Adolescents' Religiousness and Substance Use Are Linked via Afterlife Beliefs and Future Orientation

Christopher J. Holmes and **Jungmeen Kim-Spoon**

Department of Psychology, Virginia Tech

Abstract

Although religiousness has been identified as a protective factor against adolescent substance use, processes through which these effects may operate are unclear. The current longitudinal study examined sequential mediation of afterlife beliefs and future orientation in the relation between adolescent religiousness and cigarette, alcohol, and marijuana use. Participants included 131 adolescents (mean age at Time 1 = 12 years) at three time points with approximately two year time intervals. Structural equation modeling indicated that higher religiousness at Time 1 was associated with higher afterlife beliefs at Time 2. Higher afterlife beliefs at Time 2 were associated with higher future orientation at Time 2, which in turn was associated with lower use of cigarettes, alcohol, and marijuana at Time 3. Our findings highlight the roles of afterlife beliefs and future orientation in explaining the beneficial effects of religiousness against adolescent substance use.

Keywords

Religiousness; Afterlife Beliefs; Future Orientation; Adolescent Substance Use

Adolescence is a developmental period associated with elevated risk taking behavior, including increased substance use (Casey, Jones, & Somerville, 2011; Steinberg, 2010). This high level of substance use among adolescents represents a major public health issue due to its adverse impact on health and functioning during this developmental period (Kim-Spoon, McCullough, Bickel, Farley, & Longo, 2015). Thus, identifying factors that contribute to these detrimental and unhealthy behaviors is vital for informing prevention and intervention strategies. Religiousness is an important factor to consider given that extant literature has widely demonstrated its protective role against adolescent substance use. For example, a study utilizing data from the National Longitudinal Study of Adolescent Health found that higher religiousness was associated with lower alcohol and marijuana use through higher self-control (Desmond, Ulmer, & Bader, 2013). Similarly, Mason and Spoth (2011) found via latent growth curve analyses that religious salience and religious attendance growth factors were associated with less substance use in a sample of adolescents. In the current longitudinal study, we proposed that afterlife beliefs that result from an adolescent's religiousness may contribute to lower substance use behaviors among adolescents because those with afterlife beliefs are more likely to become future oriented. Accordingly, we

Correspondence concerning this article should be addressed to Christopher J. Holmes, Department of Psychology (0436), Virginia Tech, Blacksburg, Virginia 24060. holmes11@vt.edu.

sought to test statistical mediations of afterlife beliefs and future orientation linking adolescent religiousness and substance use, including cigarette, alcohol, and marijuana use over time.

Adolescent Religiousness and Substance Use

To date, how the beneficial effects of religiousness against substance use operate has not been studied extensively (McCullough & Willoughby, 2009; Rew & Wong, 2006). Previous studies have examined direct associations between religiousness and substance use and found that higher religiousness is associated with lower substance use in adolescents (e.g. Burris, Sauer, & Carlson, 2011; Miller, Davies, & Greenwald, 2000; Wills, Yaeger, & Sandy, 2003; for a review see Cotton, Zebracki, Rosenthal, Tsevat, & Drotar, 2006). Theoretically, McCullough and Willoughby (2009) proposed one way in which religiousness and health outcomes may be associated is via self-control. Grounded in this theory, a few available empirical studies suggest self-control as a mediating process such that religiousness is associated with lower substance use over time via high self-control among adolescents and young adults (DeWall et al., 2014; Kim-Spoon, Farley, Holmes, Longo, & McCullough, 2014; Laird, Marks, & Marrero, 2011). However, this area remains ripe for research as more information is needed to explain how and why adolescent religiousness and substance use are associated. One such avenue to explore is the role that afterlife beliefs, as a result of religiousness, play in this association between religiousness and substance use. McCullough and Willoughby (2009) further proposed in their theoretical paper that believers are more likely to orient themselves to the future and practice delay of gratification as a result of their belief in afterlife in which their behavior during this life will be judged; thus exhibiting behaviors reflecting denial of smaller rewards in the present in order to receive larger rewards in the future. Therefore, afterlife beliefs and future orientation may be key considerations in the link between adolescent religiousness and substance use and are thus explored in the current study.

Associations of Religiousness, Afterlife Beliefs, and Future Orientation

A major feature of almost every religion is addressing concerns regarding what happens after physical death. Despite variations between religions, each typically proposes some form of life extending beyond death that believers embrace as their eventual, and ultimate, future (Ai et al., 2014). An Ipsos global survey of adults in 23 countries showed that 51% of global citizens believe in some kind of afterlife, 23% believe they will "cease to exist," and 26% "don't know" (Ipsos/Reuters, 2011). Furthermore, empirical evidence has demonstrated a substantial correlation between higher religiousness and higher belief in the afterlife (e.g, r = .76, p < .001; Falkenhain & Handal, 2003). Considering the global pervasiveness of afterlife beliefs as well as the protective effects of religiousness against health risk behaviors such as substance use, it is important to address potential roles afterlife beliefs may play in explaining the beneficial effects of religiousness. Nevertheless, afterlife beliefs have received little empirical attention to date (e.g., Bering & Bjorklund, 2004), and no previous work has involved adolescents.

In the early literature, Azzi and Ehrenberg (1975) first proposed that religious individuals are more likely to deny short-term gains and instead focus on achieving long-term gains associated with an eternal afterlife that are greater in magnitude and result from judgment of behavior during life on earth. Indeed, time orientation can shift between the past, present, and future depending on the meaning or importance being placed on events that have occurred, are occurring, or will occur. Empirically, it has been demonstrated in a sample of sixth grade students that one's ability to delay gratification contributes to greater future orientation which was operationalized as being more affected by future goals at a given distance in time (Gjesme, 1979). It follows that religious individuals may be more future oriented given the afterlife is never yet realized and the less important present must be sacrificed in order to ensure that a positive afterlife eventually will be.

Further empirical studies have provided support for the theory that religious individuals are more future oriented and practice delay of gratification. Öner-Özkan (2007) found this relationship in a sample of predominantly Muslim undergraduate students, such that more religious individuals indicated higher future orientation and higher interest towards the afterlife. Similarly, in a sample of predominantly Christian undergraduates, higher religious commitment was associated with higher delay of gratification, and the relationship was partially mediated by higher future orientation (Carter, McCullough, Kim-Spoon, Corrales, & Blake, 2012) suggesting that religious individuals discount the future less and, though not directly examined in this study, afterlife beliefs in the more religious individuals may have contributed to this higher future orientation. A recent longitudinal study using a sample of early adolescents further demonstrated that lower personal religiousness was associated with higher delay discounting approximately two years later, which in turn was associated with higher likelihood of substance use initiation (Kim-Spoon et al., 2015). Here, too, it can be speculated that afterlife beliefs may be a driving force behind religious adolescents' future orientation and thus could be an important influential factor in risk taking behavior to examine.

Finally, it was found in a priming study of undergraduates with a mixture of religious affiliations, or lack thereof, that participants who had received a religious prime versus a neutral prime were more likely to wait a week for a larger reward than wait a day for a smaller reward (Rounding, Lee, Jacobson, & Ji, 2012). These findings led researchers to conclude that when religious thoughts are activated, as would be more commonly the case in a religious individual, that delay of gratification is more likely. As a result, such findings are consistent with previous studies indicating that religious individuals are more likely to be future orientated, perhaps as a result of their belief in the afterlife, and this greater orientation to the future will decrease substance use.

Future Orientation and Substance Use in Adolescents

Research suggests that compared to older individuals, adolescents have weaker orientations towards the future; and, thus, they are poorer at planning ahead and foreseeing long-term consequences, resulting in risky and health-demoting behaviors (see Nurmi, 1991 for a review). One way this evidence has been demonstrated in the literature is through employing delay discounting tasks. Delay discounting describes the process by which future reinforcers

are devalued as a function of the amount of time until those rewards can be obtained. Steinberg and colleagues (2009) demonstrated that adolescents exhibited lower levels of future orientation compared to adults in a sample ranging from 10 to 30 years of age. Specifically, early adolescents were less future oriented than older age groups, indicated by lower concern about the future as well as lower levels of anticipating future consequences and future planning than older age groups. Furthermore, early adolescents were more willing to accept a smaller reward delivered sooner than a larger one that is delayed compared to their older counterparts. Similarly, a recent study using a sample of adolescents and young adults (aged 12–27 years) indicated a linear decline in delay discounting with age across adolescence and young adulthood (Water, Cillessen, & Scheres, 2014). As such, adolescents may be less likely to receive the beneficial effects future orientation has on health-related behaviors. Lower levels of future orientation in adolescence have also been empirically illustrated to be at least partially responsible for the increases in risky and delinquent behaviors over time. However, there is a dearth of longitudinal studies on future orientation and adolescent substance use to date. One exception is a study by Chen and Vazsonyi (2011) that used growth curve analyses on data from the National Longitudinal Study of Adolescent Health and demonstrated that adolescents who were lower in life future orientation were more likely to show higher problem behaviors approximately seven years later, ranging in severity from dishonesty to parents about whereabouts to selling drugs. Short-sighted time orientation (or temporal discounting) has also been shown to be a key factor in the unhealthy behaviors of individuals with drug addictions. Particularly, addicted individuals discount the future more than those who are not addicted, and rate of delay discounting predicts the likelihood that an individual will use or become dependent on a drug of abuse (Bickel, Koffarnus, Moody, & Wilson, 2014). In extant literature, studies on temporal discounting and adolescent substance use are rare but the few available studies demonstrate that monetary discounting is associated with cigarette consumption among participants in mid-adolescence to young adulthood (Audrain-McGovern et al., 2009; Reynolds, Karraker, Horn, & Richards, 2003).

Taken together, prior studies suggest that being oriented towards the future helps deter individuals from risky and unhealthy behaviors in the present, including substance use. While religiousness has been identified as a characteristic associated with less substance use (e.g., Kendler et al., 2003) and been demonstrated to buffer against substance use (Mason & Spoth, 2011), it is not as well known how these effects operate. However, there is reason to expect that religious individuals adopt their religion's beliefs about the afterlife and, subsequently, become more future oriented by focusing on this more temporally distant event. The higher levels of future orientation, then, may be related to lower levels of substance use because such risky behaviors will be viewed as detrimental to long-term health rather than contributing to short-term benefits.

The Present Study

In the current longitudinal study, we examined how religiousness may play a protective role against adolescent substance use by exploring a pathway involving afterlife beliefs and future orientation. We were primarily interested in testing whether longitudinal effects of adolescents' religiousness on changes in substance use may operate through serial mediators

of afterlife beliefs and future orientation. We analyzed three time points of data and tested the mediation effects based on the following hypotheses: (1) higher religiousness would be associated with higher belief in the afterlife at a later time, (2) higher belief in the afterlife would be associated with higher future orientation, and (3) higher future orientation would be associated with lower substance use at a later time. We selected the three most commonly used substances (cigarette, alcohol, and marijuana use; CDC, 2012) and tested the hypothesized model separately for each substance. To the authors' knowledge, this study is the first to examine whether afterlife beliefs and future orientation explain the link between adolescent religiousness and substance use.

Method

Participants

Participants included 131 adolescents (66 males, 65 females) that ranged in age from 10 to 16 years of age (M = 12.64, SD = 1.47) at Time 1. Although the age range extended up to 16 years, 94% of the sample was between 10 and 14 years at Time 1 reflecting a substantial majority of early adolescents. Participants returned approximately 2 years later for Time 2 and approximately 2 years after that for Time 3. At Time 1, 91.6% of the adolescents identified as Caucasian, 6.1% African-American, 1.5% Hispanic, and 0.8% other. However, due to the small amount of non-Caucasian participants, in statistical analyses ethnicity was divided into Caucasian (91.6%) and non-Caucasian (8.4%). Mean family income fell between $35,000 and $49,999 a year. The religious affiliations of the participants were 73% Protestant, 8% Roman Catholic, 1% Jewish, 5% "none", and 13% "other."

Measures

Religiousness—Adolescents' religiousness was a composite variable measured at Time 1 and comprised of self-reports of organizational religiousness, personal religiousness, and private practices (Fetzer, 1999; Jessor & Jessor, 1977). Organizational religiousness focuses on formal religious participation and attendance. A typical item is "How often do you go to religious services?" and items are rated on a 6-point Likert scale ranging from "*1* = More than once a week" to "*6* = Never." Personal religiousness focuses on the importance of religion in one's life. A typical item is "How important is religious faith in your life?" Items are rated on a 5-point Likert scale ranging from "*1* = Very important" to "*5* = Not at all important." Finally, private practices focus on informal religious participation alone or with few other individuals. A typical item is "How often do you pray privately in places other than at church or synagogue?" and items are rated on an 8-point Likert scale ranging from "*1* = More than once a day" to "*8* = Never." All responses were reverse scored so that higher scores indicated higher general religiousness. Reliability was calculated using Cronbach's Alpha for the current sample. Organizational religiousness had an alpha of .78, personal religiousness had an alpha of .90, and private practices had an alpha of .85.

Belief in the Afterlife—Adolescents' belief in the afterlife was assessed at Time 2 by the Belief in the Afterlife Scale (McCullough & Carter, personal communication, 7/13/2014). This scale includes 8 items that assess an individual's thoughts on whether they believe there is any form of life or existence after physical death. A typical item is "There must be an

afterlife of some sort," and items were rated on a 7-point Likert scale ranging from "*1* = not at all" to "*7* = very true." Item scoring was reversed as necessary so that higher scores indicated higher belief in the afterlife. A principal components analysis found that 59.15% of the variance among the items was explained. Additionally, the items loaded on a single factor between .68 and .83 ($p < .05$) and Cronbach's alpha indicated the reliability was .90.

Future Orientation—Future orientation was measured at Time 2 by averaging the Anticipation of Future Consequences and Planning Ahead subscales of the Future Orientation Scale (Steinberg et al., 2009). Both subscales consisted of 5 items and participants were asked to choose between statements that were separated by the word "but." After choosing the statement most true of them, the participant then indicated whether that statement was "*1* = Really true for me," or "*2* = Sort of true for me." An example of an item on the Anticipation of Future Consequences subscale was "Some people like to think about all of the possible good and bad things that can happen before making a decision" whereas an example of an item on the Planning Ahead subscale was "Some people like to plan things out one step at a time." Scores on each item are then coded on a 4-point Likert scale consisting of *1* = really true for me for first descriptor, *2* = sort of true for me for first descriptor; *3* = sort of true for me for second descriptor, or *4* = really true for me for second descriptor. Higher scores indicated higher future orientation. For the current sample, reliabilities were .83 and .73 for the Anticipation of Future Consequences and Planning Ahead subscales, respectively.

Substance Use—Adolescents' use of substances was measured at Time 1 and Time 3 via self-reported items of cigarette, alcohol (beer, wine, liquor, or mixed drinks), and marijuana use. The participants reported typical frequency of use in each domain, for example, "Which is most true for you about smoking cigarettes?" was answered on a scale ranging from "*1* = Never used" to "*6* = Usually every day."

Procedures

At Time 1, 357 participants were recruited from southwest Virginia via letters using address lists purchased from contact companies, email announcements, flyers, notices placed on the internet, or snowball sampling (word-of-mouth). Participants were contacted approximately two years after their first participation and invited to return for Time 2 unless the adolescents were 17–18 years and moved on to colleges. At Times 1 and 2, adolescents and their parents were interviewed simultaneously but privately at university offices and received monetary compensation for their participation. There were 137 participants that did not return for Time 2 for reasons including: child not invited back due to age or other issues ($n = 24$), too busy ($n = 8$), moved away ($n = 12$), unable to reach ($n = 86$), child not interested ($n = 6$), and child death ($n = 1$). Time 3 for this study was conducted approximately two years after Time 2. All those who participated at Time 1 of the study were asked to participate at Time 3 of the study, regardless of their participation at Time 2. A total of 167 adolescents completed the study at Time 3. Of the 190 adolescents who did not complete the study at Time 3, 55 adolescents were contacted but did not complete the survey while the remaining 135 adolescents were unable to be contacted or did not respond to requests for participation. Adolescents who participated at Time 3 of the study completed an online survey and

received monetary compensation for their participation. All procedures were approved by the institutional review board of the university.

We performed multivariate general linear modeling (GLM) analyses to determine if the final sample of 131 adolescents who participated at all three time points differed from the 226 adolescents who did not participate in all three time points of the study with regard to demographic variables at Time 1 and study variables at Time 1 and Time 2. Results indicated that adolescents completing all three points of the study had a higher average family income ($p < .001$), but the two groups had similar age ($p = .65$), race ($p = .06$) and gender compositions ($p = .10$). Furthermore, the two groups were similar in organizational religiousness at Time 1 ($p = .88$), personal religiousness at Time 1 ($p = .23$), private practices religiousness at Time 1 ($p = .23$), cigarette use at Time 1 ($p = .32$), alcohol use at Time 1 ($p = .85$), belief in the afterlife at Time 2 ($p = .09$), and future orientation at Time 2 ($p = .23$). The effect sizes of the attrition effect for average family income was small ($\eta^2 = .06$). The final sample still had a family income level that was representative of the Southwestern Virginia region when the data were collected (U.S. Census Bureau, 2007).

Plan of Analysis

For all study variables, descriptive statistics were examined to determine normality of distributions and outliers. Skewness and kurtosis were examined for all variable distributions and acceptable levels were skewness less than 3 and kurtosis less than 10 (Kline, 2005). Furthermore, GLM was used to discern significant multivariate predictors of the endogenous variables among the demographic variables and any demographic variables that were significant ($p < .05$) using Wilk's Lambda coefficients were used as covariates. The hypothesized models were tested via Structural Equation Modeling (SEM) using MPlus statistical software version 7.1 (Muthén & Muthén, 2012). Overall model fit indices were determined by χ^2 value, degrees of freedom, corresponding p-value, Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI). RMSEA values of less than .05 were considered a close fit while values less than .08 were considered a reasonable fit (Browne & Cudeck, 1993), and CFI values of greater than .90 were considered an acceptable fit while values greater .95 were considered an excellent fit (Bentler, 1990). We sought to test our hypotheses via path analyses exploring potential sequential mediation of religiousness → afterlife beliefs → future orientation → substance use. Our method testing the conceptual model of sequential mediation with a series of mediators has been used previously (e.g. Shelleby et al., 2014; Taylor, MacKinnon, & Tein, 2008). Due to data unavailability of every construct at every time point, substance use was the only construct which had initial levels controlled for at Time 1. Full information maximum likelihood (FIML) estimation procedure (Arbuckle, 1996) was used for missing data. FIML estimates are superior to those obtained with listwise deletion or other ad hoc methods (Schafer & Graham, 2002). Asymptotic and resampling strategies were used via the bootstrapping method with 1,000 iterations to test significance levels of mediated effects with bias corrected bootstrap confidence intervals (i.e., Preacher & Hayes, 2008).

Results

Preliminary Analyses

Descriptive statistics and correlations among study variables can be found in Table 1. Eight cases were identified as multivariate outliers due to significant Mahalonobis Distances ($p < .001$); however, the pattern of results did not change when testing the models with and without the identified cases. Therefore, these outliers were not excluded from the analyses. Cigarette and alcohol use at Time 1 were transformed due to high skewness and kurtosis values. The transformation was performed by inverting the values, which has been used to transform severely positively skewed distributions, and then reflected to preserve original ordering (Tabachnick & Fidell, 2013). GLM revealed that no demographic variables were significant multivariate predictors of afterlife beliefs at Time 2, future orientation at Time 2, or cigarette, alcohol, or marijuana use at Time 3, and thus none were introduced to the models ($p = .09$ for age; $p = .51$ for gender; $p = .42$ for race; $p = .28$ for income).

Hypothesis Testing

Cigarette Use—The initial model that contained all possible regression paths among variables was fully saturated. Given that we were interested in the mediated effects of religiousness through afterlife beliefs and future orientation rather than all possible indirect and direct paths, non-significant regression paths that were not central to the current study's hypotheses were then trimmed. This method is consistent with the recommendations of Little (2013) for promoting the accuracy of structural equation models by removing estimated effects that are nonsignificant and lack theoretical expectations. We trimmed the following paths from the fully saturated model: $b^* = .09$, $p = .41$ for religiousness Time 1 → future orientation Time 2; $b^* = .02$, $p = .87$ for cigarette use Time 1 → future orientation Time 2; $b^* = .08$, $p = .43$ for afterlife beliefs Time 2 → cigarette use Time 3. Resultantly, the final model had fit indices that were excellent ($\chi^2 = 1.36$, $df = 3$, $p = .71$; RMSEA = .00; CFI = 1.00).

As shown in Figure 1, a closer examination of the results for the final model indicated higher religiousness at Time 1 was significantly associated with higher belief in the afterlife at Time 2 ($b = .56$, $SE = .07$, $p < .001$). Higher belief in the afterlife at Time 2, in turn, was significantly associated with higher future orientation at Time 2 ($b = .08$, $SE = .03$, $p = .01$). Higher future orientation at Time 2 was then associated with lower cigarette use at Time 3 ($b = -.35$, $SE = .15$, $p = .02$) after controlling for the autoregressive path from cigarette use at Time 1 to cigarette use at Time 3 ($b = 3.44$, $SE = 1.01$, $p = .001$). Additionally, religiousness at Time 1 directly predicted cigarette use at Time 3 ($b = -.17$, $SE = .06$, $p = .004$). Cigarette use at Time 1 also significantly predicted belief in the afterlife at Time 2 ($b = -5.31$, $SE = 1.82$, $p = .003$), but did not significantly covary with religiousness at Time 1 ($r = -.01$, $p = .36$), however cigarette use at Time 1 and religiousness at Time 1 significantly covaried in the initial, saturated model and was thus not trimmed from final model. The bootstrap test of indirect effects demonstrated the three-path mediated effects between religiousness at Time 1 and cigarette use at Time 3 involving afterlife beliefs and future orientation (religiousness → afterlife beliefs → future orientation → cigarette use) were significant ($b^* = -.02$, $p = .03$, 95% CI [−.05, −.003]).

Alcohol Use—The initial model that contained all possible regression paths among variables was fully saturated. Non-significant regression paths that were not central to the current study's hypotheses were trimmed (b^* = .07, p = .62 for religiousness Time 1 → future orientation Time 2; b^* = .02, p = .09 for alcohol use Time 1 → afterlife beliefs Time 2; b^* = −.04, p = .64 for alcohol use Time 1 → future orientation Time 2; b^* = .04, p = .68 for afterlife beliefs Time 2 → alcohol use Time 3) for the final model and fit indices were excellent (χ^2 = 1.16, df = 4, p = .88; RMSEA = .00; CFI = 1.00).

As shown in Figure 2, a closer examination of the results for the final model indicated higher religiousness at Time 1 was significantly associated with higher belief in the afterlife at Time 2 (b = .58, SE = .08, p < .001). Higher belief in the afterlife at Time 2, in turn, was significantly associated with higher future orientation at Time 2 (b = .08, SE = .03, p = .004). However, higher future orientation at Time 2 had a marginally significant association with lower alcohol use at Time 3 (b = −.36, SE = .21, p = .08) after controlling for the autoregressive path from alcohol use at Time 1 to alcohol use at Time 3 (b = 1.89, SE = .65, p = .004). Additionally, religiousness at Time 1 did not significantly predict alcohol use at Time 3 (b = −.13, SE = .08, p = .10), however it was significant in the initial, saturated model and thus was not trimmed from the final model. Alcohol use at Time 1 significantly covaried with religiousness at Time 1 (r = −.10, p = .003). The bias corrected bootstrap test of indirect effects demonstrated the three-path mediated effects between religiousness at Time 1 and alcohol use at Time 3 involving afterlife beliefs and future orientation (religiousness → afterlife beliefs → future orientation → alcohol use) was not significant (b^* = −.02, p = .17, 95% CI [−.05, .01]).

Marijuana Use—Given that no participants had used marijuana at Time 1, we were unable to control for initial marijuana use and instead considered this a model of marijuana use initiation by Time 3. The initial model that contained all possible regression paths among variables was fully saturated. Non-significant regression paths that were not central to the current study's hypotheses were trimmed (b^* = .08, p = .44 for religiousness Time 1 → future orientation Time 2; b^* = .03, p = .77 for afterlife Time 2→ marijuana use Time 3) for the final model and fit indices were excellent (χ^2 = .69, df = 2, p = .71; RMSEA = .00; CFI = 1.00).

As shown in Figure 3, a closer examination of the results for the final model indicated that higher religiousness at Time 1 was significantly associated with higher belief in the afterlife at Time 2 (b = .58, SE = .08, p < .001). Higher belief in the afterlife at Time 2, in turn, was significantly associated with higher future orientation at Time 2 (b = .08, SE = .03, p = .004). Higher future orientation at Time 2 was subsequently associated with lower marijuana use at Time 3 (b = −.51, SE = .20, p = .01). Additionally, religiousness at Time 1 was associated with marijuana use at Time 3 (b = −.19, SE = .07, p = .01). The bias corrected bootstrap test of indirect effects demonstrated the three-path mediated effects between religiousness at Time 1 and marijuana use at Time 3 involving afterlife beliefs and future orientation (religiousness → afterlife beliefs → future orientation → marijuana use) was significant (b^* = −.03, p = .05, 95% CI [−.06, −.001]).

Supplemental Analyses

Although we argue based on prior theory that afterlife beliefs contribute to future orientation, we tested alternative models given that these two mediators were measured at the same time point. Specifically, we tested alternatives to our final models in which afterlife beliefs at Time 2 and future orientation at Time 2 were parallel mediators between religiousness at Time 1 and substance use at Time 3 rather than sequential mediators. We tested fully saturated models with all possible paths but did not proceed with trimming nonsignificant paths given that we had no theoretical expectations for the individual paths in these alternative models. Moreover, we were mainly interested in evaluating whether the alternative mediating pathways may emerge significant rather than statistical comparisons of the model fits between parallel mediation models and sequential mediation models. We describe the results of these alternative models focusing on the direct and indirect effects.

For cigarette use, religiousness at Time 1 significantly predicted afterlife beliefs at Time 2 (b = .56, SE = .08, p < .001, b^* = .53) and future orientation at Time 2 (b = .06, SE = .03, p = .03, b^* = .19). In turn, future orientation at Time 2 significantly predicted cigarette use at Time 3 (b = −.37, SE = .14, p = .01, b^* = −.20), however afterlife beliefs at Time 2 did not significantly predict cigarette use at Time 3 (b = .05, SE = .06, p = .43, b^* = .08). Furthermore, religiousness at Time 1 also significantly predicted cigarette use at Time 3 directly (b = −.20, SE = .07, p = .001, b^* = −.31) after controlling for the autoregressive effects of cigarette use at Time 1 (b = 3.71, SE = 2.05, p = .00, b^* = .29). The bias corrected bootstrap test of indirect effects demonstrated the total mediated effects between religiousness at Time 1 and cigarette use at Time 3 involving afterlife beliefs and future orientation was not significant (b^* = .01, p = .92, 95% CI [−.10, .11]).

For alcohol use, religiousness at Time 1 significantly predicted afterlife beliefs at Time 2 (b = .56, SE = .09, p < .001, b^* = .54). Religiousness at Time 1 prediction of future orientation at Time 2 approaches significance (b = .06, SE = .03, p = .09, b^* = .17). In turn, future orientation at Time 2 predicted alcohol use at Time 3 with marginal significance (b = −.37, SE = .21, b^* = −.16, p = .07). Afterlife beliefs at Time 2 did not significantly predict alcohol use at Time 3 (b = .03, SE = .08, p = .68, b^* = .04). The direct effect of religiousness at Time 1 on alcohol use at Time 3 approached significance (b = −.14, SE = .09, p = .10, b^* = −.18) after controlling for the autoregressive effects of alcohol use at Time 1 (b = 1.91, SE = .66, p = .004, b^* = .25). The bias corrected bootstrap test of indirect effects demonstrated the total mediated effects between religiousness at Time 1 and alcohol use at Time 3 involving afterlife beliefs and future orientation was not significant (b^* = −.004, p = .94, 95% CI [−.11, .11]).

For marijuana use, religiousness at Time 1 significantly predicted afterlife beliefs at Time 2 (b = .58, SE = .08, p < .001, b^* = .56) and future orientation at Time 2 (b = .07, SE = .03, p = .03, b^* = .19). In turn, future orientation at Time 2 significantly predicted marijuana use at Time 3 (b = −.52, SE = .19, p = .01, b^* = −.22), however afterlife beliefs at Time 2 did not significantly predict marijuana use at Time 3 (b = .02, SE = .08, p = .77, b^* = .03). Additionally, religiousness at Time 1 also significantly predicted marijuana use at Time 3 directly (b = −.20, SE = .09, p = .02, b^* = −.25). The bias corrected bootstrap test of indirect effects demonstrated the total mediated effects between religiousness at Time 1 and

marijuana use at Time 3 involving afterlife beliefs and future orientation was not significant ($b* = -.03$, $p = .68$, 95% CI [$-.15$, .09]). Taken together, the alternative model testing indicated that the total mediated effects were not significant for all three substances. Moreover, there was no evidence in any of the models that there was a significant path from afterlife beliefs at Time 2 to substance use at Time 3.

Discussion

Religiousness as a protective factor against substance use among adolescents has been clearly shown in recent literature (e.g. Kim-Spoon et al., 2014, 2015; Laird, et al, 2011). Nevertheless, little is known as to the processes that explain why religious individuals tend to use fewer substances. Considering the emergence and progression of substance use behaviors during adolescence (Steinberg, 2010), further research is critical to address this gap in the literature. The present longitudinal study sought to examine pathways through which religiousness is related to the development of substance use behaviors among adolescents. In particular, we investigated whether belief in an afterlife stemming from religiousness was associated with future orientation, which in turn was associated with subsequent substance use.

Our first hypothesis was that higher religiousness would be associated with higher belief in the afterlife at a later time. This hypothesis was supported as higher religiousness at Time 1 was significantly associated with higher belief in the afterlife at Time 2 with a large effect size in all three models involving cigarette ($b* = .54$, $p < .001$), alcohol ($b* = .56$, $p < .001$), and marijuana use ($b* = .56$, $p < .001$). This result is in line with a previous finding of a large concurrent correlation ($r = .76$, $p < .001$) between religiousness and afterlife beliefs among older adults (Falkenhain & Handal, 2003). However, the current findings present a longitudinal association between religiousness and afterlife beliefs among adolescents which, to the authors' knowledge, has not been empirically demonstrated to date.

Secondly, we hypothesized that higher belief in the afterlife would be associated with higher future orientation. This hypothesis was also supported as higher belief in the afterlife at Time 2 was significantly associated with higher future orientation at Time 2 with a moderate effect size in all three models involving cigarette ($b* = .24$, $p = .01$), alcohol ($b* = .25$, $p = .004$), and marijuana use ($b* = .25$, $p = .004$). These findings are supportive of the proposition that a belief in the afterlife may be associated with more future oriented thinking (McCullough & Willoughby, 2009). Furthermore, our results are consistent with previous empirical findings based on young adult samples showing that more religious individuals demonstrate higher belief in the afterlife and higher future orientation (Öner-Özkan, 2007). Consequently, religiousness, through the afterlife beliefs of the respective faith, may be associated with more future oriented thinking as a result of active consideration of this temporally distant event. Thus, our finding specifies why individuals who are more religious tend to report higher levels of future oriented thinking (Carter et al., 2012).

Finally, we hypothesized that higher future orientation would be associated with lower substance use at a later time point. This hypothesis was also supported as higher future orientation at Time 2 was significantly associated with lower substance use at Time 3 with

small to moderate effect sizes for cigarette ($b* = -.19$, $p = .01$) and marijuana use ($b* = -.22$, $p = .01$). For alcohol, there was a trend toward higher future orientation associated with lower alcohol use ($b* = -.15$, $p = .08$). As we later discuss in greater detail, it appears that the role of future orientation is weaker for alcohol use compared to cigarette and marijuana use. Nevertheless, our finding demonstrates a within-person, longitudinal prediction of substance use behaviors from future orientation. Such findings are consistent with previous work which has found that future orientation is associated with substance use behaviors in adolescents (e.g., Chen & Vazsonyi, 2011). Moreover, this is a particularly important association to explore given the higher risk taking, such as substance use, undertaken during adolescence, which is in part due to the relatively immature brain regions of cognitive control during adolescence (e.g., Casey et al., 2011; Steinberg, 2010).

Our supplemental analyses of testing afterlife beliefs and future orientation as parallel mediators (instead of sequential mediators) further revealed a lack of significant total mediated effects in any three of the substance use models, corroborating our hypothesis of a sequential path from religiousness → afterlife beliefs → future orientation → substance use. It has been proposed that afterlife beliefs may contribute to future oriented thinking (e.g. McCullough & Willoughby, 2009), and our data supported this theoretical viewpoint by illustrating that afterlife beliefs are an important element of adolescent religiousness that explain why more religious adolescents tend to be more future oriented. Moreover, the effects of afterlife beliefs on future substance use behaviors seem to operate primarily through the proximal behavioral construct of considering future consequences before taking actions and planning for the future, rather than directly from afterlife beliefs to future substance use.

Returning to the primary analyses, we found significant mediation effects from religiousness to substance use for cigarette and marijuana use, but not for alcohol use. Specifically, the path from future orientation to alcohol use appeared to be weaker than the other two substances. This finding may indicate a fundamental difference between cigarette and marijuana smoking and alcohol drinking with respect to future orientation. Potential explanations include the normative nature of alcohol use in adolescence and young adulthood (Jackson, Sher, & Park, 2005), especially considering the use of alcohol in some religious traditions. Furthermore, alcohol consumption among late adolescents and young adults is more likely to occur in a social setting (i.e., social drinking) than cigarette and marijuana smoking. Therefore, social factors such as peer influences may be far more influential on the adolescent's decision making than his or her thinking about future consequences.

Our finding is also consistent with prior studies indicating that cigarette smokers discount delayed health gains at a greater rate than controls, suggesting that the delayed negative health-related consequences of smoking may be less impactful to cigarette smokers (Baker, Johnson, & Bickel, 2003; Bickel et al., 2014; Odum, Madden, & Bickel, 2002). Interestingly, the current literature on temporal discounting and substance use indicates that the only commonly abused drug dependence disorder that has been shown to be unassociated with temporal discounting is marijuana dependence (Johnson et al., 2010). In contrast, we found that future orientation was an important factor in predicting later

marijuana use. We speculate that the discrepancy of the findings may be due to the differences in the samples (adolescents from a community sample vs. marijuana-dependent adults and matched controls) and the measures (future oriented behaviors focusing on considering future consequences and planning for future vs. decision making between smaller, more immediate monetary reward and larger, more delayed monetary reward). Future research would benefit from replicating the current findings to explore the differential effects of future orientation (1) across different types of substances, (2) across different samples (e.g., adolescents vs. adults; clinical vs. non-clinical samples), and (3) across different measures of future orientation (e.g., behavioral measures of future orientation vs. reward associated decision-making tasks). The resulting findings will help obtain a more nuanced understanding regarding the role of future orientation in the development of substance use and abuse.

Taken together, the present findings address critical questions regarding the potential role of religiousness in positively altering the development of substance use in adolescence. In particular, we may conclude that afterlife beliefs that stem from religiousness are positively associated with adolescent health. Such an association is derived sequentially through the associations of religiousness and afterlife beliefs, afterlife beliefs and future orientation, and future orientation and substance use, respectively. While previous literature has been informative on the bivariate associations between religiousness, afterlife beliefs, future orientation, and substance use (e.g. Falkenhain & Handal, 2003; Öner-Özkan, 2007); the current findings elucidate an aspect of religiousness (i.e., afterlife beliefs) that plays an important contributing role for future orientation. In turn, the current findings demonstrate that adolescents' religiousness exerts protective effects through the association of future orientation and substance use. As such, these findings support the theoretical argument of McCullough and Willoughby (2009) that religiousness may be associated with health outcomes, in part, as a result of the more future oriented nature of believers in afterlife, which is frequently associated with religiousness.

Findings from the current study should be interpreted in the context of study limitations. First, using single informant and relying solely on questionnaires as well as the correlational nature of our data make it difficult to make strong inferences regarding causal directions of influence among variables, particularly with afterlife beliefs and future orientation measured at the same time point. However, the longitudinal nature and adherence to empirically corroborated theory help to alleviate this issue as well as the supplemental analyses which tested potential alternative models. Future studies could benefit from involving multiple informants and methods to reduce potential method bias. Second, the relatively large amount of attrition over the course of the study is noted, but the attrition analyses demonstrated the small effect size of income which was the only variable that differentiated between participants included in the analyses and those who were excluded, thus it does not appear to compromise the integrity of the results.

Third, the low levels of substance use in the sample may be a concern regarding the generalizability of the findings outside of a low-risk community sample. Although the distribution of substance use was consistent with expectations of a low-risk community of adolescents and the effect sizes were also in line with theoretical expectations, future testing

of these models in samples of differing levels of risk would be beneficial to support the robustness of the present findings. Additionally, the current sample had a relatively wide age range (10–16 years at Time 1) raising a concern to account for developmental differences. However, a closer examination of the sample revealed that 94% of the sample fell between 10 and 14 years at Time 1, and our GLM analyses revealed that age was not significantly related to endogenous study variables. Finally, the present study was predominantly Christian, as is the vast majority of existing research on adolescent religiousness. While these findings are more easily generalizable to Western religions, future research would benefit from exploring these relations in Eastern religions. While many Eastern religions still have some sort of belief about what happens upon physical death (e.g., reincarnation) and belief about the long term consequences of their actions (e.g., karma), further research should explore if the processes described in the present findings are robust to religious creeds beyond the Western tradition.

Overall, the results of the present study provide insight into the potential predictors of adolescent substance use, a major public health concern. While previous studies have noted protective effects of religiousness on adolescent substance use, our longitudinal findings elucidate the nature of these associations by demonstrating that religious beliefs are associated with belief in the afterlife. In turn, these afterlife beliefs are associated with orienting towards the future which is subsequently associated with less use of substances. Acknowledging the significance of adolescents' religiousness and their afterlife beliefs may facilitate the effectiveness of prevention and intervention programs by strengthening adolescents' abilities to resist temptation of substance use with enhanced awareness of future consequences and motivation for planning a better future. This may be particularly important in early adolescence when substance use and other risk taking behaviors are beginning to rise and prevention strategies are crucial to deter detrimental health behaviors.

Acknowledgments

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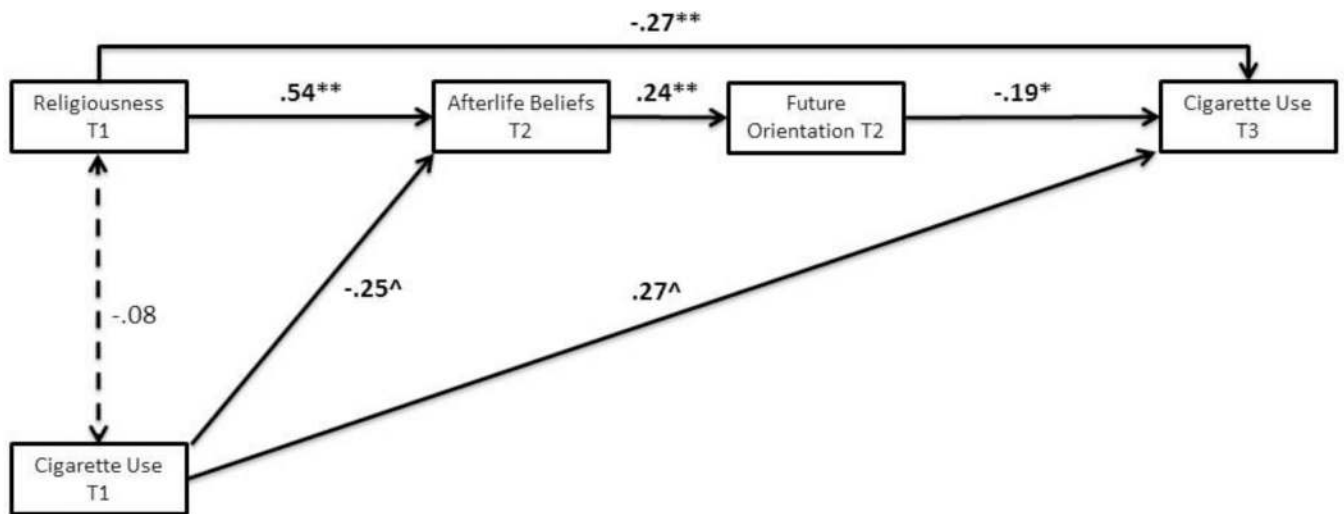
Figure 1.
Standardized coefficients from structural equation modeling for the longitudinal associations among adolescent religiousness, afterlife beliefs, future orientation, and cigarette use.

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3

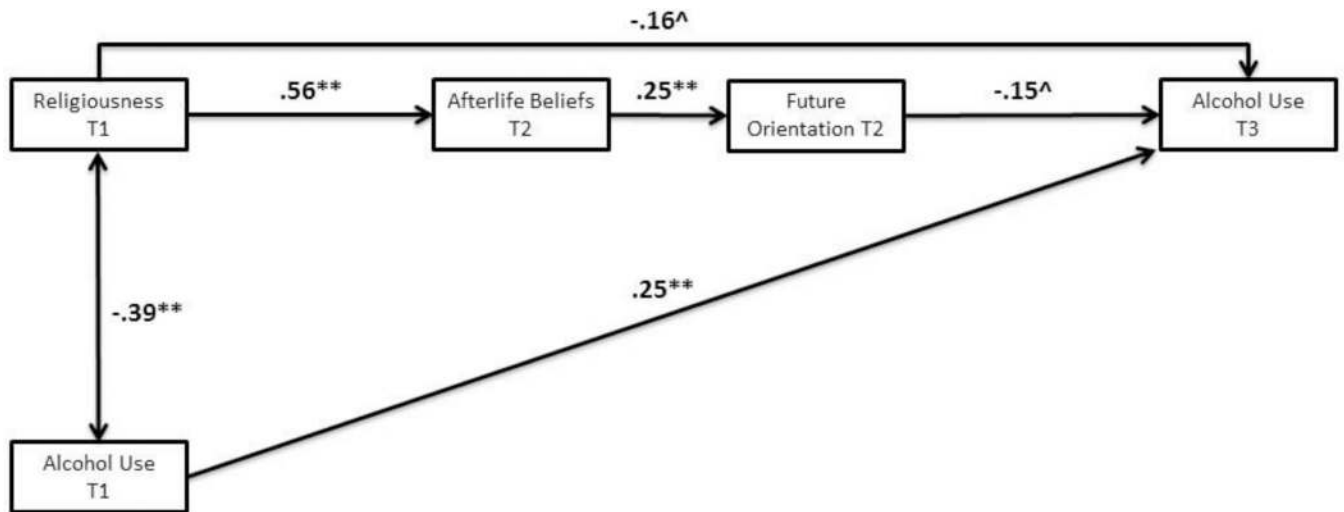^ $p < .10$, * $p < .05$, ** $p < .01$.

Figure 2.
Standardized coefficients from structural equation modeling for the longitudinal associations among adolescent religiousness, afterlife beliefs, future orientation, and alcohol use.

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3

^ $p < .10$, * $p < .05$, ** $p < .01$.

Figure 3.
Standardized coefficients from structural equation modeling for the longitudinal associations among adolescent religiousness, afterlife beliefs, future orientation, and marijuana use.
Note: T1 = Time 1, T2 = Time 2, T3 = Time 3
^ p < .10, * p < .05, ** p < .01.

Table 1

Descriptive Statistics and Bivariate Correlations of Religiousness, Afterlife Beliefs, Future Orientation, and Substance Use.

Variables	1	2	3	4	5	6	7	8	9	M (SD)
1. Religiousness T1	-									5.31 (1.55)
2. Cigarette Use T1ˣ	−.08	-								1.01 (.08)
3. Alcohol Use T1ˣ	−.39 **	.31 **	-							1.05 (.17)
4. Marijuana Use T1	-	-	-	-						- (−)
5. Afterlife Beliefs T2	.33 **	−.52 **	−.35 **	-	-					5.00 (2.02)
6. Future Orientation T2	.45 **	−.05	−.11	-	.18 *	-				2.90 (.52)
7. Cigarette Use T3	.19 *	.23 **	.23 **	-	−.02	−.16	-			1.37 (1.33)
8. Alcohol Use T3	−.09	.12	.28 **	-	−.05	−.14	.73 **	-		2.08 (1.59)
9. Marijuana Use T3	−.05	.05	.23 **	-	.01	−.18 *	.61 **	.69 **	-	1.45 (1.79)

Note:

*
p ≤.05;

**
p ≤.01;

ˣ
= transformed; T1 = Time 1; T2 = Time 2; T3 = Time 3.