"It's All Good": Perceived Benefits but not Perceived Risks or Worries among Adult Marijuana Users

Renee E. Magnan[1,2], Benjamin O. Ladd[1,2]

[1] Department of Psychology, Washington State University Vancouver, Vancouver, WA, USA
[2] Translational Addiction Research Center, Washington State University, Pullman, WA, USA

ABSTRACT

Public perception of marijuana is changing dramatically and anecdotal claims regarding the potential risks and benefits of marijuana use proliferate. These perceptions have implications for choosing to engage in marijuana use. The goal of this study was to describe perceptions of risks, benefits, and worry related to personal marijuana use and to identify the extent to which these beliefs were associated with marijuana use and problem severity. Further, we explored the extent to which individual perceived risk and worry items best predicted problem severity. Regular adult marijuana users ($N = 96$) completed assessments of their marijuana use, marijuana beliefs, and monitored their behavior over two weeks. Perceptions of risk and worry were low while perceptions of benefits were moderately high. Perceived risk and worry were positively associated with marijuana problem severity, but not marijuana use cross-sectionally or prospectively. Exploratory relative weight analyses indicated perceived risk and worry about negative mental health outcomes were most strongly associated with problem severity. Although users may experience problems, these do not seem to vary perceptions of benefits. As scientific support for marijuana's risks and benefits increases, this information should be relayed to the public in order to correct misperceptions and prevent problems.

Key words: marijuana use, perceived risk, perceived benefits, worry, marijuana problems

Public perception of marijuana use is shifting dramatically (Okaneku, Vearrier, McKeever, LaSala, & Greenberg, 2015; Pacek, Mauro, & Martins, 2015). Claims about the potential benefits of marijuana abound, which have implications for misinformation about the health risks and benefits of marijuana use (e.g., the perception that legal status is equivalent to safe). Empirically establishing the positive and negative health consequences of marijuana use will require considerable time and scientific inquiry. However, a clearer understanding of current perceptions of risks and/or benefits of marijuana among users may provide targets for intervention development (e.g. motivations for use) to increase risk accuracy, inform marijuana use decision-making, and prevent problems.

A supposition of many health behavior theories (e.g., Health Belief Model; Janz & Becker, 1984) is that perceived risk (i.e. a belief that one is susceptible to harm) of a health threat motivates health-protective action. There is general support for this relationship across a variety of health behaviors (e.g., Brewer et al., 2007; Sheeran, Harris, & Epton, 2014), including marijuana use (e.g., Salloum, Krauss, Agrawal, Bierut, & Grucza, 2018). However, investigations of perceived risk of marijuana use tend to focus on

Corresponding Author: Renee E. Magnan, Department of Psychology, Washington State University Vancouver, 14204 NE Salmon Creek Ave., Vancouver, WA, 98626, email: renee.magnan@wsu.edu, phone: 360-546-9403

global perceptions of risk (e.g., how much do marijuana users risk harming themselves; e.g., Grevenstein, Nagy, & Kroeninger-Jungaberle, 2015; Morgan, Noronha, Muetzelfeldt, Fielding, & Curran, 2013; Pacek et al., 2015; Piontek, Kraus, Bjarnason, Demetrovics, & Ramstedt, 2013; Salloum et al., 2018) rather than perceptions of personal risk (e.g., how much do you risk harming yourself due to your marijuana use). One exception is Kilmer, Hunt, Lee, and Neighbors (2007) who asked about non-health related outcomes regarding the extent to which marijuana use would interfere with getting good grades and making new friends. This distinction of risk to self and risk to others is important as individuals often believe they are at less risk compared to similar others (Weinstein, 1999) and lower perceptions of personal risk may correspond with weaker intentions to take health-protective action (Shepperd, Waters, Weinstein, & Klein, 2015).

How one feels about their risk is also a determinant of health decisions and behavior (Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004). One specific feeling of risk is worry, a combination of negative affect and negative thoughts experienced while thinking about future events (McCaul, Magnan, & Mead, in press). Worry is associated with protective health behavior intentions and actions (e.g., Hay, McCaul, & Magnan, 2006), and in some cases, predicts effects beyond those of perceived risk (e.g., Magnan, Koblitz, Zeilke, & McCaul, 2009).

Health behaviors targeted in these investigations often have clear negative health outcomes (e.g., the well-known connection between cigarette smoking and lung cancer). However, for many, marijuana use is a behavior that has ambiguous health consequences. While there are negative consequences of use (Volkow, Baler, Compton, & Weiss, 2014), there could be benefits (e.g. chronic pain management; Whiting et al., 2015) and some people anecdotally experience additional benefits. Limiting focus only on negative consequences of behavior does not capture the full extent of the decision-making process as individuals likely consider thoughts and feelings related to disadvantages as well as advantages of their behavior, and evidence supports associations between perceived benefits and health behaviors (Halpern-Felsher, Biehl,

Kropp, & Rubinstein, 2004; Song et al., 2009). Marijuana use might be a particularly important target for investigating the competing roles of perceptions of risk and benefits (Freeman, Wilson, & Mackie, 2018) although it has received little attention to date. For example, Morgan and colleagues (2013) had drug users rate perceived risks and benefits of 18 psychoactive substances. Marijuana was consistently rated as low harm and high benefit, and as being lower risk than alcohol and tobacco. However, these outcomes were not associated with frequency of use.

The first aim of the current investigation is to identify marijuana users' perceptions of personal likelihood of negative health consequences, worry about negative health consequences, and perceptions of likelihood of positive health consequences associated with marijuana use. The second aim is to test associations among these constructs, along with marijuana use and problem severity. We hypothesized a positive relationship between perceived risk and worry and a negative relationship between perceived benefits with perceived risk and worry. We further hypothesized that marijuana use would be negatively associated with perceived risk and worry, but positively associated with perceived benefits. We expected positive relationships between marijuana problem severity and perceived risk and worry, but a negative relationship with perceived benefits. An exploratory aim was to test the relative importance of the individual risk, benefit, and worry items to determine if there is a facet of these constructs that is particularly important for predicting marijuana use problem severity and behavior.

METHOD

Participants

Participants ($N = 102$) were recruited from the community to participate in a study on marijuana and health. Inclusion criteria were 1) age 21 or older, 2) having a personal smartphone, and 3) reporting marijuana use at least two times per week for the past year. For the current analysis, six pilot individuals were excluded because perceived risk, worry, and perceived benefit questions were added after they participated. The final baseline sample ($n = 96$) was 56.3% female,

predominantly White/Caucasian (80.0%), and on average 35.84 years (SD = 11.02, range: 21-77) of age. See Table 1 for sample characteristics. The study was approved by the Washington State University IRB prior to implementation.

Procedure

After providing written informed consent, participants completed an in-person baseline assessment of their marijuana use perceptions and behavior and received instructions for completing a 2-week ecological momentary assessment (EMA) protocol during which they answered up to five brief daily assessments related to their marijuana use. EMA questionnaires were customized using Metricwire (www.metricwire.com) which is downloaded as an application on personal smartphones. For current purposes, we only use assessments completed at the end of each day. Participants received up to $100 in online gift cards for completing the 2-week study.

Measures

Marijuana use. Baseline marijuana consumption was measured as total grams of marijuana (flower, edible, oil, topical) used over the past 30 days with the Timeline Follow-back (TLFB: Sobell & Sobell, 1996). On average,

participants consumed 26.11 grams (SD = 38.37) over the past 30 days.

We used the end-of-day EMA questionnaire to compute prospective marijuana use. We dropped the first and last day because these were not full monitoring days, thus total possible days of responding was 12. First, we computed compliance rates for this survey (completing the survey between 8PM and 4AM). Seven people were less than 25% compliant with the end of day questionnaire and removed from the prospective analysis (assessing correlates with next 12-day use) resulting in a sample of n = 89 for these analyses. The final compliance rate for those included in the prospective analyses was 56.3%. We calculated proportion of days used by dividing the number of days participants indicated they used marijuana by the total number of surveys each individual completed. On average, participants reported using 89.9% of the days they responded. Quantity was measured as the average daily amount of marijuana reported each day on a 5-point scale (0 = less than 0.1 gram, 4 = more than 0.25 grams). A total 12-day consumption score was computed by multiplying proportion of days used by average daily amount.

Marijuana problem severity. We used a modified version of the 11-item Marijuana Dependence Scale (MDS; Stephens, Roffman, & Curtin, 2000) as an indicator of problem severity. Each item reflects one of the symptoms of

Table 1. *Sample Characteristics*

Variable	Female (*N* = 54)	Male (*N* = 41)	Total (*N* = 96)	Response Range
Age	36.44 (12.02)	35.05 (9.64)	35.84 (11.02)	21-77
% White	85.2%	70.7%	80.0%	
Perceived risk	1.65 (0.79)	1.75 (0.95)	1.71 (0.87)	1.00-4.5
Worry	1.44 (0.62)	1.60 (0.98)	1.52 (0.79)	1.00-5.0
Perceived benefit	4.45 (1.62)	4.54 (1.63)	4.48 (1.61)	1.00-7.0
MDS	2.33 (2.37)	2.51 (2.31)	2.41 (2.32)	0.00-9.0
Past 30-day consumption (grams)*	15.69 (21.24)	40.33 (50.34)	26.11 (38.37)	0.05-240
Next 12-day consumption[†]	0.84 (0.30)	0.90 (0.26)	0.86 (0.29)	0.01-1.0

Note. Values are raw scores, and means and standard deviations (*SD*) unless otherwise indicated. One person did not indicate their gender. *denotes a significant gender difference at p < .001. [†]Next 12-day consumption (*N* = 89) includes n = 54 females and n = 35 males.

cannabis use disorder in the DSM-5 (APA, 2013). For each item, participants indicated (yes/no) if they experienced a symptom in the past year. Scores were summed such that higher scores indicate greater problems (α = .75). The average MDS score was 2.41 (*SD* = 2.32), suggesting criteria of a mild cannabis use disorder.

Perceptions of risk, benefit, and worry about marijuana use. Assessments used 7-point response scales (1 = very low/very small/not at all, 7 = very high/very big/extremely). Participants indicated the chances of experiencing perceived benefits of their marijuana use (α = .89), perceived risk of their marijuana use (α = .76), and the extent to which they worried about negative consequences of their marijuana use (α = .70) across four domains: personal benefit/harm, positive/negative health outcome, positive/negative mental health outcome, and benefitting/harming someone else due to their marijuana use at some point in their lives.

Analysis

Worry and past 30-day consumption were natural log transformed because they did not meet assumptions of normality. We calculated means and proportions for descriptive purposes. Associations across variables of interest used bivariate correlations. The exploratory test of relative importance of specific risk and benefit items used a relative weight analysis (RWA; Johnson, 2000) using RWA-Web (Tonidandel &

LeBreton, 2015). RWA breaks down the predicted variance in the criterion by transforming the set of predictors in the model to be orthogonal and uncorrelated. The analysis provides an estimate of the proportionate contribution of each variable relative to the complete set of variables in the model. Confidence intervals (95%) based on 10,000 replication bootstrapping around the estimates determine if each predictor accounts for significant variance in the criterion.

RESULTS

Relationships among Perceived Benefits, Risks, Worry and Use

Table 2 provides the means and correlations across beliefs of marijuana use, problem severity, and marijuana use. On average, perceived risk and worry were quite low, while perceived benefits were relatively high. Perceived risk was positively associated with worry and negatively associated with perceived benefits. Worry and perceived benefits were not significantly associated, but the association was in the anticipated negative direction. MDS was positively associated with both perceived risk and worry, but not perceived benefits. Perceived risk, perceived benefits, and worry were not associated with past 30-day or next 12-day consumption. Controlling for age, gender, and race did not change the interpretation of these results.

Table 2. *Correlations among Study Variables.*

	1	2	3	4	5
1. Perceived risk	-				
2. Worry	.64*	-			
3. Perceived benefit	-.37***	-.19±	-		
4. MDS	.44***	.48***	-.08	-	
5. Past 30-day consumption (grams)	-.13	-.11	.13	.16	-
6. Next 12-day consumption	-.08	-.16	-.03	.09	.58***

Note. Worry and baseline past 30-day consumption were log transformed prior to analysis.
±*p*<.10, ****p*<.001. Controlling for age, gender, and race (% White) did not alter interpretation.

Table 3. *Relative Importance of Individual Perceived Risk and Worry Variables on Marijuana Problem Severity.*

Variable	RW	RS-RW	LLCI	ULCI
Perceived Risk				
Personal harm	.009	3.50	-.118	.020
Negative health outcome	.068	25.50	-.056	.147
Negative mental health outcome	**.165**	**61.91**	**.011**	**.322**
Harm someone else	.024	9.09	-.102	.068
		$R^2 = .27$		
Worry				
Personal harm	.012	4.63	-.023	.075
Negative health outcome	**.085**	**33.75**	**.008**	**.247**
Negative mental health outcome	**.129**	**50.99**	**.026**	**.269**
Harm someone else	.027	10.63	-.006	.117
		$R^2 = .25$		

Note. Rescaled relative weight (RS-RW) represents each variable's percentage of the predicted criterion accounted for by the set of variables in the model (R^2). Bolded values are significant at $p <$ .05. LLCI=Lower limit 95% confidence interval, ULCI=Upper limit 95% confidence interval, RW = relative weight. Including age, gender, and race (% White) did not alter interpretation

.

Exploratory Relative Weight Analysis

Because the only significant relationships were between perceived risk and worry with MDS, we limited the exploratory analysis to these variables (Table 3). The relative weights (RW) indicated that perceived risk of negative mental health outcome (RW = .16) accounted for a significant amount of variance in MDS in the perceived risk model. Worry about health (RW = .09) and mental health (RW = .13) accounted for a significant amount of variance in MDS in the worry model. Perceived risk and worry of a negative mental health outcome were the most important predictors in the perceived risk and worry models, accounting for 61.91% and 50.99% of the predicted variance in MDS, respectively. Including age, gender, and race as predictors did not change the interpretation of these findings, nor did these demographic variables explain predicted variance in MDS in either the perceived risk or worry models.

DISCUSSION

Outcomes of the current study suggest regular users believe marijuana has a moderately high upside (i.e. potential for benefit) while having a low downside (i.e. potential for harm). Demographic factors may not influence this pattern of beliefs, as controlling for gender, age, or race did not substantively change observed relationships. This has implications for future research and clinical efforts to minimize the adverse consequences of marijuana, which can be both physical and psychological (Volkow et al., 2014). Interestingly, perceived benefits were not associated with problem severity. Perceived risk and worry were associated with problem severity suggesting that those experiencing some problems were more accurate regarding their risk. Further, exploratory analyses indicate that concern about the negative mental health effects of marijuana appears to be a driving factor of these relationships. Thus, from a clinical perspective, emphasis on the influence of marijuana on mental health may be a useful avenue in prevention and treatment settings. At the same time, while users perceived high benefit of marijuana use, the

mental and physical value of marijuana remains unclear scientifically speaking. As empirically-supported findings on the health risks and benefits of marijuana use grow, it will be important for researchers to use this information to correct public misperceptions.

Although perceived risk and worry were both positively associated with MDS, neither were retrospectively or prospectively associated with use. Work supporting links of perceived risk with marijuana use commonly dichotomize use (users versus nonusers; e.g. Piontek et al. 2013) or includes nonusers (e.g. Grevenstein et al., 2015). For example, Kilmer et al. (2007) found that perceived risk of academic and social consequences of marijuana use differed among users and nonusers, but was not associated with frequency of use among users. Thus, perceptions of use may not vary within users, and/or current measures of marijuana consumption may not be sensitive enough to find differences within users (e.g., Asbridge, Duff, Marsh, & Erickson, 2014). Additionally, it is possible that as people engage in behavior and do not experience immediate negative consequences, they reappraise their risk to be lower (Salloum et al., 2018). Thoughts and feelings about risk (and benefits) also may be more strongly associated with behaviors that have well-recognized health threats compared to those with a range of perceived positive and negative health consequences like marijuana use. For example, perceived ambiguity of health recommendations (e.g. advantages and disadvantages of genetic cancer screening; Cameron & Diefenbach, 2001) is associated with weaker interest in taking protective action.

There are several limitations worth noting. Measurement of risk, benefits, and worry did not ask about specific health-related outcomes (e.g. cognitive impairment, pain reduction) in order to reduce burden and the likelihood of hinting at potential outcomes. Asking about a specific outcome may remind respondents of that outcome when they had not been considering it (Weinstein, 1999). It would be informative to identify more nuanced associations of risks and benefits across the use spectrum. Participants could generate a list of their own perceptions or select from a list of options that may or may not be associated with use. Strengths of these measures is that they were self-focused and included several broad outcomes instead of global assessments. Additionally, due to the various ways in which one may use marijuana (e.g., flower, edibles) we chose to use measures that incorporated multiple forms of use. Thus, the assessment may not differentiate among users (e.g., administration method, potency) and has limited variability across the sample. Despite inclusive recruitment criteria of only weekly users, the sample consisted of regular, frequent users (approximately 50% daily users at baseline). Thus, we were unable to test these associations among less frequent users and the findings may only generalize to heavier users. Finally, although relationships with behavior were tested both cross-sectionally and prospectively, all tests were nonetheless nonexperimental and correlational in nature preventing conclusions of directionality. Indeed, the relationship of perceived risk and marijuana use may be reciprocal (Grevenstein et al., 2015; Salloum et al., 2018).

The current study suggests marijuana users believe marijuana has the potential to improve their health with limited adverse side effects. However, the current body of empirical knowledge suggests a different picture – there are established risks of use (e.g., Volkow et al., 2014) but the benefits are less clear (e.g., National Academies of Sciences, Engineering, & Medicine, 2017). Consideration of specific perceived benefits of marijuana use, such as those suggested by anecdotal evidence, may identify motivations that may not be captured by current assessment strategies. Additionally, a greater understanding of concerns about marijuana's effects on health (such as negative mental health outcomes) may inform harm reduction efforts and provide fruitful intervention targets.

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®).* American Psychiatric Pub.

Asbridge, M., Duff, C., Marsh, D. C., & Erickson, P.G. (2014). Problems with the identification of 'problematic' cannabis use: Examining the issues of frequency, quantity, and drug use environment. *European Addiction Research, 20,* 254-267.

Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., McCaul, K. D., & Weinstein, N. D. (2007). Meta-analysis of the relationship between risk perception and health behaviour: The example of vaccination. *Health Psychology, 26,* 136-145.

Cameron, L. D. & Diefenbach, M. A. (2001). Responses to information about psychosocial consequences of genetic testing for breast cancer susceptibility: Influences of cancer worry and risk perceptions. *Journal of Health Psychology, 6,* 47-59.

Freeman, T. P., Wilson, J., & Mackie, C. (2018). Commentary on Salloum et al. (2018): Rethinking adolescent cannabis use and risk perception. *Addiction, 113,* 1086-1087.

Grevenstein, D., Nagy, E., & Kroeninger-Jungaberle, H. (2015). Development of risk perception and substance use of tobacco, alcohol, and cannabis among adolescents and emerging adults: Evidence of directional influences. *Substance Use and Misuse, 50,* 376-386.

Halpern-Felsher, B. L., Biehl, M., Kropp, R. Y., & Rubinstein, M. L. (2004). Perceived risks and benefits of smoking: Differences among adolescents with different smoking experiences and intentions. *Preventive Medicine, 39,* 559-567.

Hay, J. L., McCaul, K. D., & Magnan, R. E. (2006). Does worry about breast cancer predict screening behaviors? A meta-analysis of the prospective evidence. *Preventive Medicine, 42,* 401-408.

Janz, N. K. & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly, 11,* 1-47.

Johnson, J. W. (2000). A heuristic method for estimating the relative weight of predictor variables in multiple regression. *Multivariate Behavioral Reseseach, 35,* 1-19.

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,* 3026-2033.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127,* 267-286.

Magnan, R. E., Koblitz, A. R., Zielke, D. J., & McCaul, K. D. (2009). The effects of warning smokers on perceived risk, worry, and motivation to quit. *Annals of Behavioral Medicine, 37,* 46-57.

McCaul, K. D., Magnan, R. E., & Mead, M. P. (in press). Disease-specific worry. In K. Sweeny, & M.L. Robbins (Eds.), *The Wiley encyclopedia of health psychology: The social bases of health behavior.*

Morgan, C. J. A., Noronha, L. A., Muetzelfeldt, M., Fielding, A., & Curran, H. V. (2013). Harms and benefits associated with psychoactive drugs: Findings of an international survey of active drug users. *Journal of Psychopharmacology, 27,* 497-506.

National Academies of Sciences, Engineering, and Medicine (2017). *The health effects of cannabis and cannibinoids: The current state of evidence and recommendations for research.* Washington, DC: The National Academies Press.

Okaneku, J., Vearrier, D., McKeever, R. G., LaSala, G. S., & Greenberg, M. I. (2015). Change in perceived risk associated with marijuana use in the United States from 2002 to 2012. *Clinical Toxicology, 53*, 151-155.

Pacek, L. R., Mauro, P. M., & Martins, S. S. (2015). Perceived risk of regular cannabis use in the United States from 2002 to 2012: Differences by sex, age, and race/ethnicity. *Drug and Alcohol Dependence, 149,* 232-244.

Piontek, D., Kraus, L., Bjarnason, T., Demetrovics, Z., & Ramstedt, M. (2013). Individual and country-level effects of cannabis-related perceptions on cannabis use. A multilevel study among adolescents in 32 European countries. *Journal of Adolescent Health, 52,* 473-479.

Salloum, N. C., Krauss, M. J., Agrawal, A., Bierut, L. J., & Grucza, R. A. (2018). A reciprocal effects analysis of cannabis use and perceptions of risk. *Addiction, 113*, 1077-1085.

Shepperd, J. A., Waters, E., Weinstein, N. D., & Klein, W. M. P. (2015). A primer on unrealistic optimism. *Current Directions in Psychological Science, 24,* 232-237.

Sheeran, P., Harris, P. R., & Epton, T. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin, 140,* 511-543.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis, 24,* 311-322.

Sobell, L. C. & Sobell, M. B. (1996). *Timeline follow back user's guide: A calendar for assessing alcohol and drug use.* Toronto: Addiction Research Foundation.

Song, A. V., Morrell, H. E. R., Cornell, J. L., Ramos, M. E., Biehl, M., Kropp, R. Y., & Halpern-Felsher, B. L. (2009). Perceptions of smoking-related risks and benefits as predictors of adolescent smoking initiation. *American Journal of Public Health, 99,* 487-492.

Stephens, R. S., Roffman, R. A., & Curtin, L. (2000). Comparison of extended versus brief treatments for marijuana use. *Journal of Consulting and Clinical Psychology, 68,* 898-908.

Tonindandel, S., & LeBreton, J. M. (2015). RWA web: A free, comprehensive, web-based, and user-friendly tool for relative weight analyses. *Journal of Business and Psychology, 30,* 207-216.

Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. B. (2014). Adverse health effects of marijuana use. *New England Journal of Medicine, 370,* 2219-2227.

Weinstein, N. D. (1999). What does it mean to understand a risk? Evaluating risk comprehension. *Journal of the National Cancer Institute Monographs, 25,* 15-20.

Whiting, P. F., Wolff, R. F., Deshpande, S., Di Nisio, M., Duffy, S.,... Kleijnen, J. (2015). Cannabinoids for medical use: A systematic review and meta-analysis. *JAMA, 313,* 2456-2473.