Efficacy of an HIV Prevention Program Among African American Female Adolescents Reporting High Depressive Symptomatology

Jessica M. Sales, Ph.D.,^{1,2} Delia L. Lang, Ph.D.,^{1,2} James W. Hardin, Ph.D.,³
Ralph J. DiClemente, Ph.D.,^{1,2} and Gina M. Wingood, Sc.D.^{1,2}

Abstract

Objectives: We examined the efficacy of an HIV prevention intervention among African American adolescent females reporting at or above threshold depressive symptomatology.

Methods: In this analysis, a subgroup of participants ($n = 245$) reporting at or above threshold depressive symptoms involved in a randomized controlled trial were assessed at 6-month and 12-month follow-ups on condom use and psychosocial mediators associated with HIV prevention behaviors. The intervention emphasized HIV knowledge, condom attitudes, communication self-efficacy, and condom use skills.

Results: Relative to the comparison condition, participants randomized to the intervention reported using condoms more consistently, engaged in a greater proportion of condom protected intercourse acts, had fewer episodes of unprotected vaginal sex, were more likely to use a condom at last sex, and had higher HIV knowledge, favorable attitudes toward condoms, condom use self-efficacy, and condom use skills.

Conclusions: Overall, the pattern of effects found strengthen our confidence in the efficacy of the HIV intervention assessed for a broad range of young women, including those with high levels of depressive symptoms. Although young women with high depressive symptoms benefited from this HIV intervention, future studies employing interventions that specifically address the affective needs of this population might be even more effective in terms of sexual risk reduction and amelioration of depressive symptoms.

Introduction

GIVEN THAT SEXUALLY TRANSMITTED DISEASES (STDs) have significant adverse health and social consequences for adolescents, preventing infection represents an urgent public health priority.¹⁻³ In response to the personal and public health threat posed by STDs, over the past decade a number of sexual risk reduction programs for adolescents in the United States have been published.⁴⁻⁷ These programs were designed to modify STD/HIV-associated sexual behaviors and psychosocial factors associated with STD/HIV acquisition in several at-risk adolescent populations, including homeless and HIV-positive adolescents. These programs have been developed, implemented, and evaluated in a variety of venues, including schools and clinics. However, one subgroup of adolescents at considerable risk for STD/HIV—adolescents with depression—has been neglected by STD/HIV prevention programs.⁸

Adolescence and young adulthood mark periods in which the onset of mental health difficulties and engaging in sexual risk taking behaviors is highest.^{1,9} One of the most common psychiatric issues affecting many adolescents is depression. Recent national statistics published by the Centers for Disease Control and Prevention (CDC) revealed that 28.5% of U.S. high school students reported significant sadness or hopelessness during the last 2 weeks that adversely affected daily activities; this same report suggests that 14.5% of high school students had considered suicide at some point during the past year, with 6.9% attempting suicide at least once.¹⁰ A 10-year review of depression studies found that approximately 8% of adolescents in the United States have experienced clinical depression.¹¹ Among 9–17-year-olds, the prevalence of any depressive symptoms is >6% in a 6-month period, with 4.9% exhibiting major depression.¹² Moreover, adolescent females experience higher rates of depression than males,^{10,12,13} and among these, African American adolescent

¹Rollins School of Public Health, Department of Behavioral Sciences and Health Education, Atlanta, Georgia.

²Center for AIDS Research, Social & Behavioral Sciences Core, Atlanta, Georgia.

³University of South Carolina, Department of Epidemiology and Biostatistics, Columbia, South Carolina.

females have the highest prevalence of depressive symptomatology.¹⁴

Research indicates that adolescents with depressive symptoms engage in various STD/HIV risk taking practices. Specifically, depressive symptoms have been associated with engaging in unprotected sex, having multiple or high-risk sex partners, teenage childbearing, and acquisition of STDs.^{15–20} Furthermore, data suggest that depression, both clinical and subclinical, is prevalent among sexually active adolescent populations in the United States.²¹ Consistent with previous research reporting gender differences,^{11,13,14} this report also found that sexually active females report depression with greater frequency than do sexually active males.

The current understanding of the association among negative affect (i.e., depression), dysfunctional thinking, and unhealthy behaviors dates back to Beck's theories²² of cognitive psychology. Consistent with Beck's current discussions²³ about the relationship among thoughts, feelings, and behaviors, negative thoughts not only play a central role in the way one feels about himself or herself but also influence subsequent cognitions and behaviors. Affective responses to social situations can often supersede rational decision making and cause behaviors fueled by emotionality rather than rationality.²⁴ Negative emotions often co-occur with dysfunctional cognitions,²³ a manner of thinking that does not typically promote healthy decision making and subsequent health promoting behaviors. This suggests that people with concurrent negative affect, such as depression, and dysfunctional patterns of thinking are unlikely to make safe sexual decisions and are more likely to engage in risky sexual behaviors. Thus, negative affect might impact sexual risk taking by such mechanisms as negative schemata, cognitions, and attributions.^{25,26} Given the relation between depression and STD-associated risk behavior, especially in adolescent females where rates of depression and STDs are highest, designing STD/HIV prevention programs for this vulnerable population is critical.

In an earlier study, DiClemente et al.²⁷ described the efficacy of an HIV prevention program conducted among sexually experienced African American women in reducing risky sexual behaviors and enhancing psychosocial factors associated with HIV preventive behaviors. We examined the efficacy of the intervention among a subsample of participants in the same study who reported depressive symptomatology.

Materials and Methods

Participants

Study methods have been described in detail elsewhere.²⁷ Briefly, from December 1996 through April 1999, recruiters screened 1130 African American adolescent females seeking services at four community health agencies. Of these, 609 (53.9%) met eligibility criteria, including being an African American female, 14–18 years of age, reporting vaginal intercourse in the preceding 6 months, and providing written informed consent. Of those not eligible, nearly 93% were not sexually experienced. Thus, 522 adolescents agreed to participate in the study, completed baseline assessments, and were randomized to study conditions.

For the current sample, only those adolescents who endorsed depressive symptomatology at baseline equal to or greater than the scale-specified cutoff point were included in

subsequent analyses ($n = 245$). The University of Alabama at Birmingham Institutional Review Board approved the study protocol before implementation.

Study procedures

The study design was a randomized controlled trial. Participants were randomly assigned to either the HIV intervention or a general health promotion condition, which were held concurrently to control for history effects. The HIV intervention consisted of four 4-hour group sessions conducted on consecutive Saturdays. Sessions included 10–12 participants on average, and they were implemented by a trained African American health educator assisted by two African American peer educators. Participants in the general health promotion condition also attended four 4-hour group session on consecutive Saturdays. These sessions focused on general health-related issues.

Social Cognitive Theory (SCT)²⁸ and the Theory of Gender and Power^{29,30} were complementary theoretical frameworks guiding the design and implementation of the HIV intervention. Session 1 emphasized ethnic and gender pride by discussing the joys and challenges of being an African American adolescent female, acknowledging the accomplishments of African American women, reading poetry written by African American women, and framing artwork created by African American women artists. Session 2 enhanced awareness of HIV risk reduction strategies, such as abstaining from sex, using condoms consistently, and having fewer sex partners. Session 3, through role-play and cognitive rehearsal, enhanced adolescents' confidence in initiating safer sex conversations, negotiating safer sex, and refusing unsafe sexual encounters. Additionally, peer educators discussed the importance of abstinence and proper and consistent condom use and modeled condom skills. Session 4 emphasized the importance of healthy relationships. Health educators described how an unhealthy relationship could make it difficult to practice safer sex.

Data collection

Data collection occurred at baseline and at 6-month and 12-month follow-up. At each assessment, data were obtained from the following sources. First, participants completed a self-administered questionnaire assessing sociodemographics and psychosocial mediators of HIV prevention behaviors. Subsequently, a trained African American female interviewer administered an interview assessing sexual behaviors. Finally, the interviewer assessed participants' ability to correctly apply condoms using a direct observation of skills assessment protocol.

Measures

Depressive symptoms. The Center for Epidemiologic Studies-Depression scale (CES-D) was developed for use in studies of depressive symptoms in general population samples.³¹ The original scale consists of 20 items assessing the presence of depressive symptoms during the past 7 days. The CES-D has been widely used with diverse populations of varying socioeconomic characteristics and has been shown to be valid for African Americans.^{31–33} In this study, we used a brief 8-item version of the CES-D with a 4-point response

format ranging from 0 to 3.³⁴ A total scale score was obtained by summing the numeric values for each item, for a total score range from 0 to 24. The internal consistency of the scale with the present sample was 0.82. A total score of ≥ 7 on the brief CES-D scale is the recommended threshold of depressive symptomatology³⁴ and indicates that participants may be at risk for depression. Several studies have reported an association between the CES-D and clinical diagnoses of depression as well as other diagnoses, such as anxiety disorder.^{35,36} Therefore, the CES-D is considered useful as a general screening instrument.

Primary outcome. Self-reported consistent condom use, the primary outcome, was defined as use of a condom during every episode of vaginal intercourse. Consistent condom use was assessed for the 30 days and the 6 months before the baseline and 6-month and 12-month assessments. This outcome was calculated by dividing the total number of episodes of vaginal intercourse by the total number of times a male condom was used, with a score of 1 representing consistent condom use. Consistent condom use was selected as a primary outcome based on demonstrated evidence of effectiveness in reducing sexually transmitted HIV.^{37–39}

Other outcomes measures. Other self-reported behavioral outcomes included (1) condom use at last vaginal intercourse, (2) percent of condom-protected vaginal intercourse acts in the 30 days before assessment, (3) percent of condom-protected vaginal intercourse acts in the 6 months before assessment, (4) number of unprotected vaginal intercourse acts in the 30 days before assessment, (5) number of unprotected vaginal intercourse acts in the 6 months before assessment, and (6) whether participants had a new vaginal sex partner in the 30 days before assessment. A single item assessed the frequency with which participants applied condoms on their sex partners in the past 6 months; responses ranged from 1, Never, to 5, Every time. These measures of condom use were included to allow comparison with previous HIV interventions conducted among adolescents.^{40–44} Preliminary research and our pilot study indicated that anal sex and oral sex are extremely low prevalence behaviors and, therefore, were not assessed as outcomes.

Several measures were taken to enhance the validity of participants' self-reported sexual behaviors. Participants were asked to report their behaviors over relatively brief time intervals to enhance accurate recall⁴⁵ and were provided calendars specifying the reporting intervals of interest. To enhance confidentiality, interviewers assured participants that codes rather than names would be used on records.⁴⁶ To minimize potential interviewer bias, interviewers were blinded to participants' condition assignment.

Psychosocial mediators of sexual behavior. Psychosocial mediators were derived from the underlying theoretical frameworks and a review of the empirical literature. Constructs were assessed using scales with satisfactory psychometric properties previously used with African American adolescents.^{44,47} Those psychometric properties and other elements of these measures have been discussed in detail elsewhere; here, we provide only a brief description of each measure.²⁷ HIV prevention knowledge was measured using a 16-item scale ($\alpha = 0.68$). Perceived partner-related barriers

to condom use were measured using a 6-item scale that assessed attitudes that impede participants' ability to effectively use condoms ($\alpha = 0.82$). Attitudes toward using condoms were measured using an 8-item scale ($\alpha = 0.68$). Frequency of sexual communication was measured using a 5-item scale assessing the frequency with which participants discussed HIV preventive practices with sex partners ($\alpha = 0.80$). Condom use self-efficacy was measured using a 9-item scale that assessed participants' confidence in their ability to properly use condoms ($\alpha = 0.88$). Participants' condom application skills were rated by interviewers using a structured scoring protocol that ranged from 0 to 6, with higher ratings reflecting greater proficiency at applying condoms.

Statistical methods

Statistical methods from the original publication were repeated where analyses were performed only on pre-specified hypotheses using an intention-to-treat protocol in which participants were analyzed in their original assigned study conditions irrespective of the number of sessions attended.^{48,49} At baseline, descriptive statistics were calculated to summarize sociodemographic variables, psychosocial mediators, and sexual behaviors between study conditions. Differences between conditions were assessed using Student's *t* tests for continuous variables and chi-square analyses for categorical variables.⁵⁰ Variables, in which differences between study conditions approached statistical significance ($p \leq 0.15$) or which were theoretically or empirically identified as potential confounders, were included as covariates in the models.

The effectiveness of the HIV intervention for adolescents reporting depressive symptomatology was analyzed over the entire 12-month period (from baseline to 12-month assessment). Effectiveness was also investigated for the two 6-month periods: from the baseline to the 6-month assessment and from the 6-month to the 12-month assessment. The HIV intervention effects investigation for each of the 6-month assessment periods used logistic regression to compute adjusted odd ratios (OR) for dichotomous outcomes⁵¹ and used linear regression⁵² to compute adjusted means and mean differences (D) for continuous outcomes. Each of these approaches included the corresponding baseline measure for the specific outcome as a covariate in the analysis.

To assess HIV intervention effects for adolescents reporting depressive symptomatology for the entire 12-month follow-up period, logistic and linear generalized estimating equations (GEE) regression models were designed specifically to control for repeated within-subject measurements. This technique allows for a differential number of observations on study subjects over the longitudinal course of observation. These models included a time-independent variable (study condition) as well as time-dependent variables (covariates and outcomes). The models were adjusted for the corresponding baseline measure for each outcome and other covariates to obtain adjusted ORs to assess the effect of the intervention on dichotomous outcomes and adjusted mean differences to assess the effect of the intervention on continuous outcomes. Additionally, an indicator for the time period was included in the model to capture any unaccounted temporal effects.^{53,54} An indicator for cohort was also included in

the model to adjust for clustering. Fitted GEE parameters can be interpreted as the odds (in logistic models) or mean difference (in linear regression models) over the entire 12-month period for an average participant. The 95% confidence interval (CI) around the adjusted ORs and adjusted mean differences and the corresponding p value were also computed. To obtain adjusted means and mean differences, models were repeatedly estimated from the bootstrap samples, where samples were drawn with replacement at the level of the participant. For each model, adjusted means were calculated, and standard errors were then calculated from the collection of bootstrap results.⁵⁵ Percent relative change for continuous variables was computed as the difference between the adjusted means for each condition (D) divided by the adjusted mean for the comparison condition. Percent relative change provides a common metric for measuring the magnitude of change across different scale measures relative to the baseline measure.

Unique to this study, we conducted an exploratory analysis to determine if differences existed between intervention and control group participants' self-reported depressive symptomatology (i.e., CES-D scores) over study follow-up assessments. Because CES-D scores are the dependent variable in this analysis, the covariates used in the aforementioned analyses specific to sexual risk behaviors were not included. Additionally, because decreasing depressive symptoms was not a goal of the intervention, we conducted simple repeated measures ANOVA and appropriate t tests to follow up significant effects to explore and identify possible group differences in depressive symptoms at the 6-month or 12-month follow-up time points.

All analyses were performed using Stata statistical software, version 10 (Stata Corp., College Station, TX), or SPSS, version 15.1 (Chicago, IL).

Results

Of the 522 adolescents from the original sample who completed baseline assessments, 245 (47%) reported depressive symptomatology, with 126 (51.4%) participants being randomized to the intervention condition and 119 (48.6%) to the control condition. Of the 126 participants assigned to the HIV intervention, 111 (88.1%) completed the 6-month assessment, and 109 (86.5%) completed the 12-month assessment. Of the 119 participants allocated to the control condition, 103 (86.6%) completed the 6-month assessment, and 104 (87.4%) completed the 12-month assessment. There were no differences in attrition between participants in the two study conditions at either the 6-month ($p = 0.717$) or the 12-month ($p = 0.837$) assessment.

At baseline (Table 1), we assessed the comparability of the two groups in terms of sociodemographic characteristics, psychosocial mediators linked to HIV preventive behaviors and sexual behaviors. There was one significant difference between the intervention and control group regarding douching behavior ($p = 0.006$). This and other theoretically based variables, including gang membership, desire to be pregnant, and having sex with a new partner, were included as covariates in all GEE models.

Effects of the HIV intervention on dichotomous measures of sexual behavior are shown in Table 2. Over the entire 12-month period, participants in the HIV intervention were more

likely than participants in the control condition to report using condoms consistently in the past 30 days and 6 months, respectively (OR 1.78, 95% CI 1.01-3.13, $p = 0.045$; OR 2.29; 95% CI 1.24-4.22, $p = 0.008$) and using a condom at their last sexual intercourse (OR 3.80; 95% CI 2.11-6.82, $p = 0.0001$). Effects of the HIV intervention on continuous measures of sexual behavior are shown in Table 3. Over the entire 12-month period, participants in the HIV intervention reported significantly fewer episodes of unprotected vaginal intercourse in the preceding 6 months (adjusted mean difference -10.12 , 95% CI -18.32 – -1.92 , $p = 0.004$) than participants in the control condition. A similar trend was observed for unprotected vaginal intercourse in the preceding 30 days, although this did not reach statistical significance ($p = 0.08$). The percentage of condom-protected sexual episodes in the HIV prevention group was significantly higher than the control group for the previous 30 days (adjusted mean difference 22.0, 95% CI 11.0-33.0, $p = 0.003$), as well as the previous 6 months (adjusted mean difference 28.0, 95% CI 18.0-37.0, $p = 0.0001$). Finally, participants in the HIV prevention group reported a higher frequency of condom application on their partners compared with participants in the control group (adjusted mean difference 0.47, 95% CI 0.09-0.85, $p = 0.001$).

Effects of the HIV intervention on psychosocial mediators of safe sex are shown in Table 4. In comparison with participants in the control condition, participants in the HIV intervention had higher HIV prevention knowledge (adjusted mean difference 0.81, 95% CI 0.16-1.47, $p = 0.0001$), more favorable attitudes toward condom use (adjusted mean difference 1.67, 95% CI 0.68-2.67, $p = 0.0001$), fewer perceived condom use barriers (adjusted mean difference -6.46 , 95% CI -9.74 – -3.18 , $p = 0.002$), greater proficiency in applying condoms on their partners (adjusted mean difference 1.00, 95% CI 0.74-1.25, $p = 0.0001$), and higher condom use self-efficacy scores (adjusted mean difference 4.39, 95% CI 2.14-6.63, $p = 0.002$). The frequency of negotiating safe sex with their partner was not significantly different between the two groups ($p = 0.161$).

We also assessed whether the HIV intervention decreased participants' subsequent depressive symptomatology. A 2 (condition: HIV intervention vs. general health promotion) $\times$ 3 (CES-D score: baseline, 6-month follow-up, and 12-month follow-up) ANOVA was computed, with CES-D scores as within-subject repeated variables and condition as a between-subject variable. Overall, a significant main effect of CES-D score was found, $F(2, 192) = 29.54$, $p < 0.001$. Paired-sample t tests revealed that participants' CES-D scores significantly decreased between baseline (mean 11.52, SD 3.83) and 6-month (mean 8.67, SD 5.64, $t = 7.56$, $p < 0.001$) and 12-month follow-up assessments (mean 8.18, SD 6.15, $t = 7.60$, $p < 0.001$). No other significant main effects or interactions were found.

Discussion

This secondary analysis of a randomized controlled HIV prevention trial for African American female adolescents demonstrated that similar to the main trial, among young women with at or above threshold depressive symptomatology, as indicated by the CES-D, the HIV intervention led to substantial reductions in HIV-associated sexual behaviors in comparison to the control group, whose condom use behavior

TABLE 1. COMPARABILITY OF HIV PREVENTION AND GENERAL HEALTH PROMOTION CONDITIONS FOR ADOLESCENTS WITH REPORTED SYMPTOMS OF DEPRESSION

Variable	HIV prevention condition (n = 126)		General health promotion condition (n = 119)		p
	Mean (SD)	n (%)	Mean (SD)	n (%)	
Age, mean (SD), years	15.91 (1.19)		16.11 (1.14)		0.189
Did not complete 10th grade		62 (49.2)		55 (46.2)	0.640
Recipient of public assistance		25 (19.8)		20 (16.9)	0.560
Living in single-parent home		76 (78.4)		73 (73.0)	0.382
Living with someone other than a parent		29 (23.0)		19 (16.0)	0.165
Employed		21 (16.9)		23 (19.3)	0.628
Has children		24 (45.3)		28 (52.8)	0.437
Douching		31 (24.6)		49 (41.2)	0.006
Gang involvement		21 (16.7)		16 (13.4)	0.482
Pregnancy desire		49 (38.9)		38 (31.98)	0.255
New partner in past 30 days		6 (4.8)		6 (5.0)	0.919
Consumed alcohol in past 30 days		26 (50.0)		32 (60.4)	0.285
Currently not attending school		12 (9.5)		12 (10.1)	0.883
Older sexual partners		88 (69.8)		73 (61.3)	0.161
Verbal abuse past 6 months		15 (42.9)		12 (41.4)	0.905
Forced to have sex in the past		28 (22.2)		20 (16.8)	0.286
Age of first nonconsensual sex, mean (SD), years	13.46 (2.62)		13.40 (3.58)		0.943
CES-D	11.98 (4.19)		11.36 (3.61)		0.215
HIV knowledge	8.53 (3.42)		9.05 (2.99)		0.207
Condom attitudes	35.25 (4.57)		34.91 (4.78)		0.563
Condom barriers	45.61 (14.41)		47.85 (14.69)		0.235
Communication frequency	8.29 (3.98)		8.33 (4.35)		0.937
Condom use self-efficacy	30.31 (9.18)		30.21 (8.94)		0.932
Condom use skills	2.88 (1.18)		2.97 (1.18)		0.572
% condom use past 30 days	75% (41)		76% (40)		0.907
% condom use past 6 months	69% (39)		71% (38)		0.675
Unprotected vaginal sex past 30 days	1.28 (2.96)		0.85 (1.75)		0.192
Unprotected vaginal sex past 6 months	5.50 (19.61)		3.52 (8.43)		0.331
Put condom on partner in past 6 months	1.54 (1.08)		1.45 (0.92)		0.506
Consistent condom use past 30 days		79 (69.9)		75 (67.6)	0.705
Consistent condom use past 6 months		57 (50.4)		60 (54.1)	0.588
Condom use last sex		70 (61.9)		73 (65.8)	0.552

SD, standard deviation; CES-D, Center for Epidemiologic Studies-Depression scale.

mirrors the natural decline in safe sex behaviors reported in nationally representative samples,¹⁰ as well as positive changes in theoretically derived psychosocial mediators. Moreover, depressive symptoms significantly decreased at both 6-month and 12-month follow-up assessments from baseline levels for adolescents in the study.

The findings of this study mirror those of Wingood et al.,⁵⁶ who conducted a similar secondary analysis on the same randomized controlled HIV prevention trial to explore the efficacy of the intervention among a subsample of participants who reported a history of gender-based violence. Specifically, they found that relative to the comparison condition, participants with a history of gender-based violence in the intervention group increased condom use, reduced new sexual partners, were less likely to have an STD, and demonstrated more proficient condom skills. Given the well-documented association between abuse and depression in women, it is particularly important to acknowledge that this HIV intervention was beneficial to especially vulnerable adolescent populations, including young women with histories of abuse as well as those with above threshold depressive symptomatology.

The efficacy of the HIV intervention for the subgroup of participants in this study might be attributed to its conceptualization within the framework of SCT.²⁸ Specifically, according to SCT, behavior is the result of interactions among personal factors, environmental factors, and behavior. Personal factors include an individual's confidence in performing a certain behavior (self-efficacy), one's expectations about the outcomes associated with performing that specific behavior (outcome expectancies), and the individual's goals related to the behavior. All the aforementioned personal factors can be negatively impacted by a person's affective state and dysfunctional cognitions.²²⁻²⁶ The primary aim of the HIV intervention was to enhance adolescents' confidence in their ability to self-regulate their sexual behavior. Because female adolescents who report above threshold levels of depressive symptoms are more likely than those who do not to engage in risky sexual practices and have dysfunctional thinking (i.e., negative schemata, cognitions, and attributions), addressing these issues as part of the intervention may have encouraged participants to engage in self-protective HIV behaviors.

It is worthwhile to note that among this sample, 47% of the parent study participants reported high rates of depressive

TABLE 2. EFFECTS OF HIV INTERVENTION ON SELF-REPORTED CONSISTENT CONDOM USE AND CONDOM USE AT LAST SEX

	6-Month assessment				12-Month assessment				GEE model baseline-12-month assessment	
	Unadjusted proportions				Unadjusted proportions				OR	p
	Intervention	%	Comparison	% OR ^a (95%CI) ^b	p	Intervention	%	Comparison	% OR ^a (95%CI) ^b	
Consistent condom use (past 30 days)	69.1	53.8	1.49	(0.73-3.04)	0.276	72.9	58.2	2.65	(1.11-6.28)	0.027
Consistent condom use (past 6 months)	58.1	35.1	3.21	(1.47-7.01)	0.004	54.1	43.6	1.65	(0.69-3.95)	0.262
Condom use last sex	75.5	49.4	3.89	(1.83-8.26)	0.0004	75.6	50.6	5.03	(1.99-12.71)	0.0006
									3.80	(2.11-6.82)
										0.0001

^aOdds ratio adjusted by the baseline value of the outcome variable and covariates (douching, gang involvement, pregnancy desire, and having a new sex partner in past 30 days). General health promotion condition is the referent for computing the OR.

^b95% confidence interval.
GEE, generalized estimating equations; OR, odds ratio; CI, confidence interval.

TABLE 3. EFFECTS OF THE HIV INTERVENTION ON CONTINUOUS MEASURES OF SEXUAL BEHAVIOR

	6-Month assessment					12-Month assessment					GEE model baseline-12-month assessment		
	Unadjusted means (Sd)		Adjusted mean difference (D) ^a (95% CI)	% Relative change ^b (95% CI)	p	Unadjusted means (Sd)		Adjusted mean difference (D) ^a (95% CI)	% Relative change ^b (95% CI)	p	Adjusted mean difference (D) (95% CI)	% Relative change (95% CI)	p
	I	C				I	C						
% Condom use Last 30 days	79.35 (36.09)	60.13 (46.22)	-0.18 (-0.32--0.01)	-22.15 (-35.61--1.29)	0.013	80.13 (36.05)	62.58 (46.41)	-0.26 (-0.41--0.06)	-31.93 (-48.70--10.76)	0.002	0.22 (0.11--0.33)	39.49 (14.35--64.63)	0.003
% Condom use last 6 months	80.24 (32.11)	54.34 (40.94)	-0.20 (-0.36--0.12)	-21.76 (-37.39--13.32)	0.003	71.40 (38.97)	54.35 (45.01)	-0.25 (-0.40--0.12)	-28.56 (-45.33--14.15)	0.001	0.28 (0.18--0.37)	56.03 (26.99--85.05)	0.0001
Unprotected vaginal sex last 30 Days	1.59 (4.46)	2.31 (4.72)	0.58 (-1.21-1.61)	39.31 (-34.92-190.3)	0.383	1.24 (3.07)	1.97 (4.31)	1.21 (0.55-3.14)	84.31 (1.26-447.4)	0.017	-1.27 (-2.65-0.10)	-44.64 (-77.72--11.57)	0.085
Unprotected vaginal sex last 6 months	4.28 (11.47)	11.84 (28.16)	6.67 (1.94-14.00)	178.4 (42.12-879.2)	0.021	6.74 (17.00)	13.32 (30.41)	10.19 (1.33-21.42)	133.26 (5.09-856.08)	0.019	-10.12 (-18.32--1.92)	-63.50 (-85.98--41.02)	0.004
Frequency of applying condoms on sex partners	2.20 (1.36)	1.56 (1.17)	-0.62 (-0.97--0.22)	-28.21 (-40.65--10.18)	0.002	1.90 (1.32)	1.44 (1.01)	-0.44 (-0.96--0.07)	-22.52 (-42.82--3.86)	0.014	0.47 (0.09-0.85)	29.22 (-0.84-59.29)	0.001

^aAdjusted mean difference between the intervention and comparison condition. Adjusted by the baseline value of the outcome variable and covariates (douching, gang involvement, pregnancy desire, and having a new sex partner in past 30 days) and 95% confidence interval.

^b%Relative change = [D/C_{adjusted} × 100%], 95% confidence interval for % relative change.

TABLE 4. EFFECTS OF HIV INTERVENTION ON MEDIATORS OF SEXUAL RISK BEHAVIOR

	6-Month assessment					12-Month assessment					GEE model Baseline–12-month assessment		
	Unadjusted means (Sd)		Adjusted mean difference (D) ^a (95% CI)	% Relative change ^b (95% CI)	P	Unadjusted means (Sd)		Adjusted mean difference (D) ^a (95% CI)	% Relative change ^b (95% CI)	P	Adjusted mean difference (D) (95% CI)	% Relative change (95% CI)	P
	I	C				I	C						
HIV knowledge	10.97 (2.84)	9.79 (3.40)	-1.23 (-2.29--0.43)	-11.15 (-19.63--4.08)	0.0001	10.88 (3.01)	10.24 (3.15)	-0.01 (-0.93--1.41)	-0.11 (-7.96--14.47)	0.17	0.81 (0.16--1.47)	8.06 (1.23--14.88)	0.0001
Condom attitudes	37.03 (3.52)	35.39 (4.94)	-1.66 (-2.82--0.44)	-4.46 (-7.56--1.19)	0.003	36.42 (4.32)	35.66 (4.32)	-1.25 (-2.35--0.29)	-3.37 (-6.30--0.80)	0.03	1.67 (0.68--2.67)	4.52 (1.83--7.64)	0.0001
Condom barriers	38.82 (14.03)	45.36 (16.84)	6.76 (2.23--10.68)	17.59 (4.22--29.88)	0.006	38.92 (14.65)	43.42 (14.32)	4.37 (-0.55--9.46)	11.13 (-1.30--26.80)	0.085	-6.46 (-9.74--3.18)	-14.14 (-20.72--7.57)	0.002
Communication frequency	8.82 (4.36)	8.46 (4.79)	-0.68 (-2.19--0.40)	-7.52 (-23.28--3.75)	0.59	8.75 (4.57)	7.71 (4.79)	-1.00 (-2.53--0.44)	-11.37 (-26.47--5.41)	0.05	1.19 (0.14--2.24)	15.32 (0.58--30.05)	0.161
Condom use	35.64 (9.11)	31.71 (9.33)	-4.72 (-7.12--2.18)	-13.17 (-20.74--6.55)	0.005	36.98 (8.79)	33.61 (8.73)	-3.94 (-6.33--1.91)	-10.25 (-16.21--4.92)	0.005	4.39 (2.14--6.63)	13.68 (6.06--21.30)	0.002
self-efficacy	4.39 (0.87)	3.31 (1.29)	-1.09 (-1.42--0.87)	-24.70 (-31.92--19.55)	0.0001	4.19 (1.18)	3.42 (1.24)	-0.70 (-1.11--0.29)	-16.59 (-25.66--6.92)	0.0002	1.00 (0.74--1.25)	30.28 (20.90--39.66)	0.0001
Condom use skills													

^aAdjusted mean difference between the intervention and comparison condition. Adjusted by the baseline value of the outcome variable and covariates (douching, gang involvement, pregnancy desire, and having a new sex partner in past 30 days) and 95% confidence interval.

^b%Relative change = $[D/C_{\text{adjusted}} \times 100\%]$, 95% confidence interval for % relative change.

symptomatology, which exceeds the national average of 34.5% for African American female youth reporting high depressive symptomatology in the 2007 Youth Risk Behavior Surveillance Survey.¹⁰ Thus, another noteworthy finding of this study was that depression symptoms significantly decreased for these young women after participating in the program, regardless of whether they were assigned to the HIV intervention or general health promotion group. Because decreasing negative affect was not targeted in the HIV intervention, it was not expected that participants with at or above threshold depressive symptomatology would significantly differ in reported depressive symptoms from the comparison group at follow-up assessment. However, the significant decrease in depressive symptoms experienced by both groups over time suggests that simply participating in a group-based intervention with peers (in this case, regardless of content yet still both focused on aspects of health) had unintended secondary benefits on mental health. Exactly how and why their depressive symptoms decreased remains a question for future research.

Although our study had a number of methodological strengths, including the use of a randomized controlled design and use of a comparison condition that was structurally similar to the HIV intervention condition, it was not without limitations. First, this study was limited by the use of a self-reported depressive symptom instrument (CES-D) vs. the use of a clinical assessment instrument. The CES-D is a screening tool that serves as an indicator of depressive symptomatology; it is not a substitute for a clinical diagnostic assessment of depressive disorder. Although this measure has shown adequate reliability when compared with clinical assessments of depression,^{35,36} we cannot rule out the possibility that the overall prevalence of depressive symptomatology may be significantly lower than described. Additionally, our analyses included only a subgroup of the overall study sample, and statistical power to detect differences between conditions was limited as a result of the relatively small sample size of this subgroup. Finally, the study population was limited to sexually experienced African American female adolescents recruited from clinical venues. Thus, our findings may not be generalizable to female adolescents with different risk profiles (i.e., injection drug users) or of other racial/ethnic backgrounds.

Overall, the observed size, consistency, and range of effects found strengthen our confidence in the efficacy of the HIV intervention assessed for a broad range of young women, including those with high levels of depressive symptoms. Although young women with high depressive symptoms benefited from this HIV intervention, an intervention addressing the specific needs of this population might be even more effective in terms of sexual risk reduction and amelioration of depressive symptoms. Furthermore, our study indicates that HIV interventions might be effective among especially vulnerable adolescent populations, including female adolescents with depressive symptomatology. Given the substantial prevalence of clinical and subclinical rates of depression in adolescent females, particularly African American females, and the significant associations among depression, STD/HIV risk, and STD infection, future HIV intervention research involving adolescent females should address negative affective states, such as depression.

Disclosure Statement

The authors have no conflicts of interest to report.

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Address correspondence to:
Jessica M. Sales, Ph.D.

*Emory University
 Rollins School of Public Health
 Department of Behavioral Sciences and Health Education
 1520 Clifton Rd., NE, Room 266
 Atlanta, GA 30322
 E-mail: jmcderm@emory.edu*