

Religiousness and Levels of Hazardous Alcohol Use: A Latent Profile Analysis

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Abstract Prior person-centered research has consistently identified a subgroup of highly religious participants that uses significantly less alcohol when compared to the other subgroups. The construct of religious motivation is absent from existing examinations of the nuanced combinations of religiousness dimensions within persons, and alcohol expectancy valuations have yet to be included as outcome variables. Variable-centered approaches have found religious motivation and alcohol expectancy valuations to play a protective role against individuals' hazardous alcohol use. The current study examined latent religiousness profiles and hazardous alcohol use in a large, multisite sample of ethnically diverse college students. The sample consisted of 7412 college students aged 18–25 (M age = 19.77, SD age = 1.61; 75 % female; 61 % European American). Three latent profiles were derived from measures of religious involvement, salience, and

religious motivations: *Quest-Intrinsic Religiousness* (highest levels of salience, involvement, and quest and intrinsic motivations; lowest level of extrinsic motivation), *Moderate Religiousness* (intermediate levels of salience, involvement, and motivations) and *Extrinsic Religiousness* (lowest levels of salience, involvement, and quest and intrinsic motivations; highest level of extrinsic motivation). The *Quest-Intrinsic Religiousness* profile scored significantly lower on hazardous alcohol use, positive expectancy outcomes, positive expectancy valuations, and negative expectancy valuations, and significantly higher on negative expectancy outcomes, compared to the other two profiles. The *Extrinsic* and *Moderate Religiousness* profiles did not differ significantly on positive expectancy outcomes, negative expectancy outcomes, negative expectancy valuations, or hazardous alcohol use. The results advance existing research by demonstrating that the protective influence of religiousness on college students' hazardous alcohol use may involve high levels on *both* quest and intrinsic religious motivation.

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Introduction

Research on the protective role of religiousness (i.e., religiosity) against alcohol use seems to be increasingly emphasizing person-centered analyses in comparison to the emphasis historically placed on variable-centered analyses. Variable-centered analyses examine associations between or among scores on measures of different constructs within a group of participants, whereas person-centered analyses create subgroups (i.e., classes, profiles, trajectories) within

a sample based on similarities among individuals' scores on a variety of measures. Associations between the subgroups and distal outcome variables are then examined. The transition to person-centered approaches when studying religiousness seems tied to increased recognition of the heterogeneity of individuals' religiousness (Salas-Wright et al. 2012). Person-centered approaches therefore tend to be viewed as more ecologically valid, more closely reflecting individuals' actual experiences (Hodge et al. 2007), and more accurately capturing the ways different religiousness dimensions are organized within individuals (Good et al. 2011). The religiousness dimensions of public and private involvement and salience create distinct subgroups, and these subgroups exhibit differential associations with alcohol use indicative of a protective role for religiousness among those in the high religiousness subgroups (Hodge et al. 2007; Salas-Wright et al. 2012). Missing from the person-centered literature are the constructs of religious motivation and alcohol expectancy valuations, which are increasingly recognized as relevant to understanding individuals' hazardous alcohol use (Jankowski et al. 2013).

Religiousness, when examined from a variable-centered approach, has consistently been shown to protect against hazardous alcohol use among adolescents and college-aged young adults (e.g., Burris et al. 2011; Jankowski et al. 2013). Hazardous alcohol use refers to high-risk consumption, and the Alcohol Use Disorders Identification Test (AUDIT; Babor et al. 2001) is specifically designed to assess levels of hazardous drinking. We use the term *hazardous alcohol use* to refer to drinking that increases the risk of injury and/or experiencing difficulties at work, in school, or in relationships (Babor et al. 2001). Different mechanisms for the protective effect of religiousness on hazardous alcohol use have been reported, with self-regulation (e.g., effortful control) and alcohol cognitions (e.g., alcohol expectancy outcomes, alcohol expectancy valuations) emerging as particularly meaningful mediators (Jankowski et al. 2013).

Of particular note for the current study is the possible influence of alcohol expectancy valuations. Alcohol expectancy valuations refer to the extent to which an expected alcohol outcome (e.g., become more sociable, take more risks) is perceived as a good/desirable or a bad/undesirable effect (Fromme and D'Amico 2000). Jankowski et al. (2013), for example, using a sample of adolescents aged 15–18, found that increased positive valuations strengthened the association between increased positive alcohol expectancies and increased hazardous alcohol use—indicating a moderated indirect effect between intrinsic religious motivation and hazardous alcohol use. Jankowski et al. also found a positive association between negative alcohol expectancies and hazardous use when

negative expectancies were viewed as less undesirable, whereas a negative association between negative expectancies and hazardous use was observed when the expectancies were viewed as more undesirable. Nevertheless, variable-centered approaches such as that conducted by Jankowski et al. may fail to capture more nuanced relations between individuals' religiousness and their hazardous alcohol use. Therefore, in the current study, we examined associations between religiousness and levels of hazardous alcohol use by examining the multi-faceted nature of religiousness using person-centered analysis (Pearce et al. 2013), and including positive and negative alcohol expectancy valuations as distal outcome variables because of previously demonstrated associations with individuals' hazardous alcohol use (Jankowski et al. 2013).

Religiousness and Alcohol Use

Religiousness is a multi-dimensional construct (Pearce et al. 2013) consisting of the dimensions of involvement (e.g., public religious service attendance, frequency of private prayer) and salience (e.g., self-ascribed importance of religious beliefs, practices, and subjective experiences of connection with the divine or transcendent). Salience is a broad construct that can include the affective dimension of religiousness or what some scholars have described as spirituality (Pearce et al. 2013). Religious motivation is a dimension that represents prior syntheses of Allport and Ross's (1967) original theory with self-determination theory (Neyrinck et al. 2010; see also, Ryan et al. 1993), attachment theory (Hall et al. 2009), and self-identity development theory (Bauer and McAdams 2004), with particular relevance to young adults (Cook et al. 2014). As such, religious motivation emerges from a developmental process that involves the internalization of relational experiences, including religious beliefs and practices. The internalization process intersects with individuals' basic needs for *both* agency (i.e., autonomy, mastery, exploration) *and* communion (i.e., security, intimacy, commitment; see also, Bakan 1966). Agency and communion needs converge and interact in complex and dynamic ways among college-aged young adults. Previously internalized commitments may be re-evaluated and either retained or rejected, and alternative commitments may be explored and intentionally internalized; at the same time, other commitments may go unexamined while still others may be formed outside of conscious awareness (Schwartz et al. 2013). Motivation can be operationalized in terms of individuals' reasons for engaging in religious behavior and the relative importance ascribed to differing aspects of religious experience.

Intrinsic religious motivation involves engaging in behavior because it is personally important to do so for its

own sake (Allport and Ross 1967). Intrinsically motivated religious activities are engaged in with a “greater sense of volition and psychological freedom” (Neyrinck et al. 2010, p. 427) and with greater consistency and commitment (Worthington et al. 2003). Intrinsic religiousness potentially signifies secure implicit relational models of self and other, including the divine or transcendent, and felt security with the divine or transcendent is sought with greater self-determination (Hall et al. 2009). In contrast, extrinsic motivation refers to behavior influenced by forces outside of the individual, “pressured from within, by internal demands, such as feelings of guilt [and] shame” (Neyrinck et al. 2010, p. 427), or behavior engaged in for utilitarian ends (Allport and Ross 1967). Extrinsic religiousness may represent insecure implicit relational models (Hall et al. 2009; i.e., felt security is reactively sought, with little agency or intentionality, to soothe negative affective experience).

Quest refers to the extent to which someone honestly confronts existential questions, sees doubt as positive, and is willing to change (Batson and Schoenrade 1991). Quest has demonstrated positive associations with cognitive complexity (i.e., openness, flexibility; Batson et al. 1993) and religious development has been described as a process of “dynamic complexification” (i.e., increasing numbers of distinct yet integrated self-representations; Albright 2006, p. 179). Quest demonstrated a positive association with moral reasoning (Ji 2004) and has also demonstrated consistent negative associations with prejudice (Hall et al. 2010). In contrast, extrinsic motivation demonstrated consistent positive associations with prejudice, whereas findings for intrinsic religious motivation are mixed (Hall et al. 2010). Quest may be understood as a cognitive *capacity*, akin to other developmental descriptions of cognitive complexity such as commitment-within-relativism (Perry 1970). Lastly, quest can signify a secure base experience from which intentional exploration occurs (Jankowski and Sandage 2014) or an experience of emotional dysregulation that fosters reactive exploration or occurs as a consequence of exploring (Sandage et al. 2010).

Very little research on religiousness and alcohol use involving adolescent and college-aged samples has examined religious motivation, and this is especially true of quest. The lack of research on religious motivation is surprising given that the protective influence of religiousness seems to involve the internalization of values that mitigate alcohol use (Jankowski et al. 2013). Furthermore, religious motivation has demonstrated differential associations with self-regulation, and there is evidence that self-regulation may serve as a mechanism through which religiousness protects against hazardous alcohol use (Jankowski et al. 2013; self-regulation refers to self-monitoring emotion and behavior and adjusting behavior to prosocial

goals, and subsumes the related construct of self-control; McCullough and Willoughby 2009). Intrinsic motivation has demonstrated positive associations with self-regulation whereas extrinsic motivation has demonstrated negative or non-significant associations with self-regulation (McCullough and Willoughby 2009). Intrinsic religious motivation has also demonstrated a protective effect against alcohol use beyond that of religious involvement (Galen and Rogers 2004), whereas extrinsic religious motivation has demonstrated consistent non-significant associations with alcohol consumption (e.g., Brown et al. 2008; Galen and Rogers 2004). Quest has similarly demonstrated a non-significant association with alcohol use (Johnson et al. 2008).

We argue that variable-centered approaches fail to capture nuanced associations between individuals’ religious motivations and hazardous alcohol use. Individuals may simultaneously experience multiple religious motivations to varying degrees, which might correspond to different levels of hazardous alcohol use, thus requiring a person-centered analytic approach.

Profiles of Religiousness and Alcohol Use

A number of empirical profiles of religiousness have been identified when exploring associations with alcohol use (Fife et al. 2011; Hodge et al. 2007; Salas-Wright et al. 2012). Across these studies involving adolescent, college student, and adult samples, a class of highly religious participants has been consistently empirically derived and consists of higher scores on *both* public and/or private involvement *and* salience. The highly religious class consistently uses significantly less alcohol when compared to the other classes. In the only published person-centered study involving college students, Fife et al. (2011) used a sample of 510 Black students and found that the highly religious group [high scores on public and private involvement, and salience (i.e., the extent to which beliefs guided one’s life)] engaged in significantly less binge-drinking compared to the privately-practicing-low-attenders (low on public involvement, high on private involvement, and moderate salience).

Longitudinal research has similarly found differences between the highly religious and the other religiousness classes. McCullough et al. (2009) empirically identified profiles of adults’ religiousness: (1) highly-religious (high in young adulthood, increased until mid-life, and then leveled off), (2) low-religious (low across adulthood), and (3) parabolic-religious (moderate in young adulthood, increased until middle age, and then declined). Highly-religious participants used significantly less alcohol than the other two profiles over time, whereas parabolic-religious

participants reported less alcohol use in young adulthood compared to the low-religious class.

Existing findings suggest that (a) private religious involvement (e.g., frequency of private prayer) alone is insufficient to function as a protective factor against alcohol use (Fife et al. 2011), and (b) religious salience (e.g., “internal subjective spiritual reality;” Hodge et al. 2007, p. 213) is similarly insufficient to function as a sole protective factor (Fife et al. 2011; Hodge et al. 2007; Salas-Wright et al. 2012). The combination of public involvement with *both* private involvement *and* salience seems to be required to engender a protective influence of religiousness against adolescents’ and young adults’ alcohol use.

Alcohol Use Expectancy Outcomes and Valuations

Alcohol expectancy outcomes, or more simply alcohol expectancies, refer to an individual’s beliefs about the likelihood that a given consequence will occur as a result of alcohol consumption (Fromme and D’Amico 2000). Alcohol expectancies have increasingly been included in models examining intrinsic religiousness and alcohol use among college students. Burris et al. (2011), for example, found that intrinsic religiousness (i.e., religious commitment) predicted lower alcohol use beyond the effect of positive expectancies (i.e., explained variance beyond that accounted for by positive expectancies). Positive and negative expectancies mediated the association between intrinsic religious motivation and alcohol consumption (Galen and Rogers 2004) whereas positive expectancies mediated the association between religious commitment and alcohol use (Sauer-Zavala et al. 2014). The distinct construct of alcohol expectancy valuations has been largely unexamined by researchers studying religiousness and alcohol use from a variable-centered approach, and person-centered analyses have yet to include individuals’ valuations of alcohol expectancy outcomes.

Research indicates that, among adolescents and college-attending young adults, alcohol expectancy valuations predict alcohol use beyond the effect of alcohol expectancy outcomes (e.g., Fromme and D’Amico 2000; Zamboanga and Ham 2008; Zamboanga et al. 2012). Jankowski et al. (2013) included expectancy outcomes and expectancy valuations as distinct constructs in their examination of intrinsic religiousness and hazardous alcohol use. Their study yielded two key findings: (a) intrinsic religiousness was indirectly associated with hazardous use through both positive alcohol expectancy outcomes and negative alcohol expectancy valuations, and (b) positive and negative alcohol expectancy valuations moderated the respective associations of positive and negative expectancies with hazardous alcohol use. These results provided further

evidence for conceptualizing alcohol outcome expectancies and alcohol expectancy valuations as related yet distinct constructs. These results also highlight the importance of including alcohol expectancy valuations when examining religiousness and levels of hazardous alcohol use.

The Current Study

The current study addresses significant limitations in the existing literature. Missing from the existing research on religiousness classes and alcohol use is an explicit focus on college-aged populations, except for the lone identified study by Fife et al. (2011). This gap is particularly surprising given the prevalence of problem drinking behaviors among college students (Zamboanga et al. 2014) and the potential for improving college students’ health by tailoring prevention and intervention efforts to different religiousness profiles (Salas-Wright et al. 2012). Also missing from the existing person-centered research literature on religiousness and alcohol use is the construct of religious motivation. In fact, quest motivation has been largely unexplored in both variable-centered and person-centered analyses of religiousness and alcohol use. There is also a need for a person-centered approach that incorporates the trend toward including alcohol expectancy outcomes *and* alcohol expectancy valuations when examining the protective role of religiousness against hazardous alcohol use.

Existing person-centered research has largely employed a three-step approach to examining latent classes and distal outcomes (i.e., generating classes, using probabilities to create class membership as an observed variable, and then using the observed class variable in other analyses). This three-step approach can potentially introduce error because the classes are not observed in the sample and because the probability of a given individual being assigned to her or his most likely class is not 100 %. We therefore used a novel, flexible model-based approach that avoids the shortcomings of the three-step approach (Lanza et al. 2013). Feingold et al. (2014) concluded that the three-step approach “is to be avoided because it underestimates the true associations between latent classes and auxiliary variables” (p. 263).

We hypothesized that distinct, empirically derived profiles from measures of religious salience, involvement, *and* motivation would be differentially associated with hazardous alcohol use, alcohol expectancy outcomes, and alcohol expectancy valuations. More specifically, we expected that a high religiousness profile would emerge, characterized by elevated levels of salience, involvement and intrinsic motivation. Based on the limited findings from variable-centered approaches reporting non-significant associations between both extrinsic and quest

motivations and alcohol use, we posited that the high religiousness profile would display lower levels of both extrinsic and quest motivations. We also hypothesized that the high religiousness profile would report lowered levels of hazardous alcohol use and report levels of alcohol expectancies and valuations indicative of lowered use. Based on the interaction effects observed by Jankowski et al. (2013), we posited lower positive alcohol expectancies, lower positive and negative valuations, and higher negative expectancies among highly religious participants.

Method

Participants

Data for the present study came from the Multi-Site University Study of Identity and Culture (MUSIC; see Castillo and Schwartz 2013, for more details on the sample and procedures). The original sample consisted of 9495 college students ages 18–25 (M age = 19.78, SD age = 1.61). However given the focus on religiousness variables in the present study, and given that most of the items assumed direct experience with religion and that participants had the option to select “not applicable” on several religiousness items, we purposefully restricted our sample to those who indicated a religious affiliation. Thus, we omitted from analysis those who reported being atheist or agnostic (9.2 %) or who did not identify with a religious affiliation (11.8 %). Response patterns on some of the religiousness items indicated that many participants in the atheist, agnostic, or non-religious groups did not see the items as directly applicable to their experience (i.e., selecting “not applicable”). Restricting the sample to participants who identified with a religious faith yielded a sample of $N = 7412$ college students aged 18–25 for the present study (M age = 19.77, SD age = 1.61; 75 % female; 61 % European American, 16 % Hispanic, 12 % Asian American, 10 % African American, and 1 % other). Regarding religious affiliation, 43 % were Protestant, 34 % Roman Catholic, 5 % Jewish, 4 % Mormon, 2 % Assemblies of God (Pentecostal), 2 % Buddhist, 2 % Muslim, and 8 % reported other affiliations.

Procedures

Participants were recruited from 30 higher education sites (large state universities, smaller state universities, major private universities, and smaller private colleges) from across the United States in various disciplines (e.g., psychology, sociology, business, family studies, education, and human nutrition). Data were collected via an online self-report survey. At each site, participants were directed

to the study through print or electronic announcements. Students received extra credit for their participation or participated as a course research requirement.

Measures

Religious Salience

Religious salience, or spirituality (Hodge et al. 2007; Pearce et al. 2013), was assessed using 9 items ($\alpha = .94$; sample item: “God’s presence feels very real to me”) adapted from the Awareness subscale of the Spiritual Assessment Inventory (SAI; Hall and Edwards 2002). Awareness refers to the self-ascribed importance given to experiencing God’s presence and subsequent influence on behavior. Respondents were asked to rate statements on a scale from 1 (*not at all true*) to 5 (*very true*). Items were averaged to create scale scores, with higher scores indicative of greater salience.

Religious Involvement

Religious involvement was assessed using four items common to measures of religiousness (Hill and Hood 1999). Two explicit public involvement items (“In the last month, how often have you attended a religious service at your church/mosque/synagogue?” and “How many times in the last month have you attended a religious service somewhere outside of a church/mosque/synagogue?”) were rated from 1 (*not at all*) to 5 (*more than three times per week*). The third item which also tapped into private involvement (“How often do you pray?”) was rated from 1 (*never*) to 5 (*every day*). The fourth global item (“In terms of religion, how observant are you?”) was rated from 1 (*I do not observe a religion*) to 5 (*I follow all of the customs*). The four items ($\alpha = .75$) were averaged to create scale scores, with higher scores representing greater involvement.

Religious Motivation

Three religious motivations were assessed: quest, extrinsic, and intrinsic. The 12-item ($\alpha = .80$) Quest scale (Batson and Shoenrade 1991) assessed the motivation of religious exploration (sample item: “I am constantly questioning my religious beliefs”). Items were rated from 1 (*strongly disagree*) to 7 (*strongly agree*). Extrinsic religious motivation was assessed using 10 items ($\alpha = .68$) adapted from the extrinsic subscale of the Religious Orientation Scale (Allport and Ross 1967; sample item: “What religion gives me most is comfort when bad things happen”). This subscale measured the extent to which participants’ religious involvement was motivated by social and/or personal

benefits. Items were rated from 1 (*I definitely disagree*) to 4 (*I definitely agree*). We used 5 items ($\alpha = .91$) from the Religious Commitment Inventory (RCI; Worthington et al. 2003; sample item: “My religious beliefs guide my whole approach to life”), which parallel those used in existing measures of intrinsic religious motivation (e.g., Allport and Ross 1967), to assess the degree to which religious beliefs are internalized and consistently displayed in one’s actions. The RCI has demonstrated strong positive correlations with an explicit measure of intrinsic religious motivation in a sample of undergraduate students ($r = .80$, Steger et al. 2010). Items were rated on a scale from 1 (*I definitely disagree*) to 4 (*I definitely agree*). For each orientation, the relevant items were averaged to create scale scores with high scores reflecting more motivation.

Alcohol Expectancies and Valuations

Expectancies regarding consequences of alcohol use, as well as valuations of those expectancies, were assessed using the 15-item Brief Comprehensive Effects of Alcohol Scale (Ham et al. 2013). This measure assesses positive (e.g., “I would act sociable”) and negative (e.g., “I would be clumsy”) alcohol outcome expectancies and participants’ valuations of the expectancies (i.e., the extent to which a respondent believes a certain alcohol outcome is “good” or “bad”). This measure includes 8 items for positive outcomes of alcohol use and 7 items for negative outcomes. For expectancy outcomes, participants were given the sentence stem “If I were under the influence of alcohol” and then rated 15 statements on a 1 (*disagree*) to 4 (*agree*) scale. Then, for expectancy valuations they rated these same outcomes finishing the stem “This effect is,” with a rating scale from 1 (*bad*) to 5 (*good*). Both positive ($\alpha = .80$) and negative ($\alpha = .72$) outcome expectancies, and their valuations (positive $\alpha = .86$, negative $\alpha = .80$), demonstrated acceptable reliability. Items were averaged to create subscale scores. Higher scores for positive and negative outcome expectancies indicate greater expectations of positive or negative outcomes. Higher scores for valuations indicate that those expected outcomes were seen as more acceptable or desirable.

Hazardous Alcohol Use

Level of hazardous alcohol use was assessed using the 10-item self-report Alcohol Use Disorders Identification Test (AUDIT; Babor et al. 2001). Higher scores indicate increased risk of harmful consequences to self and others due to alcohol consumption. Evidence supports the use of the AUDIT with college students (Kokotailo et al. 2004). Participants rated statements on a five-point scale from 0 to 4, with most items scaled as 0 (*never/no*) to 4 (*daily or*

almost daily/yes, during the last year). Sample items include “How often do you have six or more drinks on one occasion?” and “How often during the last year have you failed to do what was normally expected from you because of drinking?” A cut-point score of 6 indicates hazardous use among college students (Kokotailo et al. 2004). The 10 items ($\alpha = .82$) were summed to create total scale scores.

Results

Descriptive Statistics

Descriptive statistics on all the study variables were estimated using a structural equation model in Mplus (version 7.3) using robust maximum likelihood estimation, and specifying all variances and covariances and requesting sample statistics.

Latent Profile Analysis

Data were analysed using mixture modeling procedures in Mplus (version 7.3). Mixture models are estimated in Mplus using robust maximum likelihood estimation, which includes all cases with available data and is robust to non-normality. Specifically, we conducted latent profile analysis, which is similar to cluster analysis, but produces latent rather than observed subgroups. Further, latent profile analysis is similar to latent class analysis but with continuous rather than categorical indicator variables. We use the terms class and profile interchangeably when referring to subgroups. First, we estimated and compared models with 1–7 classes to identify the class structure that best balanced model fit and parsimony. We used a number of indexes to make these model comparisons (see Table 1; Lubke and Muthén 2005; Nylund et al. 2007). The Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) are relative fit indexes where smaller values indicate better model fit. The Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT) compares the estimated model to the model with one fewer class, with larger p -values indicating less improvement in model fit due to adding the additional class. Last, entropy is a marker of the clarity of class delineation, with values closer to 1 indicating fewer classification errors (Celeux and Soromenho 1996).

Using these criteria, we chose the 3-class solution (see Table 1 for fit indexes). First, the proportion reduction in AIC and BIC started to level off when moving from 3 to 4 classes and beyond. In other words, the relative improvement in model fit from adding a class diminished considerably after 3 classes. Second, the p values for the LRT tests were significant at the $p < .001$ level until 5 classes (we used $p < .001$ given the large sample size). This

Table 1 Model fit statistics

No. of classes	No. of parameters	LL	AIC	Proportion reduction AIC	BIC	Proportion reduction BIC	LRT	Entropy
1	10	−39,994.52	80,009.04	NA	80,078.14	NA	NA	NA
2	16	−36,142.20	72,316.41	0.0961	72,426.98	0.0955	0	0.75
3	22	−34,483.72	69,011.44	0.0457	69,163.48	0.0451	0	0.77
4	28	−34,065.73	68,187.45	0.0119	68,380.95	0.0113	0	0.72
5	34	−33,930.31	67,928.63	0.0038	68,163.60	0.0032	0.003	0.68
6	40	−33,819.27	67,718.53	0.0031	67,994.97	0.0025	0.03	0.68
7	46	−33,723.93	67,539.86	0.0026	67,857.76	0.0020	0.12	0.68

LL log-likelihood, AIC Akaike Information Criteria, BIC Bayesian Information Criteria, LRT Vuong-Lo-Mendell-Rubin likelihood ratio test

suggested that the improvement in model fit gained by adding a class was no longer statistically significant beyond 4 classes. Third, entropy was maximized at .77 with 3 classes. This entropy value approximated an acceptable value of .80, and indicated that the 3-class solution had the fewest classification errors. We recognize that aspects of this information could suggest the feasibility of the 4-class solution. However, the added interpretive value offered by the 4-class solution when examining associations with distal outcome variables did not outweigh that suggested by the 3-class solution, so on the basis of the principle of parsimony we chose the 3-class solution.

For interpretation of the 3-class solution, see Table 2 for the estimated class means on the indicator variables and Fig. 1 for plots of the class profiles (based on standardized means). Table 2 also contains the means and standard

deviations for the entire sample. One class profile was labelled *Extrinsic Religiousness* (i.e., low religiousness class) and was characterized by the highest level of extrinsic religious motivation and the lowest levels of religious salience, religious involvement, and quest and intrinsic religious motivations. A second profile was labelled *Quest-Intrinsic Religiousness* (i.e., a highly religious class), characterized by the lowest levels of extrinsic religious motivation and the highest levels of salience, involvement, and quest and intrinsic motivations. A third profile was labelled *Moderate Religiousness* because of intermediate levels on all five indicators.

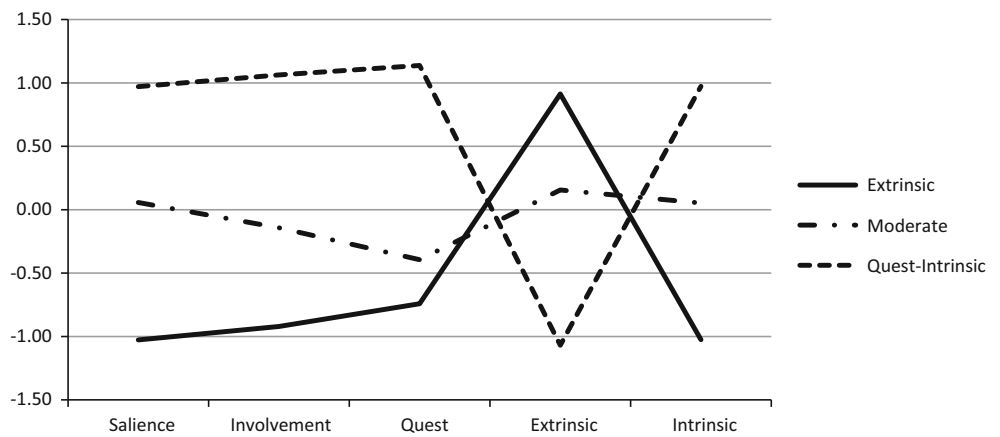
To empirically assess between-class differences on the indicator variable means, we conducted a series of follow-up models using the Model Test command in Mplus. Given that there were five indicator variables and three classes,

Table 2 Estimated means and standard deviations on indicator variables and distal outcomes

	Ms by class			Ms (SDs) for entire sample
	Extrinsic (<i>n</i> = 1808)	Moderate (<i>n</i> = 3864)	Quest-Intrinsic (<i>n</i> = 1740)	(<i>N</i> = 7412)
<i>Indicator variables</i>				
Religious salience	1.82 ^a	3.15 ^b	4.28 ^c	3.09 (1.08)
Religious involvement	1.75 ^a	2.40 ^b	3.42 ^c	2.48 (0.77)
Quest religious motivation	3.86 ^a	4.01 ^b	4.68 ^c	4.13 (0.98)
Extrinsic religious motivation	2.67 ^a	2.45 ^b	2.09 ^c	2.42 (0.50)
Intrinsic religious motivation	1.64 ^a	2.63 ^b	3.48 ^c	2.59 (0.78)
<i>Distal outcome variables</i>				
Positive expectancies	2.62 ^a	2.57 ^a	2.31 ^b	2.52 (0.66)
Negative expectancies	2.52 ^a	2.55 ^a	2.67 ^b	2.57 (0.64)
Positive valuations	3.35 ^a	3.18 ^b	2.77 ^c	3.12 (0.95)
Negative valuations	2.23 ^a	2.25 ^a	1.87 ^b	2.15 (0.79)
Hazardous alcohol use	6.39 ^a	6.69 ^a	2.20 ^b	5.54 (5.99)

Means with different superscripts are significantly different between classes. Mean differences on the indicator variables were derived using the Model Test command in the 3-class model in Mplus, whereas mean differences on the distal outcome variables were derived using Chi square tests in the model with distal outcomes as auxiliary variables (using the DCON command in Mplus). Means should not be compared across variables as not all variables had the same response scale. We used a significant level of $p < .001$ given the large sample size

Fig. 1 Religiousness class profile plots for indicator variables. *Note:* Extrinsic class $n = 1808$; moderate class $n = 3864$; quest-intrinsic class $n = 1740$. Values are z-scores based on the mean and standard deviation of the means for each variable



there were 15 total between-class parameter comparisons. Building on the 3-class solution reported above, we estimated 15 additional models. Each of these follow-up models generated a Wald test evaluating the null hypothesis of equality of the indicator variable means on a single indicator variable between a pair of classes. All of these Wald tests were statistically significant at the $p < .001$ level, suggesting that the means on all five indicator variables were significantly different across all three classes, and that these findings were likely not due to Type I error inflation.

Cohen’s d effect sizes for comparing the classes on the means of the indicator variables are reported in Table 3 to supplement the Wald hypothesis tests. The only small effect size was for the difference between the *Extrinsic* and *Moderate Religiousness* class profiles on quest religious motivation ($d = .15$). The only medium effect sizes were for the differences between the *Extrinsic* and *Moderate Religiousness* profiles on extrinsic religious motivation

($d = .45$), and the differences between the *Moderate* and *Quest-Intrinsic Religiousness* profiles on quest religious motivation ($d = .68$) and extrinsic religious motivation ($d = .72$). All other effect sizes were large ($d > .80$). Indeed the smallest amounts of between-class variation emerged for quest and extrinsic religious motivations, and the greatest amounts of between-class variation emerged for religious salience, religious involvement, and intrinsic religious motivation.

Comparing Profiles on Distal Outcomes

We compared the class profiles on alcohol-related cognitions (positive and negative alcohol expectancy outcomes; positive and negative expectancy valuations) and hazardous alcohol use using a new model-based procedure proposed by Lanza et al. (2013) for including auxiliary variables as distal outcomes of latent class solutions (see also, Asparouhov and Muthén 2014). One strategy for

Table 3 Cohen’s d effect sizes for between-class mean comparisons

	Extrinsic versus moderate	Extrinsic versus quest-intrinsic	Moderate versus quest-intrinsic
<i>Indicator variables</i>			
Religious salience	-1.24	-2.28	-1.05
Religious involvement	-0.86	-2.18	-1.32
Quest religious motivation	-0.15	-0.84	-0.68
Extrinsic religious motivation	0.45	1.17	0.72
Intrinsic religious motivation	-1.27	-2.35	-1.08
<i>Distal outcome variables</i>			
Positive expectancies	0.09	0.47	0.39
Negative expectancies	-0.06	-0.24	-0.18
Positive valuations	0.18	0.61	0.43
Negative valuations	-0.03	0.45	0.49
Hazardous alcohol use	-0.05	0.70	0.75

Cohen’s d values around $\pm .20$ are considered small, around $\pm .50$ are considered medium, and around $\pm .80$ or higher are considered large

comparing classes on outcome variables in mixture modeling is to save class assignments based on the class into which individuals are most likely classified (as per estimated posterior probabilities). However, this procedure assumes 100 % certainty in class assignments, and thus loses the information in the estimated posterior probabilities regarding individuals' likelihood of being in each of the classes (not just in their most likely class). Early attempts to deal with this issue by including the distal outcomes in the mixture model involved including distal outcomes in creating the class solution—but this approach tended to condition the class solution on the outcome variables (whereas the researcher's goal is generally to do the opposite). Thus, Lanza et al. (2013) proposed a cutting-edge approach that tests relations between latent class variables and distal outcomes within the context of the mixture model, but in multiple steps. First, the latent profile model is estimated, including only the clustering variables and excluding the auxiliary variables (i.e., distal outcomes). Second, building on Bayes' theorem conditional distributions of the distal outcomes are estimated given the latent class variable. In other words, class-specific means on the distal outcomes are estimated. Information is also generated in the process to enable Chi square tests to be conducted comparing the latent profile models with and without a particular distal outcome (with degrees of freedom being the number of classes minus one). Mplus has recently implemented a command that automates this entire procedure (i.e., auxiliary variables are specified and then labelled using the DCON command; Asparouhov and Muthén 2014). Means are estimated for each distal outcome within each class, and then Chi square tests are conducted for each distal outcome with two classes at a time, to assess mean differences across classes. At present the Lanza et al. (2013) procedure we used in Mplus is limited to handling missing data with listwise deletion based on the auxiliary variables.

Estimated means on the distal outcomes (positive expectancy outcomes, negative expectancy outcomes, positive valuations, negative valuations, and hazardous alcohol use) for each class are presented in Table 2 along with superscripts to indicate significant class differences (see Fig. 2 for a plot of these means across classes, based on standardized means). The Chi square hypothesis tests for these comparisons are presented in Table 4. We used a significance level of $p < .001$ given the large sample size. The effect sizes to supplement these hypothesis tests are provided in Table 3. All three classes differed significantly on positive valuations with the *Extrinsic Religiosity* profile associated with the highest mean. For positive expectancy outcomes, negative expectancy outcomes, negative valuations, and hazardous alcohol use, the *Extrinsic Religiosity* profile was not significantly

different from the *Moderate Religiosity* profile, but the *Quest-Intrinsic Religiosity* profile was significantly different from both. The *Quest-Intrinsic Religiosity* profile had the highest mean on negative expectancies and the lowest mean on positive expectancies, positive valuations, negative valuations, and alcohol use. The effect sizes for differences between the *Extrinsic* and the *Moderate Religiosity* classes were all small, whereas most of the effect sizes comparing either of these classes to the *Quest-Intrinsic Religiosity* class profile were medium in size (with the exception of the effect sizes for the two comparisons for negative expectancies, which were small). In short, in terms of alcohol cognitions and alcohol use, the pattern of class differences were all in the expected direction (with higher religiosity related to more adaptive alcohol cognitions and less alcohol use), and the *Quest-Intrinsic Religiosity* profile (i.e., the highly religious) seemed distinct from the other two classes.

Discussion

Prior person-centered research has consistently identified a subgroup of highly religious participants consisting of higher scores on public and/or private involvement and salience. The highly religious consistently use significantly less alcohol when compared to the other classes (Fife et al. 2011; Hodge et al. 2007; Salas-Wright et al. 2012). The present study generated latent profiles of religiosity and examined the associations among religiosity, hazardous drinking, and alcohol-related cognitions with a sample of college students. In doing so, we addressed the lack of research explicitly attending to the heterogeneity of college students' religiosity (Fife et al. 2011) and the nuanced combinations of religiosity dimensions that exist within individuals (Good et al. 2011). The lack of research is surprising given the prevalence of problem drinking among college students (Zamboanga et al. 2014) and the potential for improving college students' health by designing prevention and intervention approaches specific to the different religiosity profiles (Salas-Wright et al. 2012), thereby maximizing the protective role for religiosity against hazardous alcohol use.

Our findings advance the existing literature because (a) we used religious motivation variables along with involvement and salience to generate empirical profiles, (b) we used an innovative statistical approach to analyze the associations between latent religiosity profiles and alcohol use variables, and (c) we included the distinct constructs of alcohol expectancy outcomes and expectancy valuations in our analyses. Our findings suggest that a combination of involvement, salience, and religious motivations play a role in the protective influence of

Fig. 2 Plots across religiousness classes for distal outcome variables. *Note:* Extrinsic class $n = 1808$; moderate class $n = 3864$; quest-intrinsic religiousness class $n = 1740$. Values are z-scores based on the mean and standard deviation of the means for each variable

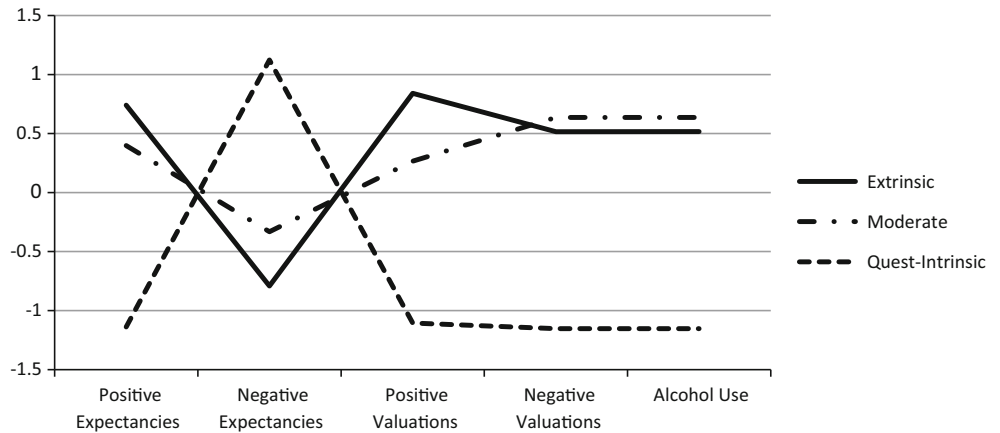


Table 4 Chi square tests for distal outcomes across religiousness classes

Model	N	Chi square
<i>Positive expectancies</i>		
Extrinsic versus moderate	5870	$\chi^2(1) = 8.15, p = .004$
Extrinsic versus quest-intrinsic	5870	$\chi^2(1) = 157.62, p = .0001$
Moderate versus quest-intrinsic	5870	$\chi^2(1) = 130.90, p = .0001$
<i>Negative expectancies</i>		
Extrinsic versus moderate	5861	$\chi^2(1) = 3.30, p = .07$
Extrinsic versus quest-intrinsic	5861	$\chi^2(1) = 40.92, p = .0001$
Moderate versus quest-intrinsic	5861	$\chi^2(1) = 31.02, p = .0001$
<i>Positive valuations</i>		
Extrinsic versus moderate	5817	$\chi^2(1) = 38.75, p = .0001$
Extrinsic versus quest-intrinsic	5817	$\chi^2(1) = 264.59, p = .0001$
Moderate versus quest-intrinsic	5817	$\chi^2(1) = 155.43, p = .0001$
<i>Negative valuations</i>		
Extrinsic versus moderate	5801	$\chi^2(1) = 1.11, p = .29$
Extrinsic versus quest-intrinsic	5801	$\chi^2(1) = 163.79, p = .0001$
Moderate versus quest-intrinsic	5801	$\chi^2(1) = 252.67, p = .0001$
<i>Hazardous alcohol use</i>		
Extrinsic versus moderate	6055	$\chi^2(1) = 2.45, p = .12$
Extrinsic versus quest-intrinsic	6055	$\chi^2(1) = 556.57, p = .0001$
Moderate versus quest-intrinsic	6055	$\chi^2(1) = 972.22, p = .0001$

Each Chi square test used listwise deletion, hence the n for each analysis is smaller than the original sample of $N = 7412$. We used a significance level of $p < .001$ given the large sample size

religiousness on college students' hazardous alcohol use. More specifically, participants in the *Quest-Intrinsic Religiousness* profile (i.e., those scoring highest on religious salience, involvement, quest and intrinsic religious motivation, and lowest on extrinsic religious motivation) engaged in significantly less hazardous alcohol use compared to the *Extrinsic Religiousness* participants (i.e., those who scored lowest on religious salience, involvement, quest and

intrinsic motivation, and highest on extrinsic motivation) and the *Moderate Religiousness* participants (i.e., those who scored in the middle when compared to the other two profiles on salience, involvement, and quest, intrinsic, and extrinsic religious motivation).

Alcohol Use Expectancies and Valuations

As hypothesized, highly religious participants (i.e., the *Quest-Intrinsic Religiousness* profile) scored significantly lower on positive alcohol expectancy outcomes, positive expectancy valuations, and negative expectancy valuations, and higher on negative alcohol expectancy outcomes compared to the other two classes. Previous variable-centered research has yielded consistent positive associations between (a) positive alcohol expectancy outcomes and hazardous alcohol use and (b) positive expectancy valuations and hazardous use, whereas prior research findings for negative alcohol expectancies and valuations have tended to be more inconsistent (Ham et al. 2013). From a person-centered approach, in a sample of women aged 18–35, a class of regular-heavy-episode users was defined by moderate positive and negative expectancy outcomes and high consumption, and a frequent-heavy-episode class of users by high positive expectancies and high consumption (Stappenbeck et al. 2013). In addition, the positive expectancy of social/physical pleasure discriminated between heavy-stable and high-decreasing alcohol use trajectories, and between light-stable and light-stable high-holiday use trajectories, among first year college students (Greenbaum et al. 2005). Taken together, the findings highlight the role of alcohol expectancy outcomes in characterizing hazardous alcohol use.

In the current study, *Quest-Intrinsic Religiousness* individuals reported greater expectations of negative alcohol outcomes and rated those expected outcomes as less acceptable or less wanted, patterns consistent with reduced levels of hazardous alcohol use (Jankowski et al. 2013).

Our findings suggest that the protective influence of religiousness among the highly religious seems tied to an internalized valuing process that perceives greater negative effects and values those effects less desirably. In fact, *Quest-Intrinsic Religiousness* participants appeared to have a more distinctive set of alcohol cognitions that helped mitigate alcohol use (i.e., lower positive expectancies and valuations, higher negative expectancies and lower negative valuations). By comparison, the *Extrinsic* and *Moderate Religiousness* profiles did not differ significantly on positive expectancy outcomes, negative expectancy outcomes, negative expectancy valuations, or hazardous alcohol use. The distinctive set of alcohol cognitions we observed among the highly religious seems somewhat akin to the anti-drinking decision-making profile found by Stapleton et al. (2014), which was characterized in part by low positive expectancies, low drinking attitudes, and high non-drinking attitudes.

Religiousness Profiles

One particularly novel contribution of the current study is the finding that highly religious individuals scored highest on quest *and* intrinsic motivations, a finding that was contrary to our hypothesized role for quest religious motivation. Quest motivation has garnered considerably less attention in the empirical literature on adolescents' and young adults' hazardous alcohol use, perhaps because it has been somewhat controversial in the psychological study of religiousness. Quest has displayed mixed results when examined in relation to a variety of indicators of religiousness (e.g., Steger et al. 2010). Some scholars have suggested that religious questing is at odds with intrinsic motivation and have highlighted positive associations between quest and maladjustment, whereas others point out the positive associations between questing and psychosocial adjustment (Cook et al. 2014; Sandage et al. 2010). In the current study, we found that highly religious participants who scored high on both quest and intrinsic motivation engaged in significantly less hazardous alcohol use than participants who scored in the mid-range or low on those religiousness indicators, and had more adaptive ways of thinking about alcohol use. Thus, an integrated quest-intrinsic religiousness may have a protective influence on levels of hazardous alcohol use. Conversely, it may be maladaptive for quest and intrinsic motivation to be at odds with each other (i.e., for intrinsic motivation to be low relative to quest).

Some authors have described patterns of high salience and high involvement as a class of spiritual-and-religious participants (e.g., Hodge et al. 2007). In contrast, a class of spiritual-but-not-religious individuals typically consists of high salience and low public involvement (e.g., Hodge

et al. 2007). Debate centers on the prevalence of the spiritual-but-not-religious orientation among young persons in the United States and the extent to which these individuals might be described as seekers actively engaged in exploration apart from public involvement (Smith and Denton 2005; Smith and Snell 2009). Although a decline in public religious involvement during the college years may be typical (Stoppa and Lefkowitz 2010), our findings seem to support the contention by some that the increasing prevalence of the spiritual-but-not-religious classification may be somewhat of a misnomer (Smith and Denton 2005; Smith and Snell 2009), at least among college students who identify a religious affiliation. We did not observe a distinct profile of college students comprised of high salience (i.e., importance of experiencing God's presence) and low involvement (which we largely operationalized as public involvement) which typically characterizes the spiritual-but-not-religious. Furthermore, all three of our classes might be described as seekers, or perhaps "spiritually open" (Smith and Snell 2009, p. 296), to some extent (i.e., at least moderate level mean scores on quest religious motivation; see Table 2), with the classes differing on the extent to which intrinsic and extrinsic motivation scores varied across profiles. The lack of a distinct class of spiritual-but-not-religious participants could have been because we included motivations in our empirical generation of profiles, or because we restricted the sample to those who identified a religious affiliation. However, excluding participants without a religious affiliation was necessary to ensure that respondents included in our analyses viewed a majority of survey items as directly applicable to their experience.

Our findings also seem to support the contention that there is a form of religious quest (i.e., non-integrative) that is associated with existential anxiety and maladjustment (Cook et al. 2014; Sandage et al. 2010). Given that the college experience tends to be a time of increased identity exploration (Schwartz et al. 2013), it makes sense that all three religiousness profiles displayed at least moderate level mean quest scores. It is possible that the increased levels of hazardous alcohol use among *Moderate* and *Extrinsic Religiousness* individuals indicated self-dysregulation, potentially stemming from a normative self-identity development process (e.g., research findings indicate an association between identity exploration and increased anxiety; Schwartz et al. 2013). Cook et al. (2014) utilizing a variable-centered approach, found *pure questers* to display highest levels of identity exploration (i.e., moratorium) and that those in the *intrinsic questers* group reported the highest levels of achieved identity. The group labelled *pure intrinsic* displayed highest levels of identity foreclosure (Cook et al. 2014). The experience of dysregulation may foster increased levels of hazardous alcohol use,

especially for those scoring higher on quest relative to lower intrinsic motivation. In contrast, an integrated quest-intrinsic religiousness may foster self-regulatory strength and/or represent greater clarity and coherence of an internalized set of values (i.e., commitments) about the positive and negative effects of alcohol, thereby lessening hazardous alcohol use.

In sum, our findings depicted a class of highly religious individuals (i.e., a *Quest-Intrinsic Religiousness* class) who engaged in religious exploration and simultaneously remained committed to and grounded in their religious beliefs and practices, and did so from a stance of intentionality and self-determination (Neyrinck et al. 2010). Our results therefore offer further support for the theoretical notion that the protective influence of religiousness against levels of hazardous alcohol use may occur as religiousness develops from an externally regulated behavior to an internalized value system or social ethic (Jankowski et al. 2013). The results advance current understanding about the protective role of religiousness against hazardous alcohol use among college students by portraying adaptive religiousness as a developmental capacity for balancing the dialectic between communion (i.e., intrinsic motivation) and agency (i.e., quest motivation) needs (Sandage et al. 2010).

Limitations and Directions for Future Research

Despite the strengths of a large, ethnically diverse, multi-site sample and our approach to person-centered analysis, several limitations of the present study should be noted. In terms of generalizability, women comprised three-fourths of our sample, and future research might include more equivalent numbers of males and females. Future research could also explore religiousness profiles among different religions and examine associations with alcohol use variables. There is some evidence that persons identifying with a particular religion score differently as a group on indicators of religiousness (Berry et al. 2013). In addition, Berry et al. (2013) found that Muslim individuals engaged in less binge-drinking than did Christian, Jewish and non-affiliated participants. However, it may be that affiliation differences disappear when other dimensions of religiousness are included in models (Ellison et al. 2008). Given that individuals who identified as atheist, agnostic, or no religious affiliation were excluded from analyses, our findings may not generalize to such students and future research could include non-affiliated participants.

Future research should address the limitations associated with a cross-sectional design and include additional variables. First, our study was cross-sectional and thus any inferences about temporal ordering should be regarded as tentative. Longitudinal and experimental designs are

needed to more fully examine the causal associations among religiousness profiles, alcohol cognitions, and hazardous alcohol use. Second, our person-centered approach offered a level of ecological validity beyond variable-centered approaches. However, additional contextual variables, such as peer alcohol use, college environment [i.e., type of college (e.g., private vs. public), alcohol use policy (e.g., ban vs. non-ban)], and family dynamics (Walker et al. 2007; Wechsler and Nelson 2008), could be examined in future studies and thereby offer further ecological validity. Lastly, given the complexity of the mixture models conducted in the present study, we did not examine gender, ethnicity, age, or other demographic characteristics. Researchers should find ways to include these variables in future analyses.

Practical Implications

Our findings appear to have important theoretical and applied implications for studying religiousness and preventing hazardous alcohol use, particularly for parents and those working with religiously-affiliated college students in different contexts. First, quest motivation may not be as incongruent with other aspects of religiousness as is sometimes assumed, and adaptive religious development may involve integrating intrinsic and quest motivations. Second, it seems that college students from various religious backgrounds could benefit from being educated about the possibility that religious exploration need not be incompatible with religious commitment, salience, and involvement (Layton et al. 2012). More specifically, highly religious students might be encouraged to maintain their religious practices while in the midst of seeking, whereas *Extrinsic* or *Moderate* religiousness students might be encouraged to re-engage in religious practices. All students might benefit from reminders that even though the practices might feel incongruent or disingenuous with their exploration, they may find such dissonance temporary or to eventually confer well-being. Students could also be encouraged to explore alternative religious practices that might feel more congruent with exploration, including those practices from outside their religious tradition (e.g., social justice advocacy, contemplative practices, expressive worship arts, liturgical practices). Exploring alternatives might be most useful to *Extrinsic* or *Moderate* religiousness students, who may have found their religious experience narrowly defined or of limited relevance, or had limited exposure to diverse religious practices. Third, college students from each of the profiles could be provided safe and supportive contexts for religious exploration, and the development of secure attachments with significant others (including the deity(ies) of their religious affiliation) could reassure them that exploration and doubt are

normative and potentially beneficial to their development (Cook et al. 2014; Sandage et al. 2010). Lastly, for students from each of the different religiousness profiles, religious exploration and involvement could be integrated with education about alcohol-related cognitions. However, for *Extrinsic* or *Moderate* religiousness students, particular attention to the relevance of religiousness to their experience may need to be explored first. Students could be encouraged to reflect on their views about alcohol use outcomes and examine how their religious beliefs, practices, and motivation already inform or could potentially inform those views and their valuing of alcohol expectancies. Experiences such as those described above might not only have a regulatory effect, but might also help foster a personal, internalized set of values that is protective against hazardous alcohol use, consistent with the differential associations displayed across profiles in the current study.

Conclusion

In the present study, we used a person-centered analytic approach with a large, ethnically diverse sample of college students to examine the role of religiousness profiles on alcohol expectancies, valuations, and hazardous alcohol use. Prior work using variable-centered approaches has drawn attention to the protective role of religious salience, involvement, and intrinsic motivation, whereas person-centered research has highlighted the heterogeneity of individuals' religiousness and the nuanced combinations of religious dimensions within individuals. Three religiousness profiles were identified in our study. The *Quest-Intrinsic Religiousness* class (i.e., those scoring highest on salience, involvement, and quest and intrinsic religious motivation, and lowest on extrinsic religious motivation) compared to those who were *Moderate* or *Extrinsic* in religiousness, scored significantly lower on hazardous alcohol use, positive alcohol expectancies, positive expectancy valuations, and negative expectancy valuations, and scored significantly higher on negative alcohol expectancies. The pattern of associations between profiles and alcohol cognitions suggests that an integrated quest-intrinsic motivation (i.e., balance of religious exploration with religious commitments) among highly religious individuals may represent an internalized set of values about the positive and negative effects of alcohol that protects them from hazardous alcohol use.

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Author contributions PJ conceptualized and designed the current study, led the writing of the manuscript, helped with the interpretation

of data, and revised the manuscript. SH conceptualized and designed the current study, conducted data analysis and interpretation, wrote and revised the manuscript. BZ conceptualized and designed the current study, helped with the interpretation of data, helped with original study design and data collection, and helped write and revise the manuscript. LH conceptualized and designed the current study, helped with the original study data collection, and helped write and revise the manuscript. SS helped with original study design and data collection, provided critical editing of the manuscript and helped with the revision. SK, LF, MB, RD, SW, EH, and MC helped with original study data collection and provided critical editing of the manuscript.

Conflict of interest The authors declare that they have no conflict of interest.

Ethical standard All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For the current study, using archival data, formal consent was not required as informed consent was obtained from all individual participants in the original data collection procedure.

References

- Albright, C. R. (2006). Spiritual growth, cognition, and complexity: Faith as a dynamic process. In J. D. Koss-Chioino & P. Hefner (Eds.), *Spiritual transformation and healing: Anthropological, theological, neuroscientific, and clinical perspectives* (pp. 168–186). Walnut Creek, CA: AltaMira Press.
- Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, 5, 447–457. doi:10.1037/h0021212.
- Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using Mplus. *Structural Equation Modeling*, 21, 1–13. doi:10.1080/10705511.2014.915181.
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *AUDIT: The alcohol use disorders identification test—guidelines for use in primary care* (2nd ed.). Geneva: World Health Organization.
- Bakan, D. (1966). *The duality of human existence: An essay on psychology and religion*. Oxford: Rand McNally.
- Batson, D. C., Schoenrade, P., & Ventis, W. L. (1993). *Religion and the individual: A social-psychological perspective*. New York: Oxford University Press. (Original work published 1982).
- Batson, C. D., & Schoenrade, P. A. (1991). Measuring religion as Quest: (2) Reliability concerns. *Journal for the Scientific Study of Religion*, 30, 430–447. doi:10.2307/1387278.
- Bauer, J. J., & McAdams, D. P. (2004). Personal growth in adults' stories of life transition. *Journal of Personality*, 72, 573–602. doi:10.1111/j.0022-3506.2004.00273.x.
- Berry, D., Bass, C. P., Shimp-Fassler, C., & Succop, P. (2013). Risk, religiosity, and emerging adulthood: Description of Christian, Jewish, and Muslim university students at entering the freshman year. *Mental Health, Religion and Culture*, 16, 695–710. doi:10.1080/13674676.2012.715145.
- Brown, T. L., Salsman, J. M., Brechting, E. H., & Carlson, C. R. (2008). Religiousness, spirituality, and social support: How are they related to underage drinking among college students? *Journal of Child and Adolescent Substance Abuse*, 17, 15–39. doi:10.1300/J029v17n02_02.
- Burriss, J. L., Sauer, S. E., & Carlson, C. R. (2011). A test of religious commitment and spiritual transcendence as independent predictors of underage alcohol use and alcohol-related problems.

- Psychology of Religion and Spirituality*, 3, 231–240. doi:10.1037/a0022204.
- Castillo, L. G., & Schwartz, S. J. (2013). Introduction to the special issue on college student mental health. *Journal of Clinical Psychology*, 69, 291–297.
- Celeux, G., & Soromenho, G. (1996). An entropy criterion for assessing the number of clusters in a mixture model. *Journal of Classification*, 13, 195–212.
- Cook, K. V., Kimball, C. N., Leonard, K. C., & Boyatzis, C. J. (2014). The complexity of quest in emerging adults' religiosity, well-being, and identity. *Journal for the Scientific Study of Religion*, 53, 73–89.
- Ellison, C. G., Bradshaw, M., Rote, S., Storch, J., & Trevino, M. (2008). Religion and alcohol use among college students: Exploring the role of domain-specific religious salience. *Journal of Drug Issues*, 38, 821–846. doi:10.1177/002204260803800308.
- Feingold, A., Tiberio, S. S., & Capaldi, D. M. (2014). New approaches for examining associations with latent categorical variables: Applications to substance abuse and aggression. *Psychology of Addictive Behaviors*, 28, 257–267. doi:10.1037/a0031487.
- Fife, J. E., Sayles, H. R., Adegoke, A. A., McCoy, J., Stovall, M., & Verdant, C. (2011). Religious typologies and health risk behaviors of African American college students. *North American Journal of Psychology*, 13, 313–330.
- Fromme, K., & D'Amico, E. J. (2000). Measuring adolescent alcohol outcome expectancies. *Psychology of Addictive Behaviors*, 14, 206–212. doi:10.1037/0893-164X.14.2.206.
- Galen, L. W., & Rogers, W. M. (2004). Religiosity, alcohol expectancies, drinking motives and their interaction in the prediction of drinking among college students. *Journal of Studies on Alcohol*, 65, 469–476.
- Good, M., Willoughby, T., & Busseri, M. A. (2011). Stability and change in adolescent spirituality/religiosity: A person-centered approach. *Developmental Psychology*, 47, 538–550. doi:10.1037/a0021270.
- Greenbaum, P. E., Del Boca, F. K., Darkes, J., Wang, C., & Goldman, M. S. (2005). Variation in the drinking trajectories of freshmen college students. *Journal of Consulting and Clinical Psychology*, 73, 229–238. doi:10.1037/0022-006X.73.2.229.
- Hall, T. W., & Edwards, K. J. (2002). The Spiritual Assessment Inventory: A theistic model and measure for assessing spiritual development. *Journal for the Scientific Study of Religion*, 41, 341–357. doi:10.1111/1468-5906.00121.
- Hall, T. W., Fujikawa, A., Halcrow, S. R., Hill, P. C., & Delaney, H. (2009). Attachment to God and implicit spirituality: Clarifying correspondence and compensation models. *Journal of Psychology and Theology*, 37, 227–244.
- Hall, D. L., Matz, D. C., & Wood, W. (2010). Why don't we practice what we preach? A meta-analytic review of religious racism. *Personality and Social Psychology Review*, 14, 126–139. doi:10.1177/1088868309352179.
- Ham, L. S., Wang, Y., Kim, S., & Zamboanga, B. L. (2013). Measurement equivalence of the Brief Comprehensive Effects of Alcohol Scale in a multiethnic sample of college students. *Journal of Clinical Psychology*, 69, 341–363. doi:10.1002/jclp.21904.
- Hill, P. C., & Hood, R. W. (1999). *Measures of religiosity*. Birmingham, AL: Religious Education Press.
- Hodge, D. R., Andereck, K., & Montoya, H. (2007). The protective influence of spiritual-religious lifestyle profiles on tobacco use, alcohol use, and gambling. *Social Work Research*, 31, 211–219. doi:10.1093/swr/31.4.211.
- Jankowski, P. J., Hardy, S. A., Zamboanga, B. L., & Ham, L. S. (2013). Religiousness and hazardous alcohol use: A conditional indirect effects model. *Journal of Adolescence*, 36, 747–758. doi:10.1016/j.adolescence.2013.06.001.
- Jankowski, P. J., & Sandage, S. J. (2014). Attachment to God and dispositional humility: Indirect effect and conditional effects models. *Journal of Psychology and Theology*, 42, 70–82.
- Ji, C. C. (2004). Religious orientations in moral development. *Journal of Psychology and Christianity*, 23, 22–30.
- Johnson, T. J., Sheets, V. L., & Kristeller, J. L. (2008). Empirical identification of dimensions of religiousness and spirituality. *Mental Health, Religion and Culture*, 11, 745–767. doi:10.1080/13674670701561209.
- Kokotailo, P. K., Egan, J., Gangnon, R., Brown, D., Mundt, M., & Fleming, M. (2004). Validity of the alcohol use disorders identification test in college students. *Alcoholism, Clinical and Experimental Research*, 28, 914–920. doi:10.1097/01.ALC.0000128239.87611.F5.
- Lanza, S. T., Tan, X., & Bray, B. C. (2013). Latent class analysis with distal outcomes: A flexible model-based approach. *Structural Equation Modeling*, 20, 1–26. doi:10.1080/10705511.2013.742377.
- Layton, E., Hardy, S. A., & Dollahite, D. C. (2012). Religious exploration among highly-religious American adolescents. *Identity: An International Journal of Theory and Research*, 12, 157–184.
- Lubke, G. H., & Muthén, B. (2005). Investigating population heterogeneity with factor mixture models. *Psychological Methods*, 10, 21–39. doi:10.1037/1082-989X.10.1.21.
- McCullough, M. E., Friedman, H. S., Enders, C. K., & Martin, L. R. (2009). Does devoutness delay death? Psychological investment in religion and its association with longevity in the Terman sample. *Journal of Personality and Social Psychology*, 97, 866–882. doi:10.1037/a0016366.
- McCullough, M. E., & Willoughby, L. B. (2009). Religion, self-regulation, and self-control: Associations, explanations, and implications. *Psychological Bulletin*, 135, 69–93. doi:10.1037/a0014213.
- Neyrinck, B., Lens, W., Vansteenkiste, M., & Soenens, B. (2010). Updating Allport's and Batson's framework of religious orientations: A reevaluation from the perspective of self-determination theory and Wulff's social cognitive model. *Journal for the Scientific Study of Religion*, 49, 425–438. doi:10.1111/j.1468-5906.2010.01520.x.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, 14, 535–569. doi:10.1080/10705510701575396.
- Pearce, L. D., Foster, E., & Hardie, J. (2013). A person-centered examination of adolescent religiosity using latent class analysis. *Journal for the Scientific Study of Religion*, 52, 57–79. doi:10.1111/jssr.12001.
- Perry, W. G., Jr. (1970). *Forms of intellectual and ethical development in the college years*. Oxford: Holt, Rinehart & Winston.
- Ryan, R. M., Rigby, S., & King, K. (1993). Two types of religious internalization and their relations to religious orientations and mental health. *Journal of Personality and Social Psychology*, 65, 586–596.
- Salas-Wright, C. P., Vaughn, M. G., Hodge, D. R., & Perron, B. E. (2012). Religiosity profiles of American youth in relation to substance use, violence, and delinquency. *Journal of Youth and Adolescence*, 41, 1560–1575. doi:10.1007/s10964-012-9761-z.
- Sandage, S. J., Link, D. C., & Jankowski, P. J. (2010). Quest and spiritual development moderated by spiritual transformation. *Journal of Psychology and Theology*, 38, 15–31.
- Sauer-Zavala, S., Burris, J. L., & Carlson, C. R. (2014). Understanding the relationship between religiousness, spirituality, and

- underage drinking: The role of positive alcohol expectancies. *Journal of Religion and Health*, 53, 68–78. doi:10.1007/s10943-012-9598-5.
- Schwartz, S. J., Zamboanga, B. L., Luyckx, K., Meca, A., & Ritchie, R. A. (2013). Identity in emerging adulthood: Reviewing the field and looking forward. *Emerging Adulthood*, 1, 96–113. doi:10.1177/2167696813479781.
- Smith, C., & Denton, M. L. (2005). *Soul searching: The religious and spiritual lives of American teenagers*. New York: Oxford University Press.
- Smith, C., & Snell, P. (2009). *Souls in transition: The religious and spiritual lives of emerging adults*. New York: Oxford University Press.
- Stapleton, J. L., Turrisi, R., Cleveland, M. J., Ray, A. E., & Lu, S. (2014). Pre-college matriculation risk profiles and alcohol consumption patterns during the first semesters of college. *Prevention Science*, 15, 705–715. doi:10.1007/s11121-013-0426-2.
- Stappenbeck, C. A., Norris, J., Kiekel, P. A., Morrison, D. M., George, W. H., Davis, K. C., et al. (2013). Patterns of alcohol use and expectancies predict sexual risk taking among non-problem drinking women. *Journal of Studies on Alcohol and Drugs*, 74, 223–232.
- Steger, M. F., Pickering, N. K., Adams, E., Burnett, J., Shin, J., Dik, B. J., & Stauner, N. (2010). The quest for meaning: Religious affiliation differences in the correlates of religious quest and search for meaning in life. *Psychology of Religion and Spirituality*, 2, 206–226. doi:10.1037/a0019122.
- Stoppa, T. M., & Lefkowitz, E. S. (2010). Longitudinal changes in religiosity among emerging adult college students. *Journal of Research on Adolescence*, 20, 23–38. doi:10.1111/j.1532-7795.2009.00630.x.
- Walker, C., Ainette, M. G., Wills, T. A., & Mendoza, D. (2007). Religiosity and substance use: Test of an indirect-effect model in early and middle adolescence. *Psychology of Addictive Behaviors*, 21, 84–96. doi:10.1037/0893-164X.21.1.84.
- Wechsler, H., & Nelson, T. F. (2008). What we have learned from the Harvard School of Public Health College Alcohol Study: Focusing attention on college student alcohol consumption and the environmental conditions that promote it. *Journal of Studies on Alcohol and Drugs*, 69, 481–490.
- Worthington, E. L., Jr, Wade, N. G., Hight, T. L., Ripley, J. S., McCullough, M. E., Berry, J. E., et al. (2003). The Religious Commitment Inventory-10: Development, refinement, and validation of a brief scale for research and counseling. *Journal of Counseling Psychology*, 50, 84–96. doi:10.1037/0022-0167.50.1.84.
- Zamboanga, B. L., & Ham, L. S. (2008). Alcohol expectancies and context-specific drinking behaviors among female college athletes. *Behavior Therapy*, 39, 161–170.
- Zamboanga, B. L., Ham, L. S., Olthuis, J. V., Martens, M. P., Grossbard, J. R., & Van Tyne, K. (2012). Alcohol expectancies and risky drinking behaviors among high school athletes: 'I'd rather keep my head in the game'. *Prevention Science*, 13, 140–149. doi:10.1007/s11121-011-0252-3.
- Zamboanga, B. L., Olthuis, J. V., Kenney, S. R., Correia, C. J., Van Tyne, K., Ham, L. S., & Borsari, B. (2014). Not just fun and games: A review of college drinking games research from 2004 to 2013. *Psychology of Addictive Behaviors*, 28, 682–695. doi:10.1037/a0036639.
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