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Efficacy of Behavioral Interventions to Increase Condom Use and Reduce Sexually Transmitted Infections: A Meta-Analysis, 1991 to 2010

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Abstract

Objective—In the absence of an effective HIV vaccine, safer sexual practices are necessary to avert new infections. Therefore, we examined the efficacy of behavioral interventions to increase condom use and reduce sexually transmitted infections (STIs), including HIV.

Design—Studies that examined a behavioral intervention focusing on reducing sexual risk, used a randomized controlled trial or a quasi-experimental design with a comparison condition, and provided needed information to calculate effect sizes for condom use and any type of STI, including HIV.

Methods—Studies were retrieved from electronic databases (e.g., PubMed, PsycINFO) and reference sections of relevant papers. Forty-two studies with 67 separate interventions (N = 40,665; M age = 26 years; 68% women; 59% Black) were included. Independent raters coded participant characteristics, design and methodological features, and intervention content. Weighted mean effect sizes, using both fixed-effects and random-effects models, were calculated. Potential moderators of intervention efficacy were assessed.

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Results—Compared with controls, intervention participants increased their condom use [$d+ = 0.17$, 95% confidence interval (CI) = 0.04, 0.29; $k = 67$], had fewer incident STIs ($d+ = 0.16$, 95% CI = 0.04, 0.29; $k = 62$), including HIV ($d+ = 0.46$, 95% CI = 0.13, 0.79; $k = 13$). Sample (e.g., ethnicity) and intervention features (e.g., skills training) moderated the efficacy of the intervention.

Conclusions—Behavioral interventions reduce sexual risk behavior and avert STIs and HIV. Translation and widespread dissemination of effective behavioral interventions are needed.

Keywords

behavior; condom; HIV/STI; meta-analysis; prevention; sex

INTRODUCTION

HIV remains a public health concern, with an estimated 2.6 million new infections occurring annually.¹ Despite treatment advances, HIV presents significant health and social challenges.² HIV is also costly, with medical care in the United States from the time of infection until the time of death estimated at \$385,200.³ Global costs associated with antiretroviral therapy are estimated to be US \$896 annually per person.⁴ In addition, new infections cost the US \$29.7 billion annually in productivity losses.⁵ If incidence trends continue, the added annual cost of HIV care in the US will be between \$128 and \$237 billion dollars.⁶ To reduce the burden of HIV, prevention efforts need to be expanded.⁷ Identifying and evaluating successful behavioral interventions is critical to ensure that effective interventions are implemented with appropriate samples and in appropriate settings to achieve reductions in HIV transmission. To achieve this goal, meta-analytic techniques can help to quantitatively synthesize the behavioral intervention literature.

Meta-analyses of behavioral interventions have documented improvements in behavioral outcomes (e.g., condom use) among a number of groups (e.g., adolescents).⁸ Relatively fewer metaanalyses have examined biological outcomes, likely due to an insufficient number of studies measuring sexually transmitted infections (STIs) and/or HIV available to date. As a result, many of those metaanalyses have been underpowered.^{9–14} A recent meta-analysis found behavioral interventions improved both behavioral and biological outcomes among clients at STI clinics in the United States.¹⁵ Although there was sufficient power to test incident STI (excluding HIV), this study was limited in that HIV incidence could be evaluated in only 5 of the 48 studies reviewed.¹⁵ Overall, it is unclear whether incident STIs, including HIV, are reduced after behavioral risk reduction interventions. Because condom use and incident STIs are independent outcomes,¹⁶ examining both behavioral and biological end points within a wider range of studies can increase our understanding of the efficacy of behavioral interventions.

The current study extends previous metaanalyses by focusing on the effects of behavioral interventions to improve both behavioral and biological outcomes. Specifically, meta analytic techniques were used to evaluate the efficacy of behavioral interventions to reduce incident STIs, including HIV, and to promote condom use. We hypothesize that those participants receiving a behavioral intervention targeting HIV prevention would increase

their condom use and would be less likely to acquire STIs, including HIV, relative to controls.

We also examine the extent to which the efficacy of behavioral interventions was a function of participant or intervention characteristics. Moderators included the following: (A) gender, age, race, and sexual orientation; (B) baseline STI or HIV; (C) intervention content (motivation and/or skills training, addressing sociocultural barriers, providing condoms, and tailored or targeted content); (D) matching facilitators to participants (on gender or race), and (E) intervention length. We hypothesize that interventions will be more efficacious when they (A) sampled greater proportions of those who are most affected by HIV (women, young adults, Blacks, Latinos, MSM, and heterosexuals);^{1,17} (B) sampled patients diagnosed with an STI or HIV at baseline, as infected participants may be more motivated to decrease their risk behavior;¹⁸ (C) targeted motivation and provided skills training, consistent with motivational and skill-based theories of HIV prevention;^{19,20} (D) tailored content to the individual, targeted content toward a specific group (e.g., women), or matched facilitators to the gender or race of the participants, as tailoring and/or targeting the intervention content may enhance message relevancy;²¹ and (E) were longer, providing participants with additional opportunities to practice skills.

METHODS

Search Strategy and Study Selection

Studies were located using 3 strategies. First, electronic databases (PubMed, PsycINFO, and other EBSCOhost databases) were searched using a Boolean search strategy for abbreviated (truncated words followed by an asterisk) and full keywords related to interventions that reported at least 1 laboratory tested incident STI: [(HIV OR STD OR STI OR (human AND immun* AND virus) OR (acquir* AND immun* AND syndrome) AND (sexual* AND transmit* AND disease) OR (sexual* AND transmit* AND infect*) OR Chancroid OR (Chlamydia AND Infect*) OR Conjunctivitis OR (Lympho granuloma and Venereum) OR Trachoma OR Gonorrhea OR (Granuloma AND Inguinale) OR Syphilis OR (Condylomata AND Acuminata) OR (Herpes AND Genitalis) OR (AIDS AND opportunistic AND infect*)] AND [(intervent* OR prevent*) AND (condom OR swab* OR sero*conver* OR (biological AND outcome))]. Second, we searched data bases and document archives of HIV-related interventions held by the National Institute of Mental Health-funded Syntheses of HIV/AIDS Risk Reduction Project (a database of HIV-related interventions, 1981 to present) at the Centers for Disease Control and Prevention (CDC) Prevention Research Synthesis Project database. Finally, reference sections of obtained articles were examined.²² Studies fulfilling the selection criteria and available by July 2010 were included.

The selection process for study inclusion in the meta-analysis appears in Figure 1. Studies were included if they examined an HIV risk-reduction strategy, used a randomized controlled trial or a quasi-experimental design, assessed condom use and laboratory confirmed incident STIs, including HIV, and provided sufficient information to calculate effect sizes (ES). Studies were excluded if the intervention(s) did not focus on reducing the risk of HIV, had no comparison condition, or evaluated a structural-level (e.g., mass media) intervention. Of the initially relevant reports, 1 had insufficient information for the

calculation of ES; the study authors did not respond to our request and the report was excluded. When multiple papers evaluated intervention efficacy with the same sample, we calculated ES for all the outcomes. Forty-two independent studies, including 67 separate interventions (k), met the selection criteria and were included in the meta-analysis.^{23–82}

Coding and Reliability

Three trained independent raters coded study information, sample characteristics (e.g., ethnicity, gender), design characteristics (e.g., recruitment method, number of follow ups), and content of control and intervention condition(s) (e.g., number of sessions). Study quality was assessed using 16 items (e.g., random assignment) from validated measures;^{83,84} scores ranged from 0 to 22. Interrater reliability for categorical variables was calculated as Cohen kappa (k).⁸⁵ Mean k was 0.73 (median = 0.74), and the mean agreement was 83%, signifying high reliability. For continuous variables, we calculated an intra-class correlation; the mean effective reliability = 0.91, also high. Disagreements between coders were resolved through discussion.

Study Outcomes and Calculation of Effect Sizes

ES estimates for condom use and STIs, including HIV, were calculated. Trials varied in their measures of “condom use” (e.g., count vs. percent of condom-protected sexual events); thus, outcomes included protected or unprotected vaginal, anal, or unspecified intercourse across an array of contexts. Because the majority of the studies reported continuous measures, ES were defined as the mean difference between the treatment and control groups divided by the pooled standard deviation (d).⁸⁶ In the absence of means and standard deviations, other statistical information (e.g., F values) was used.^{87,88} If a study reported dichotomous outcomes (e.g., frequencies), we calculated an odds ratio and transformed it to d using the Cox transformation.⁸⁹ If no statistical information was available and the study reported a nonsignificant or significant between-group difference, we estimated that ES to be zero or calculated an ES based on the minimum statistically significant P value (i.e., $P = 0.05$), respectively.⁸⁸ In calculating d, we (A) adjusted for baseline differences between condition(s) when preintervention measures were available;⁹⁰ and (B) corrected for sample size bias.⁹¹ Positive ES indicated that treated participants increased condom use and reduced the incidence of STIs compared with controls.

Multiple ES were calculated from individual studies when they had more than 1 outcome, multiple intervention conditions, or when outcomes were separated by sample characteristics (e.g., gender). When a study contained multiple measures of the same outcome, the ES were averaged. ES calculated for each intervention and by sample characteristics were analyzed as separate studies.⁸⁸ From the 42 studies that met the selection criteria, 67 interventions were analyzed. Of these 67, all measured self-reported condom use, 57 reported incident STIs, 8 reported incident HIV, and 5 reported both incident STIs and HIV, separately. If the study reported more than 1 follow-up, the last follow-up was used.

Statistical Analyses

Fixed-effect and random-effect analyses were conducted in Stata 11⁹² using published macros.⁸⁸ The homogeneity statistic, Q, determined whether each set of ESs shared a

common ES; a significant Q indicates a lack of homogeneity and an inference of heterogeneity. To assess the extent to which studies' outcomes were consistent, the I^2 index and its corresponding 95% confidence intervals were calculated;^{93,94} I^2 varies between 0 (homogeneous) and 100% (heterogeneous).⁹⁵ If the confidence interval around I^2 includes zero, the set of ES is considered homogeneous. Asymmetries in distributions of ES, which can suggest reporting bias, were examined with Begg technique,⁹⁶ trim and fill,⁹⁷ and Egger technique.⁹⁸

To explain variability in ES, the relation between sample, methodological, or intervention characteristics and the magnitude of the effects were examined using a modified weighted least squares regression analyses with weights equivalent to the inverse of the variance for each ES.^{88,99} For the mixed-effect regression models, the inverse variance for each ES included both study-level sampling error and additional between-study population variance, following the restricted maximum likelihood solution; these models are more conservative than purely fixed-effects models.⁸⁸ A priori determined moderators included sample characteristics (e.g., proportion women, age group), intervention content (e.g., motivation or behavioral skills), matching the facilitators with participants and intervention dose. Significant moderators were simultaneously entered into multiple regression models to evaluate whether they explained unique variance. Continuous variables (e.g., proportion Black, proportion Hispanic/ Latino) were mean centered to reduce multicollinearity. To retain all studies in multiple moderator models, missing values of significant moderators were imputed from the mean of other studies that reported the information.

RESULTS

Study, Sample, and Intervention Details

Descriptive features of the studies are provided in Table S1 (see Supplemental Digital Content 1, <http://links.lww.com/QAI/A223>). Methodological quality of the studies ranged from 5 to 20 (median = 15). Publication year and methodological quality score were correlated ($r = 0.52$, $P < 0.001$); published 2003 received higher quality scores (median = 17) than earlier studies (median = 14).

Studies were conducted in North America (62%), Asia (17%), Africa (14%), Europe (5%), and South America (2%). Of the 40,665 participants sampled, 68% were women, 69% were Black, and their mean age was 26 years ($SD = 7.62$; range, 15–44; 41% age 24 or younger). Several studies targeted women (50%) and Blacks and/or Hispanics (19%). Of the studies reporting alcohol (10 of 42) and/or drug use (14 of 42), 34% and 36% of participants reported current use of alcohol or illegal drugs, respectively. Twenty studies reported participants' HIV status; most participants (80%) were HIV negative and 3 studies sampled only those with HIV.^{23–25} Of the 33 studies reporting STI status at baseline, many participants (42%) had a biologically confirmed STI (excluding HIV); 6 studies restricted their samples only to those with a current STI.^{26,27,100–103}

Participants were typically assessed at a single follow up ($M = 1.04$; range = 1 to 2). The assessment typically occurred 13 weeks postintervention ($M = 23.53$; range = 0 – 208 weeks). When more than 1 follow-up was reported, we used the last assessment because

biological outcomes tended to be reported at longer assessments. The last assessment typically occurred 52 weeks postintervention ($M = 45.04$; $SD = 29.98$). Most participants (79%) were offered incentives (e.g., money) for participating in the research and/or completing the assessment(s).

Most studies (83%) randomly assigned individuals or groups to conditions. The control condition was most often HIV education (48%), but 38% used an active comparison condition (e.g., brief form of intervention), and 14% used an assessment-only control. Interventions involved face-to-face delivery to a group (45%), an individual (45%), or a combination (10%). Group interventions met for a median of 4 sessions of 120 minutes each with a median of 2 facilitators and 10 participants per session; individual interventions met for a median of 1 session of 39 minutes each with 1 facilitator. Most interventions provided education (90%). Most interventions (84%) addressed proximal (e.g., risk awareness, decisional balance exercises, and attitudes toward risk reduction) motivation, whereas 46% addressed distal (e.g., life goals, personal values) motivational components.¹⁹ Many provided skills training (i.e., with rehearsal and feedback) relating to intrapersonal (e.g., self-management; 58%), interpersonal (e.g., partner negotiation; 55%), and/or condom-specific (e.g., placing condoms on model; 43%) aspects of risk reduction. Condoms were provided in 39% of the interventions. Most interventions (94%) included counseling and testing. Boosters were provided in 46% of the interventions. In 66% of the interventions, formative research was used to target intervention content to the sample. Facilitators were often paraprofessionals (85%); some interventions reported matching the facilitators to the ethnicity (28%) or gender (45%) of the sample.

Overall Efficacy of the Interventions

Table 1 provides the weighted mean ES for the 42 studies ($k = 67$) at the final postintervention assessment. Over all, analyses indicate that behavioral interventions improved condom use and reduced incident STIs and HIV compared with controls. By the final assessment, intervention participants significantly increased their condom use ($d+ = 0.17$) and reduced their incidence of STIs ($d+ = 0.16$), including HIV ($d+ = 0.46$), compared with controls. The pattern of results was consistent using fixed-effect or random-effect assumptions. There were no asymmetries that might be interpreted as publication bias: Trim and fill results for each outcome suggested that no study was missing; Begg test⁹⁶ results were nonsignificant ($z_{\text{condom use}} = 1.15$, $P = 0.25$; $z_{\text{STI}} = 0.53$, $P = 0.60$; $z_{\text{HIV}} = 0.37$, $P = 0.71$) as were Egger's test³⁸ results ($bias_{\text{condom use}} = 0.31$, $t = 0.65$, $P = 0.52$; $bias_{\text{STI}} = 0.94$, $t = 1.14$, $P = 0.26$; $bias_{\text{HIV}} = 0.091$, $t = 0.030$, $P = 0.98$).

The hypothesis of homogeneity was rejected for each outcome; examination of I^2 confirmed high levels of heterogeneity. Moderator tests examined whether a priori determined sample or intervention characteristics related to the variability in ES (reported below; Table 2 for specific moderators). Analyses with and without moderator imputation revealed the same patterns; therefore, only the analyses with imputation appear.

Moderators of Intervention Impact on Condom Use

Bivariate regression analyses under mixed-effect assumptions examined potential moderators of condom use. As shown in Table 2, interventions increased participant's condom use when the content of the intervention excluded self-management skills-training ($\beta = -0.28$, $P = .04$), addressed sociocultural barriers ($\beta = 0.31$, $P = .03$), and the intervention targeted Blacks and/or Hispanics ($\beta = 0.32$, $P = .02$). When significant bivariate moderators were simultaneously entered into a regression model, addressing sociocultural barriers was the only variable that remained a significant moderator of condom use ($\beta = 0.31$, $P = .03$).

Moderators of Intervention Impact on Sexually Transmitted Infections

As Table 2 shows, intervention participants succeeded in reducing incident STIs when sample participants diagnosed with an STI, including HIV, at baseline ($\beta = 0.32$, $P = .04$), the intervention excluded self-management skills training ($\beta = -0.35$, $P = .03$), and when condoms were not provided ($\beta = -0.34$, $P = .03$). When entered simultaneously, only STI/HIV diagnosed at baseline ($\beta = 0.31$, $P = .04$) and self-management skills training ($\beta = -0.32$, $P = .04$) remained significant moderators of incident STIs and accounted for 32% of the variance.

Moderators of the Intervention Impact on Incident HIV

Moderator tests for the intervention impact on incident HIV appear in Table 2. HIV incidence was reduced when studies sampled fewer Blacks or more Hispanic/Latinos, intervention content included a distal motivational component, condom skills training, active interpersonal skills training, did not provide condoms, and was targeted to women. When entered simultaneously in a regression model, only proportion of Hispanic/Latino participants remained significant; thus, interventions were successful in reducing the incidence of HIV when sampling more Hispanic/Latino participants ($\beta = 0.88$, $P < .01$).

DISCUSSION

Results from the current meta-analysis of 42 studies evaluating 67 interventions and measuring both behavioral and biological outcomes demonstrated that behavioral interventions increase condom use and lower the incidence of STIs, including HIV, for durations up to 4 years. Although research indicates that between-group ES are generally smaller, especially when comparing an intervention to an active control,¹⁰⁴ weighted mean ES in the current meta-analysis were of small to medium magnitude (0.16 to 0.46). To our knowledge, this meta-analytic review is the first to examine the incidence of HIV in a wide range of populations at risk for HIV. Contrary to recent reports,¹⁰⁵ these findings show that behavioral interventions reduce behavioral risk and incident infections in a wide range of samples.

Several sample and intervention characteristics moderated intervention efficacy. First, interventions were more successful at improving condom use when sociocultural barriers of safer sex were addressed. Because several social, cultural, and economic factors influence condom use,¹⁰⁶ and because poverty, gender inequality, and stigma influence individual's

risk for HIV, this result is not surprising.¹⁰⁷ Other life challenges often overshadow HIV as a concern, with survival needs forcing people into riskier practices and relationships. Results from this meta-analysis suggest that addressing sociocultural barriers within interventions seems to make them more efficacious at reducing sexual risk.

Second, contrary to expectations, providing participants with active self-management training was less successful in improving condom use and incident STIs at the final assessment. In our prior meta-analytic review,¹⁰⁸ interventions were successful at improving condom use at “short term” (less than 3 months postintervention), but not at “long-term” (. 52 weeks), when self-management skills training was provided. In the current meta-analysis, the last assessment typically occurred at 52 weeks postintervention. One possible explanation for our findings is that self-management skills learned during the intervention were not sustained 1 year later. Active self-management training may dissipate over time; to improve sustainability, participants may benefit from boosters targeting self-management skills.

Third, consistent with expectations, interventions were diagnosed with an STI or HIV at study entry. Prior research examining the effects of STI diagnosis “alone” has found little change in sexual risk behavior compared with individuals not diagnosed with an STI.^{109,110} Consistent with this research, a diagnosis of an STI or HIV was not a significant moderator of condom use in our meta-analysis. In contrast, an STI or HIV diagnosis at baseline was the sole moderator of incident STIs in our multiple moderator analyses. Being diagnosed and receiving treatment for an STI before a behavioral HIV intervention may increase receptivity to the intervention thus behavioral changes (e.g., partner reduction, monogamy) and reducing STI incidence. Moreover, research indicates that the association between STIs and condom use varies by type of infection, and increasing condom use may not avert all STIs equally.¹⁶ Future research might examine the contexts in which STI diagnosis moderates both behavioral and biological outcomes.

Finally, interventions were more successful at reducing the incidence of HIV when sampling more Latinos. Globally, Latinos are disproportionately affected by HIV.⁷ Interventions targeting Latinos are urgently needed to avert HIV infections among this group. Our meta-analysis shows that interventions reduced incidence of HIV in samples with greater proportions of Latino participants. In an earlier review, Noguchi et al. found that sampling greater proportions of Latinos was related to acceptance and retention of HIV prevention programs.¹¹¹ Acceptance and retention of an intervention has the potential to increase participants’ exposure to targeted content. Thus, one potential explanation for these findings is that exposure to targeted intervention content increases the relevancy of the message, thereby facilitating behavioral change and ultimately reducing the incidence of HIV.²¹ Consistent with prior meta-analytic reviews, the current findings suggest that interventionists developing behavioral interventions to reduce HIV should conduct formative research to identify the specific needs of Latinos.^{9,112}

Because the ultimate goal of most behavioral interventions is to reduce the transmission of HIV, measuring HIV incidence is a desirable but rarely feasible outcome.¹¹³ Given the low incidence of HIV in many populations, testing for HIV is often impractical as large sample

sizes would be required to detect a statistically significant effect of the behavioral intervention.¹⁶ Therefore, most behavioral intervention trials use self-reported behaviors and STIs as proxy measures of the impact of an intervention on the incidence of HIV within a given subpopulation. Although prior research indicates that improvements in self-reported behaviors and incident STIs after exposure to a behavioral intervention, these findings should not imply that the same intervention was also successful in reducing HIV incidence.¹⁶ In the current meta-analysis, we show that behavioral interventions are successful both at use and at reducing incident STIs and HIV. Although it may seem that changes in behavioral outcomes resulted in changes in biological outcomes, exploratory analyses do not support that assertion. In fact, there was no association between condom use, incident STIs, and HIV ($P = .10$). Weighted regression analyses predicting incident HIV from condom use and incident STIs indicated that more successful at lowering incident STIs with patients behavioral ($\beta = -0.11$, $P = .56$, $k = 13$) and biological ($\beta = -0.03$, $P = .89$, $k = 8$) outcomes are not associated with changes in HIV incidence. Moreover, simply providing condoms to individuals was insufficient in reducing the incidence of STIs, as shown in our moderator analyses. These findings warrant further investigation as the current meta-analysis was limited in the number of studies available to test the behavioral–biological association. The association between behavioral and biological outcomes is complex. Transmission of STIs depends upon several factors including partner type, characteristics, and perceptions of partner safety.¹¹³ Thus, examining both behavioral and biological outcomes, and factors associated with sexual risk behaviors, should be important in determining the efficacy of behavioral interventions.

LIMITATIONS

Limitations of the underlying literature should be considered when interpreting these findings. First, self-reports are vulnerable to cognitive and social biases.^{114,115} Nonetheless, most researchers employed methods designed to optimize data quality.¹⁶ Second, follow-ups typically rely on a single assessment, which may not be representative of long-term ongoing risk. Still, the data do provide support for long-term efficacy of behavioral interventions given that the studies' last assessment occurred 1 year post-intervention. Third, variations in how condom use was measured (e.g., frequency, proportions) and STIs (e.g., use of composite measures) required that we employ heterogeneous markers of risk reduction that are rarely partner specific. Fourth, the diversity of samples may have obscured nuanced patterns in the study outcomes. Fifth, most studies were conducted in the U.S.; it was not feasible to examine how well findings generalize across other important geographical regions of the world. Finally, only a few studies (6 studies, see Table S1, Supplemental Digital Content 1, <http://links.lww.com/QAI/A223>) used a waitlist/no treatment/assessment-only control group, which precluded an evaluation of the impact of behavioral interventions relative to type of control group (e.g., no treatment vs. active comparisons).

CONCLUSIONS

Behavioral interventions to reduce HIV among studies measuring both behavioral and biological outcomes are successful at improving condom use and reducing incident STIs, including HIV, with effects that persist for durations as long as 4 years. Because the

association between behavioral and biological outcomes is complex,¹¹³ measuring both behavioral and biological outcomes can help to determine the efficacy of behavioral interventions. Implementation of efficacious behavioral interventions within a wide range of population groups should be a high priority.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Inclusion of HIV Prevention Studies with Behavioral and Biological Outcomes

Table 1
Weighted mean effect sizes and homogeneity statistics for outcomes at the final post-intervention assessment.

Outcome	k	d ₊ (95% CI)		Homogeneity		
		Fixed effects	Random effects	Q	P	I ² index (95% CI)
Condom use	67	0.12 (0.10, 0.14)	0.17 (0.04, 0.29)	1169.77	<.001	94% (93, 95)
Sexually transmitted infections	62	0.17 (0.14, 0.19)	0.16 (0.04, 0.29)	632.95	<.001	90% (88, 92)
HIV	13	0.19 (0.15, 0.23)	0.46 (0.13, 0.79)	1025.31	<.001	99% (99, 99)

Note. k, number of interventions. d₊, weighted mean effect size. CI, confidence interval.

Table 2

Moderators of condom use, incident STIs, and HIV at the final assessment interval *

Moderators	Condom Use				Incident STIs				Incident HIV			
	β	P	k		β	P	k		β	P	k	
<i>Sample Characteristics</i>												
Women (%)	0.23	.09	67		0.17	.27	62		0.11	.57	13	
Age group (24 years)	-0.23	.09	67		-0.07	.65	62		-0.04	.81	13	
Blacks (%)	0.07	.61	61		0.15	.34	56		-0.61	.00	12	
Latino (%)	-0.04	.77	44		-0.11	.59	39		0.98	.00	10	
MSM (%)	-0.05	.74	40		-0.28	.22	37		-0.24	.38	5	
Heterosexual (%)	0.11	.51	38		0.35	.16	35		0.24	.38	5	
STI or HIV diagnosed at baseline	0.09	.50	67		0.32	.04	62		-	-	13	
<i>Intervention Characteristics</i>												
Motivation, proximal	-0.24	.08	67		0.06	.72	62		0.23	.22	13	
Motivation, distal	0.13	.35	67		0.21	.18	62		0.43	.02	13	
Condom skills, active	0.02	.90	67		-0.16	.31	62		0.51	.01	13	
Interpersonal skills, active	0.03	.80	67		-0.13	.39	62		0.43	.02	13	
Self-management skills, active	-0.28	.04	67		-0.35	.03	62		-0.15	.43	13	
Socio-cultural barriers addressed	0.32	.02	67		0.01	.93	62		0.11	.55	13	
Provided condoms	-0.06	.68	67		-0.34	.03	62		-0.43	.02	13	
Tailored	-0.22	.11	67		-0.05	.73	62		0.09	.65	13	
Targeted, women	0.22	.10	67		0.26	.09	62		0.45	.02	13	
Targeted, Blacks or Hispanic/Latino	0.32	.02	67		0.23	.13	62		-	-	13	
Matched facilitator by gender	0.12	.37	67		0.15	.34	62		0.20	.29	13	
Matched facilitator by race	0.26	.06	67		0.15	.35	62		-	-	13	
Total dose	0.01	.96	63		0.04	.79	58		-0.25	.19	12	

* Models used the inverse of the variance for each effect size as weights; reported coefficients (β) are standardized. k = number of studies. Bold typeface values are significant at P .05 level. Potential moderators with missing values indicate all observations contained identical values.