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The association between stress, coping, and sexual risk behaviors over 24 months among African-American female adolescents

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Heightened psychosocial stress coupled with maladaptive coping may be associated with greater sexual risk engagement. This study examined the association between stress levels and coping strategy use as predictors of sexual risk behavior engagement over 24 months among African-American adolescent females (N = 701; M = 17.6 years) enrolled in an STI/HIV risk-reduction intervention program. Participants completed audio computer assisted self-interview (ACASI) measures of global stress, interpersonal stress, coping strategy use, and sexual behaviors prior to intervention participation. Follow-up ACASI assessments were conducted at 6, 12, 18, and 24 months post-intervention. Generalized estimated equation models examined associations between baseline stress levels and coping strategy use as predictors of condom use (past 90 days, last sex) and multiple partners during follow-up. Global stress and individual coping strategy usage were not associated with differences in condom use. Higher interpersonal stress was associated with lower proportion condom use (p = .018), inconsistent condom use (p = .011), and not using a condom at last sex (p = .002). There were no significant associations between stress levels, coping strategy use, and multiple partners. Future research should explore mechanisms that may underlie the association between elevated interpersonal stress and decreased condom use among this population.

Keywords: stress; coping; sexual risk behavior; HIV prevention intervention; African-American adolescent women

African-American young women experience elevated rates of sexually transmitted infections (STIs; Datta et al., 2007); African-American female adolescents between the ages of 15 and 24 experience the highest rates of chlamydia and gonorrhea (CDC, 2014). STIs pose a number of negative health consequences and increase susceptibility to HIV (Fleming & Wasserheit, 1999; Hook & Handsfield, 1999; Stamm, 1999). African-American adolescents are also disproportionately affected by the HIV epidemic (Rangel, Gavin, Reed, Fowler, & Lee, 2006), accounting for 73% of adolescent HIV infections, with a diagnosis rate nearly 23 times the rate for White adolescents (CDC, 2012). Among African-American adolescent women, the majority of incident STI/HIV infections are acquired via heterosexual sexual transmission (CDC, 2010, 2012).

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Adolescence is a period of great developmental change (Crosby, Santelli, & DiClemente, 2009) characterized by increasing levels of psychosocial stressors (Compas, 1987). During adolescence, many young people are exploring and establishing romantic relationships while navigating new sexual situations with partners (Nieder & Sieffge-Krenke, 2001), which may be a source of stress. Female adolescents also experience heightened interpersonal, relationship stress relative to their male peers (Hampel & Petermann, 2006; Rudolph, 2002; Teva, Bermúdez, & Buela-Casal, 2010). Furthermore, African-American adolescents may encounter additional chronic, contextual, or environmental stressors relative to their non-minority peers (Copeland-Linder, Lambert, Chen, & Ialongo, 2011) including increased exposure to traumatic events (Hunt, Martens, & Belcher, 2011; Jenkins, Wang, & Turner, 2009), limited financial resources (Morrison Gutman, McLoyd, & Tokoyawa, 2005), and racial discrimination (Clark, Anderson, Clark, & Williams, 1999; Gaylord-Harden & Cunningham, 2009; Sellers, Copeland-Linder, Martin, & Lewis, 2006), among others. Elevated psychosocial stressors have been posited as a core construct that may underlie adolescent engagement in health risk behaviors, including unprotected sexual encounters (Rotheram-Borus, Reid, Rosario, & Kasen, 1995).

Cross-sectional studies have explored the association between generalized, global perceived psychosocial stress levels and engagement in sexual risk behaviors. Among adolescents, higher stress levels have been associated with increased number of sexual partners (Stein & Nyamathi, 1999), greater likelihood of drug use during the last sexual encounter (Teva et al., 2010), decreased condom use (Hall, Moreau, Trussell, & Barber, 2013; Stein & Nyamathi, 1999), a history of STIs (Mazzaferro et al., 2006; Stein & Nyamathi, 1999), and greater likelihood of perceived partner concurrency (Brown, Sales, Diclemente, Latham Davis, & Rose, 2012). In addition, race-related stress among African-American adolescents has been associated with reporting a greater number of sexual partners (Stevens-Watkins, Brown-Wright, & Tyler, 2011). However, few studies have examined the longitudinal impact of heightened global stress on sexual risk behavior engagement. In one prospective study of adolescent females, elevated psychological distress (i.e., perceived stress, depression, anxiety, and hostility) was associated with a greater number of sexual partners and also riskier sexual partners over six months (Ethier et al., 2006). While this study highlights the possibility of a prospective association between greater perceived stress and sexual risk behaviors, a multidimensional assessment of psychological distress was employed rather than specifically examining the role of stress alone in relationship to sexual risk engagement. In addition, lacking are studies that have examined the role of both global stress and stress specific to adolescents' interpersonal relationships. Thus, there is a need to prospectively examine the role of stress, both generalized, global stress and stress specific to interpersonal relationships, in association with subsequent engagement in sexual risk behaviors among adolescents over extended periods of time.

While there is a lack of consensus regarding specific dimensions of coping (for reviews see de Ridder, 1997; Folkman & Moskowitz, 2004; Oakland & Ostell, 1996; Skinner, Edge, Altman, & Sherwood, 2003; Steed, 1998), the ability to adaptively cope with stressors may influence the impact of stress on current functioning and engagement in health behaviors (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001). Research by Compas and colleagues suggests that coping strategies employed by adolescents be considered along three dimensions: (a) active coping (efforts to act on the source of stress or one's emotional response to a stressor); (b) accommodative coping (efforts to adapt to the source of stress); and (c) passive, disengagement coping (efforts

to avoid or deny the stressor; Compas et al., 2001; Compas, Jaser, Dunn, & Rodriguez, 2012). Greater use of passive, disengagement coping strategies relative to active coping approaches is associated with engagement in more health risk behaviors (Compas et al., 2001). For example, passive, disengagement coping has been associated with inconsistent condom use and a greater number of sexual partners (Schwartz et al., 2008). In contrast, use of active, problem-solving coping approaches was associated with decreased likelihood of substance use during the last sexual encounter among adolescents (Teva et al., 2010) and more consistent condom use (Schwartz et al., 2008). While these studies point to a potential association between coping approaches and engagement in sexual risk behaviors, needed are studies to longitudinally examine the role of coping approaches combined with stress levels in association with sexual risk behavior engagement.

The aim of the current study is to investigate the extent to which perceived stress (both global and interpersonal stress) and use of specific coping strategies were associated with sexual risk behavior engagement over the course of 24 months among a sample of African-American female adolescents enrolled in an STI/HIV prevention intervention program. We hypothesize that greater engagement in sexual risk behaviors over 24 months would be associated with: (a) higher initial stress levels (both global and interpersonal stress levels); (b) less use of active coping strategies; and (c) increased use of passive coping strategies (i.e., behavioral disengagement and denial coping).

Methods

Participants

From June 2005 to June 2007 African-American adolescent females, aged 14–20 years, were recruited from three clinics providing sexual health services to predominantly inner-city adolescents. An African-American female recruiter approached adolescents in clinic waiting areas, described the study, solicited participation, and assessed eligibility. Eligibility criteria included self-identifying as African-American, 14–20 years of age at time of enrollment, and reporting at least one episode of vaginal sex without condom use in the past 6 months. Adolescents were excluded from participation if they were married, pregnant, or attempting to become pregnant. Adolescents meeting inclusion criteria and interested in participating were scheduled to return to the clinic to complete informed consent procedures, baseline assessments, and be randomized to trial conditions. Written informed consent was obtained from all adolescents. Parental consent was waived for those younger than 18 due to the confidential nature of sexual health clinic services. Of the eligible adolescents, 94% (N = 701) enrolled in the study, completed baseline assessments and were randomized to study conditions. Participants were compensated to attend the intervention and complete assessments. Specifically, participants received $75.00 for completing the baseline assessment and group session, $20.00 for completing each of the 6-, 12-, 18-, and 24-month follow-up assessments. The affiliated Institutional Review Board approved all study protocols.

Procedures

Study design

The study was a two-arm randomized controlled supplemental treatment trial of a behavioral HIV/STI prevention intervention (Piantadosi, 1997). In supplemental

treatment trials, participants receive a "primary" treatment and, subsequently, receive a different (supplemental) treatment to enhance the effects of the primary treatment. In this study, the aim of the supplemental treatment was to extend the primary treatment's efficacy over an extended follow-up period.

Random assignment to study condition

Random assignment to conditions was implemented subsequent to the baseline assessment using concealed allocation procedures. Prior to enrollment, investigators used a computer algorithm to generate a random allocation sequence and opaque envelopes to execute the treatment assignments. Participants were randomized to either the intervention or comparison condition.

Intervention condition

Participants randomized to the intervention condition (n = 342) received as their primary treatment an adapted version of a CDC evidence-based, culturally and gender-appropriate HIV prevention intervention for African-American female adolescents known as HORIZONS (DiClemente et al., 2009). HORIZONS is a group-based HIV intervention for African-American adolescent females designed to enhance HIV-preventive attitudes and beliefs, negotiation and refusal skills, safer sex norms, and preventive behaviors. In the current study, HORIZONS was implemented by two trained African-American female health educators with, on average, 7–8 participants attending the group session.

The supplemental treatment was a phone-delivered HIV prevention maintenance intervention (PMI) that began following participation in HORIZONS. PMI consisted of a health educator administering 12 brief, tailored phone contacts to participants approximately every 8 weeks for 24 months. PMI was a 10-min, health-educator administered phone contact, guided by a risk appraisal which identified participants' STI/HIV risks and prioritized STI/HIV prevention strategies to reduce their risk.

Comparison condition

Participants randomized to the comparison condition (n = 359) also received HORIZONS as their primary treatment, and a time- and dose-equivalent phone-delivered General Health Promotion (GHP) supplemental treatment. The GHP condition was administered on the same schedule, 12 brief, phone contacts every 8 weeks for 24 months, by a health educator. These calls focused on discussing general health topics (e.g., diet and nutrition), rather than focusing on sexual health. Use of a placebo-attention phone condition reduces the likelihood that effects of the PMI could be attributed to differences in frequency or duration of contact with staff or in the sequencing of phone contacts over the 24-month follow-up period.

Data collection

Data collection occurred at baseline, prior to randomization, and at 6, 12, 18, and 24 months following participation in the primary treatment, HORIZONS. Data collection consisted of completing an audio computer-assisted self-administered interview.

Summary of trial findings on sexual health outcomes

Findings from the main trial have been previously reported (DiClemente, 2010; Swartzendruber et al., 2012). In analyses examining outcomes through 18 months of follow-up, there were no differences between study conditions on sociodemographic characteristics, STI prevalence, or sexual behavior at the time of randomization, and retention between study arms was similar. Relative to participants assigned to the comparison condition, participants in the intervention condition had fewer incident Chlamydia infections and a greater number of condom-protected sex acts through 18 months.

Measures

Intervention condition

Intervention condition assignment was coded as 0 for the comparison condition and 1 for the intervention condition.

Assessment wave

The baseline assessment and each of the four, six-month follow-up assessment waves were coded from 1 (baseline) to 5 (24-month follow-up).

Sociodemographics

For descriptive purposes, participants reported their age, most recent grade completed in school, who they lived with, and how much financial aid their family received, if any, at baseline. In addition, the sexual health clinic from which participants were recruited was recorded. Family financial aid was analyzed as a continuous variable with 0–4 forms of aid. Age was recorded as a continuous variable; all other variables were recorded as categorical variables.

Global stress

Global stress was measured at baseline by a single question asking participants to rate their overall, global stress level from 1 (no stress) to 5 (extreme stress); global stress was analyzed as a continuous variable.

Interpersonal stress

Baseline interpersonal stress was coded as the sum of 13 modified items from the African American Women's Stress Scale (Watts-Jones, 1990). Questions assessed the amount of stress an individual feels in different interpersonal relationships. Response options were from 1 (no stress) to 5 (extreme stress). A score of 0 indicated that the question did not apply and a score of 8 indicated that the participant refused to answer. Scores of 0 were recoded to 1 to reflect no stress associated with a given interpersonal relationship. All scores of 8 for each question were removed prior to analysis. Interpersonal stress was analyzed as a continuous variable.

Coping strategies

Use of three different coping strategies was assessed at baseline through a modified 14-item version of the COPE (Carver, Scheier, & Weintraub, 1989). Three items measured Active Coping, four items measured Behavioral Disengagement and three items measured Denial Coping strategy use. Response options ranged from 1 (I usually don't do this) to 4 (I usually do this a lot). Scores for each of the three subscales were summed and analyzed as continuous variables.

Sexual risk behaviors

Sexual risk behavior engagement was assessed at baseline and at the 6-, 12-, 18-, and 24-month follow-up assessments. Participants reported on sexual behaviors in the past 90 days: (a) number of sexual partners (≤1 or > 1); (b) the proportion of condom protected episodes (calculated as the number of times in the past 90 days that a participant reported using a condom during sex divided by the number of times the participant had sex in the past 90 days), and (c) consistent condom use (coded as 1 if the proportion condom use variable = 1; coded as 0 if the proportion condom use variable < 1). Participants also reported whether or not a condom was used during their last sex encounter (0, 1).

Data analysis plan

All analyses were performed using SAS software, Version 9.3 of the SAS System for Windows. Descriptive statistics summarized participant characteristics, perceived stress levels (global stress, interpersonal stress), coping strategies, and sexual risk behaviors. Bivariate analyses examined differences in stress levels (global, interpersonal) and coping strategies (active coping, behavioral disengagement, denial coping) between experimental conditions using one-way ANOVA.

To assess the influence of baseline stress levels and coping strategies on subsequent sexual risk behaviors, analyses were performed on prespecified hypotheses using an intention-to-treat protocol with participants analyzed in their originally assigned experimental conditions (Lachin, 2000; Piantadosi, 1997; Pocock, 1993). We used a generalized estimating equation (GEE) model to control for repeated within-subject heterogeneity using Gaussian distributed effects with an autoregressive correlation structure between assessments (Hardin & Hilbe, 2003; Liang & Zeger, 1986). This model allows for a differential number of repeated observations of participants over the course of the study. Two different GEE models were created per sexual risk behavior outcome: one included age, baseline stress levels (global, interpersonal), and coping strategy use (active coping, behavioral disengagement, denial coping), while the second included age, baseline global and interpersonal stress levels, coping strategy use (active coping, behavioral disengagement, denial coping), and an indicator variable of whether an individual was in the experimental group or the control group. The 95% confidence intervals (CI) around the adjusted mean differences, and corresponding *p* values, were also computed.

Results

Participant characteristics

Sociodemographics are displayed by condition in Table 1. African-American adolescent female participants (N = 701) between 14 and 20 years old (M = 17.6, SD = 1.7) were recruited for this study.

Table 1. Sociodemographics by experimental condition.

Sociodemographic characteristic	Intervention condition (n = 342)	Control condition (n = 359)	Parametric p-value*
Age[a]	17.55 (1.62)	17.73 (1.72)	.154
Last grade completed in school[b]			
8th grade or less	26 (7.60%)	33 (9.19%)	.112
9th–12th grade	193 (56.43%)	175 (48.75%)	
Graduated high school	51 (14.91%)	79 (22.01%)	
1–2 Years college	56 (16.37%)	58 (16.56%)	
Other	16 (4.68%)	14 (3.90%)	
Clinic[b]			
Hospital-based adolescent sexual health clinic	43 (12.57%)	39 (10.86%)	.777
County health department STD clinic	179 (52.34%)	193 (53.76%)	
Planned parenthood clinic	120 (35.09%)	127 (35.47%)	
Family aid[a]	.89 (1.00)	.79 (.95)	.163

[a]Mean (standard deviation).
[b]Frequency (corresponding percent).
*p-values calculated using ANOVA or chi-square analysis.

Descriptive statistics

Baseline stress levels and coping strategies

There were no baseline differences between experimental conditions for both global and interpersonal stress levels (see Table 2). Active coping, denial coping, and behavioral disengagement did not differ between conditions (see Table 2).

Sexual risk behavior by assessment wave

Descriptive statistics for sexual risk engagement by assessment wave are presented in Table 3. Most participants endorsed one sexual partner in the past 90 days across time points. Inconsistent condom use in the past 90 days was reported by the majority of

Table 2. Baseline perceived stress levels and coping strategy level by experimental condition.

	Intervention condition (n = 342)		Control condition (n = 359)		
	M (SD)	Range	*M* (SD)	Range	p-value [a]
Perceived stress					
Global stress	2.74 (1.02)	1.0–5.0	2.74 (1.08)	1.0–5.0	.927
Interpersonal stress	31.33 (10.94)	13.0–57.0	31.13 (11.34)	13.0–63.0	.808
Coping style					
Behavioral Disengagement	5.21 (1.80)	3.0–12.0	5.48 (2.07)	3.0–12.0	.065
Denial	5.40 (2.31)	3.0–12.0	5.39 (2.24)	3.0–12.0	.977
Active coping	8.00 (2.28)	3.0–12.0	7.95 (2.33)	3.0–12.0	.799

Note: Descriptive statistics reflect unadjusted levels.
[a]One-way ANOVA analysis by experimental condition.

Table 3. Sexual risk behaviors by assessment time point.

	Assessment time point				
	Baseline	6 Months	12 Months	18 Months	24 Months
Sexual risk behaviors: past 90 days					
Multiple sexual partners[b]					
0, 1 Partners	432 (63.05%)	396 (72.53%)	367 (72.96%)	321 (70.86%)	307 (71.73%)
> 1 Partner	259 (36.95%)	150 (27.47%)	136 (27.04%)	132 (29.14%)	121 (28.27%)
Consistent condom use[b]					
No	588 (83.88%)	563 (80.31%)	560 (79.89%)	570 (81.31%)	568 (81.03%)
Yes	113 (16.12%)	138 (19.69%)	141 (20.11%)	131 (18.69%)	133 (18.97%)
Proportion condom use [a]	.48 (.37)	.54 (.41)	.54 (.43)	.52 (.43)	.53 (.42)
Sexual risk behaviors: last sexual encounter					
Condom use at last sex†					
No	399 (56.92)	255 (46.70%)	239 (47.42%)	229 (50.55%)	200 (46.73%)
Yes	302 (43.08)	291 (53.30%)	265 (52.58%)	224 (49.45%)	228 (53.27%)

[a]Mean (standard deviation).
[b]Frequency (corresponding percent).

participants across assessment points (Range*:* 79.9–83.9%). Participants endorsed using condoms for approximately half of all sexual episodes (Range*:* .48–.54) during the past 90 days. Between 43.1 and 53.3% of participants endorsed condom use during the last vaginal sex episode across assessment time points (See Table 3).

Association between baseline stress levels and coping strategy use on sexual risk behaviors over 24 months

The results for the associations between the four sexual outcomes of interest – proportion condom use, consistent condom use, multiple sexual partners, and condom use last sex – and baseline stress and coping strategies are displayed in Tables 4 and 5. Table 5 presents associations controlling for condition assignment.

Proportion condom use

With regard to proportion condom use during the past 90 days, age and interpersonal stress were significant at the $p < .05$ level. The estimate for adjusted mean difference for age was −.023 (95% CI: −.040, −.005; *p*-value: .012) and the estimate for adjusted mean difference for perceived interpersonal stress was −.038 (95% CI: −.070, −.007; *p*-value: .018). When the condition assignment group variable was inserted into the model, age and interpersonal stress were still the only significant variables. While the estimates and 95% confidence intervals did not change, the p-values did changed to *p*-value = .011 for age and to *p*-value = .021 for interpersonal stress.

Consistent condom use

For consistent condom use in the past 90 days, only interpersonal stress was significant at the $p < .05$ level. The estimate for adjusted mean difference for interpersonal stress was −.041 (95% CI: −.071, −.010; *p*-value: .012). When the condition assignment

Table 4. GEE outcomes for the association between baseline stress, coping strategy use, and sexual risk behaviors.

	Estimate	Standard error	95% Confidence interval	*p*-value
Proportion condom use, past 90 days				
Age	**−.0225**	**.0088**	**(−.0398, −.0052)**	**.0115**
Active coping	.0068	.0065	(−.0059, .0196)	.2936
Behavioral disengagement coping	.0113	.0085	(−.0054, .0279)	.1888
Denial coping	−.0091	.0075	(−.0239, .0056)	.2270
Global stress	−.0016	.0015	(−.0046, .0013)	.2809
Interpersonal stress	**−.0381**	**.0161**	**(−.0696, −.0065)**	**.0179**
Consistent condom use, past 90 days				
Age	−.0117	.0088	(−.0290, .0055)	.1834
Active coping	−.0063	.0067	(−.0194, .0069)	.3517
Behavioral disengagement coping	.0153	.0087	(−.0017, .0324)	.0766
Denial coping	−.0073	.0073	(−.0216, .0069)	.3113
Global stress	−.0008	.0015	(−.0037, .0022)	.6174
Interpersonal stress	**−.0405**	**.0158**	**(−.0714, −.0095)**	**.0117**
Multiple sexual partners, past 90 days				
Age	.0081	.0058	(−.0033, .0194)	.1658
Active coping	−.0042	.0041	(−.0122, .0039)	.3105
Behavioral disengagement coping	−.0076	.0058	(−.0189, .0038)	.1951
Denial coping	**.0113**	**.0054**	**(.0008, .0219)**	**.0363**
Global stress	.0018	.0011	(−.0002, .0039)	.0863
Interpersonal stress	.0085	.0101	(−.0114, .0283)	.4043
Condom use last sex				
Age	**−.0167**	**.0077**	**(−.0317, −.0017)**	**.0312**
Active coping	.0015	.0057	(−.0096, .0127)	.7887
Behavioral disengagement coping	.0043	.0077	(−.0108, .0194)	.5745
Denial coping	−.0035	.0070	(−.0173, .0103)	.6168
Global stress	−.0002	.0014	(−.0029, .0025)	.8812
Interpersonal stress	**−.0428**	**.0138**	**(−.0698, −.0158)**	**.0024**

Note: Bolded values indicate significance at the $p < .05$ level.

group variable was inserted into the model, interpersonal stress was again significant, and the estimate, 95% confidence interval and *p*-value did not change.

Multiple sexual partners

Considering the dichotomous variable representing more than one sexual partner, only baseline denial coping was significant at the $p < .05$ level. The estimate for adjusted mean difference for baseline denial coping score was .011 (95% CI: .001, .022; *p*-value .036). When the condition assignment group variable was inserted into the model, baseline denial score was still the only significant variable. Although the estimate and 95% confidence interval did not change, the *p*-values did change to *p*-value = .039 for baseline denial coping score.

Condom use at last sex

For condom use at last sex, age and interpersonal stress were significant at $p < .05$. The estimate for adjusted mean difference for age was −.017 (95% CI: −.032, −.002; *p*-value: .031) and the estimate for adjusted mean difference for interpersonal stress was −.043 (95% CI: −.070, −.016; *p*-value: .002). When the condition assignment group

Table 5. GEE outcomes for the association between baseline stress, coping strategy use, and sexual risk behaviors, including experimental condition.

	Estimate	Standard error	95% Confidence interval	*p*-value
Condom use proportion				
Experimental condition	−.0082	.0285	(−.0641, .0477)	.7739
Age	**−.0226**	**.0089**	**(−.0399, −.0052)**	**.0112**
Active coping	.0069	.0065	(−.0059, .0196)	.2907
Behavioral disengagement coping	.0111	.0086	(−.0057, .0278)	.1973
Denial coping	−.0091	.0075	(−.0238, .0057)	.2300
Global stress	−.0016	.0015	(−.0046, .0013)	.2828
Interpersonal stress	**−.0381**	**.0161**	**(−.0696, −.0065)**	**.0205**
Consistent condom use				
Experimental condition	−.0000	.0292	(−.0573, .0572)	.9995
Age	−.0117	.0089	(−.0291, .0056)	.1858
Active coping	−.0063	.0067	(−.0194, .0069)	.3536
Behavioral disengagement coping	.0153	.0087	(−.0018, .0325)	.0784
Denial coping	−.0073	.0073	(−.0216, .0070)	.3131
Global stress	−.0008	.0015	(−.0037, .0022)	.6172
Interpersonal stress	**−.0405**	**.0158**	**(−.0714, −.0095)**	**.0117**
Multiple sexual partners				
Experimental condition	.0179	.0194	(−.0201, .0560)	.3552
Age	.0084	.0058	(−.0030, .0198)	.1495
Active coping	−.0043	.0041	(−.0124, .0038)	.2984
Behavioral disengagement coping	−.0071	.0058	(−.0185, .0043)	.2245
Denial coping	**.0112**	**.0054**	**(.0006, .0217)**	**.0385**
Global stress	.0018	.0011	(−.0003, .0039)	.0899
Interpersonal stress	.0084	.0101	(−.0114, .0282)	.4055
Condom use last sex				
Experimental condition	.0459	.0249	(−.0029, .0946)	.0661
Age	**−.0159**	**.0077**	**(−.0309, −.0008)**	**.0408**
Active coping	.0013	.0057	(−.0099, .0124)	.8227
Behavioral disengagement coping	.0052	.0076	(−.0097, .0202)	.4908
Denial coping	−.0038	.0070	(−.0175, .0100)	.5874
Global stress	−.0003	.0014	(−.0029, .0024)	.8496
Interpersonal stress	**−.0423**	**.0137**	**(−.0692, −.0154)**	**.0026**

Note: Bolded values indicate significance at the $p < .05$ level.

variable was inserted into the model, age and interpersonal stress were still the only significant variables, although the estimates, 95% confidence intervals, and *p*-values did change slightly to −.016 (95% CI: −.031, −.001; *p*-value: .041) for age and to −.042 (95% CI: −.069, −.015; *p*-value: .003) for interpersonal stress.

Discussion

Adolescence is a time of developmental change where young adults may experience increased stressors, particularly in their interpersonal relationships. Heightened psychosocial stressors coupled with maladaptive coping approaches, particularly use of passive coping approaches, may be associated with greater engagement in risk behaviors that may adversely affect the health of African-American adolescents.

Findings from this study suggest that higher interpersonal stress levels, regardless of coping strategies employed, were associated with decreased condom use across a 24-month period. While prior research has not examined the association between

interpersonal stress and sexual risk behavior engagement, this finding highlights the possibility that heightened stress in young women's relationships may affect sexual decision-making and in turn result in decreased condom use with partners. Previous adolescent cross-sectional studies have found an association between increased global stress levels and decreased condom use (Hall et al., 2013; Stein & Nyamathi, 1999). However, this study found no association between global stress levels and condom use over an extended follow-up period. Furthermore, in contrast to previous studies (Ethier et al., 2006; Stein & Nyamathi, 1999), there was no association between baseline global or interpersonal stress levels and the multiple sexual partners over the 24-month period. Thus, findings suggest that interpersonal stressors, rather than global perceived stress, may play a more significant role in sexual risk engagement among adolescents. Future research should further examine how the role of stress intensity and the nature and type of stressors impact African-American adolescents' sexual health and engagement in sexual risk behaviors. For example, it may be that heightened interpersonal stress is associated with elevated depressive symptoms or increased substance use, which in turn affects engagement in sexual risk behaviors.

Contrary to our a priori hypotheses, the type of coping strategy used was not associated with differences in sexual risk engagement over time. Prior research suggests that adolescents who employ more active coping approaches report fewer sexual risk behaviors (Schwartz et al., 2008; Teva et al., 2010), while adolescents who utilize more passive coping strategies may engage in more frequent sexual risk behaviors (Schwartz et al., 2008). Our findings could reflect that individuals may employ a variety of coping strategies to manage stressors rather than relying upon use of a single, primary coping strategy. Furthermore, coping strategy use was assessed broadly rather than specifically to within the context of sexual encounters or interpersonal relationships. Thus, it may be that assessing overall coping strategy use does not adequately measure how adolescents cope with challenges navigating sexual health decisions with their partners. Additional research is needed to better understand how the role of coping may interact with stress levels to affect adolescents' sexual health decisions and behaviors.

Future research should examine potential mechanisms that may underlie the association between stress levels and engagement in sexual risk behaviors. For example, partner-specific factors and relationship dynamics may affect global stress, interpersonal stress (particularly in romantic relationships) and the extent to which condoms are used within the relationship. Furthermore, additional research is needed to better understand the extent to which use of specific coping strategies are employed with regard to navigating protective sexual behaviors within the context of adolescents' romantic relationships. For example, future studies could assess the extent to which coping strategies employed to manage other life stressors are utilized within the context of stressors specific to sexual relationships.

Strengths and limitations

This study is limited by the use of a reduced version of the COPE. Thus, we were not able to assess the full range of potential coping strategies used by participants. Our measure of interpersonal stress focused on stress associated with a broad array of interpersonal relationships and a single-item measure of global stress, so may not reflect the range and variability of stressors faced by participants. Furthermore, our analyses focused on baseline levels of perceived stress and coping strategies, which may vary over time. In addition, this sample consisted of urban African-American female

adolescents recruited from sexual health clinics. Therefore, results may not generalize to other non-clinic recruited adolescent populations.

Strengths of this study included an extended follow-up period of 24 months. Additionally, this study enrolled a large cohort of African-American female adolescents from an urban setting with high levels of retention over the two-year period. To our knowledge, this study is the first to longitudinally examine the effects of both perceived stress and coping strategy use on sexual risk engagement over a long period of follow-up.

Conclusions

This study suggests that high levels of interpersonal stress are associated with greater engagement in sexual risk behaviors over time. African-American adolescent women may experience a range of stressors associated with their interpersonal relationships and in other areas of their life. While no differences were found in sexual risk behavior engagement based on global stress levels or coping strategy usage, results highlight that interpersonal relationship stressors may be associated with decreased condom use. These findings call for additional investigations to further examine potential mechanisms that may underlie the association between increased stress in adolescents' relationships and decreased condom use among African-American young women.

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