

# Measuring Protective Behavioral Strategies for Marijuana Use Among Young Adults

ERIC R. PEDERSEN, PH.D.,<sup>a,\*</sup> JUSTIN F. HUMMER, M.A.,<sup>b</sup> DIPALI VENKATARAMAN RINKER, PH.D.,<sup>c</sup>  
ZACH K. TRAYLOR, B.S.,<sup>c</sup> & CLAYTON NEIGHBORS, PH.D.<sup>c</sup>

<sup>a</sup>*Department of Behavioral and Policy Sciences, RAND Corporation, Santa Monica, California*

<sup>b</sup>*Department of Psychology, University of Southern California, Los Angeles, California*

<sup>c</sup>*Department of Psychology, University of Houston, Houston, Texas*

**ABSTRACT. Objective:** Marijuana use can result in a variety of negative consequences, yet it remains popular among young adults and the general public at large. Combined with the growing empirical support for the benefits of medicinal marijuana as well as the steady increase in popular opinion regarding its legalization, it is of growing importance to identify strategies that may mitigate the harms related to marijuana use, reduce consumption levels, and limit resulting negative consequences among young adults who use marijuana. The purpose of this study was to develop and conduct initial psychometric analyses on a new scale, which we named the Protective Behavioral Strategies for Marijuana (PBSM) scale. **Method:** A sample of undergraduate college students who reported past-6-month marijuana use ( $n = 210$ ) responded to the initial pool of PBSM items and completed measures of marijuana use,

consequences from marijuana use, alcohol use, and protective behavioral strategies for alcohol. **Results:** Results from an iterative principal component analyses process yielded a single-factor structure with 39 items. The PBSM mean composite score negatively associated with marijuana use and consequences, with the strongest correlations evident for past-month users. The PBSM also significantly positively correlated with alcohol protective strategies. **Conclusions:** Protective behavioral strategies for marijuana appear to be a measurable construct that are related to marijuana frequency and consequences, and thus may be a useful component of intervention and prevention programs with young adults. More work testing the PBSM items with larger and more diverse samples of young adults is encouraged. (*J. Stud. Alcohol Drugs*, 77, 441–450, 2016)

YOUNG ADULTS ARE AN AT-RISK POPULATION for marijuana use and negative consequences. During young adulthood, marijuana use reaches its peak (Johnston et al., 2014), with nationwide data indicating that approximately 1 in 3 young adults have used marijuana in the past year and 1 in 5 report past-30-day use (Johnston et al., 2014; Substance Abuse and Mental Health Services Administration, 2014). Daily marijuana use is now at its highest rate among college students in more than three decades, and 1 in 10 non-college young adults report daily use (Johnston et al., 2014). Young adults who use marijuana frequently have an increased risk for a variety of short- and long-term consequences, such as injuries and accidents, decreased academic performance, cognitive difficulties such as memory loss, risky sexual behavior, physical complications such as poor lung capacity and difficulty breathing, lower self-confidence and self-esteem, and psychological difficulties such as increased depression and social anxiety (Buckner et al., 2010; Hall & Degenhardt, 2009; Kalant, 2004; Looby & Earleywine, 2007; Simons et al., 2010; Taylor et al., 2000).

Although there is evidence that heavy and chronic use of

marijuana can be problematic for some users, recent longitudinal work suggests that chronic teenage use may not be linked to long-term physical and mental health consequences (Bechtold et al., 2015). In addition, the benefits of medicinal marijuana are becoming better understood (Fischer et al., 2015). Long-standing barriers limiting medical and psychological research with marijuana and its derivatives are beginning to ease, thereby opening the way for scientific study of the therapeutic effects of the drug. These effects include the drug's purported ability to reduce nausea and vomiting, stimulate appetite, promote weight gain and the sense of taste in cancer patients, improve symptoms of chronic neuropathic pain and pain associated with chemotherapy, alleviate symptoms of spasticity associated with multiple sclerosis, and diminish intraocular pressure from glaucoma (Grant et al., 2012; Koppel et al., 2014). Several states in the United States have begun legalizing recreational use, medicinal use, and personal cultivation of marijuana. As of early 2015, 18 states had passed laws decriminalizing possession of marijuana, 23 had legalized medical marijuana use, and 4 had legalized marijuana for recreational use. The societal and cultural messages young people are receiving about the limited harms associated with recreational marijuana use may further influence their perceptions about risks. Indeed, young adults believe that marijuana is generally low risk and/or the consequences following use are tolerable (Johnston et al., 2014; Kilmer et al., 2007; Lee et al., 2009).

Given the prevalence of marijuana use among young adults, emerging research on long-term harms, the trend in

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\*Correspondence may be sent to Eric R. Pedersen at the Department of Behavioral and Policy Sciences, RAND Corporation, 1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138, or via email at: ericp@rand.org.

new legalization laws, and perceptions about the low risks resulting from use, it is of growing importance to provide more focused attention on reducing unwanted consequences of using marijuana rather than focusing exclusively on prevention of use in any form (i.e., abstinence). Substance use disorder researchers have discussed harm-reduction principles for addressing substance use behaviors in both recreational users and in heavy/chronic users (Marlatt et al., 2011), with these principles informing many efficacious prevention and treatment strategies for addressing young adult alcohol misuse (Logan & Marlatt, 2010). Discussing the use of protective strategies, which are behaviors that one engages in to limit potential consequences if they choose to use substances (e.g., avoiding high-risk drinking activities like drinking games, monitoring how much one is drinking), is one important component of these approaches. For example, a growing empirical body of research has investigated the use of protective behavioral strategies for alcohol use, including scales for assessing the behaviors (Martens et al., 2005, 2007) and interventions centered around teaching and reinforcing the use of these strategies while drinking (Kenney et al., 2014). Engagement in these behaviors by drinkers has been found to be associated with less frequent consequences and fewer heavy drinking episodes (Borden et al., 2011; LaBrie et al., 2010; Pearson, 2013).

The use of protective strategies among young adult marijuana users may similarly help prevent negative consequences and the development of cannabis use disorder (CUD). Scales have been developed to assess marijuana expectancies (Buckner et al., 2013; Torrealday et al., 2008), motives for using (Lee et al., 2009; Simons et al., 1998), and consequences (Copeland et al., 2005; Simons et al., 2012) in the young adult population, and recent work has looked at self-efficacy to employ use-reduction strategies (e.g., confidence to use cognitive behavioral strategies to cut down) among a community sample of marijuana users (Davis et al., 2014a, 2014b). However, there is a need for a broader behavioral measure of protective strategies beyond use reduction among young people.

### *Present study*

We designed the present study to develop a scale to measure the protective strategies young adults engage in when choosing to use marijuana and assess its initial psychometric properties. In addition to describing the psychometric properties of the scale, we sought to determine whether protective strategies are linked with limited consequences and reduced CUD risk, hypothesizing that higher scores on the newly developed Protective Behavioral Strategies for Marijuana (PBSM) scale (i.e., more frequent use of protective strategies) would be associated with less frequent marijuana use, fewer negative consequences, and lower scores on a measure

of cannabis use problems for young adult marijuana users. We hypothesized that these associations would be strongest for more recent users.

## **Method**

### *Participants and procedures*

Participants were recruited during two semesters at a large, public university in the southern United States. All students enrolled in psychology courses were eligible and received course credit for completing an online survey. Approximately 1,500 students were eligible to complete this and other studies available through the psychology subject pool for course credit, of which 636 students completed the online survey for this study. Of these, 256 (40%) denied lifetime marijuana use and were not included in the study. An additional 29 did not provide consistent responses on three validity check questions, which served as a check to remove participants with false or unreliable data. Among the final sample of lifetime users ( $N = 351$ ), we retained the past-6-month users only ( $n = 210$ ) in analyses to examine protective strategies used by regular marijuana users. Those who used infrequently or just once or twice in their lifetime likely did not have a chance to engage more regularly in the protective strategies our measure intended to capture. Past-6-month users reported a mean age of 22.12 years ( $SD = 3.87$ ) and were 78% female. Approximately 28% reported Hispanic ethnicity, with 57% White; 16% Black/African American; 12% Asian, Native Hawaiian, or Pacific Islander; 2% Native American/American Indian; 5% multiethnic; and 8% other ethnicities. The sample was matched with the broader university for race and ethnicity; however, women were overrepresented. There were no differences in age, gender, or race/ethnicity among the lifetime users and the past-6-month users retained for analyses. The study was approved by the university's Committee for the Protection of Human Subjects.

### *Development of the Protective Behavioral Strategies for Marijuana scale*

The purpose of the scale was to assess protective strategies that marijuana users employ before, during, after, or instead of using marijuana to limit heavy use and minimize potential negative consequences. Items were developed through an iterative process around this concept. First, each of the authors consulted the young adult marijuana literature and discussed with colleagues well published in the young adult marijuana field to generate lists of protective strategies for marijuana use, focusing on themes of limiting use, manner of use, harm reduction, avoidance, and alternative activities before, during, after, or instead of using. Items were also generated from conversations with

undergraduate and graduate student marijuana users to create items that marijuana users practice. In total, we generated 73 unique strategies. Slight wording changes in items were agreed on by the group when suggested. Next, each of the authors rated each of the 73 strategies from 1 (*poor*) to 5 (*excellent*) in terms of three domains: (a) the ability for the item to be measured in behavioral terms (i.e., is this something someone could measure by observing themselves or others?), (b) readability/ease of understanding of the item (i.e., does the wording of the item make sense?), and (c) perceived likelihood that a marijuana user might actually engage in the strategy to protect themselves. Items that were rated with means of 3.0 or higher across the five authors were retained, generating a list of 50 items for inclusion in the testing of the scale with young adult marijuana users. Based on wording from similar protective strategies scales for alcohol use (Martens et al., 2005, 2007), we chose a response style from 1 (*never*) to 6 (*always*) and asked participants to “Please indicate the degree to which you engage in the following behaviors when using marijuana/cannabis.”

#### *Other measures*

*Demographics.* Participants indicated their age, gender, ethnic identity (Hispanic or non-Hispanic), and race.

*Marijuana use and consequences.* Participants were asked if they had ever used marijuana (cannabis, pot, hash, hashish) in their lifetime as well as in the past 6 months. Past-6-month users then indicated how many days they had used in the past month. Participants were asked to consider “use” to mean smoking cannabis (e.g., in a joint, bowl, pipe, bong, vaporizer) or eating cannabis (e.g., in a brownie). This could be even just one hit or bite of something containing cannabis. In addition, past-6-month users were asked the frequency of their use on days in which marijuana was used in the past month: “On the days when you used marijuana, about how many times per day did you use? Consider times per day to be whenever you smoked a new joint, bowl, bong, used a vaporizer, or ate a new piece of food containing marijuana after a break of at least 30 minutes.” Past-6-month users completed the 21-item Brief-Marijuana Consequences Questionnaire (B-MACQ; Simons et al., 2012), which has been used in its full 50-item form in prior work with young adults (e.g., Dvorak & Day, 2014;  $\alpha = .90$  in our sample). Example items include, “When using marijuana I have done impulsive things that I regretted later” and “I have lost motivation to do things because of my marijuana use.” Participants indicated whether they had experienced each of the consequences in the past 6 months. Past-6-month users also completed the Cannabis Use Disorder Identification Test (CUDIT; Adamson et al., 2010), which is an eight-item measure used to assess symptoms of CUD. The scale has displayed adequate

reliability in previous work with young adults (Finch et al., 2013; Ramo et al., 2012) as well as in our sample ( $\alpha = .83$ ). A score of 8 or more indicates hazardous cannabis use, and scores of 12 or more indicate possible CUD.

*Alcohol protective behavioral strategies and use.* Use of alcohol in the past month was assessed with two items regarding days used and typical amount consumed. Participants also completed the 15-item Protective Behavioral Strategies Scale (PBSS) for alcohol use, which is a widely used and validated questionnaire in alcohol prevention research (Martens et al., 2005; 2007). The scale has been frequently used in research with young adults to assess protective behaviors used while drinking alcohol (Borden et al., 2011; LaBrie et al., 2011; Lewis et al., 2012). It contains three subscales of limiting/stopping drinking (seven items;  $\alpha = .86$ ), manner of drinking (five items,  $\alpha = .71$ ), and serious harm reduction (three items,  $\alpha = .72$ ).

#### *Analytic strategy*

We undertook principal component analysis (PCA) as an initial approach to determine the factor structure of the items in the PBSM. Although the approaches typically yield similar results, at this initial developmental stage of the PBSM, PCA was selected over exploratory factor analysis to summarize the data without losing much information and to explore patterns in the data rather than restricting the data to underlying theoretical constructs expected to emerge (Brown, 2009; Meglen, 1991). Moreover, PCA allows for the maximal amount of variance in the correlation matrix to be accounted for, including variance unique to each variable, variance common among variables, and error variance (Brown, 2009), which is important information to review at this initial stage. To reduce the number of items, we ran an initial PCA and removed items that did not load at .40 or higher. We then ran subsequent PCAs to generate factors that held theoretical significance. Using the final solution of items, we then assessed the reliability, means, standard deviations, factor loadings, and communalities of the items in the resulting scale. Inter-item correlation coefficients were also examined, as excessively large correlations (above .90) may produce problems with multicollinearity or suggest that the items are capturing the same construct, and found no item-level correlations above the .90 threshold. We evaluated convergent and criterion-related validity to further evaluate the psychometric properties of the PBSM scale with other scales. To this end, a correlation matrix was computed to assess bivariate associations between the final solution and a conceptually related measure of protective behavioral strategies for alcohol use (PBSS), past-month marijuana use frequency, frequency of use on days in which marijuana was used, marijuana-related consequences (B-MACQ), and CUD symptoms (CUDIT).

## Results

### *Sample description*

Participants reported using a mean of 8.56 ( $SD = 10.71$ ) days per month and 2.12 ( $SD = 3.34$ ) times per day on marijuana-using days. Participants endorsed experiencing about five marijuana-related consequences on average in the past month ( $M = 4.60$ ,  $SD = 4.71$ ) and reported a mean score on the CUDIT of 8.17 ( $SD = 6.07$ ). The majority of the sample (89%) also reported using alcohol in the past 30 days, with a mean frequency of 7.11 ( $SD = 6.63$ ) days in the past 30 days and 3.50 ( $SD = 3.03$ ) drinks per occasion. The means of the three PBSS subscales were 3.36 ( $SD = 1.22$ ) for limiting/stopping drinking, 3.50 ( $SD = 1.09$ ) for manner of drinking, and 4.66 ( $SD = 1.24$ ) for serious harm reduction.

### *Principal component analysis*

*Statistical assumptions.* Statistical assumptions for PCA using the 50 items were satisfied, as skewness and kurtosis levels were within reasonable limits (skew  $< 1.5$ , kurtosis  $< 1.8$ ; West et al., 1995). The communalities, which indicate how much variance in each item is accounted for by the set of extracted factors, all had moderate strength (0.38–0.71). The factorability of the underlying covariance matrix was assessed via two indices. The Kaiser–Meyer–Olkin index of sampling adequacy value of 0.89 was good (Kaiser, 1974). Bartlett's (1950) test of sphericity, which compares the correlation matrix against the identity matrix, was also good,  $\chi^2(1225) = 5,315.01$ ,  $p < .001$ .

*Estimation specifications.* The method of extraction was principal components factor analysis, which reduces the number of variables in the analysis by using a surrogate factor to represent a number of variables and retaining the variance that was present in the original variables. If multiple dimensions are present, they would be expected to be inter-correlated; thus, a non-orthogonal direct oblimin rotation was used to facilitate interpretation of the extracted solution (Abdi, 2003; Clarkson & Jennrich, 1988).

*Factor structure.* Initially, results produced a 12-factor solution, according to the eigenvalue greater than 1 criterion (Kaiser, 1960). However, examination of the scree plot (Cattell, 1966) and the percent variance explained by each of the initial eigenvalues strongly supported the existence of one strong overarching factor, but possibly as many as four factors. The first factor had an eigenvalue of 14.01 and explained 28.03% of the variance. The next three factors, with eigenvalues of 3.24, 2.83, and 1.99, respectively, accounted for a combined 16.11% of the variance. Factors 5 through 12, with eigenvalues ranging from 1.11 to 1.68 together accounted for 21.29% of the variance. At this stage, we removed five items with loadings less than .40 on any factor (Table 1). Factor 1 contained 39 items; Factor 2 contained

3 items; Factor 3 contained 4 items (two items cross-loaded with Factor 1); and Factor 4 contained 1 item, which cross-loaded with Factor 1. No items loaded on Factors 5 through 12. As this initial solution did not yield a simple structure for interpretation (Gorsuch, 1983) due to multiple cross loadings, some factors with no adequate factor loadings from items, and a lack of a unified theme within the possible factors, the data were re-estimated to test the existence of up to four factors.

We extracted a fixed four-factor solution and compared this against a three-factor solution. For the four-factor solution, the one item on the fourth factor dropped below a .40 loading (Item 38; see Table 1) and we removed this item from subsequent analyses. The three-factor solution had two factors represented with only three items each, and each had less than adequate reliability estimates. Factor 2 contained Items 1, 2, and 29, the latter of which also cross-loaded on Factor 1 ( $\alpha = .68$ ), and Factor 3 contained Items 28, 46, and 49 ( $\alpha = .57$ ). The items within these factors did not yield strong theoretical justification for retaining these items as separate factors.

Accordingly, we again re-estimated the data with the set of 44 items remaining after the initial and subsequent four- and three-factor PCAs with a one-factor specification for extraction. This solution produced 39 items that loaded highly onto the one factor, with all factor loadings greater than or equal .40. The five items that solely loaded onto Factors 2 and 3 were dropped because of poor loadings on the single factor, whereas the one cross-loading item was retained. Thus, based on conceptual interpretability and criteria noted earlier for determining the number of factors, corroborating evidence suggested that a unidimensional scale was most appropriate at this time. This unidimensional factor with 39 items explained 34.05% of the variance. The Kaiser–Meyer–Olkin index of sampling adequacy value of .91 was good (Kaiser, 1974), as was Bartlett's (1950) test of sphericity,  $\chi^2(741) = 4,265.26$ ,  $p < .001$ . Table 1 contains the final set of 39 items, along with their means, standard deviations, factor loadings, and communalities in the final single-factor model. The internal consistency reliability for the factor, assessed with Cronbach's alpha, was excellent ( $\alpha = .95$ ). Analysis also revealed that deletion of none of the items would improve the reliability of the overall scale, providing further corroboration for the creation of a one-factor scale. All items were frequently endorsed by participants, and no item had a mean lower than 2.8 (corresponding to a response of "occasionally").

*Criterion-related validity.* To examine the PBSM's criterion-related validity to behavioral outcomes, we evaluated the association between the PBSM and marijuana use frequency, marijuana use consequences from the B-MACQ, and CUD symptoms on the CUDIT. The overall mean of the 39-item PBSM for the full sample of past-6-month users was 4.15 ( $SD = 0.96$ ), which significantly and negatively correlated with

TABLE 1. Means, standard deviations, factor loadings, and communalities of PBSM items

Item	<i>M</i>	<i>SD</i>	Factor loading	<i>h</i> <sup>2</sup>
4. Avoid use while spending time with family	5.13	1.35	.52	.54
5. Avoid using marijuana before work or school	5.09	1.38	.65	.65
6. Avoid using marijuana to cope with emotions such as sadness or depression	4.02	1.77	.53	.49
7. Use a designated driver (i.e., someone who has not used) after using marijuana	3.68	1.90	.62	.68
8. Do not keep marijuana in the car, whether as a driver or passenger	4.76	1.63	.48	.53
9. Avoid bringing marijuana into events or venues where you are likely to be searched	5.32	1.23	.47	.57
10. Limit use to weekends	3.89	1.76	.75	.69
11. Avoid driving a car after using	4.06	1.74	.69	.71
13. Avoid using marijuana habitually (that is, every day or multiple times a week)	4.22	1.90	.66	.68
14. Avoid using marijuana early in the day	4.31	1.70	.66	.66
15. Keep track of your costs to get an accurate picture of how much you spend on marijuana	4.04	1.96	.39	.38
16. Avoid using marijuana for several days in advance of a big test, interview, performance, or other engagement for which you need to be crisp and are being evaluated	4.26	1.92	.60	.55
17. Use a little and then wait to see how you feel before using more	3.87	1.71	.48	.40
18. Avoid buying marijuana	3.69	1.75	.59	.56
19. Avoid using marijuana if currently taking any kind of prescription drug that might intensify the effects (e.g., make you feel more tired)	4.34	1.80	.67	.58
20. Avoid mixing marijuana with other drugs	4.80	1.68	.56	.56
21. Only use at night (that is, not during the day)	4.05	1.58	.65	.63
22. Stop using marijuana if you become anxious or paranoid	4.55	1.65	.62	.56
23. Avoid using marijuana in public places	4.82	1.45	.51	.46
24. Take periodic breaks if it feels like you are using marijuana too frequently	4.64	1.55	.68	.68
25. Buy less marijuana at a time so you smoke less	3.82	1.72	.48	.52
26. Excuse yourself from the room if people are smoking marijuana and you feel uncomfortable or do not wish to be offered marijuana	2.78	1.87	.52	.67
27. Avoid situations that you anticipate being pressured to use marijuana	2.83	1.83	.51	.66
29. Avoid possibilities of legal repercussions (e.g., smoke in a safe place like home, avoid having marijuana with you where you might get searched, etc.)	5.21	1.16	.49	.57
31. Take a break from using if feeling a loss of motivation	4.40	1.56	.50	.54
32. Only use when you know you have nothing important to do for the rest of the day/night	4.74	1.38	.58	.50
33. Having a set amount of "times" you take a hit (e.g., passing on a shared joint if you have already hit that limit)	3.49	1.83	.49	.46
34. Avoid using marijuana out of boredom	3.28	1.78	.59	.50
35. Avoid methods of using marijuana that can make you more intoxicated than you would like (e.g., using large bong, volcano, "edibles," etc.)	3.64	1.78	.56	.57
36. Only use marijuana on private property	4.33	1.55	.39	.38
37. Pass on shared joints, bong, etc. if already feeling high	4.49	1.48	.56	.51
39. Only use one time during a day/night	3.87	1.59	.57	.50
40. Avoid using marijuana in large gatherings or crowds	3.96	1.52	.54	.53
41. Limit the amount of marijuana you smoke in one sitting	3.95	1.54	.61	.67
43. Avoid using when feeling anxious (e.g., using to calm you down or stop worrying)	3.66	1.69	.60	.57
45. Avoid using marijuana in concentrated forms (e.g., hashish, hashish/honey oil, kief, marijuana butter/oil, etc.) to avoid getting too high	3.87	1.84	.58	.52
47. To decrease tolerance, take a break for a week or two, or take longer breaks than usual between use	3.68	1.72	.39	.36

Table continued

TABLE 1. *Continued*

Item	<i>M</i>	<i>SD</i>	Factor loading	<i>h</i> <sup>2</sup>
48. Use enough only to achieve a slight buzz or to avoid getting "too high"	4.00	1.57	.63	.63
50. Avoid using marijuana before engaging in physical activity (i.e., exercise, hiking)	4.47	1.65	.57	.48
Items dropped due to factor loadings < .40 in initial PCA				
3. Avoid mixing marijuana with alcohol	3.62	1.58	—	—
12. Only purchase marijuana from a trusted source	5.22	1.32	—	—
30. Use a vaporizer or other smokeless method to avoid carcinogens	3.12	1.60	—	—
42. If attending a party or going out to a social event (e.g., bar), decide in advance whether you want to use marijuana or not	4.03	1.78	—	—
44. Only use before special events (e.g., movies, concerts) or on special occasions	3.18	1.52	—	—
Item dropped due to factor loading < .40 for three- and four-factor solution PCA				
38. Use eye drops so others do not know you have used	3.40	1.78	—	—
Items dropped due to factor loading < .40 for one-factor solution PCA				
1. Only use marijuana after completing all of the day's responsibilities	4.30	1.56	—	—
2. Use marijuana only among trusted peers	5.00	1.30	—	—
28. Use only at home	3.63	1.68	—	—
46. Use higher potency marijuana so you can take less hits and avoid lung damage	3.57	1.67	—	—
49. Use your own marijuana (if alone or sharing with friends) so you know what you are using	3.72	1.73	—	—

Notes: Factor pattern matrix for 39 items remaining in final 1 factor solution is displayed. *h*<sup>2</sup> = communalities. Items were rated as 1 = *never*, 2 = *rarely*, 3 = *occasionally*, 4 = *sometimes*, 5 = *often*, 6 = *always*. PCA = principal component analysis; PBSM = Protective Behavioral Strategies for Marijuana scale.

a higher frequency of past-month marijuana use ( $r = -.50$ ), frequency of use on marijuana using days ( $r = -.27$ ), marijuana use consequences on the B-MACQ ( $r = -.33$ ), and total score on the CUDIT ( $r = -.47$ ) (all  $ps < .01$ ). To look at those with more recent use, we next examined the PBSM means and correlations separately for those reporting past-6-month use but no past-month usage ( $n = 47$ ) and those reporting past-month use ( $n = 163$ ) (Table 2). As would be expected, more recent users reported the greatest use and consequences; however, past-6-month users reported significantly higher means on the PBSM than past-month users, indicating that they used strategies more frequently than past-month users. Yet, moderate negative correlations existed between the PBSM and use and consequence variables for past-month users. Using a Fisher's  $r$ -to- $z$  transformation, we found that the correlations between the PBSM and consequence measures (B-MACQ, CUDIT) were significantly stronger among past-month users than among past-6-month users.

*Convergent validity.* To demonstrate convergent validity, we examined the association between the PBSM and the alcohol PBSS. The PBSM and PBSS subscales were correlated for the full 6-month user sample for limiting/stopping use ( $r = .25$ ), manner of drinking ( $r = .33$ ), and serious harm

reduction ( $r = .32$ ) (all  $ps < .01$ ). The scales were significantly and positively correlated within each of the two user groups, with the correlations between manner of drinking and the PBSM and serious harm reduction and the PBSM significantly stronger for those reporting past-6-month use but no past-month use (Table 2).

## Discussion

This study was designed to develop and conduct a preliminary psychometric assessment of a new measure of protective behavioral risk-reduction strategies for marijuana. Using a sample of young adult college student marijuana users, we developed the 39-item PBSM to assess behaviors that would theoretically limit the use of marijuana and protect against negative consequences. Through a series of iterative PCAs beginning with a 50-item pool, we found that the final 39 items loaded adequately and could be represented by a single factor, which explained approximately 34% of the variance. The composite scale had excellent internal consistency. Significant, yet moderate, correlations between the PBSM and the subscales of an alcohol protective strategies scale reflected the underlying construct of protective behavioral

TABLE 2. Correlations between PBSM composite and marijuana use/consequences and alcohol protective behavioral strategies for past-6-month and past-month users

Variable	Past-6-month users, no use past month (n = 47)		Past-month users (n = 163)	
	M (SD)	Correlation with PBSM	M (SD)	Correlation with PBSM
Days used in past month	0.00 (0.00) <sup>1</sup>	–	10.86 (10.96) <sup>2</sup>	-.50**
Times used per day in past month	0.00 (0.00) <sup>1</sup>	–	2.69 (3.54) <sup>2</sup>	-.22**
Marijuana use consequences in past 6 months	2.79 (3.97) <sup>1</sup>	-.06 <sup>a</sup>	5.07 (4.79) <sup>2</sup>	-.35** <sup>b</sup>
CUDIT composite score in past 6 months	5.08 (5.12) <sup>1</sup>	-.12 <sup>a</sup>	8.97 (6.05) <sup>2</sup>	-.51** <sup>b</sup>
PBSS (alcohol) limiting/stopping drinking	3.36 (1.44) <sup>1</sup>	.38*** <sup>a</sup>	3.36 (1.15) <sup>1</sup>	.22*** <sup>a</sup>
PBSS (alcohol) manner of drinking	3.64 (1.20) <sup>1</sup>	.53*** <sup>a</sup>	3.47 (1.06) <sup>1</sup>	.27*** <sup>b</sup>
PBSS (alcohol) serious harm reduction	4.63 (1.39) <sup>1</sup>	.52*** <sup>a</sup>	4.66 (1.20) <sup>1</sup>	.28*** <sup>b</sup>
PBSM (marijuana) composite	4.72 (0.93) <sup>1</sup>	–	4.01 (0.91) <sup>2</sup>	–

Notes: PBSM = Protective Behavioral Strategies for Marijuana scale; CUDIT = Cannabis Use Disorder Identification Test; PBSS = Protective Behavioral Strategies Scale (for alcohol).

\*\*Correlation significant at  $p < .01$ ; <sup>1,2</sup>means with different numbered superscripts between user groups are significantly different at  $p < .05$ ;

<sup>a,b</sup>correlations with different lettered superscripts between user groups are significantly different at  $p < .05$ .

strategies for drug use but indicated that the constructs are indeed unique to their respective substances.

All 39 items generated were frequently endorsed by the sample, which indicates that the scale as a whole is adequately capturing protective behaviors used by marijuana users. Items endorsed with the greatest frequency centered around avoiding use in certain situations (e.g., when with family, in public places, in a car, before school or work, when using other drugs, when feeling anxious/paranoid), taking periodic breaks, avoiding potential legal repercussions, and only using when there are no important things to do for the rest of the day or night. These items were different from the items reflecting confidence to use cognitive behavioral strategies to cut down use that Davis and colleagues (2014b) found as most highly endorsed in a community sample of young adult users (i.e., limiting use to once per day, not keeping a large amount around, refusing use, and not seeking more marijuana immediately once one’s supply runs out). The PBSM scale also demonstrated criterion-related validity. Similar to prior work looking at self-efficacy to employ use-reduction strategies (Davis et al., 2014a, 2014b), the PBSM was negatively correlated with use of marijuana (frequency in the past month, times per day used), experience of negative marijuana-related consequences, and CUD symptoms, and there were stronger negative and significant correlations between the PBSM and these factors for more recent users. Thus, the PBSM appears to represent a single factor of protective strategies that, when practiced by marijuana users, may limit heavy and frequent use and limit harms associated with use.

*Research implications*

The PBSM has the potential to fill important gaps in young adult marijuana use research. For example, the scale

can be used to assess how the use of protective strategies limits the use of marijuana and the experience of consequences over time. First, however, further exploratory and confirmatory factor analyses are warranted before implementation of the PBSM in large-scale research settings with young people. Future psychometric work with the scale is encouraged so that, if appropriate, the number of items can be reduced in brief formats of the scale for practical use in settings with time-limited assessments.

In research settings, PBSM scores could also be used to determine correlates of protective strategies in larger and more diverse samples. Indeed, given recent policy movement around legalizing medicinal and recreational marijuana use for those 21 years and older in some states, protective strategies for marijuana use may need to be revised over time. If legal consequences are removed, such as if recreational use is legal in one’s state and/or one has a medicinal marijuana prescription, protective strategies for marijuana use may change substantially. Likewise, protective strategies may vary for users in different states, such as for those younger than 21 years of age and those 21 years and older, for users with sole medicinal versus recreational reasons for using marijuana, and between genders and ethnicity/race groups. Protective strategies may also be particularly important for those using for coping reasons (as opposed to social reasons) or those suffering with mental health concerns like depression or anxiety, which has been found to be an important factor for consideration of alcohol protective behavioral strategies (Kenney et al., 2013; LaBrie et al., 2010, 2011). Thus, much work needs to be conducted in the future with the items to determine appropriateness of use within different subgroups and geographic locales of young adults.

Last, the PBSM has important implications for advancing emerging research on protective behavioral strategies in general. Despite the apparent harm-reduction qualities

of alcohol protective behavioral strategies (Borden et al., 2011; LaBrie et al., 2010; Martens et al., 2005, 2007; Pearson, 2013) and the early successes of targeting these in interventions (Kenney et al., 2014), research has noted methodological concerns about how the alcohol protective behavioral strategies measures are treated in study designs. These concerns are thought to limit a full understanding of how the behaviors function to protect oneself from harm. A review by Prince and colleagues (2013) found that cross-sectional inconsistencies in outcomes exist primarily because of the wide variety of measures used to describe protective behavioral strategies for alcohol. Thus, for our purposes regarding marijuana protective strategies, we attempted to create a measure that more comprehensively assesses the variety of protective behavioral strategies that one engages in not only during use of the substance, but also before, after, and instead of use. A better understanding of the full spectrum from pre- to post-use can help alleviate some of the methodological problems inherent in existing protective behavioral strategies research.

#### *Practical and clinical implications*

The PBSM has potential for important practical and clinical use with young people. Interventions with empirical evidence for young adult alcohol use include a discussion of strategies to limit heavy and problematic use if one chooses to drink (Carey et al., 2007; Crounce & Larimer, 2011; Logan & Marlatt, 2010; Miller et al., 2013; Scott-Sheldon et al., 2014). Although the literature is less compelling regarding efficacious brief interventions for young adult marijuana users, the models that do exist incorporate some discussion of protective strategies (Elliott et al., 2014; Lee et al., 2010, 2013). Thus, the PBSM could be incorporated into established marijuana interventions or be used to develop new stand-alone approaches with young people, similar to approaches based on alcohol protective behavioral strategies (Kenney et al., 2014). In addition, the PBSM could serve as an important tool to include in baseline and follow-up assessments in brief intervention studies and in more intensive therapies in treatment settings. For instance, it may benefit clinicians to learn of an individual's strategies to avoid use when confronted with a risky situation. Likewise, teaching protective strategies to individuals or reinforcing existing strategies may help them to reduce marijuana use and related harms. It should be noted that despite past-6-month users reporting more use of marijuana protective strategies, the correlations between the PBSM and consequences for past-month users were approximately five times stronger than they were for past-6-month users, suggesting that the behaviors, when practiced by more recent users, may limit their experience of consequences. Thus, protective strategies may be most appropriate for use by more frequent users in particular.

#### *Limitations*

Limitations to the study exist. First, items were tested with a young adult sample of mostly female college students from one site. Although this initial examination of the items gives us important information about the item loadings with this sample, it will be important to continue to test items in samples with more representative numbers of men. As other preliminary investigations of protective strategies scales have noted (Martens et al., 2005, 2007), an in-depth examination of gender difference in the underlying structure of the PBSM items is beyond the scope of this article but is an area for future research efforts. We also need to expand beyond college young adults and look at other groups (e.g., non-college workforce). Furthermore, data were collected in a state where all forms of marijuana use are illegal. Since consequences may necessarily vary based on the legal status of marijuana, specific protective behavior strategies may be more or less relevant in some places than others.

In addition, although we generated items from discussions with marijuana researchers and student marijuana users, scale creation would have been strengthened by vetting the original items with larger focus groups of college student marijuana users. Convergent validity of the scale was also conducted with the same sample used to generate the factor structure, which is consistent with other studies generating protective behavioral strategy scales for alcohol (Delva et al., 2004; Martens et al., 2005, 2007), but items may benefit from additional convergent validity testing outside this sample. Last, we did not specify a timeframe for the use of these strategies, as we modeled the scale of the widely used PBSS for alcohol (Martens et al., 2005, 2007). Although the PBSM yields information about the general use of strategies, it limits understanding when the strategies were used in regard to the time-specific items assessing use (e.g., in the past month) and consequences (in the past 6 months). Variations of the scale could consider including a time period (e.g., use of strategies the last 10 times marijuana was used) and detailed daily assessments to understand how individuals use these strategies before, during, after, or instead of use.

#### *Conclusions*

This study represents an important first step toward developing a psychometrically sound scale that assesses protective behavioral strategies for marijuana use in young adults. Our exploratory examination of the PBSM suggests that the measure is best accounted for by a single factor and that items adequately represented the hypothesized construct. Use of such behaviors may protect young people from heavy frequency of use and limit the experience of negative consequences from use. We encourage others to use this initial pool of validated items to examine its utility in populations



beyond college students and with event-level and longitudinal designs.

## References

- Abdi, H. (2003). Factor rotations in factor analyses. In M. Lewis-Beck, A. Bryman, & T. Fulin (Eds.), *Encyclopedia for research methods for the social sciences* (pp. 978–982). Thousand Oaks, CA: Sage.
- Adamson, S. J., Kay-Lambkin, F. J., Baker, A. L., Lewin, T. J., Thornton, L., Kelly, B. J., & Sellman, J. D. (2010). An improved brief measure of cannabis misuse: The Cannabis Use Disorders Identification Test-Revised (CUDIT-R). *Drug and Alcohol Dependence, 110*, 137–143. doi:10.1016/j.drugalcdep.2010.02.017
- Bartlett, M. S. (1950). Tests of significance in factor analysis. *British Journal of Statistical Psychology, 3*, 77–85. doi:10.1111/j.2044-8317.1950.tb00285.x
- Bechtold, J., Simpson, T., White, H. R., & Pardini, D. (2015). Chronic adolescent marijuana use as a risk factor for physical and mental health problems in young adult men. *Psychology of Addictive Behaviors, 29*, 552–563.
- Borden, L. A., Martens, M. P., McBride, M. A., Sheline, K. T., Bloch, K. K., & Dude, K. (2011). The role of college students' use of protective behavioral strategies in the relation between binge drinking and alcohol-related problems. *Psychology of Addictive Behaviors, 25*, 346–351. doi:10.1037/a0022678
- Brown, J. D. (2009). Principal components analysis and exploratory factor analysis—Definitions, differences, and choices. *Shiken: JALT Testing & Evaluation SIG Newsletter, 13*, 26–30. Retrieved from <http://jalt.org/test/PDF/Brown29.pdf>
- Buckner, J. D., Ecker, A. H., & Cohen, A. S. (2010). Mental health problems and interest in marijuana treatment among marijuana-using college students. *Addictive Behaviors, 35*, 826–833. doi:10.1016/j.addbeh.2010.04.001
- Buckner, J. D., Ecker, A. H., & Welch, K. D. (2013). Psychometric properties of a valuations scale for the Marijuana Effect Expectancies Questionnaire. *Addictive Behaviors, 38*, 1629–1634. doi:10.1016/j.addbeh.2012.10.010
- Carey, K. B., Scott-Sheldon, L. A., Carey, M. P., & DeMartini, K. S. (2007). Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors, 32*, 2469–2494. doi:10.1016/j.addbeh.2007.05.004
- Cattell, R. B. (1966). The screen test for the number of factors. *Multivariate Behavioral Research, 1*, 245–276. doi:10.1207/s15327906mbr0102\_10
- Clarkson, D. B., & Jennrich, R. I. (1988). Quartic rotation criteria and algorithms. *Psychometrika, 53*, 251–259. doi:10.1007/BF02294136
- Copeland, J., Gilmour, S., Gates, P., & Swift, W. (2005). The Cannabis Problems Questionnaire: Factor structure, reliability, and validity. *Drug and Alcohol Dependence, 80*, 313–319. doi:10.1016/j.drugalcdep.2005.04.009
- Cronce, J. M., & Larimer, M. E. (2011). Individual-focused approaches to the prevention of college student drinking. *Alcohol Research & Health, 34*, 210–221.
- Davis, A. K., Osborn, L. A., Leith, J., Rosenberg, H., Ashrafioun, L., Hawley, A., . . . Baik, K.-d. (2014a). Development and evaluation of the Marijuana Reduction Strategies Self-Efficacy Scale. *Psychology of Addictive Behaviors, 28*, 575–579. doi:10.1037/a0036665
- Davis, A. K., Osborn, L. A., Rosenberg, H., Cross, N., Lauritsen, K. J., Ashrafioun, L., . . . Leith, J. (2014b). Psychometric evaluation of the Marijuana Reduction Strategies Self-Efficacy Scale with young recreational marijuana users. *Addictive Behaviors, 39*, 1750–1754. doi:10.1016/j.addbeh.2014.07.005
- Delva, J., Smith, M. P., Howell, R. L., Harrison, D. F., Wilke, D., & Jackson, D. L. (2004). A study of the relationship between protective behaviors and drinking consequences among undergraduate college students. *Journal of American College Health, 53*, 19–27. doi:10.3200/JACH.53.1.19-27
- Dvorak, R. D., & Day, A. M. (2014). Marijuana and self-regulation: Examining likelihood and intensity of use and problems. *Addictive Behaviors, 39*, 709–712. doi:10.1016/j.addbeh.2013.11.001
- Elliott, J. C., Carey, K. B., & Venable, P. A. (2014). A preliminary evaluation of a web-based intervention for college marijuana use. *Psychology of Addictive Behaviors, 28*, 288–293. doi:10.1037/a0034995
- Finch, K. A., Ramo, D. E., Delucchi, K. L., Liu, H., & Prochaska, J. J. (2013). Subjective social status and substance use severity in a young adult sample. *Psychology of Addictive Behaviors, 27*, 901–908. doi:10.1037/a0032900
- Fischer, B., Murphy, Y., Kurdyak, P., Goldner, E., & Rehm, J. (2015). Medical marijuana programs — Why might they matter for public health and why should we better understand their impacts? *Preventive Medicine Reports, 2*, 53–56. doi:10.1016/j.pmedr.2014.12.006
- Gorsuch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Grant, I., Atkinson, J. H., Gouaux, B., & Wilsey, B. (2012). Medical marijuana: Clearing away the smoke. *Open Neurology Journal, 6*, 18–25. doi:10.2174/1874205X01206010018
- Hall, W., & Degenhardt, L. (2009). Adverse health effects of non-medical cannabis use. *The Lancet, 374*, 1383–1391. doi:10.1016/S0140-6736(09)61037-0
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2014). *Monitoring the Future national survey results on drug use, 1975–2013: Volume 2, College students and adults ages 19–55*. Ann Arbor, MI: Institute for Social Research, The University of Michigan.
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141–151. doi:10.1177/001316446002000116
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31–36. doi:10.1007/BF02291575
- Kalant, H. (2004). Adverse effects of cannabis on health: An update of the literature since 1996. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 28*, 849–863. doi:10.1016/j.pnpb.2004.05.027
- Kenney, S. R., & LaBrie, J. W. (2013). Use of protective behavioral strategies and reduced alcohol risk: Examining the moderating effects of mental health, gender, and race. *Psychology of Addictive Behaviors, 27*, 997–1009. doi:10.1037/a0033262
- Kenney, S. R., Napper, L. E., LaBrie, J. W., & Martens, M. P. (2014). Examining the efficacy of a brief group protective behavioral strategies skills training alcohol intervention with college women. *Psychology of Addictive Behaviors, 28*, 1041–1051. doi:10.1037/a0038173
- Kilmer, J. R., Hunt, S. B., Lee, C. M., & Neighbors, C. (2007). Marijuana use, risk perception, and consequences: Is perceived risk congruent with reality? *Addictive Behaviors, 32*, 3026–3033. doi:10.1016/j.addbeh.2007.07.009
- Koppel, B. S., Brust, J. C. M., Fife, T., Bronstein, J., Youssof, S., Gronseth, G., & Gloss, D. (2014). Systematic review: Efficacy and safety of medical marijuana in selected neurologic disorders: Report of the Guideline Development Subcommittee of the American Academy of Neurology. *Neurology, 82*, 1556–1563. doi:10.1212/WNL.0000000000000363
- LaBrie, J. W., Kenney, S. R., & Lac, A. (2010). The use of protective behavioral strategies is related to reduced risk in heavy drinking college students with poorer mental and physical health. *Journal of Drug Education, 40*, 361–378. doi:10.2190/DE.40.4.c
- LaBrie, J. W., Lac, A., Kenney, S. R., & Mirza, T. (2011). Protective behavioral strategies mediate the effect of drinking motives on alcohol use among heavy drinking college students: Gender and race differences. *Addictive Behaviors, 36*, 354–361. doi:10.1016/j.addbeh.2010.12.013
- Lee, C. M., Neighbors, C., Hendershot, C. S., & Grossbard, J. R. (2009).

- Development and preliminary validation of a comprehensive marijuana motives questionnaire. *Journal of Studies on Alcohol and Drugs*, 70, 279–287. doi:10.15288/jsad.2009.70.279
- Lee, C. M., Neighbors, C., Kilmer, J. R., & Larimer, M. E. (2010). A brief, web-based personalized feedback selective intervention for college student marijuana use: A randomized clinical trial. *Psychology of Addictive Behaviors*, 24, 265–273. doi:10.1037/a0018859
- Lee, C. M., Kilmer, J. R., Neighbors, C., Atkins, D. C., Zheng, C., Walker, D. D., & Larimer, M. E. (2013). Indicated prevention for college student marijuana use: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 81, 702–709. doi:10.1037/a0033285
- Lewis, M. A., Patrick, M. E., Lee, C. M., Kaysen, D. L., Mittman, A., & Neighbors, C. (2012). Use of protective behavioral strategies and their association to 21st birthday alcohol consumption and related negative consequences: A between- and within-person evaluation. *Psychology of Addictive Behaviors*, 26, 179–186. doi:10.1037/a0023797
- Logan, D. E., & Marlatt, G. A. (2010). Harm reduction therapy: A practice-friendly review of research. *Journal of Clinical Psychology*, 66, 201–214. doi:10.1002/jclp.20669
- Looby, A., & Earleywine, M. (2007). Negative consequences associated with dependence in daily cannabis users. *Substance Abuse Treatment, Prevention, and Policy*, 2, 3. doi:10.1186/1747-597X-2-3
- Marlatt, G. A., Larimer, M. E., & Witkiewitz, K. (2011). *Harm reduction, second edition: Pragmatic strategies for managing high-risk behaviors*. New York, NY: Guilford Press.
- Martens, M. P., Ferrier, A. G., Sheehy, M. J., Corbett, K., Anderson, D. A., & Simmons, A. (2005). Development of the Protective Behavioral Strategies Survey. *Journal of Studies on Alcohol*, 66, 698–705. doi:10.15288/jsa.2005.66.698
- Martens, M. P., Pederson, E. R., LaBrie, J. W., Ferrier, A. G., & Cimini, M. D. (2007). Measuring alcohol-related protective behavioral strategies among college students: Further examination of the Protective Behavioral Strategies Scale. *Psychology of Addictive Behaviors*, 21, 307–315. doi:10.1037/0893-164X.21.3.307
- Meglén, R. R. (1991). Examining large databases: A chemometric approach using principal component analysis. *Journal of Chemometrics*, 5, 163–179. doi:10.1002/cem.1180050305
- Miller, M. B., Leffingwell, T., Claborn, K., Meier, E., Walters, S., & Neighbors, C. (2013). Personalized feedback interventions for college alcohol misuse: An update of Walters & Neighbors (2005). *Psychology of Addictive Behaviors*, 27, 909–920. doi:10.1037/a0031174
- Pearson, M. R. (2013). Use of alcohol protective behavioral strategies among college students: A critical review. *Clinical Psychology Review*, 33, 1025–1040. doi:10.1016/j.cpr.2013.08.006
- Prince, M. A., Carey, K. B., & Maisto, S. A. (2013). Protective behavioral strategies for reducing alcohol involvement: A review of the methodological issues. *Addictive Behaviors*, 38, 2343–2351. doi:10.1016/j.addbeh.2013.03.010
- Ramo, D. E., Liu, H., & Prochaska, J. J. (2012). Reliability and validity of young adults' anonymous online reports of marijuana use and thoughts about use. *Psychology of Addictive Behaviors*, 26, 801–811. doi:10.1037/a0026201
- Scott-Sheldon, L. A., Carey, K. B., Elliott, J. C., Garey, L., & Carey, M. P. (2014). Efficacy of alcohol interventions for first-year college students: A meta-analytic review of randomized controlled trials. *Journal of Consulting and Clinical Psychology*, 82, 177–188. doi:10.1037/a0035192
- Simons, J., Correia, C. J., Carey, K. B., & Borsari, B. E. (1998). Validating a five-factor marijuana motives measure: Relations with use, problems, and alcohol motives. *Journal of Counseling Psychology*, 45, 265–273. doi:10.1037/0022-0167.45.3.265
- Simons, J. S., Dvorak, R. D., Merrill, J. E., & Read, J. P. (2012). Dimensions and severity of marijuana consequences: Development and validation of the Marijuana Consequences Questionnaire (MACQ). *Addictive Behaviors*, 37, 613–621. doi:10.1016/j.addbeh.2012.01.008
- Simons, J. S., Maisto, S. A., & Wray, T. B. (2010). Sexual risk taking among young adult dual alcohol and marijuana users. *Addictive Behaviors*, 35, 533–536. doi:10.1016/j.addbeh.2009.12.026
- Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings*. Rockville, MD: Author.
- Taylor, D. R., Poulton, R., Moffitt, T. E., Ramankutty, P., & Sears, M. R. (2000). The respiratory effects of cannabis dependence in young adults. *Addiction*, 95, 1669–1677. doi:10.1046/j.1360-0443.2000.951116697.x
- Torrealday, O., Stein, L. A., Barnett, N., Golembeske, C., Lebeau, R., Colby, S. M., & Monti, P. M. (2008). Validation of the Marijuana Effect Expectancy Questionnaire-Brief. *Journal of Child & Adolescent Substance Abuse*, 17, 1–17. doi:10.1080/15470650802231861
- West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 56–75). Newbury Park, CA: Sage.