A Mediation Model to Explain the Effects of Information Seeking from Media and Interpersonal Sources on Young Adults' Intention to Use Marijuana

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Guided by the integrative model of behavioral prediction and research on information seeking, we tested a mediation model of information seeking about marijuana across two samples of young adults from the United States (*N* = 498) and Israel (*N* = 426). Results of online surveys showed direct associations between information seeking and (nonmedical) marijuana use intention in both samples. In addition, across both samples, results showed indirect associations between information seeking and behavioral intention through changes in attitude and perceived normative pressure. Cross-comparative differences were also examined. Findings suggest that information seeking may shape determinants of behavioral intention to use marijuana nonmedically. Information seeking may serve as an indicator of risk behavior and as a target for drug prevention efforts.

Keywords: information seeking, media, interpersonal sources, attitudes, social norms

Introduction

The transition to college represents a critical period in which patterns of nonmedical drug use may begin or become established (Pinchevsky et al., 2012). Nonmedical drug use and particularly the nonmedical use of marijuana among young adults is a public health concern in the United States (National Institute on Drug Abuse, 2010) and Israel (Bar-Hamburger, Ezrahi, Rosiner, & Nirel, 2009) as it can lead to adverse health and social outcomes (Allen & Holder, 2014). Previous research has found that young

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adults in both countries are seeking information about nonmedical marijuana use. Information seeking is driven by motivations including the desire to make an informed choice about drug use and to reevaluate previously held opinions, curiosity about recreational use and its effects, and policy-related motivations driven by debate regarding legalization (Lewis, Martinez, Agbarya, & Piatok-Vaisman, 2016).

Existing research (e.g., Boyer, Lapen, Macaolino, & Hibberd, 2007; Kam & Lee, 2013) suggests that active seeking of drug-related information may place youth at higher risk for drug initiation, and thus represents an early indicator of risk that may aid in targeted drug use prevention programs. This study aims to contribute to the conceptualization of drug-related information seeking, examine its association with drug use intentions, and identify drug-related information seeking as a significant indicator of drug use intentions and behavior. In addition, we contrast indirect associations between seeking from media sources and from interpersonal sources and intentions through attitudes and perceived normative pressure (PNP) related to marijuana.

From a functional perspective, mass media and interpersonal sources are likely to play different roles in information acquisition and dissemination (Chaffee, 1986). These roles relate to the ways in which each type of source is perceived. Source selection is largely governed by perceptions that the source provides accessible and credible information about the topic (Chaffee, 1986). A prior study on information seeking about marijuana found evidence that college students perceive interpersonal sources such as peers as highly credible and mass media sources as offering a broad and diverse range of informational options for marijuana-related topics (Lewis, Martinez, Agbarya, & Piatok-Vaisman, 2016). However, it is not clear how information acquisition from these different sources shapes behavioral intention. Although a number of studies have begun to examine how interpersonal sources and media sources influence individuals (e.g., Lee, 2009; Ruppel & Rains, 2012), more research on how these pathways operate concurrently is needed.

This study examined the association between information seeking (from media sources and interpersonal sources) and behavioral intention in the context of nonmedical use of marijuana. Our study tested hypotheses among two populations of young adults in the United States and Israel, two countries currently facing policy debates regarding the legalization of nonmedical and medical marijuana. In the United States, much of the debate related to nonmedical marijuana is focused on the extent to which marijuana use confers health benefits and costs to individuals and society (e.g., Volkow, Baler, Compton, & Weiss, 2014) and the effects of decriminalization (Holmes, 2014). Similarly, in Israel, controversies regarding whether to view marijuana as a medicine or an illicit drug (e.g., Sznitman & Lewis, 2015) are currently fueling national policy debates.

This study is part of a larger project aimed at investigating the role of active seeking and passive (scanning) for drug-related information among young adults in transition to college. The goal of this research is to advance communication and behavior change theory by testing direct and indirect associations of information seeking from two distinct types of sources (i.e., media sources and interpersonal sources) through behavioral determinants outlined by the integrative model of behavior prediction (IMBP; Fishbein & Ajzen, 2010; Fishbein et al., 2002). Information seeking may follow different pathways of influence depending on the nature of the channel used in seeking actions. The goal is to

identify these pathways while strengthening theoretical underpinnings of information seeking and its influence on intention and behavior.

Literature Review

Information Seeking

The concept of information seeking has been examined by scholars spanning several disciplines (Case, 2002). Several models have been developed to explain the process by which individuals acquire information. One such model is the comprehensive model of information seeking, which conceptualizes information seeking as "the purposive acquisition of information from selected information carriers" (Johnson, 1997, p. 4). Information-seeking efforts are proposed to be driven, in many cases, by the motivation to reduce uncertainty created by previously acquired information (Case, 2002; Johnson, 1997).

Information seeking is conceptualized here as active and directed attempts to acquire information that go beyond incidental information acquisition resulting from habitual exposure to various sources (Niederdeppe et al., 2007; Shim, Kelly, & Hornik, 2006). This definition of information seeking underscores the importance of active informational pursuits, and diverges from conceptualizations characterized by less deliberate modes of procuring information, such as information scanning. Information scanning, in contrast to seeking, is conceptualized as information acquisition through passive exposure to information during typical use of information sources (Hornik & Niederdeppe, 2008; Niederdeppe et al., 2007).

Research on information seeking in health communication has focused on describing (e.g., Nagler et al., 2010) and quantifying (e.g., Lewis et al., 2012) the effects of information seeking on behaviors. Several studies examining longitudinal effects of information seeking on various behaviors ranging from cancer prevention (i.e., increasing fruits and vegetables in diet) and cancer detection behaviors (i.e., undergoing a colonoscopy when recommended) have observed direct effects of information seeking on behavior (Lewis et al., 2012; Ramirez et al., 2013).

Existing research has primarily focused on recommended behaviors. Information encountered through active seeking efforts is likely to promote a fairly consistent message that these behaviors are positive and socially desirable. However, research on information seeking has yet to address whether seeking about topics that are not viewed as unequivocally desirable (due to legal or health implications) will yield a similar pattern of results. When individuals look for information about a risky or controversial behavior such as nonmedical marijuana use, will they be more or less likely to engage in behaviors associated with the information sought?

The current study begins to answer this question and builds on a prior study showing that motivations for seeking information about marijuana originated, among many of the respondents interviewed, from curiosity about the outcomes (positive and negative) of nonmedical marijuana use (Lewis, Martinez, Agbarya, & Piatok-Vaisman, 2016). Other motivations for information seeking were to explore reasons for nonmedical marijuana use and perceptions of this behavior among other young adults

(i.e., approval or disapproval). The first category is likely to inform attitudinal beliefs, and the second is more relevant for influencing PNP. Consequently, the current study focused on the associations between information seeking about marijuana and indirect effects on intention to use marijuana nonmedically through both of these theoretical constructs.

Furthermore, we considered the associations of information seeking from interpersonal sources (e.g., friends, parents, coworkers, siblings) independent of the associations of seeking from media sources (e.g., mass media, the Internet, social media channels, newspapers, etc.). This approach is consistent with research examining individual preferences for particular information sources and the goals and purposes that motivate the use of mediated versus interpersonal sources (Freimuth, Stein, & Kean, 1989). This distinction enables researchers to link specific forms of media use with various audience goals and provides a more nuanced conceptualization of information seeking and its effects (Johnson, 1997).

The comprehensive model of information seeking theorizes that the utility of sources represents an important consideration in users' selection and use of different sources (Johnson, 1997). According to Johnson (1997), the primary concern among information seekers relates to informational content rather than the channel through which information is obtained. Thus, the perceived utility of sources is primarily based on goals, needs, and expectations of the seeker, and how well these factors are fulfilled by use of selected sources. In the context of this study, we proposed that there would be an association between information seeking about marijuana from interpersonal sources and from media sources on intentions to use marijuana nonmedically. This expectation was based on the findings of a previous study, which found that college students in the United States and Israel reported seeking information from each of these sources, and that this information shaped their beliefs and attitudes (Lewis, Martinez, Agbarya, & Piatok-Vaisman, 2016). It is also consistent with research on the importance of peer influence in drug misuse (Sayeed, Fishbein, Hornik, Cappella, & Kirkland Ahern, 2005) and studies finding associations between exposure to drug-related information from media sources and drug-related beliefs (Boyer, Shannon, & Hibberd, 2005; Wax & Reynolds, 2000).

H1:   There will be an association between information seeking about nonmedical use of marijuana from (H1a) media sources and (H1b) interpersonal sources and intention to engage in nonmedical use of marijuana.

Integrative Model of Behavioral Prediction (IMBP)

Most research examining effects of information seeking has focused on uncovering direct effects of seeking efforts on behavior (e.g., Ramirez et al., 2013). However, less empirical research has explored the indirect effects of information seeking and behavior through more proximal (psychosocial) determinants of behavior. One useful framework for understanding explanatory processes of information seeking on behavior is the IMBP (Fishbein & Ajzen, 2010). Building on assumptions and concepts from previous theories including the theory of reasoned action (Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1991), the health belief model (Becker, 1974), and social cognitive theory (Bandura, 1986), the IMBP postulates that intention serves as the most immediate predictor of behavior. Behavioral intention is influenced by three factors: (1) attitude, or the extent to which an individual perceives

outcomes of a behavior to be desirable and likely; (2) perceived norms, or "perceptions of what others think one should do, as well as perceptions of what others are doing" (Fishbein, 2000, p. 275); and (3) perceived behavioral control (PBC), or perceived confidence in personal abilities to perform the behavior (Ajzen, 1991; Bandura, 1986). It should be noted that research has shown that combining both types of norms for a measure of PNP increases the amount of explained variance in behavioral intention (e.g., Albarracin, Fishbein, & Middlestadt, 1998; Sayeed et al., 2005).

The IMBP also includes distal variables. The effects of distal variables on intention and behavior are theorized to be mediated through the more proximal determinants of intention (e.g., attitude, perceived norms, and PBC). Fishbein and Ajzen (2010) locate media exposure within this category of distal variables. Media exposure is frequently conceptualized as the consumption or use of media or content as presented to an audience (Slater & Rasinski, 2005), and is often operationalized as the frequency with which the media or content is used by an audience (e.g., Bleakley, Hennessey, Fishbein, & Jordan, 2011).

Although the IMBP in its current form does not include an explicit role for information seeking, one aim of the current study was to begin to integrate these complementary literatures and to further communication theory by providing empirical evidence for direct effects of information seeking on intention, as well as indirect effects of information seeking on intention, accounting for general media exposure. Similar to predictions of indirect effects of other distal variables (Fishbein & Ajzen, 2010), we hypothesized that information seeking would be associated with intention, and that this association would be partially mediated by proximal determinants of intention. This study did not aim to conduct a formal test of the IMBP or the reasoned action approach in general, but focused more specifically on the role of information seeking within the existing IMBP framework.

H2:   Associations between information seeking about nonmedical use of marijuana from (a) media and (b) interpersonal sources and intention to engage in nonmedical use of marijuana will be partially mediated by attitude.

H3:   Associations between information seeking about nonmedical use of marijuana from (a) media and (b) interpersonal sources and intention to engage in nonmedical use of marijuana will be partially mediated by PNP.

Previous research has found a statistically significant association between drug intentions and PBC, the third determinant of intention outlined in the IMBP. However, this effect is generally the weakest among the three determinants (e.g., Fishbein et al., 2002). Thus, we focused on attitude and norms in the current study as they represent the strongest predictors of drug intentions.

Method

Participants

U.S. sample. Four hundred and ninety-eight college students (N = 498) enrolled in a large Midwestern university ages 18–21 years or older were recruited from a Web-based subject pool management system from October 2012 to April 2013 (researchers post studies in need of participants to the pool, and students may participate in the studies of their choice in exchange for extra credit or course credit). As the students self-selected into the study, we did not calculate response rates for the U.S. sample. Eligibility criteria required that participants were currently enrolled as full-time undergraduate students and were over the age of 18.

Israeli sample. In total, 426 young adults were recruited during July through October 2013 to participate in an online survey study. Participants were recruited using a Web-based online panel through a survey company (Panel4All). Participants were compensated for participation through vouchers provided by the survey company. The response rate was 24% (i.e., of the total number of panel members who were contacted regarding this survey). Eligibility criteria for this sample required that participants were over the age of 18 and had completed high school. Participants who could not provide consent were excluded from participation in the study.

Measures

Independent Variable: Drug-Related Information Seeking

Using a conception of information seeking from previous research (Lewis et al., 2012; Niederdeppe et al., 2007; Ramirez et al., 2013; Shim et al., 2006), we asked respondents, "Were you actively looking for information about marijuana in the past 12 months, from any of the following sources?" Response options included a range of sources: (1) doctors or other medical professionals; (2) parents; (3) siblings; (4) friends; (5) coworkers; (6) television or radio; (7) newspapers, magazines, or newsletters; (8) Internet (e.g., websites, search engines such as Google, blogs) via personal computer or mobile devices such as phones; (9) social media (e.g., Facebook, Twitter); and (10) other sources. Respondents were asked to check all that applied. In addition, each question offered an option for respondents to indicate that they had not actively looked for information or did not remember. This measure was selected for use in this study as previous research has shown that it is related to validated measures of similar concepts such as information scanning (Kelly et al., 2010), but is also conceptually distinct (Shim et al., 2006). In addition, recent research using Google search data to capture information-seeking behavior (e.g., Weeks, Friedenberg, Southwell, & Slater, 2012) instead of self-report has shown patterns of findings similar to studies using this measure.

Seeking from interpersonal sources. As the goal of the study was to test the independent association of seeking information about marijuana from interpersonal sources and from media sources, two distinct seeking measures were created for each sample. The measure of information seeking from interpersonal sources was a summed score that included the following four sources: (1) parents, (2) siblings, (3) friends, and (4) coworkers.

Seeking from media sources. The measure of information seeking from media sources was assessed by summing responses to the seeking item for the following four sources: (1) television or radio; (2) newspapers, magazines, or newsletters; (3) Internet; and (4) social media.

Dependent Variables

Drug-use intentions. Intention to engage in future drug use behavior was measured using items adapted from the Monitoring the Future National Survey Study (Johnston, O'Malley, Bachman, & Schulenberg, 2008, 2012) and modified following the standard approach for asking intentions questions in the IMBP (Fishbein & Ajzen, 2010) for time frame and behavior. Intention to use marijuana was assessed by measuring participants' agreement with this statement: "I intend to use marijuana nonmedically in the next year," with responses scored on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*) for a direct measure of intention.

Mechanism Variables: IMBP Factors

In addition to measures of intention, the survey used measures of attitudes, PNP, and PBC with respect to using marijuana nonmedically in the next 12 months. IMBP factors were measured using items consistent with this theoretical framework (Fishbein & Ajzen, 2010).

Attitudes. Attitudes toward drug use were assessed by measuring responses with the common item stem "My using marijuana nonmedically in the next year would be*. . . .*" We used two 7-point semantic differential items with endpoints that were *good–bad* and *pleasant–unpleasant*. The sum of these items was computed to create the scale of attitudes toward marijuana use.

PNP. PNP was measured by averaging responses to two standardized items, one measuring injunctive norms and one descriptive norms. This approach is consistent with previous studies (Bleakley et al., 2011; Smith-McLallen, Fishbein, & Hornik, 2011). The injunctive norm item elicited agreement with the following statement: "Most peers whose opinion I value would approve of my using marijuana nonmedically in the next year." Responses were scored on a 7-point scale (1 = *very unlikely* to 7 = *very likely*). The descriptive norm item measured agreement with this statement: "Most peers whom I respect and admire would use marijuana nonmedically in the next year." Responses were scored on a 7-point scale (1 = *not probable* to 7 = *probable*). The items for injunctive norms and descriptive norms were averaged to create a measure of PNP for marijuana. The correlations between the two original ordinal items were .69 ($p < .001$) in the U.S. sample and .12 ($p < .01$) in the Israeli sample.

PBC. PBC related to drug use was assessed by measuring responses to the statement "My using marijuana nonmedically in the next year is completely up to me*.*" Responses were scored on a 7-point Likert scale (1= *strongly disagree* to 7 = *strongly agree*) to create a measure of PBC for marijuana use.

Control Variables

The analyses included control variables to minimize confounding effects caused by third factors, such as demographic and background characteristics, as well as prior use of marijuana.

Demographics and background characteristics. Demographic variables included gender (1 = female, 0 = male), age, and race (1 = White, 0 = other). The survey also measured other background characteristics: general media usage in the past 7 days (see Murphy, Cody, Frank, Glik, & Ang, 2009), a scale that averaged responses to use of six media sources on a 7-point scale (0 = *none* to 7 = *7 days*); religious service attendance (adapted from Hull, Hennessy, Bleakley, Fishbein, & Jordan, 2011): "How often do you attend religious services?" with answer options 1 = *1–2 times per year*, 2 = *3–4 times per year*, and 3 = *7 or more times per year*); and number of close friends (adapted from Lewis & Martinez, 2014), with answer options 0 = *none*, 1 = *1–2*, 2 = *3–4*, 3 = *5–10*, 4 = *11 or more*.

Risk behaviors and personality. Measures included family use of marijuana (1 = yes, 0 = no/don't know), own prior use of marijuana in the past 30 days (0 = *none at all/prefer not to say*, 1 = *1–2 times*, 2 = *3–4 times*, 3 = *5 or more times*), and risk behaviors that are known to be significantly associated with nonmedical marijuana use that were combined into a single scale (U.S. sample: α = .89; Israeli sample: α = .81). Items included behaviors such as having unprotected sex (e.g., Benotsch, Snipes, Martin, & Bull, 2013) and cigarette smoking (e.g., Camenga et al., 2014) in the past month, (assessed with 12 items on a 5-point scale: 0 = *not at all/prefer not to say*, 1 = *1–2 times*, 2 = *3–4 times*, and 4 = *5 or more times*). Sensation seeking (Zuckerman, 1984), which has been shown to be associated with intention to use drugs (Donohew, 1990), was measured using the 5-item Brief Sensation Seeking Scale (U.S. sample: α = .77; Israeli sample: α = .73). This scale has demonstrated good reliability and validity in past studies (e.g., Hornik et al., 2003), and uses a 5-point scale, where 0 = *strongly disagree* and 5 = *strongly agree*.

Results

Descriptive Analyses

U.S. sample. The final sample included 498 college students. The majority of our sample was White (79%), female (58%), and 21 years of age or older (24.5%). Approximately two thirds of respondents reported no prior use of marijuana in the past 30 days, and one third had engaged in nonmedical use of marijuana at least once during that time.

Israeli sample. The final sample included 426 young adults who were interviewed during the summer following graduation from high school. The majority of participants were 18 years old (82%), female (63%), born in Israel (92%), and identified as Jewish (96%). Only 6% of participants reported using marijuana in the past 30 days. Other demographic and marijuana use-related characteristics of each sample are reported in Tables 1 and 2.

Table 1. Demographic Characteristics of Samples.

Characteristic	U.S. sample (*N* = 498)	Israeli sample (*N* = 426)
Gender, %		
Female	58	63
Male	42	37
Age (years), %		
18	16	82
19	23	14
20	20	3
≥21	41	1
Number of close friends, %		
0	1	1
1–2	7	9
3–4	32	33
5–10	43	40
≥11	17	17
Religious (attend services per year), %		
0 times	0	29
1–2 times	48	23
3–6 times	17	12
≥6	35	36
Mean (*SD*) general media use (range 0–7)	4.35 (0.75)	3.12 (1.16)

Table 2. Marijuana Use-Related Characteristics.

Characteristic	U.S. sample (*N* = 498)	Israeli sample (*N* = 426)	χ^2	*t*	*df*
Prior (own) use of marijuana, %					
None	66	94	109.98***		
1–2 times	12	4			
≥3 or more times	22	2			
Family use of marijuana, %					
No	41	90	233.99***		
Yes	59	10			
Mean (*SD*) risk behaviors (range 0–21)	4.48 (3.56)	2.26 (3.43)		9.37***	866
Mean (*SD*) sensation seeking (range 4–20)	14.47 (3.18)	12.36 (3.44)		9.62***	917

*p < .05. **p < .01. ***p < .001.

Overall, participants in the U.S. sample were more likely to have engaged in nonmedical marijuana use and report nonmedical use by at least one family member compared with Israeli participants. In addition, U.S. participants scored significantly higher on sensation seeking and previous engagement in risk behaviors than Israeli participants.

Table 3 describes each sample on the six variables of interest. Overall, U.S. participants were more likely to seek information about marijuana from a wider range of media and interpersonal sources when compared with Israeli participants. In addition, U.S. participants reported significantly more positive attitudes, PNP, and intention to engage in nonmedical use of marijuana than Israeli participants.

Table 3. Primary Variables.

Variable	U.S. sample (N = 498)				Israeli sample (N = 426)				t	df
	%	M	SD	Range	%	M	SD	Range		
Information seeking from media sources	23	2.32	1.29	0–4	10	0.18	0.62	0–4	6.66***	769
Information seeking from interpersonal sources	22	1.66	1.00	0–4	9	0.15	0.57	1–7	5.50***	865
Intention to use marijuana		3.02	2.24	1–7		1.47	1.25	1–7	13.21***	792
Attitudes toward marijuana use		7.06	4.20	2–14		4.99	4.35	0–4	7.32***	911
Perceived normative pressure to use marijuana		3.79	1.91	1–7		2.45	1.52	1–7	11.83***	911
Perceived behavioral control to use marijuana		6.14	1.55	1–7		5.95	1.86	1–7	1.70	831

*$p < .05$. **$p < .01$. ***$p < .001$.

These differences may reflect more permissive cultural norms relating to nonmedical use of marijuana in the United States compared with Israel. This explanation would also be consistent with policy changes that had already begun to occur in United States at the time of our study. In contrast, recreational marijuana use is, to date, illegal in Israel. Another possible explanation may relate to the timing of the survey in each country. The U.S. survey was conducted after the first semester of freshman year, whereas the Israeli survey was conducted among young adults during the summer following their graduation from high school but prior to freshman year. Thus, observed differences may be due to the influence of other peers in college and exposure to information related to marijuana on campus.

Table 4. Correlations Among Primary Variables.

Variable	U.S. sample (N = 498)					Israeli sample (N = 426)				
	1	2	3	4	5	1	2	3	4	5
1. Information seeking from media sources	–					–				
2. Information seeking from interpersonal sources	.30**	–				.70**	–			
3. Attitudes toward marijuana use	.14*	.10	–			.24***	.23***	–		
4. Perceived normative pressure to use marijuana	.04	.04	.53***	–		.33***	.26***	.23***	–	
5. Intention to use marijuana	.18*	.12	.80***	.55*ʾ	–	.30***	.34***	.29***	.43***	–

*p < .05. **p < .01. ***p < .001.

Table 4 shows the correlations among the primary variables. Correlations between variables related to marijuana use were positive and significant at the .05 level or less for the Israeli sample. Although most correlations were statistically significant for the U.S. sample, PBC was not significantly associated with information seeking from media or interpersonal sources. In addition, neither attitude nor intention was significantly associated with information seeking from interpersonal sources.

Analytic Approach

To assess whether the indirect effects of information seeking about marijuana on intention to use marijuana through attitudes and PNP were significant (i.e., did not include zero), we constructed bias-corrected confidence intervals with bootstrapping procedures using PROCESS, a computational tool for path analysis-based mediation (and moderation) analysis (Hayes, 2013). This approach involves empirically bootstrapping the sampling distribution of the indirect association and obtaining its bias-corrected confidence interval. Bootstrapping is a recommended method for mediation analysis because of its high power and the fact that it does not assume a normal sampling distribution (Hayes, 2009; Preacher, & Hayes, 2004, 2008b). This method generates direct and indirect effects in mediation models and is recommended as superior to a normal theory approach (Preacher & Hayes, 2008a). The bootstrapping approach was conducted using SPSS Version 21.0 (SPSS Inc., Chicago, IL) with the PROCESS macro developed by Preacher and Hayes (2008a).

Prior to testing mediation hypotheses, we conducted ordinary least squares regressions to identify covariates that were statistically significantly associated with marijuana intentions for the U.S. and Israeli samples. For the U.S. and Israeli samples, these covariates included general media use (past 7 days), gender, own use of marijuana in past 30 days, family members' use of marijuana, risk behaviors, and participants' number of close friends. In addition, the U.S. sample included covariates for race (White vs. other), and the Israeli sample included measures of age and sensation seeking in analyses. Covariates for each sample were included in all analyses. We handled treatment of missing cases with listwise deletion for all analyses (fewer than 15% of cases were missing across all variables entered into every analytical model). The following sample sizes were used for each analysis: U.S. marijuana ($N = 419$) and Israel marijuana ($N = 407$).

Tables 5 and 6 summarize the direct and indirect associations of mediation for the U.S. sample and the Israeli sample, respectively. Hypothesis 1 predicted that information seeking about nonmedical use of marijuana from media sources (H1a) and from interpersonal sources (H1b) would be directly associated with intention to engage in nonmedical use of marijuana. Among U.S. participants, results showed a direct association of information seeking from media sources and intention to use marijuana nonmedically ($B = .38$, $SE = .09$, $p < .001$, CI [.203, .559]) when accounting for effects of covariates. Thus, H1a was supported for the U.S. sample. However, there was no direct association of information seeking from interpersonal sources on intention to use marijuana ($B = -.14$, $SE = .13$, $p > .05$) in the U.S. sample. Thus, H1b was not supported.

Among Israeli participants, information seeking from media sources was positively associated with intention to use marijuana when accounting for control variables ($B = .29$, $SE = .11$, $p < .01$, CI [.075, .504]). Thus, H1a was supported in the Israeli sample. However, there was no direct association between information seeking from interpersonal sources and intention to use marijuana nonmedically ($B = .03$, $SE = .13$, $p > .05$). Thus, H1b was not supported for this population.

Mediation Analysis

To examine the hypotheses predicting that attitudes (H2a and H2b) and PNP relating to nonmedical marijuana use (H3a and H3b) would partially mediate the relationship between information seeking and intention to use marijuana, we conducted mediation path analyses with multiple parallel mediators using PROCESS (Hayes, 2013). This approach generates direct and indirect effects of multiple mediators functioning in parallel. Mediation analyses were conducted separately for each sample, and were based on 1,000 bootstraps (Model 6) with information seeking as a predictor variable, attitudes and PNP as two mediators, and intention to use marijuana as the dependent variable.

For the U.S. sample, the mediation model was significant and explained 25% of the overall variance for intention to use marijuana: $R^2 = .25$, $F(11, 407) = 12.17$, $p < .001$. Information seeking from media sources (but not interpersonal sources) was associated with intention to use marijuana, after controlling for covariates (gender, general media use, prior use of marijuana, other risk behaviors, religiosity, race, family use of marijuana, number of close friends, and PBC with regard to using

marijuana). Information seeking from media sources was positively and significantly associated with attitudes related to marijuana use, but not with PNP.

Table 5. Indirect Effects for Mediation Analyses, U.S. Sample (N = 419).

		Indirect effect		Total effect
		Effect size	Bias-corrected bootstrap CI	Effect size
H2a	Information seeking (media) ➡ Attitude ➡ Intention	**.119**	[.041, .213]	.381
H2b	Information seeking (interpersonal) ➡Attitude ➡ Intention	−.051	[−.181, .069]	−.140
H3a	Information seeking (media) ➡ Perceived normative pressure ➡ Intention	.024	[.001, .065]	.381
H3b	Information seeking (interpersonal) ➡ Perceived normative pressure ➡ Intention	−.002	[−.048, .032]	−.140

Note. Nonzero indirect effect appears in bold type. These analyses report the effects of the compound path from the first named variable to the last named variable through the mediator, adjusting for confounders.

Both mediators were significantly associated with intention to use marijuana. Furthermore, the indirect path from information seeking to intention through attitudes was significant. The bootstrapping approach showed that the 95% bias-corrected confidence interval for the indirect association of information seeking from media and intention to use marijuana through attitudes did not include zero ($B =$ .12, $SE = .04$, CI [.041, .213]). However, the indirect path through PNP was not significant ($B = .02$, $SE =$ .01, CI [.00, .07]). Thus, for the U.S. sample, H2a was supported, but H3a was not supported (see Table 5 and Figure 1).
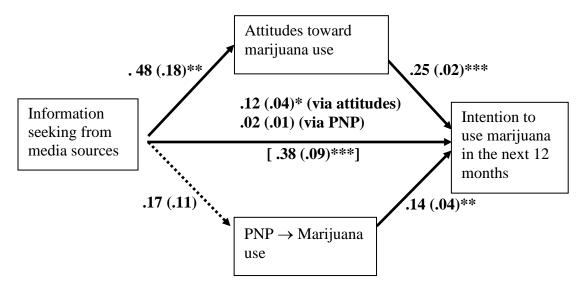
Figure 1. Mediated pathway between information seeking and intention to use marijuana through attitudes and perceived normative pressure (PNP) for the U.S. sample (N = 419). Mediation model showing the relation between information seeking from media sources and intention to use marijuana as mediated through attitudes and PNP related to marijuana, adjusting for confounders. Nonstandardized path coefficients are shown; the parenthetical value represents the direct effect. Asterisks indicate significant coefficients (*p < .05, **p < .01, ***p < .001). The association between the mediators was positive and significant (B = .60, SE = .09, p < .001).

For the Israeli sample, the mediation model was significant and accounted for 26% of the overall variance for intention to use marijuana: $R^2 = .26$, $F(11, 395) = 12.53$, $p < .001$. Information seeking from media sources (but not interpersonal sources) was associated with intention to use marijuana, after controlling for covariates (i.e., gender, general media use, prior use of marijuana, other risk behaviors, age, sensation seeking, family use of marijuana, number of close friends, and PBC with regard to using marijuana). Information seeking about marijuana from media sources was positively and significantly associated with attitudes and with PNP related to marijuana use. In addition, both mediators were significantly associated with the outcome. Furthermore, the bootstrapping approach showed that the 95% bias-corrected confidence interval for the indirect association between information seeking and intention through attitudes ($B = .03$, $SE = .01$, CI [.002, .088]) and through PNP ($B = .10$, $SE = .04$, CI [.033, .208]) did not include zero.

Contrast tests revealed that the indirect path via PNP was significantly greater in magnitude than the path via attitudes. Thus, for the Israeli sample, Hypotheses 2a and 3a were supported (see Table 6 and Figure 2). In addition, information seeking from interpersonal sources showed no indirect association with intention through attitude or PNP in both samples. Thus, Hypotheses 2b and 3b did not receive evidence of support in either sample.

Table 6. Indirect Effects for Mediation Analyses, Israeli Sample (N = 407).

		Indirect effect		Total effect
		Effect size	Bias-corrected bootstrap CI	Effect size
H2a	Information seeking (media) ➡ Attitude ➡ Intention	**.031**	[.002, .088]	.289
H2b	Information seeking (interpersonal) ➡ Attitude ➡ Intention	.012	[−.018, .058]	.025
H3a	Information seeking (media) ➡ Perceived normative pressure ➡ Intention	**.101**	[.033, .208]	.289
H3b	Information seeking (interpersonal) ➡ Perceived normative pressure ➡ Intention	−.016	[−.098, .072]	.025

Note. Nonzero indirect effects appear in bold type. These analyses report the effects of the compound path from the first named variable to the last named variable through the mediator, adjusting for confounders
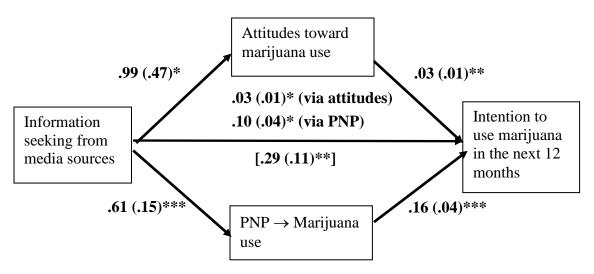

Figure 2. Mediated pathway between information seeking and intention to use marijuana through attitudes and perceived normative pressure (PNP) in the Israeli sample (N = 407). Mediation model showing the relation between information seeking from media sources and intention to use marijuana as mediated through attitudes and PNP related to marijuana. Nonstandardized path coefficients are shown; the parenthetical value represents the direct effect. Asterisks indicate significant coefficients (*p < .05, **p < .01, ***p < .001). The association between the mediators was positive and significant (B = .32, SE = .16, p < .05).

It should be noted that although the literature suggests that nonmedical marijuana use is primarily driven by attitude and PNP, it is possible that information seeking from interpersonal and/or media sources could improve one's sense of control over engaging in this behavior. However, on testing for the presence of indirect associations between information seeking and intention through PBC, our results did not find evidence supporting this proposition for either sample.

Discussion and Conclusion

This study examined whether and how information seeking from different sources shapes behavioral intention in the context of drug use in the United States and Israel. We found that information seeking from media sources is positively associated with intentions to engage in nonmedical marijuana use. Young adults in the United States and Israel who engaged in greater amounts of information seeking from media sources reported stronger intentions to use marijuana for nonmedical purposes, compared with young adults who sought less. These results converge with findings of past studies demonstrating cross-sectional associations (e.g., Shim et al., 2006) and longitudinal predictive effects of information seeking and performance of behaviors about which information is sought (e.g., Lewis et al., 2012; Ramirez et al., 2013; Tan, Mello, & Hornik, 2012).

This study also found that the associations between information seeking from media sources and intention to use marijuana nonmedically are mediated, in part, through changes in attitudes and PNP. Interestingly, among the U.S. sample, the indirect path through attitudes was the more dominant path, in contrast to the Israeli sample for which PNP was a more significant mediator of effects of information seeking than attitudes. However, among both populations, marijuana-related attitudes and PNP were positively associated with intention to use marijuana in the next 12 months. Furthermore, the indirect association of information seeking and intention was observed when accounting for the effects of a wide range of other risk factors (e.g., current use of marijuana and other risk behaviors).

Although information seeking from media sources influenced intentions and attitudes in both samples, no (direct or indirect) associations of information seeking from interpersonal sources and intention were found for either sample. One explanation for this may be that young adults seeking information about marijuana can easily access a broader range of information that is continually evolving and readily available from media channels, compared with interpersonal sources. Although interpersonal sources represent a credible information source for many young adults, they also offer a more limited scope of information.

Another explanation may relate to the changing nature of interpersonal communication and information engagement with peers. Among many young people, communication with peers is increasingly occurring online (Lenhart, 2015). Consequently, some of the participants in our study may have reported information seeking from peers that took place via social media or other online channels as information seeking from a media source rather than seeking from friends (i.e., an interpersonal source). Previous scholars have noted that social media and peer-to-peer networks may blend features of interpersonal and media sources while facilitating the flow of information among young adults (e.g., Southwell, 2013). Our measure did distinguish between media and interpersonal sources, but the distinction was admittedly

blurry. As a result, our measure of information seeking from media also may have captured some seeking (about marijuana) from interpersonal sources. This likely would have mitigated observed effects of information seeking from interpersonal sources on outcomes.

Despite the consistent results regarding direct and indirect associations of information seeking from media sources and intention via attitude, several differences between the two samples are worthy of discussion. First, U.S. participants overall tended to seek from a greater number of information sources and reported stronger integrative model determinants of behavior (attitude, PNP, PBC, and intention) compared with the Israeli participants. Participants in the U.S. sample also, on average, scored more highly on sensation seeking than the Israeli sample.

Second, an indirect association of information seeking from media sources and PNP was detected for the Israeli sample, but not for the U.S. sample. It is possible that U.S. and Israeli participants may have sought information from mass media that were more likely to inform behavioral beliefs and outcome evaluations (e.g., marijuana use has beneficial properties). In contrast, Israeli participants may have been more likely to seek information from media sources (e.g., social networking platforms) that would influence attitudes, but would also impact normative perceptions related to marijuana (e.g., prevalence of nonmedical marijuana use). Future research may examine the topics about which information was sought for both populations and determine whether they might contribute to the formation of underlying attitudinal or normative beliefs.

We acknowledge a number of limitations to this study. First, although significant, the results presented here are modest in magnitude. Second, the study used samples that were nonrepresentative. Third, the study relied on cross-sectional self-report data. We do not know the extent to which psychosocial and behavioral data reported here reflect actual attitudes, norms, intentions, and behavior related to drug use. Although we assured our participants that their responses would be anonymized, there remains a possibility that social desirability may have influenced the responses of some individuals. In addition, the current analysis did not compare the U.S. and Israeli samples in a statistical sense. Future research may test a moderated mediation model using nationality as a moderator to determine whether mediation effects are different for young adults from both countries.

Another limitation relates to the composition of the U.S. and Israeli samples. Recruitment was based on self-selection. The response rate for the Israeli sample was also fairly low, although not atypical of online surveys. Furthermore, response rates of this magnitude have been shown to produce results that are statistically comparable to surveys with higher response rates (Keeter, Kennedy, Dimock, Best, & Craighill, 2006). However, it is possible that participants who selected to participate in this research were different from students who selected to participate in other studies or not at all.

In addition, as the data were cross-sectional, we can only speculate that the flow of causal influence runs from information seeking to attitude and behavior. Although using data from one time point did not allow us to test the flow of causal influence, the results of this study can serve as a foundation for future research that allows for the testing of causal order and the elimination of rival hypotheses. One rival hypothesis for the observed associations is that individuals who already possess a favorable attitude

toward marijuana or have already experimented with marijuana are drawn to seek information about this drug. As the present study represents a first step to establish a model as part of a wider project, future research may collect and examine longitudinal data to rule out this possibility.

Despite these limitations, this study exhibits several strengths. It is among the first to examine information seeking from different types of sources on a risk behavior generally and on substance use in particular. The study extends existing research by showing that information seeking may shape risk behaviors by acting as an important precursor of intention and behavior. Direct associations of seeking from media sources and marijuana intentions are shown for two distinct samples when accounting for a wide range of demographic and drug-related variables. In addition, the study also found associations indicating partial mediation of information seeking through attitudes, suggesting a process in which information seeking influences attitudes, and that attitudes in turn influence intention and consequently behavior.

This study provides preliminary supporting evidence for the utility of treating information seeking as a distal variable that may influence factors underlying intention (i.e., attitude), a potential mechanism that is consistent with predictions of the integrative model framework. This mechanism was consistent in two distinct samples of college student populations. Furthermore, the identification of an earlier predictor of drug misuse may serve as an early indicator and offer opportunities for more effective targeting of drug interventions. These opportunities, however, will be largely contingent on the degree to which information seeking about nonmedical drug use occurs in the population of interest and the extent to which information seeking shapes important determinants of nonmedical drug use intentions. For example, in this study, we observed that U.S. participants sought marijuana information from a greater number of sources and showed stronger intention to engage in nonmedical marijuana use than Israeli participants. Such differences might suggest that using information seeking as an early target for drug abuse prevention may be a promising strategy for prevention efforts targeting young adults in the United States, but perhaps may be less useful among Israeli young adults.

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