections. All participants completed demographic and substance use measures from Phase I, and the preliminary 47-item Marijuana Decisional Balance (MDB) scale. When responding to the MDB scale, participants were encouraged to consider the reasons why they chose to use marijuana or not to use marijuana, and rate the importance of each item as it might influence their own decisions to use or not use. In order to interpret the meaning of the items, participants were told to use all information available to them, using their own experiences when relevant but also secondhand information. The investigators encouraged participants to make note of any items that were unclear.

Phase II Results

Most participants (70%) reported lifetime experience with marijuana. Marijuana users were similar to abstainers in age and year in school, but users were more likely to be male ($\chi^2 = 6.21$, $p < 0.05$) and White ($\chi^2 = 26.01$, $p < 0.01$). Of those who had used marijuana, their first experience occurred at about age 16 ($SD = 1.80$, range = 8 – 20) and they reported using marijuana an average of 7 days ($SD = 9.21$, range 0 – 30) in the last month.

Exploratory Factor Analysis and Parallel Analysis—An exploratory factor analysis (EFA) using principal factor, or common factors extraction, was conducted. Factors were considered for retention using both the eigenvalues greater than one criterion and inspection of scree plots (Floyd & Widaman, 1995). Four factors emerged with eigenvalues greater than one (13.38, 6.21, 1.31, 1.03; representing proportions of variance of 0.49, 0.23, 0.05, and 0.04, respectively), but the scree plot suggested retention of two factors whose contents are best described as pros and cons of marijuana use. The third factor represented pros specifically associated with expansion or enhancement of experience. The fourth factor had no meaningful loadings that could be used to determine the content. We conducted a Parallel Analysis, which compares eigenvalues to those obtained by chance (Hayton, Allen, & Scarpello, 2004; Horn, 1965). The first two factors fell well over the chance level (greater than 5.0 difference in eigenvalues). Thus, the first two factors were distinct from the others both mathematically and theoretically, and accounted for 72% of the total scale variance.

Promax rotation was used to allow for the possibility of a correlation between factors (Preacher & MacCallum, 2003) (see Appendix A for rotated factor loadings). Items were

retained if they loaded .45 or greater on one factor and less than .30 on the other (Tabachnick & Fidell, 2007). Seven items that did not meet these requirements were deleted (items 9, 13, 14, 30, 33, 39, 47). Item loadings were again examined using data from the marijuana users, and four additional items were deleted because they did not meet the above criteria in the reduced sample (items 1, 12, 41, 42). Thus, eleven items that did not meet stated criteria for factor loadings in the EFA in both (a) the full sample and (b) the marijuana users sample were deleted. With the reduced set of 36 items, the two factors (pros and cons) accounted for 81% of the total variance. Items were edited for clarity using participants' recommendations.

Phase III: Psychometric Testing

The purpose of phase III was to conduct a confirmatory factor analysis (CFA) measurement model of the 36-item revised scale. Additional aims were to establish internal consistency and to assess evidence for construct validity for the pros and cons subscales.

Phase III Method

Participants & Procedures—Students ($N = 182$) completed the study either for credit toward their undergraduate psychology class ($n = 174$) or for a ten dollar payment ($n = 8$). Sample size was selected based on convention of five to ten participants per item (Floyd & Widaman, 1995). Phase III participants were 20 years of age ($SD = 1.30$, range = 18 – 24), White (58%), mostly freshman (37%) or sophomores (26%), and half were female (49%). Participants met in groups of less than 20, provided written informed consent, and completed survey packets.

Measures—Demographics and substance use measures from Phase I were used in Phase III; substance use measures assessed both past 30 day and lifetime use. Substance use measures were included to describe the sample and provide evidence of validity, since we expected frequency of marijuana use to correlate positively with pros and negatively with cons for marijuana use. Participants also completed the revised 36-item MDB Scale.

In addition, participants completed the 19-item Marijuana Problems Scale (MPS; Stephens, Roffman & Curtin, 2000) to provide evidence for validity. Participants rated whether they had experienced each problem within the past 30 days, and if so, at what level of severity (0 = no problem, 1 = minor problem, 2 = serious problem). One point is given for each response of either 'minor problem' or 'serious problem.' Participants also reported on lifetime problems. Internal consistencies for lifetime use and recent use were K-R 20 = 0.80 and K-R 20 = 0.74, respectively. Following empirical precedent from the alcohol literature, we expected that problems would correlate positively with pros but minimally with cons (cf. Noar, LaForge, Maddock, & Wood, 2003).

Also administered to provide further evidence for validity was the 48-item version of the Marijuana Effect Expectancy Questionnaire, the MEEQ-S (Aarons, Brown, Stice, & Coe, 2001), with five response options (1 = disagree strongly to 5 = agree strongly). Composite positive and negative expectancies were internally consistent in this sample (positive expectancies: $\alpha = 0.89$; negative expectancies: $\alpha = 0.87$). We expected pros to correlate positively with positive expectancies, as both address appealing features of marijuana that are likely to increase use, and cons to correlate positively with negative expectancies, as both address deterrents from use.

Participants' motivation to change marijuana use was assessed using the Marijuana Ladder (Slavet, Stein, Colby, Barnett, Monti, Golembeske, et al. 2006), ranging from no motivation to change marijuana use (1) to commitment to already-modified behavior (10). The

Marijuana Ladder has demonstrated both concurrent and predictive validity with marijuana use and treatment engagement in a group of incarcerated adolescents (Slavet et al.). For this study, the phrase “after release,” appearing in the original version, was omitted and an additional response option was included (0 = I have *never* used marijuana). Excluding lifetime abstainers, we expected that users reporting more costs of marijuana use and fewer benefits should report greater motivation to change on the Marijuana Ladder.

The Reasons for Not Using Marijuana (RNUM) items were taken from a 17-item scale focusing on alcohol consumption (Greenfield, Guydish, & Temple, 1989). The ten items that did not assume prior use were adapted for marijuana use for this study ($\alpha = 0.79$); the other seven items were excluded because they were not applicable to lifetime abstainers. For each of the 10 reasons for maintaining a period of abstinence, respondents rated how important that reason was to their decision to not use marijuana (0 = *very important*, 1 = *fairly important*, 2 = *not at all important*) or indicated *not applicable*. Only individuals who had *not* used marijuana in the past 30 days were asked to complete this measure, targeting those with deliberate efforts to limit use or abstain. This sample included both prior users and lifetime abstainers. Reasons for not using marijuana were expected to correlate positively with cons, and negatively with pros.

The 13-item Short Social Desirability Scale (Short SDS; Reynolds, 1982) was used to detect potential for presentation bias in responses to the new MDB Scale. Welte and Russell (1993) suggested higher scores on the SDS are associated with lower reports of alcohol and drug use. The K-R 20 coefficient for the Short SDS in this sample was 0.70.

Finally, two questions assessed participants’ (a) opinions on the legality of marijuana, and (b) concern about developing a dependence on marijuana. Students who supported legality were expected to report more pros and fewer cons than non-supporters; greater concern about dependence would be related to more cons and fewer pros.

Phase III Results

Of the 182 participants, 125 (69%) reported lifetime experience with marijuana. Marijuana users were similar to abstainers in age, gender, and year, but users were more likely to describe their ethnic identity as White ($\chi^2 = 5.44, p < 0.05$). Among lifetime users, their first experience occurred at about age 16 ($SD = 1.76$, range = 12 – 21) and they reported using marijuana an average of 7 days in the last month ($SD = 9.54$, range = 0 – 30).

Data Screening—Before conducting a CFA measurement model, we (a) screened our data for missing observations, (b) inspected inter-item correlations among variables for multicollinearity, and examined our data for (c) univariate and (d) multivariate normality consistent with structural equation modeling procedures described by Kline (1998). Most participants ($n = 172$) responded to all MDB items, with only ten participants missing one or more items. Twelve responses were missing, with no more than two participants missing any given item. Because no consistent patterns were observed (i.e., missing data assumed to be at random), we opted to estimate missing data using maximum likelihood estimation procedures.

Next, we analyzed inter-item correlations for multicollinearity, confirming that two highly correlated items in Phase II were also highly correlated in Phase III ($r = 0.88, p < 0.01$; “I would feel happy when I’m high” and “I would feel good when I’m high”). Because the high correlation replicated across samples, indicating that the items were seen as virtually identical, the item most problematic was deleted (item 5: “I would feel good when I’m high”). Correlations between two other pairs of items were high (“It is something fun and exciting to do, especially if I’m bored” and “It would make things funnier,” $r = 0.70$; “It

could serve as a ‘gateway drug,’ leading to more dangerous drug use” and “It could lead to dependency or addiction,” $r = 0.72$), but the items were retained because they appeared theoretically distinct.

Items were evaluated for univariate normality. The MDB items were evaluated for skewness in both the Phase II and III datasets. Eight items that exhibited significant skew in both samples were deleted from the model. Consistently skewed items are undesirable because they are less informative (i.e., less variability in responses), because they are likely to correlate poorly with other items, and because skewed variables are more prone to unstable correlations with other constructs (Clark & Watson, 1995).

Finally, we evaluated our data for multivariate normality using the Mahalanobis distance test (d^2). A lack of multivariate normality was found. Three participants’ data that were most problematic were excluded and the model was rerun; results were consistent with and without these data and thus responses were retained.

Confirmatory Factor Analysis Measurement Model—To assess how well the data fit with the proposed model of pros and cons, we ran a CFA measurement model using AMOS 16 (Arbuckle, 2006). Model fit was assessed using the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and chi-square/degrees of freedom ratio (Kline, 1998). CFI compares the hypothesized model with the independence model, in which nothing is related (Byrne, 2001). A CFI of 0.95 or above indicates good fit. The RMSEA estimates how well the model fits with the estimated population covariance matrix (Byrne, 2001). RMSEA should be well under 0.10, and preferably under 0.06 (Tabachnick & Fidell, 2007). A good fitting model is assumed when chi-square is non-significant; however, chi-square is extremely sensitive to sample size. To minimize this problem, chi-square is divided by the degrees of freedom with a chi-square/ df ratio of 3 or less indicating acceptable fit (Kline, 1998).

Fit of our initial model was poor (CFI = 0.87; RMSEA = .08; $\chi^2 = 722.86$, $df = 349$, $\chi^2/df = 2.02$). Inspection of the standardized residual covariances indicated two problem items (“It could enhance my creativity and the creative process [e.g. making art or music, writing]”; “It’s an escape from reality and everyday life”). These two items were removed because several high standardized residual covariances indicated that they did not fit well in the model (standardized residual covariances fell over 2 with several other items). The respecified model was analyzed using CFA: CFI = 0.88; RMSEA = .08; $\chi^2 = 603.11$, $df = 298$, $\chi^2/df = 2.02$. One additional item (“It could change how I act in social situations, for the worse [e.g. it would make me socially awkward, insensitive to others’ feelings]”) was then removed because of (a) high standardized residual covariances (over 2), (b) it was listed in several modification indices (when run with complete data), and (c) a high loading on the opposing factor. Fit statistics for the respecified model were: CFI = 0.89; RMSEA = .08; $\chi^2 = 554.42$, $df = 274$, $\chi^2/df = 2.02$.

Following these deletions, patterns of standardized residual covariances, modification indices, and theoretical links between items were further evaluated. Seven high error covariance associations were incorporated into the model by linking items, indicating that these sets of items prompted similar response patterns across participants. Our final model (Figure 1) fit the data well (CFI = 0.95; RMSEA = .05; $\chi^2 = 359.22$, $df = 244$, $\chi^2/df = 1.47$). Thus, the final scale consisted of 24 items, with eight pros and 16 cons (see Appendix B for final items). This model fit better than both a two-factor uncorrelated model ($p < .001$) and a one-factor model ($p < .001$).

Reliability and Validity—Subscales were found to be internally consistent ($\alpha = 0.91$ for pros and 0.93 for cons) and yielded a mean endorsement level of 2.77 ($SD = 1.06$) for pros items and 3.10 ($SD = 1.03$) for cons items. Pros and cons were negatively correlated ($r = -0.39, p < 0.01$). For descriptive purposes, we evaluated the associations of pros and cons with demographics (gender, age, year, and ethnicity). Pros did not differ by gender, age, year, or ethnicity, all $ps \geq 0.06$. Cons did not differ by year ($p = 0.43$), but did differ by gender ($p < 0.01$), age ($p < 0.05$), and ethnicity ($p < 0.01$). Women, younger students, and non-White students endorsed more cons than men, older students, and Whites ($ps < .05$). Lifetime marijuana users reported more pros ($M = 3.16, SD = 0.90$) and fewer cons ($M = 2.75, SD = 0.91$) than lifetime abstainers (pros: $M = 1.90, SD = 0.86$; cons: $M = 3.85, SD = 0.86$), all $ps < 0.01$. We also explored correlations with social desirability, which was significantly related to pros ($r = -0.18, p < 0.05$) but not to cons ($r = -0.05, p = 0.47$).

Evidence for the validity of the pros and cons subscales came from several sources. First, we tested hypothesized associations with other measures related to marijuana use (see Table 1). Participants who reported any use in the previous month ($n = 75$) used on an average of 11 days in that month ($SD = 10.19$; range = 1 to 30). Frequency of use was marginally positively associated with pros ($r = 0.22, p = 0.057$) but was not related to cons ($r = -0.15, p = 0.19$). Recent ($n = 75$) and lifetime ($n = 126$) marijuana users reported an average of 3.09 ($SD = 2.69$) recent problems and 4.03 ($SD = 3.18$) lifetime problems, respectively. As predicted, problems were at least marginally positively associated with pros (recent: $r = 0.22, p = 0.06$; lifetime: $r = 0.35, p < 0.05$). Problems and cons were not significantly correlated (recent: $r = 0.17, p = 0.16$; lifetime: $r = 0.01, p = 0.93$).

All 182 participants completed the MEEQ-S, yielding data on positive and negative expectancies. As expected, pros and positive expectancies were positively correlated ($r = 0.37, p < 0.05$), as were cons and negative expectancies ($r = 0.41, p < 0.05$).

On the Marijuana Ladder, lifetime marijuana users ($n = 125$) averaged 6.51 ($SD = 3.25$) out of 10, and motivation to change was negatively associated with pros ($r = -0.21, p < .05$), but the predicted positive correlation with cons was not significant ($r = 0.15, p = .09$). The RNUM was completed by the 106 participants who had *not* used marijuana in the last month; the RNUM correlated negatively with pros ($r = -0.55, p < .05$) and positively with cons ($r = 0.67, p < .05$).

Marijuana opinion questions also provide partial support for validity. Lifetime marijuana users ($n = 126$) reported minimal dependence concern, averaging 1.40 ($SD = 0.80$; range = 1–5). Dependence concern was not associated with pros ($r = 0.08, p = .35$) or cons ($r = 0.10, p = .25$). All 182 participants responded to the question regarding support for legality. The average score was 3.26 ($SD = 1.31$; range = 1–5), indicating a trend toward approval of legality; this score was positively associated with pros ($r = 0.39, p < .01$) and negatively associated with cons ($r = -0.39, p < .01$).

Phase IV: Confirmation Phase

The purpose of phase IV was to conduct a CFA on the 24-item MDB scale with an independent sample. In addition, reliability and construct validity analyses were replicated and extended. We also present evidence of incremental validity.

Phase IV Method

Participants & Procedures—A total of 248 students (M age = 19, $SD = 0.89$; 66% female, 63% White, 70% freshman) completed Phase IV for course credit. Sample size was determined based on the need for 10 participants per item (Floyd & Widaman, 1995).

Participants met in groups of 20 to 25 in computer labs, provided informed consent, and completed the questionnaires online.

Measures—All measures from Phase III were used, along with two additional measures. The Stage of Change Questionnaire (SOCQ) was adapted for cannabis use from the Smoking: Stage of Change Short Form (DiClemente, Prochaska, Fairhurst, Velicer, Rossi, & Velasquez, 1991). The SOCQ assesses current use, past quit attempts, and quit intentions, and assigns individuals to stages (precontemplation, contemplation, preparation, action, maintenance, nonuser) consistent with the transtheoretical model of change (Prochaska & DiClemente, 1982). This scale was used to determine if the crossover pattern observed for other problem behaviors (e.g. Prochaska et al., 1994) held for marijuana use. Specifically, prior research suggests that pros would exceed cons in precontemplation and contemplation stages of change, whereas cons may exceed pros by the action stage of change. In addition, all participants were asked how likely they were to use marijuana in the next week, next month, and ever in the future, using a six-point scale (1 = *definitely will not*; 6 = *definitely will*). The items were internally consistent ($\alpha = 0.93$), and averaged to create a composite behavioral intentions scale for a proxy test of predictive validity.

Phase IV Results

Of the 248 participants, 150 (60%) reported lifetime marijuana use. Marijuana users were similar to abstainers in age and year, but more lifetime use was reported by males ($\chi^2 = 9.74$, $p < 0.01$) and White students ($\chi^2 = 27.90$, $p < 0.01$). Of those who had used marijuana, first experience occurred at age 16 ($SD = 1.59$, range = 12 – 20). Recent users ($n = 101$) reported using marijuana an average of 10 days ($SD = 9.34$, range = 1 – 30) in the last month.

Confirmatory Factor Analysis—CFA was used to examine the factor structure of the model. Maximum likelihood estimation was used to estimate missing data (12 participants had missing data). Overall fit statistics indicated adequate fit; chi-square/degrees of freedom ratio was 2.02 ($\chi^2 = 493.65$, $df = 244$, $p < 0.001$). CFI was 0.94, just under the desired level of 0.95, but within other acceptable ranges of 0.90–1, and the RMSEA fell at 0.06, which is considered acceptable (Kline, 1998).

Descriptive Analyses—Pros did not vary by age, year, or ethnicity, all $ps \geq .23$. Males reported more pros than females ($p < .05$). Cons did not vary by age ($p = .74$) or year ($p = .25$). Again, females reported more cons than males ($p < .05$). Cons also differed by ethnicity ($p < .05$); Asian-American students reported the most cons whereas White students reported the fewest. In contrast to Phase III, pros were not associated with social desirability ($r = -0.06$, $p = 0.33$), and social desirability remained uncorrelated with cons ($r = -0.04$, $p = 0.48$). Again, pros and cons were significantly negatively correlated ($r = -0.40$, $p < .05$).

Reliability and Validity—Internal consistency of the pros and cons subscales of the MDB scale was supported in Phase IV. Alphas for pros and cons were 0.91 and 0.95, respectively.

As shown in Table 1, the bivariate validity analyses from Phase IV were generally consistent with previous findings (see Table 1). Phases III and IV data were then combined for the purpose of obtaining the most stable correlations with a larger sample. Additional evidence of validity emerged in the relationship of pros and cons to the new scales introduced in Phase IV. Behavioral intentions correlated positively with pros, $r = 0.68$, and negatively with cons, $r = -0.59$, both $ps < .05$. The expected pattern of pros and cons emerged across stage of change (Figure 2). We restricted these analyses to lifetime users, and found that earlier stages were associated with more pros ($F [4, 146] = 16.66$, $p < .01$) and fewer cons ($F [4, 146] = 5.05$, $p < .01$) than later stages.

To address the issue of whether pros and cons contributed unique variance in relation to one another, several regression analyses were run to test whether pros and cons predicted other variables independently. Both pros and cons independently predicted behavioral intentions ($\beta_{\text{pros}} = .53$, $\beta_{\text{cons}} = -.38$, $R^2 = .59$, $p < 0.001$), use frequency ($\beta_{\text{pros}} = .26$, $\beta_{\text{cons}} = -.29$, $R^2 = .12$, $p < 0.01$), motivation to change ($\beta_{\text{pros}} = -.51$, $\beta_{\text{cons}} = .36$, $R^2 = .53$, $p < 0.001$), and reasons for not using marijuana ($\beta_{\text{pros}} = -.31$, $\beta_{\text{cons}} = .49$, $R^2 = .44$, $p < 0.001$). Consistent with bivariate relationships, pros but not cons predicted recent and lifetime problems ($\beta = .27$ and $.32$, respectively).

In addition to demonstrating construct validity, it is important to show that the MDB scales provide predictive incremental validity beyond that provided by similar cognitive constructs. An exploratory analysis addressed the relative value of the MDB compared to expectancies in the prediction of behavioral intentions to use. Intentions correlated more highly with pros ($r = 0.68$) and cons ($r = -0.59$) than with positive expectancies ($r = 0.33$) and negative expectancies ($r = -0.16$), though all were significantly associated. A regression equation using pros and cons to predict behavioral intentions explained more variance ($R^2 = 0.59$) than one composed of positive and negative expectancies ($R^2 = 0.22$). Hierarchical regression was used to demonstrate incremental validity of pros and cons over and above positive and negative expectancies for behavioral intentions. Intentions was regressed first on positive and negative expectancies, and then on expectancies combined with pros and cons. All predictors in this model explained significant amounts of variance ($ps \leq .001$); pros and cons increased R^2 from $.22$ to $.60$.

Discussion

This series of studies developed a decisional balance scale to assess the costs and benefits of marijuana use among young adults. The final MDB scale contains 24 items, with 8 representing pros and 16 representing cons of marijuana use. Reliability analyses indicated strong internal consistency ($\alpha > 0.90$ for both subscales). The MDB scale represents a new tool for understanding motivations to use marijuana.

Pros and cons were moderately but inversely correlated, suggesting that these constructs are related but represent independent sources of information. Though rarely reported in published studies, the correlations between pros and cons ranges from essentially zero to slightly positive for other behaviors such as drinking by college students (Migneault et al., 1999; Noar et al., 2003) and physicians' implementation of smoking cessation programs (Park et al., 2001). Thus, pros and cons appear to be more strongly related for marijuana use, which differs from other behaviors studied with regard to its illegal status.

The majority of predictions about the presence and directionality of relationships with other known measures were supported. Endorsement of the pros of marijuana use was associated with greater frequency of use, intentions to use in the future, and more problems, as well as stronger positive expectancies and attitudes in favor of legalizing marijuana. These findings are consistent with a generally favorable evaluation of and/or greater involvement with marijuana. Endorsement of the cons of marijuana use was more likely by females, younger and non-White participants. Stronger endorsement of cons was associated with less frequent use and lower intentions to use, consistent with previous research showing a negative relation between use frequency and perceived risk (e.g. Kilmer et al., 2007). Participants who endorsed cons held stronger negative outcome expectancies and were unlikely to favor legalizing marijuana. Yet, cons were inconsistently related to marijuana-related problems. This finding is consistent with Noar et al. (2003) with regard to alcohol DB, and suggests that even users experiencing few problems acknowledge that there are cons to using marijuana. We observed the potential for social desirability bias on pros in one sample, but

no relationship with cons. Thus, participants who tried to present themselves in a socially desirable light were reluctant to endorse pros of marijuana use, perhaps because it is an illicit substance. The potential for social desirability bias should be taken into account in future research using this scale.

The incremental validity of the MDB scales was supported with regard to positive and negative expectancies. Pros and cons predicted behavioral intentions better than expectancies did, most likely reflecting the personalized, motivational component of pros and cons not seen in expectancies. However, how well pros and cons predict future use remains untested.

The association between marijuana pros and cons across stages of change provides cross-sectional support for predictions from the transtheoretical model of change. Specifically, the “crossover effect” appears to occur on the cusp of the Preparation and Action phases. This is a late point in the stages according to some health behaviors (e.g., safe sex), but approximates the point at which the crossover occurs for other behaviors (e.g., exercising) (Prochaska et al., 1994).

Overall, analyses support the construct validity of the pros and cons subscales. In addition, the pros and cons in the final scale reflect several of the content domains suggested by Janis and Mann (1977), including personal gains/losses from marijuana use (e.g. “It would help me sleep”), gains/losses for others (e.g. “It may cause me to be a bad influence on others”), and issues regarding approval and disapproval from others (e.g. “It’s not accepted or approved of by people who are important to me”). Although no retained item directly references self –approval or –disapproval, many items imply approval or disapproval based on item valence.

Several strengths of this study enhance confidence in the findings. The MDB scale was developed based on the input and responses from four independent samples from a relevant population in a four-phase design. Samples included both marijuana users and abstainers, and thus addressed pros and cons associated with both decisional outcomes. Due to the advertisement of this project as a study of marijuana use, users were over-sampled; indeed, the prevalence of recent use exceeds that of national samples of young adults (Gledhill-Hoyt, Lee, Strote, & Wechsler, 2000). Validation and confirmation phases of the research employed well-validated, psychometrically sound measures, and revealed theoretically-consistent patterns of relationships.

As with any research, this study was subject to limitations. The sample sizes, though adequate according to published guidelines, fell at the low end of the target ranges. As a result, the marijuana users and abstainers were analyzed simultaneously; it is possible that they might produce distinct patterns in data that could have been detected with larger samples. Although sample size limitations preclude separate factor analyses by use subgroup, *validity* analyses by use subgroup provided generally consistent results (results available upon request from the first author). Though marijuana users were over-represented (relative to population prevalence), the inclusion of abstainers may have led to the retaining of some items less frequently endorsed by marijuana users, and may be related to the large number of cons in the final scale. Differing patterns in data may also even be detected between former versus current users, though this is likely to be less significant than the differences between users and abstainers. Additionally, the psychometric support for the scale has only been collected in self-selected undergraduate samples at a single university in the northeastern United States, potentially limiting external validity. The young adults of this sample represent a demographic (18–25 years) at high risk for marijuana use, and both genders and several ethnicities are represented in the sample; however, education and

residence on a college campus may limit generalizability. Also, rates of recent use in the current samples clearly exceed most other young adult populations (SAMHSA, 2008); last month prevalence of use ranged from 40.7%-50.9%, compared to approximately 16.5% nationally among 18–25 year olds. Generalizability to non-college attending adults thus cannot be assumed; further research must be done before the scale is used with other populations.

Additional research would help to establish the utility of the MDB scale. First, replicating the factor structure with new populations (e.g., those with cannabis dependence) could shed light on its generalizability. Similarly, validating the scale with other populations would support its utility beyond young adults attending college. Second, the incremental validity of pros and cons could be further addressed by comparing them to generic drug use DB scales or other psychological constructs like motives; such designs could establish the extent to which the MDB scales provide unique or greater explanatory power than alternative measures. Third, tests for true predictive validity are needed to determine the degree to which pros and cons predict subsequent marijuana use throughout the life course. For example, MDB scales may predict the onset and/or escalation of use in a developmental context. Furthermore, among established users, the MDB scale may serve as a method of monitoring motivational changes over time; if scores on pros and cons do predict future use, then changes in DB components might reflect increases or decreases in motivation or readiness to change. Finally, test-retest reliability has not yet been assessed, thus we do not yet know how stable pros and cons remain over time.

A DB scale for marijuana use could be helpful within clinical contexts, stimulating discussions in therapy. Eliciting the pros and cons of use may aid an individual in identifying sources of ambivalence about marijuana use, a technique used in Motivational Interviewing (Miller & Rollnick, 2002). This exercise helps the client articulate personal reasons for behavior change, which may promote movement through stages of change. Although the therapeutic DB exercise often involves generation of ideas without suggestions, the MDB scale may facilitate more guided discussions. Additionally, the MDB scale could serve as a screening mechanism for interventions, such that individuals reporting many pros could be targeted for decisional balance based interventions designed to build motivation to change use.

DB, or the consideration of pros and cons, is a prominent concept in behavioral change (Prochaska et al., 1994). Its key role in decision making allows clinicians to gain insight into the willingness of the individual to embark on the process of change. This scale development project marks the initial step toward an empirical understanding of the pros and cons of marijuana use. The MDB scale allows for theory testing, exploration of the utility of the DB concept for marijuana use, and provides a potential marker of motivation for change. Additional research is needed to confirm structure in more diverse samples and explore predictive validity. In sum, we provide initial evidence that marijuana use can be assessed from a DB framework, and that such a framework may advance our ability to predict current and future marijuana use.

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Appendix A

(Promax) Rotated factor loadings from Phase II Exploratory Factor Analysis

Item		Factor 1 Cons	Factor 2 Pros	Mean (SD)
2	It's illegal, and I could get caught.	0.62	−0.08	3.30 (1.51)
3	It's not accepted or approved of by people	0.57	−0.23	3.05 (1.49)

Item		Factor 1 Cons	Factor 2 Pros	Mean (SD)
	who are important to me.			
5	It could impair my performance in my daily activities.	0.69	-0.05	3.33 (1.43)
7	It could reduce my ability to pay attention or remember things.	0.69	-0.00	3.30 (1.39)
10	It's not socially acceptable.	0.56	-0.16	2.25 (1.39)
16	It could make me feel bad physically (e.g. dry mouth, red eyes, racing heart).	0.66	-0.10	3.13 (1.44)
18	It could have unpleasant psychological effects (e.g. mood swings, depression, paranoia).	0.73	-0.07	3.07 (1.53)
20	It could be laced with other drugs.	0.47	0.01	3.18 (1.65)
22	It might cause damage to my body (e.g. brain, lungs, heart).	0.72	-0.13	3.60 (1.42)
24	It could impair my reaction time, vision, or perception.	0.69	0.00	3.22 (1.39)
25	It could serve as a "gateway drug," leading to more dangerous drug use.	0.72	0.07	2.96 (1.75)
27	It could lead to dependency or addiction.	0.76	-0.03	2.97 (1.68)
29	It could change how I act in social situations, for the worse (e.g. it would make me socially awkward, insensitive to others' feelings).	0.60	0.07	2.72 (1.47)
32	It may cause me to be a bad influence on others.	0.67	-0.06	2.92 (1.46)
34	It could make me feel "burnt out" or less energetic.	0.64	0.06	3.11 (1.43)
36	It could damage my current relationships.	0.70	-0.11	3.11 (1.59)
38	It could cause me to make the wrong type of friends.	0.73	-0.03	3.01 (1.60)
40	It could make me fail drug tests, which could disqualify me from jobs or other activities.	0.63	0.02	3.77 (1.47)
44	It could give me a bad image (e.g. labeled as a "pothead").	0.74	-0.11	2.98 (1.60)
45	It could impair my judgment, which may endanger myself or others.	0.72	-0.04	3.31 (1.52)
4	I would feel happy when I'm high.	-0.25	0.65	2.88 (1.30)
6	I would feel good when I'm high.	-0.28	0.69	3.12 (1.39)
8	It would relieve stress, anxiety, or worry.	-0.12	0.64	3.19 (1.39)
11	It could create opportunities for social activities (e.g., meeting new people, bonding, or spending time with friends).	-0.06	0.52	2.58 (1.32)
15	It could enhance reality or change the way I see the world.	0.12	0.65	2.34 (1.29)
17	It could enhance my creativity and the creative process (e.g. making art or music, writing).	0.12	0.63	2.39 (1.34)
19	Everyday activities would be more enjoyable (e.g. watching TV or movies, listening to music, playing video games).	-0.13	0.70	2.82 (1.40)
21	It is something fun and exciting to do, especially if I'm bored.	-0.13	0.70	2.59 (1.40)
23	It would make me more relaxed or calm.	-0.19	0.70	2.87 (1.29)
26	It would help me sleep.	-0.15	0.57	2.43 (1.37)

Item		Factor 1 Cons	Factor 2 Pros	Mean (SD)
28	It would make food taste better.	-0.13	<i>0.56</i>	2.00 (1.30)
31	I find the culture of those who smoke marijuana appealing.	0.02	<i>0.58</i>	2.03 (1.22)
35	It would make things funnier.	-0.14	<i>0.66</i>	3.04 (1.36)
37	It could help me have deep, new thoughts.	0.03	<i>0.71</i>	2.28 (1.26)
43	It's an escape from reality and everyday life.	-0.02	<i>0.63</i>	2.50 (1.37)
46	It could improve sex.	0.00	<i>0.57</i>	2.17 (1.35)
Items omitted ^a				
1	It seems like a "safe" way to get high.	-0.19	0.51	2.77 (1.34)
9	It's expensive.	0.38	0.20	2.92 (1.45)
12	It smells bad.	0.52	-0.12	2.05 (1.39)
13	Using marijuana would make others see me more positively (e.g. cool, fun, or sociable).	0.19	0.40	1.67 (0.94)
14	It would give me the munchies (increase my appetite).	0.17	0.45	2.08 (1.31)
30	It's against my morals or values.	0.62	-0.31	2.90 (1.72)
33	It would make me feel more rebellious or unconventional.	0.40	0.34	2.05 (1.29)
39	My friends want or expect me to smoke.	0.18	0.38	1.87 (1.19)
41	It could help get rid of headaches.	0.09	0.51	1.85 (1.09)
42	It could make me tired, sleepy, lazy, or slow.	0.55	0.12	2.88 (1.46)
47	It would help me to concentrate and be more productive.	0.31	0.59	2.05 (1.26)

Note. $N = 260$. Italicized factor loadings indicate that the item loaded significantly on a single factor.

^a Items were omitted from final factors because they (a) did not load highly enough ($>.45$) on one, (b) cross-loaded ($>.30$ on second factor) or (c) did not retain loading above .45 criterion in reduced sample of marijuana users.

Appendix B

Final Items

Item
Pros
I would feel happy when I'm high. (3)
It would relieve stress, anxiety, or worry. (6)
It could create opportunities for social activities (e.g., meeting new people, bonding, or spending time with friends). (9)
Everyday activities would be more enjoyable (e.g. watching TV or movies, listening to music, playing video games). (12)
It is something fun and exciting to do, especially if I'm bored. (15)
It would make me more relaxed or calm. (18)
It would help me sleep. (21)
It would make things funnier. (24)
Cons
It's illegal, and I could get caught. (1)

Item
It's not accepted or approved of by people who are important to me. (2)
It could impair my performance in my daily activities. (4)
It could reduce my ability to pay attention or remember things. (5)
It could make me feel bad physically (e.g. dry mouth, red eyes, racing heart). (7)
It could have unpleasant psychological effects (e.g. mood swings, depression, paranoia). (8)
It could contain other drugs. (10)
It could impair my reaction time, vision, or perception. (11)
It could serve as a "gateway drug," leading to more dangerous drug use. (13)
It could lead to dependency or addiction. (14)
It may cause me to be a bad influence on others. (16)
It could make me feel "burnt out" or less energetic. (17)
It could damage my current relationships. (19)
It could cause me to make the wrong type of friends. (20)
It could give me a bad image (e.g. labeled as a "pothead"). (22)
It could impair my judgment, which may endanger myself or others. (23)

Note. Item numbers in parentheses correspond with items in Figure 1.

Figure 1.
Final Model from the Phase III Confirmatory Factor Analysis.

Figure 2. Pros and Cons by Stage of Change. All Stage IV participants who had used marijuana were grouped as follows: precontemplation ($n = 82$), contemplation ($n = 24$), preparation ($n = 3$), action ($n = 17$), and maintenance ($n = 25$).

Table 1
Validity Assessment Correlations for Phases III (N = 182) and IV (N = 248) and Combined Sample (N = 430)

	Pros					Cons		
	Predicted	Phase III	Phase IV	Combined Sample	Predicted	Phase III	Phase IV	Combined Sample
Positive expectancies	+	+0.37*	+0.39*	+0.38*	0	-0.01	-0.17*	-0.10*
Negative expectancies	0	-0.10	-0.02	-0.05	+	+0.41*	+0.31*	+0.35*
Support for legality	+	+0.39*	+0.43*	+0.41*	-	-0.39*	-0.40*	-0.40*
Behavioral Intention to use	+	n/a	+0.68*	+0.68*	-	n/a	-0.59*	-0.59*
Use Frequency (recent users) ^a	+	+0.22	+0.20*	+0.21*	-	-0.15	-0.24*	-0.21*
Recent problems (recent users) ^a	+	+0.22	+0.30*	+0.26*	0	+0.17	+0.21*	+0.19*
Lifetime problems (lifetime users) ^b	+	+0.35*	+0.32*	+0.33*	0	+0.01	-0.12	-0.08
Marijuana Ladder (lifetime users) ^b	-	-0.21*	-0.32*	-0.27*	+	+0.15	+0.25*	+0.20*
Dependence concern (lifetime users) ^b	-	+0.08	+0.18*	+0.14*	+	+0.10	+0.12	+0.11
Reasons for Not Using Marijuana ^c	-	-0.55*	-0.47*	-0.51*	+	+0.67*	+0.59*	+0.62*

Note. Asterisks (*) indicate significance, $p < 0.05$. For predictions, "+," indicates a predicted positive association, "-" indicates a predicted negative association, and "0" indicates no predicted association.

^aRecent (past 30 day) marijuana users: Phase III, $n = 75$; Phase IV, $n = 101$; Combined $n = 176$.

^bLifetime marijuana users: Phase III, $n = 126$; Phase IV, $n = 150$; Combined, $n = 276$.

^cOnly participants who had abstained in the last 30 days responded: Phase III, $n = 106$; Phase IV, $n = 134$; Combined $n = 240$.