

# Religiosity as a Moderator of the Relation Between Sensation Seeking and Substance Use for College-Aged Individuals

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Substance use has been identified as a major problem on college campuses across the country, with excessive use often leading to unintended and unwanted negative health outcomes. Sensation seeking has been shown to be a consistent predictor of engagement in various health risk behaviors, including substance use. Religiosity has been shown to negatively predict substance use. However, there is mixed evidence on the relations among these risk and protective factors. This may be due to the operational definitions of religiosity in previous research. The current study investigated religiosity as a moderator of the relation between sensation seeking and substance use using robust measures of religiosity. The primary hypotheses were (a) sensation seeking would be positively associated with higher levels of heavy episodic drinking and marijuana use; (b) religiosity would be negatively associated with higher levels of substance use; and (c) religiosity would moderate the relation between sensation seeking and substance use such that, when religiosity was high, there would be no association between sensation seeking and substance use, but at low and moderate levels of religiosity, there would be a positive association between them. Religiosity was a significant moderator of the relation between risk seeking and marijuana use ( $p < .01$ ), but it was less effective as a moderator between sensation seeking and heavy episodic drinking. Religiosity appears to have a stronger buffering effect for illegal drug use compared with alcohol use, perhaps in part because of the relative acceptance of alcohol consumption across major U.S. religious orientations.

*Keywords:* intrinsic religiosity, religious service attendance, spirituality, heavy episodic drinking, marijuana use

Substance use represents a serious public health concern for college-aged individuals in the United States. Heavy episodic drinking (Johnston, O'Malley, Bachman, & Schulenberg, 2012; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994) and marijuana use (Compton, Grant, Collier, Glantz, & Stinson, 2004; Johnston et al., 2012) commonly occur on college campuses. Approximately 32% of adults between the ages of 18 and 24 years engaged in heavy episodic drinking, having five or more drinks (four or more drinks for women) on a single drinking occasion (Jackson, 2008) on at least 1 day in the past year (National Center for Health Statistics, 2011). In addition, 5.2% reported engaging in "heavier" drinking, consuming more than 14 drinks per week (7 drinks per week for women) on average. In regards to marijuana use among college students, 14% reported using in the past month (American College Health Association, 2012), and 25% of those met criteria for marijuana use disorder (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008).

Excessive alcohol use in college is linked to several negative consequences, including sexual assault, bodily injury, academic

underperformance and failure, and death (Porter & Pryor, 2007). Using marijuana is also associated with negative outcomes, including lower educational attainment, reduced workplace productivity, increased high-risk sexual behavior, adverse respiratory and cardiovascular effects, increased delinquent behavior, using other substances, and motor vehicle accidents (Brook, Balka, & Whiteman, 1999; Compton et al., 2004; Palmer, McMahan, Moreggi, Rounsaville, & Ball, 2012). Greater understanding of the predictors and moderators of heavy episodic drinking and marijuana use should improve efforts to mitigate the association between substance use behaviors and negative health outcomes.

One widely researched predictor of substance use is sensation seeking (Baker & Yardley, 2002; Horvath & Zuckerman, 1993). Zuckerman (1994) defined sensation seeking as the desire for novel sensations and experiences and the willingness to take risks for such experiences. Individuals high in sensation seeking tend to engage in novel, thrilling, and adventurous activities, such as substance use and high-risk sexual behaviors, despite the high risk of experiencing a negative outcome, such as injury or illness (i.e., contracting a sexually transmitted infection or developing substance use disorders), incarceration, or death (Wagner, 2001). Multiple research studies have established links between sensation seeking and heavy episodic alcohol use and marijuana use (Crawford, Pentz, Chou, Li, & Dwyer, 2003; Kopstein, Crum, Celentano, & Martin, 2001; van Beurden, Zask, Brooks, & Dight, 2005). However, not all individuals who are high in sensation seeking engage in these high-risk behaviors. It is important to identify

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moderators of the relation between sensation seeking and substance use behaviors because these leverage points may allow for more effective prevention and intervention strategies.

Two potential moderators of the relation between sensation seeking and substance use are religiosity and spirituality. Religiosity is typically conceptualized as religious commitment, salience of religion, frequency of church attendance, or a combination of two or more of these indicators (Forthun, Bell, Peek, & Sun, 1999). Allport and Ross (1967) developed differentiated orientations of religiosity: intrinsic and extrinsic. Intrinsically religious individuals express a genuine commitment to their faith and beliefs whereas extrinsically religious individuals use religion for their own self-serving purposes (Genia, 1993). Spirituality, a construct that can both overlap with and be distinct from religiosity, is often conceptualized as a union with a higher power, a sense of the transcendental, an inner awareness of one's belief system, and/or a connection with other beings (Miller & Thoresen, 2003; VonDras, Schmitt, & Marx, 2007).

Despite some mixed findings, religiosity has largely been found to be negatively associated with both alcohol and marijuana use (Bahr, Maughan, Marcos, & Li, 1998; Kendler, Gardner, & Prescott, 1997; Mason & Windle, 2002; Wills, Yaeger, & Sandy, 2003). More specifically, intrinsic religiosity was negatively correlated with drinking quantity, frequency, expectations, and number of drunken episodes (Galen & Rogers, 2004; Patock-Peckham, Hutchinson, Cheong, & Nagoshi, 1998). In addition, facets of spirituality have been found to be inversely associated with alcohol use and the likelihood of attending an event at which alcohol is present (VonDras et al., 2007). The relation between religiosity and substance use may exist through restrictions applied by the religion to not engage in substance use (Galen & Rogers, 2004), or it may be that religious affiliation and attendance of services provides increased social support, which decreases the likelihood of developing problematic substance use behaviors (Brown, Salsman, Brechting, & Carlson, 2008). On the other hand, religiosity may influence substance use by adjusting a person's expectations, attitudes, and access to various substances through the influence of close peers (Chawla, Neighbors, Lewis, Lee, & Larimer, 2007; Galen & Rogers, 2004). Lastly, religious commitment, whether to religious beliefs, organizations, or a higher power, may provide greater meaning and a sense of purpose in an individual's life, which serves to fulfill a spiritual void previously satisfied by substance use (Bahr et al., 1998).

Despite an abundance of research suggesting that sensation seeking and religiosity are potential risk and protective factors, respectively, for substance use, few studies have been conducted that examine the effects of the interaction of the two on substance use. Forthun and colleagues (1999) examined the interaction of sensation seeking and religiosity in relation to the use of legal and illegal substances. Although religiosity and sensation seeking were both found to be independent predictors of substance use, no significant interactions were found between the two. Mason and Spoth (2011) further supported these results when they found that the relation between sensation seeking and adolescent substance use was not moderated by religiosity. Results were possibly limited given that the primary measure of religiosity in both studies was a single item assessing religious service attendance or salience, which may not have fully captured the complexity of this construct. It is important to explore robust measures of religiosity

to further examine and clarify its relation with sensation seeking and substance use.

Although there has been a dearth of research and support for religiosity as a moderator of the relation between sensation seeking and substance use, there remains plausibility for this interaction. For instance, religiosity may provide high sensation seekers with access to a supportive network of family and peers who are less likely to engage in and encourage substance use. Furthermore, the influence of spiritual support may elicit similar effects (Maton et al., 1996). In addition, strong religious and/or spiritual beliefs often morally and socially conflict with a lifestyle of heavy substance use (Benda, 1997; Donahue & Benson, 1995; Kutter & McDermott, 1997; Oetting, Donnermeyer, & Deffenbacher, 1998).

The current study examined religiosity, measured robustly, as a potential moderator of the relation between sensation seeking and heavy episodic drinking and marijuana use. The primary hypotheses were that (a) sensation seeking would positively predict these types of substance use; (b) religiosity, operationalized as genuine commitment to religious beliefs and faith (e.g., intrinsic religiosity), and spirituality (e.g., religious and existential well-being) would negatively predict substance use; and (c) religiosity would moderate the relation between sensation seeking and substance use. More specifically, when religiosity was high, there would be no association between sensation seeking and substance use, but at low and moderate levels, there would be a significant positive association between sensation seeking and substance use.

## Method

### Participants and Recruitment

Participants ( $N = 514$ ) were undergraduate students (70.6% female) enrolled in psychology and marketing undergraduate courses at Temple University, which is a large, urban university located in the Mid-Atlantic Region of the United States. All participants were at least 18 years of age. The sample was racially and ethnically diverse (66.3% White, 15.8% Black, 11.5% Asian, 0.2% American Indian or Alaskan Native, 0.2% Native Hawaiian or other Pacific Islander, 1.0% other, and 5.1% who did not wish to respond). In addition, 6.0% of all participants identified as Hispanic/Latino. The sample endorsed various religious orientations/beliefs (55.3% Christian, 4.5% Jewish, 3.1% Muslim, 2.1% Buddhist, 1% Hindu, 12.5% nonreligious, 5.6% atheist, 6.8% agnostic, 7% other, and 1.9% chose not to respond). They were recruited through a departmentally approved website appointment system and received credits toward satisfying a course requirement for their participation. The study had the approval of the Temple University Institutional Review Board. All data used in the analyses were collected using online surveys. Participants had the freedom to access and complete the survey at times and locations of their own convenience.

Although data were collected from 514 participants, only 376 had complete data. Given that Little's missing completely at random analysis was nonsignificant ( $\chi^2 = 22,256.44$ ;  $p = .11$ ) and that most variables (all but 1) had <5% missingness (and in many cases <1%), pairwise deletion was used for each analysis to maximize the power to detect differences and to retain participants who completed questions relevant to each analysis. The range of final  $N$ s for each analysis is presented in Tables 1–4.

Table 1  
Descriptive Statistics for Sensation Seeking, Religiosity, and Substance Use Variables

Variable	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
1. Risk Seeking	23.70	6.42	.03	-.23
2. Experience Seeking	19.31	2.91	-.32	.17
3. Religious Service Attendance	1.18	2.71	6.00	53.96
4. Intrinsic	22.81	6.03	.50	.09
5. RWB	35.24	11.70	-.09	-.88
6. EWB	33.36	5.81	-.60	.58
7. Marijuana Use	7.31	34.06	10.52	130.35
8. Binge Drinking	3.22	3.81	1.48	2.14

Note. RWB = religious well-being; EWB = existential well-being. *N* is 466–514 cases because of missing data.

## Measures

**Demographic characteristics.** Participants were asked to self-report demographic information concerning their sex, race, ethnicity, and religious orientation. Religious orientation was not a variable of interest for the tests of the hypotheses but was included as a means of characterizing the sample.

**Sensation Seeking Personality Type Scale.** To assess sensation seeking, the 18-item version of Sensation Seeking Personality Type scale (SSPT; Conner & Henson, 2010) was used. Participants responded to each item by indicating how much they agree or disagree with a given statement using a 5-point Likert-type scale. The two subscales of the SSPT included in this study were risk seeking (e.g., “I enjoy participating in unsafe activities”) and experience seeking (e.g., “I think it is important to try as many new things as I can”), for which higher scores indicate greater risk seeking and experience seeking. The SSPT has previously demonstrated good retest reliability ( $r = .87$  with a 6-week interval between test administrations) and internal consistency (risk seeking Cronbach’s  $\alpha = .88$ , experience seeking Cronbach’s  $\alpha = .82$ ). The SSPT has also demonstrated strong construct validity because previous research has shown it to be significantly and positively associated with the engagement in risky behaviors such as drug use, alcohol use, risky sexual behaviors, and risky sports activities (Conner, 2006). For the current study, Cronbach’s  $\alpha$  for the risk seeking and experience seeking subscales were .88 and .76, respectively.

Table 3  
Negative Binomial Regression Coefficients for the Main Effects of Sex, Sensation Seeking, and Religiosity on Each of the Substance Use Variables

Variable	Marijuana Use	Binge Drinking
Sex (1 <sup>a</sup> = female, 2 = male)	1.39***	.19
Risk Seeking	.15***	.07***
Experience Seeking	.12***	.06***
Religious Service Attendance	-.71***	-.14***
Intrinsic	-.12***	-.04***
RWB	-.05***	-.01**
EWB	-.07***	.01

Note. RWB = religious well-being; EWB = existential well-being. *N* is 447–511 cases because of missing data.

<sup>a</sup> Females were used as the reference variable.

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

**Risky Behavior Inventory.** The Risky Behavior Inventory (RBI) was developed to be used in conjunction with the SSPT (Conner, 2011). The RBI allows researchers to gather information about engagement in substance use behaviors using questions (typically dichotomous; i.e., “yes” or “no”). Answering “yes” to any of these questions results in several follow-up questions related to the frequency and severity of the behaviors. Given the hypotheses of the current study, the following two frequency questions were used to assess substance use behaviors: (a) “How many times have you used marijuana in the last 30 days?” and (b) “In the past 30 days, how many times have you consumed five or more drinks (if you are male) or four or more drinks (if you are female) on one drinking occasion?”

**Religious Orientation Scale: I/E-Revised II.** The Religious Orientation Scale: I/E-Revised II (ROS-r II) is a 14-item scale that measures three distinct areas of religiosity: Intrinsic (I), Extrinsic Person-Oriented (Ep), and Extrinsic Socially Oriented (Es) (Genia, 1993). Questions were answered using a 5-point Likert-type scale containing the following anchors: *Strongly Disagree* and *Strongly Agree*. Because the interest was in examining the influence of genuine religious and spiritual commitment on substance use, measures that assessed more superficial aspects in these constructs (e.g., extrinsic religiosity) were not included.

The I scale (e.g., “My whole approach to life is based on my religion”) has been shown to have good internal consistency

Table 2  
Pearson Correlations Among Sensation Seeking, Religiosity, and Substance Use Variables

Variable	1	2	3	4	5	6	7	8
1. Risk Seeking	—							
2. Experience Seeking	.35**	—						
3. Religious Service Attendance	-.12**	-.09*	—					
4. Intrinsic	-.22**	-.15**	.46**	—				
5. RWB	-.21**	-.11**	.36**	.80**	—			
6. EWB	-.07	.14**	-.06	.04	.11*	—		
7. Marijuana Use	.21**	.03	-.09	-.12*	-.11*	-.10*	—	
8. Binge Drinking	.37**	.15**	-.18**	-.19**	-.12*	.01	.15**	—

Note. RWB = religious well-being; EWB = existential well-being. *N* is 449–512 cases because of missing data.

\*  $p < .05$ , two tailed. \*\*  $p < .01$ , two tailed.

Table 4  
*Negative Binomial Regression Analyses for Sensation Seeking by Religiosity Interactions, With Substance Use as the Outcome Variable*

Interaction	$\beta$	SE
Risk seeking predicting marijuana use		
Risk Seeking $\times$ Religious Service Attendance	.05***	.01
Risk Seeking $\times$ Intrinsic	.00*	.00
Risk Seeking $\times$ RWB	.00**	.00
Experience Seeking predicting binge drinking		
Experience Seeking $\times$ Religious Service Attendance	.03*	.01

Note. RWB = religious well-being. *N* is 475–494 cases because of missing data.

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

(Cronbach's  $\alpha = .86$ ) (Genia, 1993); in the current study, the Cronbach's  $\alpha$  for the I subscale was .71. Item 5 from the ROS-rII, "I have often had a strong sense of God's presence," was modified to replace the word "God" with "a higher power" to maintain consistency with other items in the study.

**Modified Spiritual Well-Being Scale.** The Spiritual Well-Being Scale (SWBS) was developed to measure two components of spirituality: (a) religious well-being (RWB), which is characterized by having a connection to a higher power, and (b) existential well-being (EWB), which is characterized as having a sense of purpose and meaning in life experiences (Fernander, Wilson, Stanton, & Leukefeld, 2004). Spirituality was operationalized by each of these two components (i.e., religious and existential well-being). Questions were answered using a 5-point Likert-type scale anchored with *Strongly Disagree* and *Strongly Agree*. Representative items from the Modified SWBS (SWBS-m) include, "I have a personally meaningful relationship with a higher power" (RWB) and "I understand my place in the world" (EWB) (Fernander et al., 2004). The SWBS-m differs from the original version by rewording some of the items (primarily represented by switching the word "God" to "higher power") and the inclusion of four additional items. In a study conducted by Fernander et al. (2004), the Cronbach's  $\alpha$  values for the modified RWB and EWB scales were .94 and .82. In the current study, Cronbach's  $\alpha$  values for the RWB and EWB subscales were .95 and .85.

**Religiosity item.** Religiosity was further assessed using an item to measure religious service attendance: "How many religious services (e.g., church services, synagogue services, etc.) do you currently attend per month?" This was done to enable comparisons between current study findings and those from previous research that analyzed the effect of religiosity on substance use, which have typically relied on this type of single indicator approach to operationalizing religiosity (e.g., Forthun et al., 1999; Mason & Spoth, 2011).

## Data Analyses

Pearson correlations were used to examine the associations between each of the predictors (e.g., risk seeking, experience seeking, intrinsic religiosity, etc.) and the associations between each of the predictors and the outcome variables (frequency of marijuana use, frequency of heavy episodic drinking).

A series of regression analyses were conducted to test the three primary hypotheses. Given that each of the outcome variables were count variables and not normally distributed, negative binomial regressions were used to determine the relation between the predictors, moderators, and the outcome variables (Gardner, Mulvey, & Shaw, 1995). Typical regression techniques, such as ordinary least squares regression, assume that the outcome variable is normally distributed. Violating this assumption can lead to incorrect estimates of variance terms and false inferences about the regression. Count-based regressions, such as Poisson and negative binomial, do not make such assumptions about the distribution of the outcome variable, which gives them an advantage over traditional methods (Gardner et al., 1995). Furthermore, negative binomial regression has an advantage over Poisson regression when the variance of the outcome variable is larger than the mean, which is the case herein, making negative binomial regression the appropriate statistic for the current study. For tests of main effects,  $\beta$  coefficients were used to determine the strength and the direction of the relationship between the predictor and outcome variables.

For the moderation analyses, sensation seeking variables (e.g., the risk and experience seeking subscales, respectively), religiosity variables (e.g., religious service attendance, and the I, RWB, and EWB subscales, respectively), and their interaction terms were entered as predictors. To calculate the interaction terms, each of the sensation seeking and religiosity variables were first mean-centered (with the exception of the number of religious services attended per month as it is a count variable) and then multiplied together. The resulting mean-centered variables and their interaction terms were entered as predictor variables for each of the respective moderations being tested. Main effects variables (i.e., sensation seeking and religiosity) were mean-centered primarily to help facilitate the interpretation of the regression model (Aiken & West, 1991). For tests of moderation, plotting high (i.e., 1 *SD* above the mean) and low (i.e., 1 *SD* below the mean) values of the interaction terms allowed for the greatest ease of interpretation for the strength and direction of the moderation. Given that sex was a significant predictor for sensation seeking as well as each of the outcome variables, it was included as a covariate for all tests of moderation.

## Results

Descriptive statistics for all sensation seeking, religiosity, and substance use variables can be found in Table 1.

### Pearson Correlations Among Sensation Seeking, Religiosity, and Substance Use Variables

As seen in Table 2, there were several significant correlations among the sensation seeking, religiosity, and substance use variables. The effect sizes for many of the significant correlations were low ( $r^2$ s = .01–.14), calling into question the practical significance of some of these correlations, especially given the size of the sample used in all analyses (Conner, 2010). Concerns regarding multicollinearity were minimal given the large sample size and the relatively small effect sizes of the correlations.

## Main Effects of Sensation Seeking and Religiosity on Substance Use

Negative binomial regression equations were used to test the main effects of sensation seeking and religiosity on each of the substance use outcome variables. The results of each regression are presented in Table 3.

In line with the first hypothesis, higher risk seeking and experience seeking scores were significantly predictive of higher frequencies for each of the substance use behaviors ( $p < .001$ ). In addition, in line with the second hypothesis, almost all of the religiosity variables significantly negatively predicted each of the substance use behaviors. However, of particular note, existential well-being did not significantly predict the frequency of binge drinking episodes ( $p = .56$ ).

## Religiosity as a Moderator of the Relationship Between Sensation Seeking and Substance Use

Results for all significant interactions are presented in Table 4 and Figure 1. For the frequency of marijuana use in the past 30 days, significant interactions were found for risk seeking and religious attendance ( $p < .001$ ), intrinsic religiosity ( $p < .05$ ), and religious well-being ( $p < .01$ ). In line with the third hypothesis, when religiosity was low, there was a positive association between risk seeking and marijuana use. However, at high levels of religiosity, there was either no association or a reduced positive association between risk seeking and marijuana use. All other risk seeking and religiosity interactions as well as all experience seek-

ing and religiosity interactions were nonsignificant for the marijuana use variable ( $p > .05$ ).

For the number of binge drinking episodes in the last 30 days, a significant interaction was found for experience seeking and religious attendance ( $p < .05$ ). As depicted in Figure 1D, when religious service attendance was low, there was a significant positive association between experience seeking and binge drinking, but at high levels of religious service attendance, there was a reduced positive association between experience seeking and binge drinking. All other interactions between the sensation seeking and religiosity variables were nonsignificant for binge drinking ( $p > .05$ ).

## Discussion

As expected, risk and experience seeking, facets of sensation seeking, had significant positive associations with most of the outcome variables. For sensation seeking, only the relation between experience seeking and frequency of marijuana use was nonsignificant. These findings are consistent with prior findings that high sensation seeking is significantly positively associated with heavy episodic drinking and increased marijuana use (Crawford et al., 2003; Kopstein et al., 2001; van Beurden et al., 2005). In addition, intrinsic religiosity, religious service attendance, and a subscale of spiritual well-being (RWB) had significant negative associations with the substance use variables. These results are consistent with existing literature that has found religiosity to be negatively associated with alcohol and marijuana use (Bahr et al., 1998; Galen, &

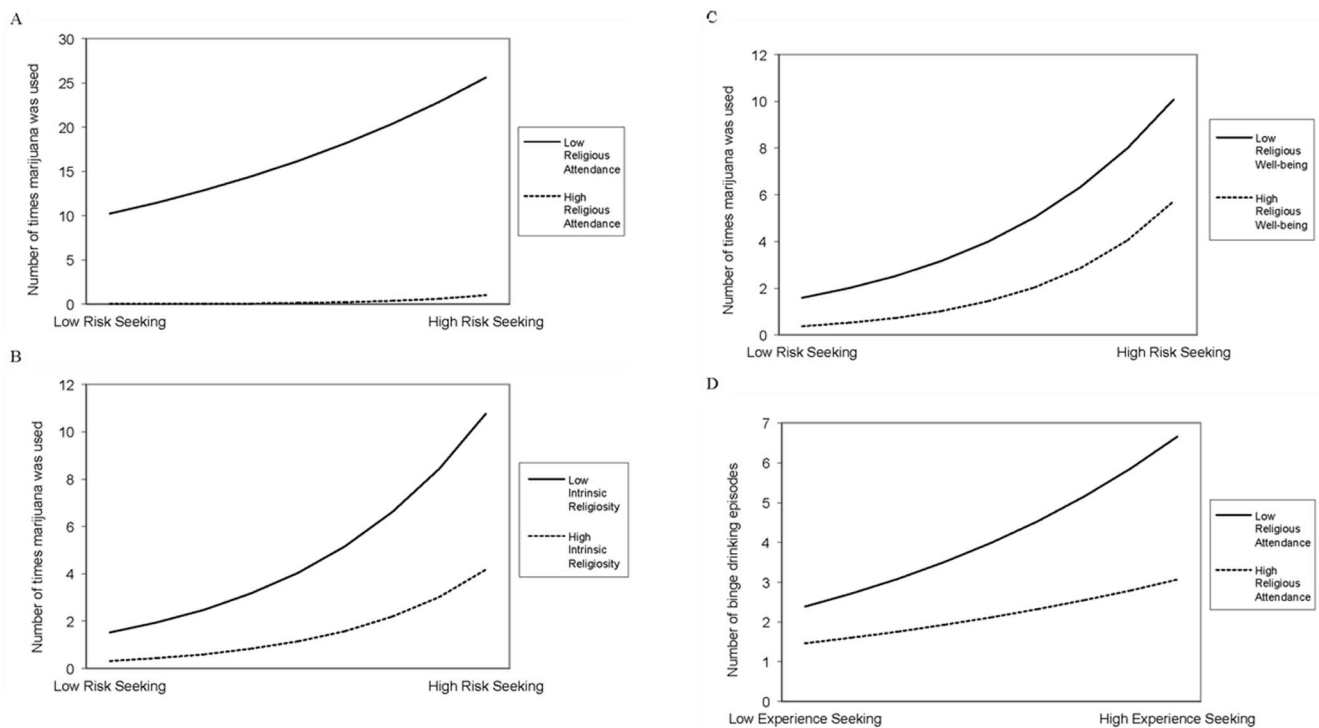


Figure 1. (A) Interaction for Risk Seeking × Religious Service Attendance, (B) interaction for Risk Seeking × Intrinsic Religiosity, (C) interaction for Risk Seeking × Religious Well-Being, and (D) interaction for Experience Seeking × Religious Service Attendance.

Rogers, 2004; Kendler et al., 1997; Mason & Windle, 2002; Patock-Peckham et al., 1998; Wills et al., 2003). However, the EWB subscale of the SWBS did not have a significant negative relation to the binge drinking variable. Existential well-being, which has a stronger focus on spirituality in terms of the material elements of a person (i.e., a person's personality, disposition, etc.), may not provide the same protective benefits as the other facets of religiosity. Therefore, a connection to immaterial aspects of life (i.e., a Holy Spirit, higher power, etc.) may be important to the protective relation between religiosity and alcohol use.

Mixed support was shown for religiosity as a moderator of sensation seeking and substance use. Although facets of sensation seeking interacted with facets of religiosity in predicting substance use, the majority of these significant interactions were found with risk seeking as the predictor and marijuana use as the outcome. More specifically, risk seeking interacted with religious service attendance, intrinsic religiosity, and religious well-being in predicting the frequency of marijuana use. The pattern of moderation was in the expected direction, with individuals who had higher risk seeking and lower religiosity engaging in more frequent marijuana use whereas individuals who had higher risk seeking and religiosity scores exhibited less frequent marijuana use. The only interaction between experience seeking and religiosity was with religious service attendance and involved predicting the number of binge drinking episodes. This interaction was in the expected direction, with individuals who had higher experience seeking and lower religious service attendance engaging in more frequent binge drinking. Given that religious service attendance had the strongest interaction with risk and experience seeking, it may be plausible to assume that regularly attending religious services provides protective benefits beyond those that might be associated with religious/spiritual beliefs alone (e.g., belief in something greater than yourself, meaning/purpose to life, support from a God/higher power, etc.). In other words, individuals with high risk and experience seeking may especially benefit from the structure of religious service attendance (e.g., having less time to be around substances of abuse) and the additional support of the community (i.e., involvement with others who are interested in their well-being) (Brown, Salsman, Brechting, & Carlson, 2008). Or perhaps, in addition to the influence that religious/spiritual beliefs can have on a person's self-image and/or motivation, religious service attendance may provide these individuals with a better opportunity to form close relationships with peers who are less likely to abuse substances (Galen & Rogers, 2004).

The results reported herein are contrary to findings reported by Forthun and colleagues (1999) and Mason and Spoth (2011), who each found that the relations between aspects of sensation seeking and substance use were not moderated by religiosity. This disparity in research findings may be explained, in part, by the use of measures that captured more robust dimensions of religiosity (i.e., the ROS-r II and SWBS-m) rather than single-item measures of religious salience and/or attendance. However, given that several of the significant interactions were found with the religious service attendance variable, these results may also have varied because of the make-up of the current sample, which was more diverse in regards to race, ethnicity, and religious orientation than the previously conducted research (e.g., the current study was 66.3% Caucasian and 55.3% Christian, compared with 98.6% and 90% Caucasian, and 79% [estimated] and 88% Christian, in the Mason and

Spoth (2011) and Forthun and colleagues (1999) studies, respectively).

In addition, these results suggest that religiosity has a more protective effect in the relation between risk seeking and substance use than it does for experience seeking and substance use. One explanation for this finding is that experience seeking may be a weaker predictor of substance use behavior in comparison to risk seeking because experience seeking measures one's propensity to seek out novel sensations whereas risk seeking measures one's propensity to engage in dangerous activities. This was demonstrated with the current sample (see Table 3); experience seeking (compared to risk seeking) was a weaker predictor of each of the substance use behaviors. This difference might be salient because substance use behaviors were measured over time (i.e., "How many times have you . . .") rather than the number of new substances that were recently tried. In other words, we were using measures of repeated behavior as our dependent variables; thus, an independent variable measuring preference for new activities would probably not be as predictive of these outcomes. In addition, it is possible that religiosity may be less effective at limiting the initial use of a substance, but it may facilitate less substance use over time (e.g., through increased social support, identity building, positive peer influences, etc.).

The lack of significant interactions between sensation seeking and religiosity in predicting heavy episodic drinking is noteworthy because it suggests that the effectiveness of religiosity as a protective factor may vary by substance among those high on sensation seeking. A possible explanation for this finding is that religiosity may be a more meaningful moderator of the relation between sensation seeking and illegal drug use, rather than alcohol use, which, although illegal for individuals under 21 years of age, is typically viewed as a more accepted or sanctioned substance to use. A common tendency associated with most religious organizations is to apply moral consequences to behaviors that overlap and reinforce laws in today's society (e.g., committing murder, stealing, using recreational drugs, etc.) (Grasmick, Kinsey, & Cochran, 1991). Thus, for individuals who recognize religion as an influential factor in their lives, the potential stigma of being labeled a "criminal" or a "bad person" may be enough to deter them from engaging in illegal and far less accepted behaviors, such as marijuana use. Alcohol use and, as an extension, heavy episodic drinking, which is typically not prohibited in most organized religions, may not be subject to the same stigma or negative consequences as marijuana use. Perhaps the general acceptance of alcohol use by most religions allows for greater initial access to an addictive substance, which limits the usefulness of religiosity as a protective factor. Future research would benefit from comparing the influence of religiosity on heavy episodic drinking across religious orientations that vary in regard to their proscriptions on alcohol use.

There are several limitations to the current study. First, the sample consisted of college-aged and enrolled individuals; therefore, the findings may not generalize to individuals outside of an undergraduate setting. Second, the study consisted solely of self-report measures, which may have led to inaccuracies in general reporting or recall bias regarding past substance use (e.g., accurately remembering how many times a substance was used up to 30 days ago). Third, the relatively small effect size of some of the results, in combination with the use of a large sample, raises some

concerns about the practical significance of certain findings. Finally, the cross-sectional design of this study limits the ability to make causal inferences about directionality. For example, sensation seekers may be less interested in attending religious services; therefore, they may not be very religious. Future research using a more general sample of the population, and varied measures of past substance use, including longitudinal assessments of substance use, timeline follow-back interviewing, and confederate reports, would address the limitations identified herein and bolster the hypothesis that religiosity moderates the relation between sensation seeking and substance use.

However, the current study advances the literature on sensation seeking, religiosity, and substance use among college-aged individuals. More specifically, this study contributes to the limited amount of research on religiosity as a moderator of the relation between sensation seeking and substance use. The use of multi-item scales of religiosity that assessed various dimensions of religiosity, in combination with a sample that was diverse in terms of race, ethnicity, and religious orientation, provides a meaningful contribution to gaps in the existing literature. The current study provides support for the protective quality of religiosity on the relation between risk seeking and marijuana use.

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