1-1-2018

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Journal of Transcultural Nursing, Vol. 29, No. 1 (January 1, 2018): 74-83. DOI.

Sexual Risk Behaviors of African American Adolescent Females: The Role of Cognitive and Religious Factors

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Abstract

Introduction: African American (AA) high school-age girls are more likely to have had sex before age 13 years and have higher rates of *all* sexually transmitted infections. Cognition and religion/spirituality are associated with adolescent sexuality, therefore, the purpose of this study was to identify cognitive and religious substrates of AA girls' risky sexual behaviors. **Method:** A descriptive study was conducted with 65 AA girls aged 15 to 20 years using computerized questionnaires and cognitive function tasks. **Results:** Average age was 17.8 ± 1.9 years and average sexual initiation age was 15.5 ± 2.6 years. Overall, 57.6% reported a history of vaginal sex. Girls who reported low/moderate religious importance were significantly younger at vaginal sex initiation than girls for whom religion was very/extremely important. Girls who attended church infrequently reported significantly more sexual partners. **Implications:** Health care providers can use these findings to deliver culturally congruent health care by assessing and addressing these psychosocial factors in this population.

Keywords

sexual risk behavior, sexual risk taking, adolescent, religiosity, cognition

Introduction

Early sexual initiation among American adolescents represents a major public health crisis. According to the Centers for Disease Control and Prevention (CDC), young people between the ages of 15 and 24 years acquire about half of all new sexually transmitted infections (STIs), and one in four sexually active adolescent females have an STI (CDC, 2012). According to the CDC, by the end of adolescence, most youth have reported having had sexual intercourse; specifically, 47.4% of youth, Grades 9 to 12 reported having sexual intercourse (Youth Risk Behavior Surveillance System, 2011). Additionally, the CDC has reported that sexual behavior among adolescents contributes to the leading cause of death and disability among adolescents, specifically, due to unintended pregnancies, STIs, and HIV/AIDS (Brener et al., 2013; Eaton et al., 2011).

African American (AA) adolescents report a greater incidence of risky sexual behaviors and unplanned pregnancies than their counterparts in other racial and ethnic groups (Grunbaum et al., 2004). In 2009, AA women aged 15 to 19 had a pregnancy rate that was more than twice that of their Caucasian and Hispanic counterparts (CDC, 2012). Additionally, young AA females are at higher risk of acquiring an STI due to a combination of behavioral, biological, and cultural factors.

Adolescence involves significant changes in neural and social environments, including cognitive, socioemotional, and behavioral changes that affect adolescents' behavior, including sexual risk behavior (DiClemente, Santelli, & Crosby, 2009; Paus, 2005; Sisk & Foster, 2004; Sisk & Zehr, 2005; Spear, 2000; Steinberg, 2008, 2014). Midadolescence, in particular, is a vulnerable period for sexually risky behaviors due to several biological and social factors—including hormonal and neurodevelopmental changes, psychosocial factors, increased social pressures to engage in sex, sexual interest, and sexual opportunity (Casey, Tottenham, Liston, & Durston, 2005; Steinberg, 2008).

Adolescence also involves a restructuring of the social information processing network, a network of connections between the prefrontal cortex—which controls decision making—and limbic areas such as the amygdala that regulate emotions and social interactions (Steinberg, 2008, 2014). Changes in social information processing network connectivity may contribute to increased sexual motivation (Sisk & Foster, 2004) and sexuality, increased peer orientation, and decreased parent/family orientation, but the details of these changes and effects remain poorly understood (Nelson, Leibenluft, McClure, & Pine, 2005).

Sexual risk behavior and the HIV/STI epidemics in the United States are inextricably tied to individual, psychosocial, and cultural phenomena (DiClemente, Wingood, Rose, Sales, Lang, et al., 2009; DiClemente, Wingood, Rose, Sales, Latham, et al., 2009). Predictors of adolescent sexual risk-taking behavior may include factors such as peer relations, family and personal spirituality, affective disorders, education, socioeconomic strata, sex, and adolescent neurodevelopment and religiosity (Boyd-Starke, Hill, Fife, & Whittington, 2011; McCree, Wingood, DiClemente, Davies, & Harrington, 2003; Muturi & An, 2010; Raznahan et al., 2010; Rostosky, Wilcox, Wright, & Randall, 2004; Steinman & Zimmerman, 2004; Swenson et al., 2009; Udell, Donenberg, & Emerson, 2011; Zaleski & Schiaffino, 2000).

Studies have found that when AA youth are more religiously active, they tend to be less involved in sexual intercourse and more likely to delay sexual intercourse (McCree et al., 2003; Steinman & Zimmerman, 2004). Review of longitudinal studies also show that religiosity/spirituality delays the sexual debut of adolescent females (Rostosky et al., 2004). However, others have noted a paradox among Black youth; those who report being more religiously active (Taylor, Chatters, & Levin, 2003) or express a greater importance of religion (Sinha, Cnaan, & Gelles, 2007) also report being most sexually active. Others found that religiosity was not protective against sexual risk behavior among Black college students (Thomas & Freeman, 2011).

Religion/spiritualty is relevant to AA adolescents' sexuality, given the importance of religion to AAs (Giger, Appel, Davidhizar, & Davis, 2008; Newlin, Knafl, & Melkus, 2002; Taylor et al., 2003) and AA adolescents (Bachman, Johnston, & O'Malley, 2005; McCree et al., 2003; Regnerus, Smith, & Fritsch, 2003; Smith, Denton, Faris, & Regnerus, 2002). Therefore, the purpose of this study was to identify cognitive and religious substrates of AA adolescent girls' risky sexual behaviors, particularly the roles of religious cognition and importance of religion.

Background

Sexual Risk Behaviors Among Adolescents

Many adolescents report early age sexual debut, inconsistent condom use, and the use of substances before or during sex (Brookmeyer & Henrich, 2009). Adolescents also report multiple sex partners, different types of sex partners, varying frequency of sex, and use of alternative forms of contraception (Beadnell et al., 2005). The 2013, Youth Risk Behavior Survey report (Kann et al., 2014) highlighted several sexual risk behaviors among adolescents. Nearly half had a sexual history (47%), 6% had sex before age 13, 15% had sex with four or more persons, 34% were currently sexually active, and 41% did not use a condom during their last sexual encounter (Kann et al., 2014). Additionally, 15% reported that they were never taught in school about HIV/AIDS and 87% had never been tested for HIV (Kann et al., 2014).

These statistics represent a consistent national trend from 1991 through 2013, with few celebratory changes (Kann et al., 2014). Compared with Caucasian students, AA students were significantly more likely to report: ever having sex, having sex before age 13, four or more sex partners in their lifetime, and being currently sexually active (Kann et al., 2014).

Religion and Spirituality

Spirituality is a personal concept involving one's attitudes and beliefs related to God or a higher power (Kliewer, 2004; O'Brien, 2003). It also relates to people's ability to transcend themselves to seek and experience meaning and purpose in life beyond their physical existence through contemplation and action aimed ultimately toward the sacred (Benson, Roehlkepartain, & Rude, 2003; Miller & Thoresen, 2003). Spirituality is a broader concept than religion (Goldberg, 1998; McSherry & Draper, 1998; Mueller, Plevak, & Rummans, 2001; Seeman, Dubin, & Seeman, 2003) and may or may not be rooted in or related to religion (Miller & Thoresen, 2003). *Religion* refers to an individual's beliefs and behaviors associated with a specific religious tradition (O'Brien, 2003) and focuses on more prescribed beliefs, practices, rituals, and social institutional factors (Kliewer, 2004; Miller & Thoresen, 2003).

Religion and Spirituality Among Adolescents

In general, religion and spirituality are important to American adolescents (Cotton, Zebracki, Rosenthal, Tsevat, & Drotar, 2006; Regnerus et al., 2003; Rew & Wong, 2006). An estimated 95% of adolescents report a belief in God and 50% report attending religious services, with AAs reporting higher rates of attendance (Sinha et al., 2007; Smith et al., 2002). In comparison with adolescents from other race and ethnic groups, AA adolescents report higher religious involvement, religious beliefs, and importance of religion, especially AA adolescents living in the South (Bachman et al., 2005; Smith, Faris, & Regnerus, 2003). Among AA adolescent females, 64% report high religiosity scores (McCree et al., 2003). Spirituality and religiosity are key factors in understanding sexually risky behaviors among AA adolescent females; especially, since more AA females report affiliation with a religious denomination than other groups (Boyd-Starke et al., 2011; Muturi & An, 2010).

Religion/Spirituality and Adolescent Sexual Behaviors

Studies show inverse associations between spirituality/religiosity and risky sexual behaviors (Boyd-Starke et al., 2011; McCree et al., 2003; Nonnemaker, McNeely, & Blum, 2003; Rostosky et al., 2004; Sinha et al., 2007; Steinman & Zimmerman, 2004; Udell et al., 2011; Wills, Gibbons, Gerrard,

Murry, & Brody, 2003). Adolescents who attend religious services show decreased rates of early sexual behavior (Donahue & Benson, 1995; Vesely et al., 2004; Wallace & Williams, 1997). Among AA adolescents those that are more religiously active tend to be less involved in sexual intercourse, smoking, and drug use, and are more likely to delay sexual intercourse (McCree et al., 2003; Steinman & Zimmerman, 2004).

In a nationally representative sample of adolescents, those who perceived religion as important, that is, those who attended church, and those who participated in a religious youth group; engaged significantly less in risk behavior such as drug, alcohol, and sexual behavior (Nonnemaker et al., 2003; Sinha et al., 2007). Even when household income and education were accounted for, religious variables were significantly associated with reduced risk behaviors among adolescents (Sinha et al., 2007).

In a study of AA adolescent females, greater religious involvement was associated with higher self-efficacy for communicating with partners about sexual behavior, pregnancy prevention, and refusing to engage in unsafe sex (McCree et al., 2003). This association between religiosity and sexual behavior seems to decrease with age, among AA college females, religiosity and spirituality does not predict a decrease in sexual risk taking behavior (Sinha et al., 2007; Thomas & Freeman, 2011).

The literature strongly suggests a connection between spirituality/religiosity and sexual risk behaviors. In studies conducted in mixed samples of adolescents, however, there is limited differentiation made among racial groups, which makes interpretation of the results more difficult and less generalizable to AA adolescents (Cotton et al., 2006; Nonnemaker et al., 2003; Rew & Wong, 2006; Sinha et al., 2007; Wills et al., 2003). Few studies examine the association between spirituality/ religiosity and sexuality or HIV-associated sexual risk behaviors among AA adolescents and the findings are mixed (McCree et al., 2003; Sinha et al., 2007; Steinman & Zimmerman, 2004; Wills et al., 2003).

Overall, knowledge gaps persist regarding religious and cognitive determinants of adolescents' risky sexual behaviors. Knowledge gained can inform future studies to better identify neurobiocultural pathways of risky sexual behaviors and the development of programs to facilitate optimal decision making, including sexual decision making and sexual behaviors, and to change and prevent the unintended consequences of risky sexual behaviors. The purpose of this study was to identify cognitive and religious substrates of AA female adolescents' risky sexual behaviors, particularly the roles of religious cognition and importance of religion.

Method

Recruitment Procedures

Participants were recruited from community-based organizations, including religious institutions, Young Men's Christian Association (YMCAs), and Young Women's Christian Association (YWCAs) in a large Metropolitan area using study flyers approved by the university institutional review board. To be eligible for the study participants had to speak English, identify as AA or Black, female, provide consent (if age 18 years or older) or assent with parental consent (if younger than 18 years old), and be within the age range of 15 to 23 years. However, the current analysis of cognition only focused on females

aged 15 to 20 years. These age ranges were selected based on the literature regarding cognitive function in midadolescents and older adolescents.

Interested participants contacted the study office or those who indicated interest to organizations' staff were contacted by study staff to briefly discuss the study and determine eligibility, then a study appointment was scheduled for those who were eligible to obtain written informed consent or assent with written parental consent if less than 18 years old. After providing written informed consent and/or assent, participants were assigned a unique study identification number to enhance confidentiality. Assessments were conducted in a private room at the principal investigator's research office, a private room at the respective community-based organization, or other private location preferred by participants. The study protocol was approved by the university's institutional review board. Participants were compensated $40 for participating.

Data Collection

Participants completed a thorough battery of computerized tests to assess sociodemographics, spirituality, psychosocial factors, sexual behaviors, and cognitive functioning.

Sociodemographics

A demographic questionnaire assessed age, education, parental income, employment status, living arrangements, relationship status, number of children, and so on.

Religiosity/Spirituality

The Modified Brief Multidimensional Measure of Religiousness/Spirituality (Fetzer Institute, 1999; Piedmont, Mapa, & Williams, 2006), consisting of 39 items, assessed spiritual experiences and religious beliefs, practices, coping, support and history and self-rated religiousness/spirituality. Most responses were based on a Likert-type scale. There is no total score for this measure. No scale scores were used, therefore, no reliability statistics were calculated. Religious cognition was assessed using one item, "I believe in a God who watches over me" and was rated on a 4-point response scale (1 = *strongly agree* to 4 = *strongly disagree*). This item was recoded to 0 = *strongly disagree*, 1= *disagree*, 2 = *strongly agree*, and 3 = *strongly agree*.

Cognitive Function

The Cambridge Neuropsychological Test Automated Battery (CANTAB®) was used to assess cognitive functioning in participants between ages 15 and 20 years. A battery of four CANTAB® tests was used: Stockings of Cambridge (SOC), Information Sampling Task (IST), Affective Go/No-Go (AGN), and Cambridge Gambling Task (CGT). These computerized, automated tests provide high reliability and objectivity (Robbins et al., 1998) and several authors report good psychometric (Bowden-Jones, McPhillips, Rogers, Hutton, & Joyce, 2005; Clark, Cools, & Robbins, 2004; Deakin, Aitken, Robbins, & Sahakian, 2004; Happaney, Zelazo, & Stuss, 2004; Robbins et al., 1998; Sahakian et al., 2002).

The SOC assesses executive function (frontal lobe) and has three outcome measures: number of correct trials, percentage of correct trials, and latency (response time). The CGT assesses decision-making and risk-taking behavior and the likely neural substrate for this task is the orbitofrontal prefrontal cortex. CGT outcome measures include risk taking, quality of decision making, deliberation time, risk adjustment, delay aversion, overall proportion bet. The IST assesses impulsivity or impulse control in decision making.

IST outcome measures include number of errors, latency (response time), total correct trials, mean number of boxes opened per trial, and the probability of participant's decision being correct based on the available evidence at the time of the decision. The AGN assesses information processing emotional biases for positive and negative stimuli. The likely substrate for this task is the ventral and medial–prefrontal cortex and the limbic connections with this region. AGN outcome measures include latency (response time), errors of commission, errors of omission. Only participants between the ages of 15 and 20 years completed the cognitive function tasks since the primary purpose of the main study was to examine cognitive function of girls aged 15 to 20 years. Validity of these computerized tests have been previously established in adults and adolescents.

Sexual Risk Behavior

The AIDS Risk Behavior Assessment (Donenberg, Emerson, Bryant, Wilson, & Weber-Shifrin, 2001) was used to measure sexually risky behaviors. There is no total or subscale scores for this measure, therefore, no reliability statistics were calculated. A composite sexual risk behavior index variable was created that combined girls' report of sexual experience (0 = *never*; 1 = *previous experience*), number of sex partners in the past 6 months (0 = *0 partners*; 1 = *1 partner*; 2 = *2+ partners*), proportion of unprotected sex acts and history of lifetime STIs (0 = *no*; 1 = *yes*), and pregnancy (0 = *no*; 1 = *yes*). Proportion of unprotected sex acts was calculated as the number of times in the past 6 months a respondent had sex without a condom divided by the number of times in the past 6 months she had sex (0 = 1.00; 1 = 0.50-0.99; 2 = 0-0.49). Scores on the sexual risk behavior index variable range from 0 to 7, with higher scores representing greater HIV/STI-associated sexual risk.

The sexual risk behavior outcome variable was also dichotomized to differentiate low risk and high risk. Low-sexual risk behavior scores range from 0 to 1 and refers to respondents with: (a) no sexual history or only one lifetime partner, (b) consistent (100%) condom use, (c) no history of STIs, and (d) no history of pregnancy. High-sexual risk behavior scores range from 2 to 8 and refers to respondents with two or more of the following: (a) two or more lifetime partners, (b) more than one sex partner in the past 6 months, (c) inconsistent condom use or condom use less than 100% of the time, or (d) a history of an STI and/or pregnancy. No reliability coefficient is calculated for this index variable. These sexual risk behavior groups are consistent with previous sexually risky behaviors groups of sexual risk takers and lower risk teens (Luster & Small, 1994). The sexual risk behavior index has been successfully and reliably used in our recent and current pilot studies with AA girls. We also used age at vaginal sex initiation as a dependent variable.

Data Analysis Procedures

All analyses were conducted using SPSS Statistics Software Version 22 and were conducted at a $p \geq .05$ significance level. Bivariate correlations were conducted to provide an initial assessment of the expected relations between girls' sexual risk behavior and continuous cognitive and psychosocial variables, and dummy coded religious variables and to identify covariates. Covariates that were significantly associated with sexual risk behavior were included in the hierarchical multiple linear regression (HMLR) models using the enter method. Theoretical or significant sociodemographic covariates were entered together in the first step in all HMLR models. HMLR models were developed to examine hypotheses and research questions using the composite sexually risky behaviors outcome as the dependent variable.

A significant overall *F* test (*F*-statistic) and regression (standardized Beta) coefficients ($p < .05$) were used to support HMLR. A significant change in R^2 between the last step and previously entered steps provided support for unique variance added or explained in sexual risk behavior by the variable(s) included in the previous step in the HMLR. One-way analysis of variance tests were used to examine mean differences in sexual risk behavior scores between girls with high versus low religiosity. Significant *F* tests were used to support analysis of variance.

Results

Sample Characteristics

Sociodemographic, sexual, and religious characteristics about the sample are presented in Table 1. The sample included 65 girls, with a mean age of 17.8 years (*SD* = 1.94). Over half of the girls reported a history of ever having vaginal sex, with the average age of debut at 15.5 ± 2.57 years. One third reported a history of oral sex, with an average age of debut at 16.3 ± 1.59 years. Ten percent reported a history of anal sex, with average debut at age 15.4 ± 6.32 years.

Table 1. Sample Characteristics.

Variable	Frequency/ percentage	*n*
Sexually history		
Vaginal sex (Yes)	57.6	38
Anal sex (Yes)	10.6	7
Oral sex (Yes)	33.3	22
# Sex partners in past 6 months		
0	15.2	10
1	31.8	21
2+	13.6	9
# Sex partners in past 3 months		
0	19.7	13
1+	36.3	24
# Sex partners in past month		
0	31.8	21
1+	27.3	18
Sexual risk behavior category		
High-sexual risk behavior	43.8	28
Low-sexual risk behavior	48.4	31
Education		
10th/11th Grade	10.6	7
12th Grade/HS diploma/GED	19.7	13
Some college/technical	9.1	6
Employment		
Full time	15.2	10
Part time	15.2	10
Unemployed	21.2	14
Parental annual income		

<$11,000	29.7	19
$11,000-$20,999	12.5	8
Children		
Yes	12.1	8
Importance of religious beliefs		
Somewhat/moderately	27.3	18
Very/extremely	62.1	41
Religious attendance		
Weekly or so	27.2	18
Monthly or so	34.9	23
1-2 Annually	18.2	12
Never	13.6	9
Religious affiliation/preference		
Belief in God, but no religious affiliation	12.1	8
Christian (nonspecific)	47.0	31
Baptist	24.2	16
Prayer		
Daily	39.4	26
Weekly	21.2	14
Monthly	16.7	11
Never	7.6	5
Meditation		
Some	53.0	35
Never	40.9	27

Table 2. Bivariate Correlates of Adolescent Sexual Risk Behaviors.

Variables	Sexual risk behavior[a] (*p*)	Vaginal sex debut age (*p*)	# Sex partners in past 6 months (*p*)	# Sex partners in past 3 months (*p*)	# Sex partners in past 1 month (*p*)
Age	.41 (.001)	.49 (.002)	—	—	.38 (.018)
Religious attendance[b]	—	—	—	−.40 (.014)	−.46 (.003)
Prayer[c]	—	.37 (.022)	—	—	—
Religiousness[d]	—	.37 (.023)	—	—	—
Religious importance[e]	—	.50 (.002)	—	—	—
Religious cognition[f]	−.29 (.022)	.41 (.012)	−.39 (.017)	−.35 (.033)	—
IST sampling errors (WD)	.30 (.041)	—	—	—	—
CGT delay aversion	—	−.55 (.004)	—	—	—
IST total correct (WD)	−.30 (.039)	—	—	—	—
IST mean # boxes opened per trial (WF)	−.32 (.029)	−.43 (.028)	—	—	—

IST mean correct (WF)	—	−.49 (.011)	—	—	—

Note. IST = Information Sampling Task; CGT = Cambridge Gambling Task; WF = win fixed condition; WD = win decreasing condition. [a]Sexual risk behavior: continuous aggregate sexual risk variable. [b]Religious attendance: 0 = *less than monthly*, 1 = *monthly* or *more*. [c]Prayer: 0 = *less than daily*, 1 = *daily* or *several times daily*. [d]Religiousness: To what extent do you consider yourself a religious person? 0 = *not at all* and *slightly*, 1 = *very* and *moderately*. [e]How important are your religious beliefs to you? 0 = *not at all*/*somewhat*/*moderately*, 1 = *very*/*extremely*. [f]Religious cognition: "I believe in a God who watches over me," 0 = *disagree* or *strongly disagree*, 1 = *agree*, 2 = *strongly agree*.

More than one third (44%) of girls had scores indicative of high-sexual risk behavior. Of the girls who were sexually active (Table 1), almost half (45%) had one or more sexual partners within the 6 months before participation in the study and about a third had at least one sexual partner within previous 3 months (36%) and 1 month (27%). Eight of the girls (12%) had one or two children. Ten percent of the girls were still in high school, almost 20% completed high school or equivalent, and 9% completed some college or technical school. One third worked part-time or full-time. Almost half (42%) reported annual parental income less than $21,000.

Girls' religious beliefs and practices varied (Table 1). However, religious beliefs were somewhat or very important to the majority (89%) of girls. Majority of girls (71%) in our sample were Christian. More than half of girls: (a) attended religious services on a weekly or monthly basis (62%), (b) prayed daily or weekly (61%), and/or (c) sometimes meditated (53%).

Group Differences in Sexual Risk Behavior Based on Religious Factors

A few significant mean differences in sexual behavior were noted between girls based on religious factors. Girls for whom religion was not at all, somewhat, or only moderately important reported significantly (p = .002) younger mean age at initiating vaginal sex than girls for whom religion was very or extremely important. Additionally, compared with girls who attended church weekly or monthly, girls who attended less than at least monthly reported significantly greater number of male sexual partners in the previous month (p = .004) and in the previous 3 months (p = .023), on average. There were no differences in sexual behavior between girls based on prayer frequency, reasons for church attendance, or religiousness.

Religious and Cognitive Correlates of Sexual Risk Behavior

Higher sexual risk behavior was significantly associated with older age, less favorable religious cognition, poorer impulse control, greater sampling errors, and lower accuracy on the IST. Age at vaginal sex initiation was significantly associated with age, prayer, religiousness, religious importance, religious cognition and inversely associated with delay aversion on the CGT, and impulse control measured by average number of boxes opened per trial and average number correct on the IST. Religious cognition was the only significant correlate of the number of sexual partners within the previous 6 months. Lower levels of religious cognition were significantly associated with a greater number of sexual partners in the previous 6 months. Higher numbers of sexual partners in the previous 3 months was significantly associated with lower number of attending religious services and levels of religious cognition. Higher number of sexual partners in the previous month was significantly associated with older age and infrequent attendance of religious services. No significant correlations were found between religious factors and history of ever having vaginal sex.

Bivariate correlations between religious and cognitive variables showed that greater religious cognition was significantly associated with better decision making. Praying daily or more often was significantly associated with better impulse control, better decision making, and more information processing bias for negative stimuli.

Results from the model estimating sexual risk behavior (Table 3), showed that age and religious cognition were the only two significant predictors. Higher sexual risk behavior was significantly associated with being older and having lower religious cognition scores or less of a "belief in a God who watches over me." The full model significantly accounted for 19.4% of the variance in sexual risk behavior (p = .015). Religious cognition significantly explained 7.5% of this variance in sexual risk behavior (p = .044), beyond that explained by age and impulse control.

Table 3. Hierarchical Regression Results for Sexual Risk Factors.

Variable	Overall F test	β[a]	Standardized β	t	df	p	R^2	Adjusted R^2	ΔR^2	Significant ΔF
Model 1										
Dependent: Sexual risk behavior[b]										
Block 1 (Demographic)	9.182				1, 45	**.004**	.169	.151	.169	**.004**
Age		2.65	.37	2.51		**.016**				
Block 2 (Cognitive)	2.723				4, 42	**.042**	.206	.130	.036	.591
Sampling errors[c]		1.98	.30	0.94		.353				
Information sampling[d]		−0.25	−.13	−0.84		.404				
Information sampling accuracy[e]		1.39	.21	0.61		.547				
Block 3 (Religious)	3.210				5, 41	**.015**	.281	.194	.075	**.044**
Religious cognition[f]		−5.33	−.29	−2.07		**.044**				
Model 2										
Dependent: Vaginal sex debut[g]										
Block 1 (Demographic)	1.078				1, 24	.309	.043	.003	.043	.309
Age		0.20	.11	0.58		.567				
Block 2 (Cognitive)	1.832				3, 22	.171	.200	.091	.157	.140
Information sampling accuracy[h]		−11.80	−.40	−1.90		.072				
Decision making quality[i]		0.07	.01	0.04		.973				
Block 3 (Religious)	2.719				4, 21	**.050**	.341	.216	.141	**.046**
Religious importance[j]		1.784	.38	2.12		**.046**				

Note. IST = Information Sampling Task; CGT = Cambridge Gambling Task; *df* = degrees of freedom. [a]Beta and *p* values reported are from the final block in each model. [b]Sexual risk behavior composite score. [c]IST sampling errors (win decreasing condition): higher scores = poorer impulse control and poorer decision making. [d]IST mean number of boxes opened per trial (win fixed condition): higher scores = better impulse control. [e]IST total correct (win decreasing condition): higher scores = better accuracy and decision making across all trials. [f]Religious cognition: "I believe in a God who watches over me," 0 = *disagree* or *strongly disagree*, 1 = *agree*, 2 = *strongly agree*. [g]Vaginal sex initiation age. [h]IST mean correct (win fixed condition): average number correct across trials, higher scores = better accuracy and decision making, on average. [i]CGT delay aversion: avoidance of delay in decision making, higher scores = poorer quality of decision making. [j]How important are your religious beliefs to you? 0 = *not at all*/ *somewhat*/*moderately*, 1 = *very*/*extremely*. *P*-values displayed in bold represent significance at the 5% level (≤ .05).

The model estimating age at vaginal sexual debut or initiation revealed that religious importance was the only significant predictor. Reporting religion as very or extremely important was significantly associated with older age at vaginal sex initiation (p = .046). The full model—including age, impulse control, decision making, and importance of religion—explained 21.6% variance in vaginal sex debut (p = .05). Importance of religion also accounted for 14.1% of this variance. The model did not include multiple impulse control scores identified as significant correlates due to issues with multicollinearity (p = .000) between IST mean number of boxes opened per trial and IST mean correct, which was included since it was a stronger predictor.

Discussion and Conclusions

This is one of the first studies to examine the complementary role of cognitive function and religiosity in the sexual risk behavior of AA midadolescent girls. Strong religious perceptions, specifically high religious importance, and thoughts or beliefs about God was associated with lower sexual risk. Daily prayer and religious cognition was associated with better cognitive function. Our results were consistent with the large body of literature that demonstrates that AA adolescent girls are at high risk of engaging in sexually risky behaviors (Nonnemaker et al., 2003; Sinha et al., 2007; Swenson et al., 2009; Thomas, Yarandi, Dalmida, Frados, & Klienert, 2015). In this sample, 43.8% (n = 28) engaged in high risky sexual behaviors.

Similar to other studies with AA adolescents (McCree et al., 2003), this study found that those who were more religiously active were more likely to delay sexual intercourse. A review of 10 longitudinal studies also found that religiosity, significantly delayed the sexual debut of adolescent females (Rostosky et al., 2004).

Similar to previous studies (Boyd-Starke et al., 2011; Steinman & Zimmerman, 2004), this study also found an inverse relationship between religiosity, including church attendance, and self-reported risky sexual behaviors.

Frequent religious attendance, self-identification as a very or extremely religious person, high importance of religion, weekly prayer, and strong belief or perception that “God watches over me” were significantly associated with less risky sexual behavior, overall. However, religious cognition and importance of religion were the strongest predictors and significantly explained unique variance in sexual risk behavior and vaginal sex debut age, respectively. Age also significantly predicted sexually risky behaviors, but not age at vaginal sex debut.

Reason for church attendance was not a significant correlate of any of the sexual behavior variables. However, other research (Sinha et al., 2007) note that church attendance has a stronger explanatory power in reduced risk behavior than the importance of religion. However, our study found that both church attendance and importance of religion were important in differing aspects of sexual risk behavior. In our study, church attendance was a stronger correlate of the number of sexual partners within the previous 3 months and 1 month, and religious importance was the strongest predictor of age at vaginal sex initiation. However, this study uniquely identified religious cognition or belief in a protective God as the strongest religious predictor across most of the sexual risk behaviors studied and the strongest overall predictor of sexual risk behavior scores. Unlike other research (Nonnemaker et

al., 2003), this study did not find any significant associations between religious factors and ever having had sexual intercourse.

This study identified important cognitive correlates of sexual risk behaviors. Less avoidance of delay in risky decision making was associated with a later age at sexual initiation. It would be more beneficial for adolescents to delay risky decision making until they gather sufficient information and weigh the risks and benefits. Due to a cognitive system imbalance, resulting from the immaturity of prefrontal structures that control high-level decision making and impulses, as well as, an overactive amygdala (Asato, Terwilliger, Woo, & Luna, 2010; Steinberg, 2007, 2008). Poorer impulse control scores were significantly associated with higher sexual risk behavior scores and earlier age at vaginal sexual debut. These findings are consistent with previous research (Casey, Getz, & Galvan, 2008; Casey, Jones, & Hare, 2008; Steinberg, 2007, 2008). Greater religious cognition and daily prayer was associated with better cognition, including better decision making and impulse control. Praying daily or more often was also associated with a tendency to respond to negative stimuli.

The literature has a strong trend of articles and published studies focused on behavioral measures of religiosity, with few studies focused on cognitive aspects of religiosity or faith. It is important to assess participants' spiritual perceptions because they may be accurate measures of a person's faith and better predict sexual risk behavior. Although useful, behavioral measures may not always accurately reflect adolescents' religious beliefs or thoughts about God because adolescents may attend church or pray due to social, cultural, or parental expectations.

Overall, these findings show that religiosity, including religious practices, and spiritual/religious ratings were associated with sexual risk behavior in our sample. The most important/significant findings highlight that the importance that AA adolescent girls attribute to religion may influence their decisions regarding when to initiate sexual activity. The findings also show that AA adolescent girls' thoughts or perceptions about whether God cares about them might also affect their sexual risk behavior choices.

Study Strengths and Limitations

Overall, this study adds unique information to the literature; it identified the importance of religious variables in the sexual risk behavior and cognition of AA adolescent girls. The homogenous sample of AA midadolescent girls, although necessary to address the aims, limits generalizability of study findings to this group but will help inform our understanding of their religiosity, cognition, and sexually risky behaviors. The use of self-report surveys may increase the risk of social desirability bias and recall bias, however, use of audio computer-assisted self-interview has been shown to help reduce these risks. Although the study sample was small, the findings can inform hypotheses to be tested in a study with a larger sample.

Clinical and Research Implications

The findings from this study can help inform the provision of culturally congruent health care and education among health care providers, social workers, teachers, and other professionals who work with adolescent girls. The findings may help facilitate understanding the unique roles of religious and cognitive factors in AA adolescent girls' sexual decision making and sexual risk behavior to help professionals tailor educational efforts and support for these girls. The relationship between sexual

behavior, cognitive cognition, and religiosity among adolescent AA girls can facilitate partnerships between health care providers and community organizations to provide culturally congruent health care.

The findings of this study can help inform future studies with greater power to allow for assessment of mediator and moderator relationships among key variables. Future studies could also compare and contrast neurobiocultural correlates of sexually risky behaviors among AA midadolescent girls and other vulnerable girls in other age or racial/ethnic groups. Longitudinal studies should also be conducted to examine trends over time in religious and sexual behavior and the effect of religiosity and cognition on sexual risk behavior, over time. Knowledge gained from this study and future studies can be used to inform the development of comprehensive interventions to prevent or reduce sexual risk among mid to late AA adolescent girls. The findings can also be incorporated into curriculum focused on teaching students about factors that are important in understanding adolescent sexuality. The information could also be used by parents and religious leaders to inform sexual education with AA girls.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by a grant from the Emory University Religion and Public Health Collaborative.

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