

Processes Linking Parents' and Adolescents' Religiousness and Adolescent Substance Use: Monitoring and Self-Control

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Received: 23 May 2013 / Accepted: 10 August 2013
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Abstract Empirical evidence suggests that religiousness is related negatively to adolescent substance use; yet, we know little about how such protective effects might occur. The current study examined whether parents' and adolescents' religiousness are associated positively with parental, religious, and self-monitoring, which in turn are related to higher self-control, thereby related to lower adolescent substance use. Participants were 220 adolescents (45 % female) who were interviewed at ages 10–16 and again 2.4 years later. Structural equation modeling analyses suggested that higher adolescents' religiousness at Time 1 was related to lower substance use at Time 2 indirectly through religious monitoring, self-monitoring, and self-control. Higher parents' religiousness at Time 1 was associated with higher parental monitoring at Time 2, which in turn was related to lower adolescent substance use at Time 2 directly and indirectly through higher adolescent self-control. The results illustrate that adolescents with high awareness of being monitored by God are likely to show high self-control abilities and, consequently, low substance use. The findings further suggest that adolescents' religiousness as well as their religious environments (e.g., familial context) can facilitate desirable developmental outcomes.

Keywords Religiousness · Monitoring · Self-control · Adolescent substance use

Introduction

Among youth in the United States, the leading causes of morbidity and mortality include tobacco, alcohol, and other drug use (CDC 2012). Empirical findings have identified religiousness as having protective effects against involvement with substance use (Bahr and Hoffmann 2008; Ford and Hill 2012; Mason and Spoth 2011; Miller et al. 2000; see Chitwood et al. 2008 for a review). Yet, how these effects operate is not well understood (McCullough and Willoughby 2009). In particular, identifying the mediating processes by which religiousness exerts protective influences against adolescent substance use is crucial for determining how religiousness influences adolescent health. In the current investigation, we examined whether parents' and adolescents' religiousness are associated positively with parental, religious, and self-monitoring which are related to higher adolescent self-control, which in turn is related to lower levels of adolescents' involvement in substance use.

Religiousness Promotes Monitoring Behaviors and Self-Regulation

We propose that the negative associations of religiousness and adolescent substance use exist because religiousness improves self-regulation. We define “self-regulation” as the ability to regulate the self strategically in response to goals, priorities, and environmental demands and use the terms “self-control” and “self-regulation” interchangeably (Vohs and Baumeister 2004). At least two major theoretical viewpoints are useful to explain the associations among

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religiousness, self-control, and substance use. These theoretical perspectives are not mutually exclusive, but rather, emphasize different aspects of religiousness (i.e., organizational religiousness and personal religiousness). First, social learning theory predicts lower rates of substance use and problem behaviors among religious adolescents because participation in religious services and activities encourages adolescents to develop self-regulatory skills and self-efficacy, which deter risk behavior (Bartkowski and Xu 2007).

Second, in their reformulation of the social control theory, Gottfredson and Hirschi (1990) proposed that low self-control, rather than social control, is the root cause of delinquent behaviors; according to this view, adolescents must be taught by parents and older adults to internalize the rules and principles of their societies so that they consider the full range of consequences of their behaviors. When this socialization is inadequate, adolescents develop stronger preferences for smaller-sooner rewards over larger-later rewards, which often are associated with substance abuse and addiction as well as delinquent behaviors. It is expected that strongly religious adolescents are likely to internalize religious principles and regulations that become personally meaningful and use them to guide thought and action. As a result, they may become better at self-regulation during adolescence than do their less religious peers.

The practical significance of self-regulation for understanding risk behavior is suggested in prior research demonstrating that inadequate self-regulation is linked to substance use. Adolescents who have problems with self-regulation are more prone to become addicted because they are less able to restrain impulsive responses to temptations (Miller and Brown 1991; Sayette 2004). Furthermore, evidence also indicates a crucial mediating role of self-regulation between religiousness and substance use. For example, lower levels of adolescents' religiousness were associated with lower self-control (measured by soothability, planfulness, and problem solving), which in turn was related to higher antisocial behaviors indicated by aggression, delinquency, and drug use (Walker et al. 2007). Similarly, a recent longitudinal study suggests that the association between weak self-regulation and high levels of substance use may occur because adolescents with low religiousness are less able to decline immediate smaller rewards in order to obtain larger rewards later (Kim-Spoon et al. 2013). Taken together, these previous findings suggest that self-regulation may play a crucial role in linking adolescents' religiousness and lower levels of substance use. Nevertheless, the processes through which religiousness might foster self-regulation have received only minimal attention.

One way that religiousness might promote self-regulation is by increasing people's awareness of being monitored by God or a higher power. Feeling that one is being watched by God or a higher power is likely to make people more conscious of their behavior, the possible consequences of their

behaviors, and the discrepancies between their behaviors and their own standards for their behaviors. Similarly, Baumeister and his colleagues theorized that both an omnipresent God and attentive religious communities can incentivize individuals to monitor their behavior more closely (Baumeister et al. 2010). In support of these perspectives, Carter et al. (2012) found that religious young adults, compared to their non-religious counterparts, were more likely to believe that God or a higher power was watching them (i.e., religious monitoring) and also to monitor their own behavior with reference to their own goals (i.e., self-monitoring). They also found that the association between religiousness and self-control was mediated through religious monitoring, which in turn was related positively to self-monitoring. Taken together, these insights suggest that religiousness might foster adolescent self-regulation by bolstering adolescents' awareness of their own behaviors as well as their perception of being monitored by God or a higher power.

Contributions of Parents' Religiousness to Adolescent Self-Regulation and Substance Use

Parents' own religiousness deserves attention because of its relation to both adolescents' religiousness and adjustment. Prior investigations have demonstrated that parents' religiousness is related inversely to substance use and externalizing problems among adolescents (Brody and Flor 1998; Kim-Spoon et al. 2012; Laird et al. 2011). One route by which parents' religiousness can influence adolescent outcomes is parental involvement in children's development of self-regulatory abilities. Indeed, studies suggest that higher levels of parental monitoring—the extent to which parents are aware of their children's activities and friends—are related to higher levels of self-control among their children (Bartkowski et al. 2008; Brody and Flor 1998; Wilcox 2002). The association between parental monitoring and adolescent self-regulation might come to exist because monitoring enables parents to be adequately informed about children's activities so that they can be prepared to respond to their children's needs (Bowers et al. 2011; Brody and Flor 1998). Thus, parental monitoring seems to be an important mediator that may explain how parents' religiousness promotes the development of self-regulation among their children.

The Present Study

The present study addresses critical shortcomings present within the literature on family religiousness and adolescent development. We used a prospective longitudinal design to evaluate how parents' religiousness and adolescents' religiousness jointly influence adolescent substance use over time, after controlling for initial levels of substance use.

We simultaneously considered multiple protective processes by which adolescents' and parents' religiousness might influence adolescent substance use, including parental and religious monitoring, and adolescent self-monitoring and self-control. Information was obtained from both adolescents and their respective parents. Our primary goal was to test the hypothesis that both parents' religiousness and adolescents' religiousness are related positively to parental monitoring and adolescents' perceived religious monitoring and self-monitoring, which in turn are associated with higher adolescent self-control that then is related to lower levels of adolescent substance use.

Method

Participants

Participants included 220 adolescents (121 boys and 99 girls) and their primary caregivers (220 total; parents hereafter), including 83 % mothers, 15 % fathers, and 2 % other caregivers at Time 1. Adolescents' ages ranged from 10 to 16 years at Time 1 ($M = 12.67$, $SD = 1.52$) and 12 to 18 years at Time 2 ($M = 15.12$, $SD = 1.53$). About 87 % of adolescents were White, 10 % African American, 2 % Hispanic, and 1 % in other ethnic groups. At Time 1, parents' ages ranged from 25 to 69 ($M = 43.28$, $SD = 6.56$) with the ethnic composition of 90 % White, 7 % African American, 2 % Hispanic, and 1 % other. At Time 1, the majority (77 %) of parents were married or living with a partner as though married. Mean family income was between \$35,000 and \$49,999 a year at both times. In terms of religious affiliation at Time 1, 70 % of adolescents reported as Protestant, 11 % reported Roman Catholic, 1 % reported Jewish, 5 % reported no religious affiliation, and 13 % reported "other." For parents, 67 % reported as Protestant, 10 % reported Roman Catholic, 10 % reported no religious affiliation, and 13 % reported "other." We used a web-based computerized questionnaire for adolescent substance use because this format is known for being less intrusive for sensitive topics that might otherwise prove difficult in an interview, such as underage alcohol use (Dillman and Smyth 2008). One of the participants' responses was not coded inadvertently, resulting in missing data in substance use at Time 2. Therefore, the current analyses involved 219 adolescents (121 boys and 98 girls).

Measures

Religiousness at Time 1

Religiousness was assessed by adolescents' self-reports with ten items from published measures (Fetzer/NIA 1999;

Jessor and Jessor 1977). Organizational religiousness was measured using a composite averaging two items that assessed participants' involvement in formal public religious institutions by instructing participants to indicate how often they attended "religious services" and "other religious activities," respectively. Responses ranged from 1 = *never* to 6 = *more than once a week*. Personal religiousness was assessed using a composite averaging across four items that instructed participants to indicate the importance of religious faith in their lives and the degree to which the respondent thinks religiousness matters in his/her life (e.g., how important they think it is "to believe in God"). Responses ranged from 1 = *not at all important* to 4 = *very important*. Private Practices were assessed using four items assessing the *informal* religious and spiritual practices of the respondent (e.g., pray privately other than at church; read religious literature). Responses ranged from 1 = *never* to 8 = *more than once a day*. Internal consistency coefficients (α) were .70 and .86 for adolescents' and parents' organizational religiousness, .88 and .91 for adolescents' and parents' personal religiousness, and .82 and .79 for adolescents' and parents' private religious practices, respectively. Based on confirmatory factor analysis results showing that all of the factor loadings were significant and comparable in magnitude (factor loadings ranged from .48 to .82), we derived religiousness composite scores by calculating the average of subscale scores of organizational and personal religiousness and private practices (with the organizational and personal religiousness subscale scores transformed on a 1 to 8 scale).

Parental Monitoring at Time 2

Parents were asked about parental monitoring habits using the 13-item *Knowledge of Activities* subscale from the Child Monitoring Scale (Hetherington and Clingempeel 1999). Items on this scale ask how much the parent knows about his/her adolescents' decisions about various aspects of the adolescent's life such as performance in school, where the adolescent is when not at home, and dating behaviors. Answers on this scale ranged from 1 = *always knows* to 5 = *never knows* (reverse coded). In the current sample, internal consistency coefficient (α) was .88.

Self, Other, and Religious Monitoring at Time 2

Adolescents completed nine items regarding the extent to which (a) they monitor their personal goals and values (self-monitoring); (b) they feel monitored by other people (other-monitoring); and (c) they feel watched by a higher power, or monitored by God (religious monitoring), using a Likert-type scale ranging from 1 = *not at all* to 5 = *very true* (Carter et al. 2012). Preliminary analyses indicated

that other-monitoring was not correlated with adolescents' religiousness ($r = .07$, $p = .28$), whereas religious monitoring and self-monitoring were ($r = .57$, $p < .001$ and $r = .27$, $p < .001$, respectively). As we were interested in examining how religiousness might exert protective effects against adolescent substance use by fostering monitoring, we focused on the religious monitoring (three items, $\alpha = .72$, e.g., "I sometimes feel as though I am being observed by a higher power") and the self-monitoring (three items, $\alpha = .91$, e.g., "I often stop at the end of the day to consider if I made progress in reaching my goals") subscales.

Self-Control at Time 2

We used two questionnaires that measure aspects of self-control. First, adolescents completed planning and anticipation of consequences (PAC) subscales of the Future Orientation Scale (Steinberg et al. 2009). These subscales assessed the ability to engage in planning and tendency to reflect on consequences of behaviors (e.g., Wills et al. 2008). There were five items on planning ahead and five items on anticipation of future consequences. Adolescents were asked to pick the statement most like them (e.g., "Some people like to plan things out one step at a time BUT Other people like to jump into things without planning them out beforehand" for planning ahead and "Some people like to think about all of the possible good and bad things that can happen before making a decision BUT Other people don't think it's necessary to think about every little possibility before making a decision" for anticipation of future consequences). After selecting a statement that is most like them, adolescents were then asked how much they endorsed that statement (*sort of true* or *really true*). Responses were coded on a 4-point scale, ranging from *really true* for one descriptor to *really true* for the other descriptor. Internal consistency coefficients (α) were .80 for planning ahead and .73 for anticipation of future consequences. The two subscale scores were substantially correlated with each other ($r = .58$, $p < .001$). Scale scores were calculated as means of item responses, and the mean of the two subscales was calculated.

Second, adolescents and parents were asked to report adolescents' behavioral self-control with the Brief Self-Control Scale (BSCS; Tangney et al. 2004). The scale's 13 items asked how typical each statement (e.g., "I am good at resisting temptation") was of the adolescent using a Likert-type scale ranging from 1 = *not at all* to 5 = *very much*. Internal consistency coefficients (α) were .83 for adolescent reports and .89 for parent reports. We used the mean of adolescent and parent reports. To create an overall index of self-control, we first standardized the PAC and BSCS scores using z -score transformations. We then averaged the

resulting transformed scores; the PAC and BSCS scores were substantially correlated ($r = .55$, $p < .001$).

Substance Use at Time 1 and Time 2

Adolescent substance use was measured by three items. Specifically, adolescents were asked to indicate typical frequencies of alcohol (beer, wine, hard liquor, or mixed drinks), cigarette, and marijuana use (e.g., which is the most true for you about smoking cigarettes?) using a Likert-type scale ranging from 1 = *never used* to 6 = *usually use every day*. A composite index was formed by calculating the mean of the three items. Internal consistency coefficients (α) were .42 for the Time 1 composite and .81 for the Time 2 composite. The low reliability for the Time 1 composite may be, in part, due to the fact that marijuana use at Time 1 was a constant variable because all participants reported '1 = *never used*.'

Procedure

The procedure for the original longitudinal study from which participants for the current study were drawn has been described previously (Kim-Spoon et al. 2012). Participants were recruited from Southwestern Virginia by diverse advertisement methods including flyers, recruitment letters, and e-mail distributions. Families interested in the study were asked to call the research office. Research assistants described the nature of the study to the interested individuals over the telephone and invited them to participate. Data collection took place at the university's offices where adolescents and their parents were interviewed by trained research assistants and received monetary compensation for participating.

The participants were invited back for a follow-up study approximately 2.4 years later. Those who had already attended their first year of college were considered to be aged out of the study and were not invited for this follow-up. There were 137 participants that did not return at Time 2 for reasons including: child not invited back due to being aged out ($n = 24$), a busy schedule ($n = 8$), moving out of the study area ($n = 12$), inability to be located or not showing up ($n = 86$), disinterest in continuing study participation ($n = 6$), and child death ($n = 1$). We performed multivariate general linear modeling (GLM) analyses to predict attrition (participated at Time 2 or not) based on demographic variables. Attrition analyses indicated that participants who did not participate in Time 2 ($n = 137$), compared to those who did ($n = 220$), were more likely to be non-White ($p = .027$), and tended to have lower family incomes ($p < .001$) at Time 1. However, the effect sizes of the attrition effects were small ($\eta^2 = .01$ for race and $\eta^2 = .05$ for income) with the proportion of non-White

adolescents decreasing from 16 % at Time 1 to 13 % at Time 2 and the mean family income remaining the same between Time 1 and Time 2 (between \$35,000 and \$49,999). No significant differences were found regarding gender ($p = .61$) but those who did not participate at Time 2 tended to be older ($p < .001$) as those who aged out were not invited back. Furthermore, our longitudinal sample had the family income level and the percentage of non-White persons that were representative of the Southwestern Virginia region (including five counties and two cities; U.S. Census Bureau 2012). All procedures were approved by the institutional review board of the university.

Statistical Analyses

We estimated a series of structural equation modeling (SEM) analyses using Mplus 7.0 (Muthén and Muthén 2012) based on maximum likelihood estimation. We tested whether adolescents' religiousness at Time 1 was associated with adolescent substance use at Time 2 mediated through religious and self-monitoring and adolescent self-control at Time 2 (after controlling for the initial levels of substance use). Furthermore, we examined parents' religiousness and parental monitoring to evaluate intergenerational transmission (i.e., correlation between adolescent and parents' religiousness) as well as the relative contributions of adolescent and parents' religiousness. We evaluated whether parents' and adolescents' religiousness at Time 1 were associated with adolescent substance use at Time 2 mediated through parental and religious monitoring and adolescent self-monitoring and self-control at Time 2 after controlling for initial levels of substance use.

In evaluating the overall goodness of fit of each model, the root mean square error of approximation (RMSEA; Browne and Cudeck 1993) index assesses the degree of lack of fit for a model and values less than .05 and .08 are taken to reflect a close fit and a reasonable fit, respectively. The Tucker–Lewis Index (TLI; Bentler 1990) varies along a 0–1 continuum, and values exceeding .90 and .95 are considered to reflect acceptable and excellent fits to the data, respectively.

Results

Descriptive statistics and correlations for study variables are presented in Table 1. We examined the degree to which the study variables deviated from assumptions of univariate normality (skewness greater than 3 and kurtosis 10; Kline, 1998). A non-normally distributed variable (substance use at Time 1) was log transformed prior to conducting the main analyses. Next, we examined multivariate outliers on the six religiousness, monitoring, and self-control variables

using Malhalanobis's distance values. There was no outlier that had a Malhalanobis's distance score greater than the critical value [$\chi^2(6) = 22.46, p < .001$]. Finally, univariate GLM analyses revealed no significant effects of some demographic characteristics on the outcome variable, including gender ($p = .46$), ethnicity ($p = .38$), family income ($p = .21$), and parent marital status ($p = .98$). Because age showed significant effects in GLM ($p < .001$), it was included in the path models as a covariate along with Time 1 level of substance use.

As shown in Fig. 1, we were interested in the contributions of parents' religiousness to adolescent substance use while simultaneously taking into account the contributions of adolescents' religiousness. Accordingly, we estimated the direct effect of adolescents' and parents' religiousness at Time 1 on adolescent substance use at Time 2 and their indirect effects through parental, religious, and self-monitoring and adolescent self-control. We also examined cross-lagged effects of Time 1 parents' religiousness on Time 2 adolescent religious and self-monitoring and cross-lagged effects of Time 1 adolescents' religiousness on Time 2 parental monitoring. Additional cross-lagged effects were examined between Time 1 substance use and Time 2 constructs (including parental, religious, and self-monitoring, self-control, and substance use).

The initial model that estimated all possible regression paths for the direct and indirect effects of parents' and adolescents' religiousness yielded a poor fit [$\chi^2 = 17.54, df = 4, p = .002, RMSEA = .12, and TLI = .70$]. Given that we are interested in the mediated effects of religiousness through monitoring and self-control rather than all possible indirect and direct paths between religiousness and substance use, we kept only the significant paths by fixing non-significant parameter estimates to zero. The model with those non-significant parameters fixed to zero yielded a good fit [$\chi^2 = 30.79, df = 17, p = .02, RMSEA = .06, and TLI = .93$]. We further compared those two models and confirmed that the model fit did not degrade significantly by fixing the non-significant parameters to zero ($\Delta\chi^2 = 13.24, \Delta df = 13, p = .43$).

Table 2 presents unstandardized parameter estimates (including fixed parameters), standard errors, and 95 % confidence intervals. As Fig. 1 shows, parents' religiousness at Time 1 was associated positively with parental monitoring at Time 2; however, adolescents' religiousness at Time 1 did not predict parental monitoring at Time 2. In contrast, both adolescents' religiousness and parents' religiousness at Time 1 were related positively to religious monitoring at Time 2. Parental monitoring was related positively to adolescent self-control, but not adolescent self-monitoring. Adolescent religious monitoring was related to self-control via self-monitoring. Adolescent self-

Table 1 Descriptive statistics and bivariate correlations of parents’ and adolescents’ religiousness, parental, religious, and self- monitoring, self-control, and substance use

Variables	1	2	3	4	5	6	7	8		
1. Adolescents’ religiousness T1	–									
2. Parents’ religiousness T1	.68***	–								
3. Religious monitoring T2	.54***	.52***	–							
4. Self-monitoring T2	.27***	.22***	.49***	–						
5. Parental monitoring T2	.22***	.30***	.31***	.10	–					
6. Adolescent PAC T2	.14*	.10	.18**	.29***	.10	–				
7. Adolescent BSCS T2	.11*	.07	.17**	.17**	.29***	.55***	–			
8. Adolescent cigarette use T1	–.04	–.03	–.13*	–.11	–.20***	–.06	–.10	–		
9. Adolescent alcohol use T1	–.30***	–.17**	–.23***	–.20**	–.18**	–.04	–.05		.41***	
10. Adolescent Marijuana use T1	–	–	–	–	–	–	–	–		
11. Adolescent substance use T1	–.23***	–.13*	–.22***	–.19***	–.22***	–.06	–.08		.78***	
12. Adolescent cigarette use T2	–.20**	–.17**	–.21***	–.10	–.30***	–.16***	–.31**		.50***	
13. Adolescent alcohol use T2	–.27***	–.25***	–.21***	.01	–.36***	–.20**	–.26***		.26***	
14. Adolescent Marijuana Use T2	–.25***	–.21***	–.24***	–.13*	–.30***	–.19**	–.29***		.32***	
15. Adolescent substance use T2	–.28***	–.24***	–.26***	–.07	–.38***	–.21**	–.33***		.41***	
		9	10	11	12	13	14	<i>M</i>	<i>SD</i>	
1. Adolescents’ religiousness T1								5.24	1.49	
2. Parents’ religiousness T1								5.31	1.60	
3. Religious monitoring T2								4.75	2.14	
4. Self-monitoring T2								4.78	1.45	
5. Parental monitoring T2								4.48	.47	
6. Adolescent PAC T2								2.84	.54	
7. Adolescent BSCS T2								3.61	.55	
8. Adolescent cigarette use T1								1.06	.33	
9. Adolescent alcohol use T1	–							1.14	.45	
10. Adolescent Marijuana Use T1	–	–						1.00	.00	
11. Adolescent substance use T1	.89***	–	–					1.07	.22	
12. Adolescent cigarette use T2	.37***	–	.51***	–				1.35	.84	
13. Adolescent alcohol use T2	.44***	–	.43***	.57***	–			1.81	1.05	
14. Adolescent Marijuana use T2	.37***	–	.41***	.74***	.55***	–		1.35	1.02	
15. Adolescent substance use T2	.45***	–	.51***	.87***	.83***	.88***		1.52	.84	

N = 219. PAC planning and anticipation of consequences, BSCS Brief Self-Control Scale, T1 Time 1, T2 Time 2

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

control, in turn, was associated negatively with adolescent substance use after controlling for the baseline level of substance use. In addition, parental monitoring, but not religious or self-monitoring, was associated directly with adolescent substance use. A significant reciprocal effect indicated that higher adolescent substance use at Time 1 was associated with lower levels of parental, religious, and self-monitoring at Time 2. The direct effects of Time 1 parents’ and adolescents’ religiousness on Time 2 adolescent substance use were not significant.

We performed product-of-coefficients tests using standard errors estimated by the delta method to test the significance levels of the two-, three-, and four-path mediated

effects (Taylor et al. 2008). First, with respect to adolescents’ religiousness, there was a significant four-path mediated effect (i.e., three mediators in series) between adolescents’ religiousness and substance use involving religious monitoring, self-monitoring, and self-control (religiousness → religious monitoring → self-monitoring → self-control → substance use; $b = -.01$, $SE = .002$, $p = .027$, 95 % CI [–.009, –.001]). Next, with respect to parents’ religiousness, the four-path mediated effect between parents’ religiousness and adolescent substance use, via three mediators—religious monitoring, self-monitoring, and self-control—was significant ($b = -.004$, $SE = .002$, $p = .028$, 95 % CI [–.008, .000]). In addition, the three-path mediated

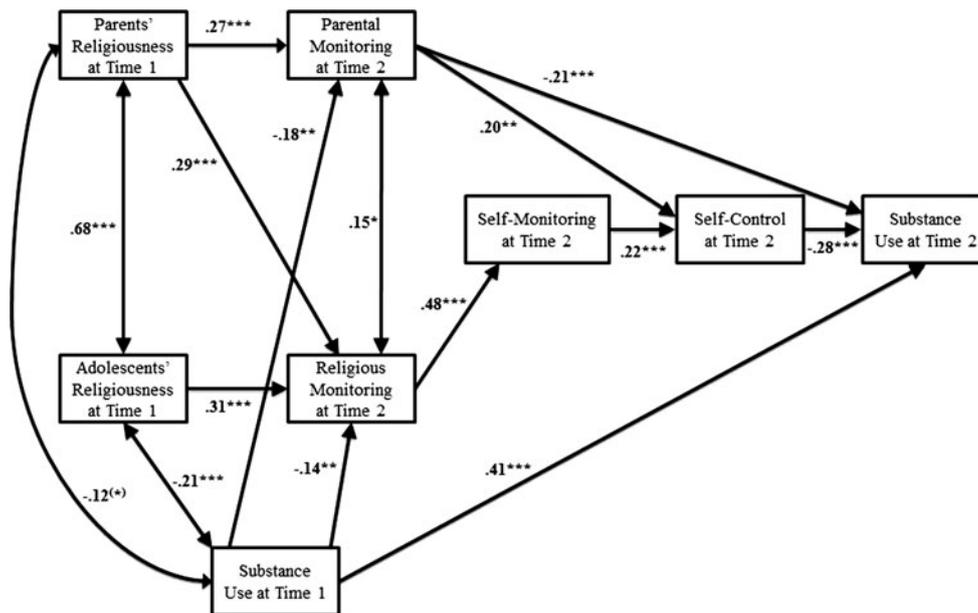


Fig. 1 Summarized model fitting results of the associations among parents’ and adolescents’ religiousness, parental monitoring, religious monitoring, self-monitoring, self-control, and adolescent substance use. *Notes* Standardized parameter estimates are presented. For clarity of presentation, the following non-significant coefficients are not

shown: substance use at Time 1 → self-monitoring at Time 2 = $-.10$; self-monitoring at Time 2 → substance use at Time 2 = $.10$. The following coefficients related to the age covariate are not shown: age → substance use at Time 1 = $.36^{***}$; age → substance use at Time 2 = $.15^{**}$. (* $p = .06$; * $p < .05$; ** $p \leq .01$; *** $p \leq .001$)

effects between parents’ religiousness and adolescent substance use via two mediators of parental monitoring and adolescent self-control were significant (religiousness → parental monitoring → self-control → substance use; $b = -.01$, $SE = .004$, $p = .024$, 95 % CI $[-.015, -.001]$). The two-path mediated effect of parents’ religiousness on adolescent substance use through parental monitoring was also significant ($b = -.03$, $SE = .01$, $p = .004$, 95 % CI $[-.051, -.009]$). Overall, the effects of parents’ and adolescents’ religiousness involving monitoring and self-control accounted for 29 % of variance in Time 2 adolescent substance use.

Finally, we tested an alternative model to further investigate the efficacy of our theoretical model. Because it could be argued that adolescents with better self-control are more likely to self-monitor (e.g., Wills and Dishion 2004), we specified an alternative model in which religiousness variables were predictive of parental and religious monitoring variables, which were predictive of self-control. Self-monitoring, in turn, was predictive of adolescent substance use. This model produced similar model fits to the original model with self-monitoring predicting self-control [$\chi^2 = 17.31$, $df = 4$, $p = .002$, RMSEA = .12, and TLI = .70 for the initial model with all possible regression paths and $\chi^2 = 28.93$, $df = 15$, $p = .02$, RMSEA = .07, and TLI = .92 for the final model after dropping non-significant paths]. A close inspection of

significant parameters in the final model revealed that the same patterns were found as the original model with regard to the associations among religiousness, monitoring, and self-control (i.e., parents’ religiousness → parental and religious monitoring; adolescents’ religiousness → religious monitoring; parental monitoring → self-control; religious monitoring → self-monitoring). In addition, self-control was predictive of self-monitoring ($b^* = .17$, $p = .004$) as well as substance use ($b^* = .17$, $p = .004$). However, self-monitoring was not related to substance use ($b^* = .09$, $p = .11$). Therefore, our data seem to suggest that, as we hypothesized in Fig. 1, self-control is a more proximal predictor of substance use compared to self-monitoring.

Discussion

The majority of previous studies on religion and adolescent health have focused on examining only direct associations between adolescents’ religiousness and health outcomes. A critical next step is systematic examination of specific models that identify mediating processes that are involved in the link between religiousness and health risk behaviors. In the current study, we focused on self-control as a potential mediator because of its known links to both religiousness and health outcomes. We also aimed to test

Table 2 Parameter estimates, standard errors, and confidence intervals for path model of religiousness, monitoring, self-control, and adolescent substance use

	Estimate	Std. error	Confidence interval (95 %)
Par. Relig. T1 → Par. Mon. T2	.08***	.02	[.04, .12]
Adol. Relig. T1 → Par. Mon. T2	0=		
Adol. SU T1 → Par. Mon. T2	-1.32**	.46	[-2.23, -.41]
Par. Relig. T1 → Relig. Mon. T2	.39***	.10	[.20, .59]
Adol. Relig. T1 → Relig. Mon. T2	.44***	.11	[.23, .66]
Adol. SU T1 → Relig. Mon. T2	-4.76**	1.87	[-8.43, -1.10]
Par. Relig. T1 → Self Mon. T2	0=		
Adol. Relig. T1 → Self Mon. T2	0=		
Par. Mon. T2 → Self Mon. T2	0=		
Adol. SU T1 → Self Mon. T2	-2.35	1.36	[-5.01, .32]
Relig. Mon. T2 → Self Mon. T2	.33***	.04	[.25, .41]
Par. Relig. T1 → Self-Con. T2	0=		
Adol. Relig. T1 → Self-Con. T2	0=		
Par. Mon. T2 → Self-Con. T2	.37**	.12	[.14, .61]
Adol. SU T1 → Self-Con. T2	0=		
Relig. Mon. T2 → Self-Con. T2	0=		
Self Mon. T2 → Self-Con. T2	.13**	.04	[.05, .21]
Par. Relig. T1 → Adol. SU T2	0=		
Adol. Relig. T1 → Adol. SU T2	0=		
Adol. SU T1 → Adol. SU T2	5.31***	.76	[3.83, 6.80]
Adol. Age → Adol. SU T2	.09**	.03	[.02, .15]
Par. Mon. T2 → Adol. SU T2	-.38**	.10	[-.57, -.19]
Self Mon. T2 → Adol. SU T2	.06*	.03	[-.01, .12]
Relig. Mon. T2 → Adol. SU T2	0=		
Self-Con. T2 → Adol. SU T2	-.27***	.05	[-.37, -.16]
Par. Relig. T1 ↔ Adol. Relig. T1	1.62***	.19	[1.23, 2.00]
Par. Relig. T1 ↔ Adol. SU T1	-.01*	.01	[-.03, .00]
Par. Relig. T1 ↔ Adol. Age	0=		
Adol. Relig. T1 ↔ Adol. SU T1	-.02***	.01	[-.03, -.01]
Adol. Relig. T1 ↔ Adol. Age	0=		
Adol. Age ↔ Adol. SU T1	.04***	.01	[.02, .05]
Relig. Mon. T2 ↔ Par. Mon. T2	.11*	.05	[.01, .22]

Par. Parents'/parental, Relig. religiousness, Mon. monitoring, Adol. adolescent, SU substance use, Self-Con. self-control, T1 Time 1, T2 Time 2. The "=" symbol indicates a parameter is fixed

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

whether parental, religious, and self-monitoring operate as mediating processes through which parents' and adolescents' religiousness are related to adolescent self-control and substance use.

We found that adolescents' religiousness was related to lower subsequent substance use through its positive intermediate effects on religious monitoring, self-monitoring, and self-control. Our findings support the view that self-control is one cause of religion's protective effects (Gottfredson and Hirschi 1990). Prior cross-sectional studies have demonstrated that religiousness obtains its negative associations with adolescent substance use and delinquent

behaviors in part through its apparent promotion of self-control (Walker et al. 2007). Our longitudinal analyses suggest furthermore that adolescents with higher religiousness may develop better self-control over time in part due to their higher perception of being monitored by God (see also Carter et al. 2012). As a consequence, religious adolescents, compared to their nonreligious peers, may closely monitor their behaviors with regard to their personal goals and values that are influenced by the rules and principles of religious teachings.

Scholars have observed that many religious belief systems posit a god, or gods, that watch human behaviors and

pass judgment (Carter and McCullough 2010; Laurin et al. 2012), and our results revealed that adolescents who are more religious reported higher levels of belief that one is being monitored by God, an evaluative audience. Prior research has primarily focused on the effects of “supernatural monitoring” (Gervais and Norenzayan 2012) on prosociality, suggesting that reminding people of watchful supernatural agents who are capable of moral judgment promotes prosocial behaviors such as honesty and cooperation (e.g., Shariff and Norenzayan 2007). The current investigation, to our knowledge, is the first study that illuminates how adolescents’ enhanced awareness of being monitored by God is related to higher self-control abilities and, consequently, lower substance use.

In our data, the observed link between adolescents’ religiousness and self-monitoring was fully mediated by religious monitoring. It seems, therefore, that viewing God as an ever-watching, evaluative being is a useful way of conceptualizing the influence of religiousness on self-control. In other work, Laurin et al. (2012) found that priming God increased young adults’ willingness to resist temptation among those whose representation of God included the feature of omniscience, whereas no such effect was found among those whose representation of God did not include this feature. Practically, religious adolescents also may show higher self-monitoring due to their involvement in introspective religious practices such as prayer and meditation through which they monitor for discrepancies between their goal states and their actual behavior (McCullough and Carter 2011).

Our findings highlight the important role of self-control as a proximal predictor of adolescent substance use. Data from human brain imaging studies suggest that neurobiological processes that underlie self-control have implications for the development of substance use in adolescence. Prior research shows that control-related activations are initially diffuse among prefrontal regions in childhood and early adolescence, but these diffuse patterns of activity become increasingly focal with maturation during adolescence. In addition, both control behavior and prefrontal cortical activity come to resemble adult performance and neural patterns with increasing age throughout adolescence (Casey et al. 2000). Risk-taking in adolescence such as substance use can be thought to be the product of the interaction between two developing systems: a network sensitive to rewards and a network associated with control (Steinberg 2008). Given heightened brain responses in limbic circuitry to reward during adolescence (Casey and Caudle 2013), it is crucial to identify factors that can facilitate self-control development for effective preventive intervention for adolescents with emerging substance use (and ultimately abuse and addiction). Our findings present preliminary evidence that adolescents’ and parents’ religiousness may be significant contributors that influence the

development of self-control through their associations with monitoring perceptions and behaviors.

Based on these findings, we suggest two possible routes for future research. First, further research is needed for a better understanding of neurobiological bases for the link between religiousness and self-control, which will enhance our ability to identify adolescents who are vulnerable to substance use. For example, there is a preliminary finding suggesting that religious primes may reduce neurophysiological reactivity (specifically anterior cingulate cortex activity) that is associated with regulating anxious reactions (Inzlicht and Tullett 2010). Second, future research should consider that the pathways through which religious monitoring influence adolescent substance use may depend on the nature of representation of God or a higher being. We speculate that believing that God is an omniscient, all-knowing being may reduce adolescent substance use by promoting self-monitoring, whereas believing that God is an omnipotent, controlling force may reduce adolescent substance use by increasing punishment sensitivity (e.g., Kambouropoulos and Staiger 2004).

Within the empirical literature on religiousness, studies that considered the effects of both parents’ and adolescents’ religiousness are rare. We examined both adolescents’ own religiousness and parents’ religiousness to evaluate their relative contributions to the development of adolescent substance use. We found that the protective effects of parents’ religiousness on adolescent substance use operated primarily through elevated parental monitoring. Specifically, parents with greater religiousness showed better knowledge of their children’s activities and whereabouts. Furthermore, although the direct association between parents’ religiousness and adolescent substance use was not significant, higher parental monitoring mediated the links between parents’ religiousness and adolescent substance use as well as between parents’ religiousness and adolescent self-control.

Thus, our results highlight the beneficial effects of parental monitoring for deterring the development of adolescent substance use (Li et al. 2000; Piko and Balázs 2012). Vigilant parental monitoring may reduce adolescent substance use by maximizing opportunities for parents to intervene in adolescents’ involvement in risky behaviors and thwart negative influences of substance using peers. In addition, consistent with previous work (Vazsonyi and Huang 2010), we found strong evidence for positive socialization effects on adolescent self-control. Particularly, parental monitoring may foster adolescent self-control by working as a conduit for transmitting behavioral rules and guidelines and encouraging adolescents to internalize these regulation strategies (e.g., Crossley and Buckner 2012). These findings emphasize the significant impact that parents’ religiousness and parental monitoring may have for their children’s self-control and substance use in

adolescence, above and beyond the contributions of adolescents' own religiousness and monitoring behaviors. However, it should be noted that the roles of parents' religiousness and monitoring in the development of adolescent substance use might change across familial contexts as well as developmental periods. For example, it has been shown that the strength of the links between parents' religiousness and adolescent adjustment varies depending on parent–adolescent relationship quality (Kim-Spoon et al. 2012).

Simultaneously considering both parents' and adolescents' religiousness and monitoring behaviors revealed interesting patterns of mutual associations. First, there was evidence for the intergenerational transmission of religiousness, indicated by strong positive associations between parents' and adolescents' religiousness. Second, higher parents' religiousness was statistically predictive of higher adolescent religious monitoring over time; however, adolescents' religiousness was not statistically predictive of parental monitoring behaviors. Third, our data revealed that higher levels of adolescent substance use were associated with lower parental monitoring at a later time, adding direct evidence for the bidirectional effects between parental knowledge and adolescent maladjustment to the extant literature regarding reciprocal effects between parenting style and adolescent adjustment (e.g., Kerr et al. 2012).

Some limitations of this study suggest directions for future research. First, it is important to note that our findings do not establish causality in relations among the study variables. The mediated effects of religiousness found in this study warrant further replications using multiple-wave data. Second, most of the research on religiousness and adolescent adjustment has been conducted in North America with participants who were predominantly from Christian backgrounds, even though the evidence gathered from participants from other religions seems to consistently indicate the protective role of religiousness (e.g., Klanjsek et al. 2012). Future studies will benefit from examining the processes by which family religiousness may influence adolescent substance use across diverse religious and cultural groups. Finally, our Time 1 data were drawn from relatively young adolescents, which may be a unique contribution of this study to the field given the lack of knowledge regarding the roles of religiousness in early adolescence. However, our community sample showed low levels of substance use, especially at Time 1, which may be due to the young age of our sample (i.e., at Time 1, only about 6 % of our participants were older than 14 years, the typical substance use onset).

Conclusion

The present study contributes to expanding knowledge regarding the association between religiousness and

adolescent health by illustrating that religious adolescents report stronger religious and self-monitoring than do their less religious counterparts and further suggesting that such monitoring might promote self-control abilities that help deter their engagement in substance use. Our results also present evidence for parental monitoring as a mediating process through which parents' religiousness exerts protective effects on the development of substance use in adolescence. Taken together, the findings support the notion that greater recognition of adolescents' religious needs and dispositions as well as their religious environments (e.g., familial context) can facilitate desirable developmental outcomes (Levesque 2002). The findings also provide implications for preventive intervention against adolescent substance use. Acknowledging the significance of adolescents' religiousness and their perception of religious monitoring may facilitate the effectiveness of prevention and intervention programs by strengthening adolescents' abilities to resist temptation of substance use. Parental monitoring also can be targeted in interventions in tandem to reduce adolescent substance use.

Acknowledgments This work was supported by Grants from the National Institute of Child Health and Human Development (HD057386) and the John Templeton Foundation. We thank Laurel Marburg, Eirini Papafratzeskakou, and Diana Riser for their help with data collection. We are grateful to adolescents and parents who participated in our study.

Author Contributions JKS conceived the study, participated in its design and coordination, performed statistical analyses and interpretation of the data, and drafted the manuscript; JPF participated in data collection and statistical analyses, and helped to draft the manuscript; CH participated in statistical analyses and helped to draft the manuscript; GSL participated in data collection and helped to draft the manuscript; MEM conceived the study and helped to draft the manuscript. All authors read and approved the final manuscript.

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