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Brief Report: Bifactor Modeling of General vs. Specific Factors of Religiousness Differentially Predicting Substance Use Risk in Adolescence

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Abstract

Religiousness is important to adolescents in the U.S., and the significant link between high religiousness and low substance use is well known. There is a debate between multidimensional and unidimensional perspectives of religiousness (Gorsuch, 1984); yet, no empirical study has tested this hierarchical model of religiousness related to adolescent health outcomes. The current study presents the first attempt to test a bifactor model of religiousness related to substance use among adolescents ($N = 220$, 45% female). Our bifactor model using structural equation modeling suggested the multidimensional nature of religiousness as well as the presence of a superordinate general religiousness factor directly explaining the covariation among the specific factors including organizational and personal religiousness and religious social support. The general religiousness factor was inversely related to substance use. After accounting for the contribution of the general religiousness factor, high organizational religiousness related to low substance use, whereas personal religiousness and religious support were positively related to substance use. The findings present the first evidence that supports hierarchical structures of adolescent religiousness that contribute differentially to adolescent substance use.

Keywords

religiousness; bifactor modeling; adolescent substance use

It is well understood that religiousness is related negatively to adolescent health risk behaviors; however, methodological weakness in prior research examining the link between religiousness and adolescent outcomes lies in its limitation relating to how religiousness has

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been measured. First, measures of religiousness are often single-item measures and attendance in religious services is used most frequently (see Rew & Wong, 2006 for a review). Such single-item measures are problematic because religiousness is best considered multidimensional, including aspects of behaviors, devotion, and beliefs (e.g., King & Hunt, 1975).

Second, religiousness might be meaningfully represented as a general factor encompassing multiple, specific factors. However, using global religious variables combining multiple factors of religiousness into a single summary score may be limited in helping us understand why and how religiousness affects adolescent health because different factors of religiousness may relate differentially to health risk behaviors. In support of this particular view, a few available studies utilized a meaningful distinction between organizational religious activities such as service attendance versus those of private activities or spiritual experiences (e.g., Sinha, Cnaan, & Gelles, 2007). Previous studies on substance use further suggest the utility of the distinction between two correlated yet independent factors of religiousness: personal religiousness (importance), but not organizational religiousness (attendance), was related to adolescent substance use (Walker, Ainette, Wills, & Mendoza, 2007). However, focusing on only the general religiousness factor or only the specific religiousness factors makes it difficult to determine whether the results are due to the general factor of the religiousness construct, the specific factors, or both.

A theoretical paradigm advocating a hierarchical model of religiousness integrates the two above-mentioned viewpoints (Gorsuch, 1984; Tsang & McCullough, 2003). This viewpoint recognizes a higher order integration by suggesting a model with general religiousness as a broad construct subdivided into a set of more specific factors. Yet, no empirical study has tested this hierarchical model of religiousness and its relations to adolescent health outcomes. The current study presents the first attempt to test a bifactor model (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012; Holzinger & Swineford, 1937) of adolescent religiousness related to substance use. Religiousness is believed to have a beneficial effect on adolescent substance use inasmuch as adolescents with higher religiousness are less likely to use substances (Walker et al., 2007). We used the bifactor model to test our hypothesis that there exist the simultaneous effects of the general religiousness construct (shared by the specific factors of religiousness) as well as effects of specific religiousness factors over and above the general religiousness construct.

Method

Participants

Participants included 220 adolescents (121 boys, 99 girls). Adolescents' ages ranged from 12 to 18 years ($M = 15.12$, $SD = 1.53$) and 87% of adolescents were White, 10% African American, 2% Hispanic, and 1% in other ethnic groups. Adolescent religious affiliation was 58% Protestant, 11% Roman Catholic, 1% Jewish, 16% no religious affiliation, and 14% "other." Participants were recruited from Southwestern Virginia by diverse advertisement methods including flyers, recruitment letters, and e-mail distributions.

Measures

Religiousness—Religiousness was assessed by adolescents' self-reports with eight items from published measures (Fetzer/NIA, 1999). Organizational religiousness was measured using two items assessing participants' involvement in formal public religious institutions (i. g., frequencies of attendance and religious activities; 1 = *never* to 6 = *more than once a week*). Personal religiousness was assessed using three items instructing respondents to indicate the degree they think religiousness matters in their life (1 = *not at all important* to 4 = *very important*). Religious support was assessed using three items indicating the emotional support received from congregations (1 = *very often* to 4 = *never*, with 5 = *not applicable*). We reverse coded the religious support scores so higher scores indicated greater religious support and treated “not applicable” as equal to “never” because both answers indicated a lack of religious support. Internal consistency coefficients (α) were .70 for organizational religiousness, .90 for personal religiousness, and .92 for religious support.

Substance use—Adolescent substance use was measured with the mean of adolescents' reports of typical frequencies (e.g., “Which is the most true for you about smoking cigarettes?”) of cigarette, alcohol (beer, wine, hard liquor, or mixed drinks), and marijuana use, using a Likert-type scale ranging from 1 = *never used* to 6 = *usually use every day*.

Results

Descriptive statistics and correlations for all study variables appear in Table 1. Univariate general linear modeling (GLM) analyses revealed no significant effects of some demographic characteristics on adolescent substance use, including gender, ethnicity, family income, and parent marital status. Because age showed significant effects on adolescent substance use ($p < .001$), we included it as a covariate in the structural equation modeling (SEM) analyses.

We fit a bifactor model (a.k.a. a general-specific model) of religiousness to evaluate the multifaceted construct of religiousness. The bifactor modeling approach allows for (1) testing whether a specific factor may no longer exist after partialling out a general factor, and (2) testing whether there are unique contributions of the specific factors in predicting an outcome variable while controlling for the association of the outcome variable with the general factor (Chen et al., 2012). As shown in Figure 1, the bifactor model simultaneously assessed the specific factors of organizational religiousness, personal religiousness, and religious support as well as the general construct of “religiousness” shared by those specific factors. The specific factors were uncorrelated with each other, and the general factor was uncorrelated with the specific factors.

This bifactor model described the data well ($\chi^2 = 32.59$, $df = 13$, $p = .002$, RMSEA = .08, and CFI = .98). We tested an alternative model without bifactor involving only the three specific factors. We fixed factor loadings and factor variance of the general factor to zero and added factor correlations among the three specific factors. The model fit of this alternative model (not nested to the bifactor model) was comparable to that of the bifactor model ($\chi^2 = 35.66$, $df = 18$, $p = .008$, RMSEA = .07, and CFI = .99). This highlights that the

choice between the models should be determined based on a theoretically informed hypothesis but not necessarily on statistical superiority shown in model fit.

As shown in the bifactor model (Figure 1), all factor loadings were significant and all of the items made a stronger contribution to the general factor than to their specific factors. In addition, the variances of the specific factors and the general factor were significant, except the organizational religiousness factor for which the factor variance had to be fixed to one for model identification (variance = .14, $t = 2.14$, $p < .001$ for personal religiousness; variance = .23, $t = 3.52$, $p = .032$ for religious support; and variance = .61, $t = 5.66$, $p < .001$ for the general religiousness factor). The findings indicated a superordinate general religiousness factor, and also unique variances related to the specific factors above and beyond the variances explained by the general factor.

To examine relations of both the specific and general factors of religiousness to substance use, we used the bifactor model to predict the latent factor of substance use. Adolescent age was included as a covariate. The model fit the data well ($\chi^2 = 75.56$, $df = 44$, $p = .002$, RMSEA = .06, and CFI = .98). Similar to the results of the first bifactor model, factor loadings were notably stronger for the general religiousness factor than for the specific factors. As shown in Figure 2, the only exception was that the two factor loadings for the organizational religiousness manifest variables were negative ($b^* = -.28$ and $-.27$, $p < .001$). The general factor of religiousness was inversely related to substance use ($b^* = -.52$, $p < .001$), indicating adolescents with high religiousness reported lower levels of substance use compared to adolescents with low religiousness. After accounting for the contribution of the general religiousness factor, the three specific factors of religiousness still had significant associations with substance use. High organizational religiousness was related to low substance use ($b^* = -.44$, $p = .008$). However, personal religiousness and religious support were positively related to substance use ($b^* = .63$, $p < .001$ and $b^* = .24$, $p = .026$, respectively). As shown in prior research (e.g., Chen et al., 2012), we observed that the pattern of relations in the bifactor analysis could be opposite of zero-order bivariate correlations. This discrepancy may arise because the bifactor model separates the common variance shared by specific factors from the unique variance germane only to the particular factor (Chen et al., 2012).

Discussion

An important contribution of the present study is to present an innovative approach of bifactor modeling to obtain greater conceptual clarity of the hierarchical nature of adolescent religiousness and its relations to substance use. Our bifactor analysis results illustrated the multidimensional nature of religiousness and also demonstrated the presence of a superordinate general religiousness factor directly explaining the covariation among the individual indicators. We tested the bifactor model predicting substance use and found the general religiousness factor had a strong, negative association with substance use, as expected based on prior research findings. However, there were positive associations of personal religiousness and religious support with substance use after partialling out the contribution of general religiousness factor to substance use. If these findings are replicated in future studies, they may imply that in the absence of the common elements of

religiousness (shared by organizational and personal religiousness and religious support), behaviors and attitudes particularly specific to personal religiousness and religious support might be related to substance use vulnerability, such as a propensity to use substances as a negative coping strategy against stress.

Findings from the current study should be interpreted in the context of study limitations. Replications using samples of adolescents with diverse socioeconomic, ethnic, and geographical representations would be beneficial for generalizability of the results beyond a low risk community sample. Additionally, we measured religiousness and substance use based solely upon adolescents' self-reports. Consequently, associations among the variables might have been inflated artificially by method variance due to single informant or monomethod bias. Using data from multiple informants (e.g., parents, teachers, and clinicians) and multiple methods (e.g., observation, clinical interview, and formal diagnostic criteria) might be worthwhile for future research.

Given the factor loadings were notably stronger for the general religiousness factor than for the specific factors and the general religiousness factor showed a strong inverse relation with adolescent substance use, our findings support the viewpoint advocating the use of a general religiousness factor encompassing multiple, specific factors. Our findings provide further evidence that, as Tsang and McCullough (2003) suggested, researchers should consider controlling for the higher order general religiousness factor before concluding for the effects of any particular specific factor, because specific factors of religiousness do not function independently and they contain significant amounts of variance attributable to the general religiousness factor.

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Figure 1.

A bifactor model of general and specific factors of adolescent religiosity.

Note. Standardized parameter estimates are presented.

* $p < .05$

Figure 2.

A bifactor model of general and specific factors of adolescent religiousness predicting adolescent substance use.

Note. Standardized parameter estimates are presented.

* $p < .05$

Table 1

Descriptive Statistics and Correlations of Religiousness and Substance Use

Variables	1	2	3	4	5	6	M(SD)	Range
1. Organizational Religiousness							3.76 (1.33)	1.00-6.00
2. Personal Religiousness	.61**						3.15 (0.78)	1.00-4.00
3. Religious Support	.45**	.42**					2.69 (0.98)	1.00-4.00
4. Cigarette Use	-.18**	-.15*	-.13				1.35 (0.84)	1.00-6.00
5. Alcohol Use	-.22**	-.23**	-.22**	.61**			1.81 (1.05)	1.00-5.00
6. Marijuana Use	-.27**	-.19**	-.21**	.66**	.52*		1.34 (1.00)	1.00-6.00

* $p < .05$;** $p < .01$.