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Sexual Risk Reduction Interventions Do Not Inadvertently Increase the *Overall Frequency* of Sexual Behavior: A Meta-Analysis of 174 Studies with 116,735 Participants

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Abstract

A meta-analytic review of the influence of HIV-risk reduction interventions on sexual occasions, number of partners, and abstinence was conducted, in order to assess whether condom-related interventions inadvertently undermine sexual health promotion efforts by increasing the frequency of sexual behavior. Included studies examined sexual-risk-reduction strategies, used a controlled design, and provided sufficient information to calculate effect sizes. Data from 174 studies (206 interventions, *N*=116,735 participants) were included. In general, HIV-risk reduction interventions (including condom education /promotion programs) neither increased nor decreased sexual occasions or number of partners reported. Participants in intervention conditions were less likely to be sexually active than those in control conditions. When samples included more Black participants, interventions reduced the number of sexual occasions; interventions were more successful at reducing the number of partners in samples that included more men who have sex with men (MSM) or individuals engaged in sex trading. Samples that included more MSM were more likely to adopt abstinence as a risk reduction strategy. Consistent with behavioral science theory, interventions that included more information, motivational enhancement, and skills training also led to greater risk reduction. HIV-risk reduction interventions do *not* increase the overall frequency of sexual activity. To the contrary, for some particularly at risk sub-groups, interventions reduce the frequency of sexual events and partners, especially when interventions include components recommended by behavioral science theory.

Keywords

Sexual frequency; meta-analysis; HIV risk-reduction intervention; number of partners; abstinence

Over the last two decades, numerous studies evaluating the efficacy of HIV risk reduction interventions have focused on condom use or drug-related risk behaviors (e.g., needle sharing) as key outcome variables. For example, Semann et al. [1] focused on unprotected sex and use of male condoms, and concluded that the proportion of drug users who reduced their risk behavior was 13% greater in intervention groups compared to controls. Although condom use

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is clearly an important marker of risk reduction, transmission risk can also be measured by outcomes involving sexual frequency indicators, including number of sexual partners, total number of sexual occasions, and sexual activity status (i.e., active vs. abstinent). When individuals are part of a risky sexual network, HIV and STI transmission risk increases as sexual frequencies increase [2–6]. In other words, if each act of intercourse is viewed as a potential transmission episode, then fewer acts (with fewer partners) will reduce the likelihood that HIV will be transmitted. Thus, examining frequency-related outcomes is an important yet neglected outcome of risk reduction interventions.

Some authors have called for increasing attention to frequency-related outcomes, noting that focusing solely on condom use as a sexual risk indicator ignores a critical dimension of sexual behavior [e.g., 7]. In addition, experts have mentioned how increased intercourse frequency and numbers of partners lead to increased potential for STI exposure [8–9]. As an illustration, Project RESPECT found more STIs in those with more sexual partners [10]. Similarly, another study estimated pre- to post-intervention changes in participants' STI risk and found that reduced intercourse frequency was a superior marker of decreased risk for less infectious STIs like HIV, but change in the number of sexual partners was preferable for highly infectious STIs like gonorrhea [11]. In this analysis, increased condom use was not strongly correlated with changes in STI risk under most conditions.

Although researchers believe that the frequency of sexual behavior can be reduced by interventions [12] and although they routinely assess sexual frequency outcomes, their reports tend to focus their reports on condom use, perhaps because frequency-related effects are often too small to detect in a typical single study. If so, using meta-analytic techniques to synthesize frequency-related outcomes could help determine whether interventions modify frequency-related sexual outcomes and, if so, the size of their impact. To our knowledge, frequency-related outcomes have not been systematically reviewed.

Evaluation of frequency outcomes is especially important because vocal organizations, such as the Family Research Council [13], Focus on the Family [14], and the Rutherford Institute [15–16], have expressed concern that risk reduction interventions (especially those including condom promotion) will encourage *more* frequent sexual activity, thereby increasing transmission risk if a person engages in penetrative sex with infected partners. Thus, even if behavioral interventions increase condom use, they may inadvertently enhance risk due to increased sexual occasions or increased numbers of sexual partners, or because condoms do not provide perfect protection against all STIs (e.g., human papillomavirus). For adolescents, some policy makers worry that learning about or possessing condoms may encourage sexual debut at an earlier age, also potentially increasing transmission risk. The potential unintended effects of condom-based risk reduction interventions have not been systematically examined across samples.

The current meta-analysis addressed these issues and had three purposes. First, we examined whether condom-related interventions affected three *frequency*-related outcomes, namely: (1) number of sexual occasions, (2) number of sexual partners, and (3) sexual activity status. We also characterized the associations among these three sexual frequency indicators and condom use. The overarching goal here was to evaluate the possibility that condom-related interventions may inadvertently undermine sexual health promotion efforts by increasing the frequency of sexual behavior.

Because investigators have used many different intervention strategies and population sub-groups, we expected intervention effects to vary across studies. Therefore, we examined participant and intervention characteristics that might influence the magnitude of observed effects. We first evaluated the differential impact of HIV-related interventions as a function of

demographic characteristics such as gender, race/ethnicity, and age. In addition, many studies have investigated individuals who are at especially "high risk" for possible HIV transmission. These groups, which have been disproportionately impacted by the HIV epidemic [17], include injection drug users (IDU), commercial sex workers (CSW), alcohol users, and men who have sex with men (MSM), were also systematically examined. If these sub-groups of individuals are at elevated risk for HIV, one way in which their risk can be lessened is by the reduction of number of sexual occasions and number of sexual partners. Thus, we were particularly interested in how interventions affected frequency outcomes in "high risk" groups.

A final goal of this review was to evaluate the predictive utility of Fisher and Fisher's [18–21] information-motivation-behavioral skills (IMB) model, a meta-theoretical account of HIV risk behavior. In a direct test of this model, St. Lawrence and colleagues [23] systematically tested and found that the inclusion of information, motivation, and behavioral skills was more successful at reducing sexual frequency-related behavior than information alone. Because individual studies vary in the extent to which they include or exclude IMB components, we were able to provide a test of this model across the literature of sexual frequency outcomes, something that no prior meta-analysis has done [22].

Method

Sample of Studies and Selection Criteria

We searched for studies through the simultaneous use of several strategies. First, we searched electronic reference databases (MEDLINE, PsycINFO, AIDSearch, CINAHL, Dissertation Abstracts Online, ERIC) using search terms related to HIV and other sexually transmitted diseases (i.e., human or acquired and immu* and syndrome or virus, or AIDS, or HIV; sexually and transmitted and disease* or infection, or STD, or STI), intervention (intervene* or prevent*) and sexuality (sex*, condom*, or intercourse). Second, we checked HIV-related listservs, the NIH database of grant awardees, and conference proceedings. We also requested papers from individual researchers conducting HIV interventions and searched the reference lists of relevant, obtained papers. Finally, we manually searched journals likely to publish intervention results (e.g., American Journal of Public Health, Health Psychology, *JAMA*). These supplemental strategies ensured the comprehensiveness of the reference database searches. Studies that fulfilled the search criteria and that were available as of May 2003 were included.

Studies were included if they (1) examined a deliberate HIV-risk-reduction strategy in a non-perinatal context; (2) used a randomized controlled trial or a quasi-experimental design with rigorous controls (e.g., participants did not self-select into conditions); (3) measured a frequency-related marker (i.e., presence of sexual activity, frequency of intercourse, and number of partners) following the intervention; and (4) provided sufficient information to calculate effect size (ES) estimates. For the purposes of this review, a deliberate HIV-risk-reduction strategy was defined as at least 15 minutes of HIV-relevant instruction. Of the initially relevant articles, 22 had insufficient information for the calculation of effect sizes, and these study authors were contacted. Twelve authors (55%) sent requested information, and these studies were included.

The use of these criteria yielded 174 studies, which investigated 206 separate interventions [see references 23–124 for included manuscripts, some of which included more than one study]. Of the 174 studies, 32 were not published at the time the search was closed (May, 2003). In total, these interventions began with a total of 149,660 participants; the average retention rate was 78%, leaving 116,735 participants for analysis. Consistent with meta-analytic convention [125–127], each intervention was treated as an individual study during analysis.

Study Information

Two raters independently coded each study for descriptive purposes and to determine whether variation in ESs can be attributed to features of the studies. The following dimensions were coded: (1) sample demographics (e.g., ethnicity, gender), (2) risk characteristics (e.g., sex trade, drug or alcohol use, men who have sex with men (MSM)), (3) HIV serostatus, (4) design and measurement specifics (e.g., number of follow-ups), and (5) content of control and intervention condition(s) (e.g., total amount of time spent across all sessions). Finally, we also coded studies according to whether they provide information, motivational, and/or behavioral skills components, consistent with the IMB model [18,19].

Across the study- and intervention-level categorical dimensions, coders agreed on the majority of judgments (*M* agreement = 83%). Disagreements were resolved through discussion. Effective reliability for the continuous variables was calculated by the Spearman-Brown result, which takes into account the mean interjudge correlation as well as the number of judges. For these variables, the effective reliability ranged from .60 to 1.00 (*M* = .86).

When studies did not include sufficient data regarding the moderators of interest, values were imputed. When only an age range or category was given (and not the mean age of the sample), we used the midpoint of the age category as the mean age of the sample. In addition, if authors did not report that their sample included MSM, IDU, sex traders or commercial sex workers, and/or excessive alcohol users, we imputed a zero value for these characteristics, assuming no prevalence.

Frequency-Related Study Outcomes and Effect Size Derivation

We calculated individual ESs for all frequency-related measures reported in each of the 206 separate interventions examined across the 174 included studies. Specifically, we analyzed self-reported sexual frequency measures including (1) number of sexual occasions, defined as the number of episodes of penetrative intercourse (vaginal or anal); (2) number of sexual partners, defined as the number of unique partners an individual had in a given amount of time; and (3) sexual activity status, defined as having or not having some type of intercourse.

The number of sexual occasions and partners were continuous “counts” whereas sexual activity status was dichotomous. Because two of the three outcomes were continuous rather than dichotomous, the ES calculated was the standardized mean difference (*d*); odds ratios are meant for cases in which both the independent and the dependent variable are categorical. We represented the third dimension in *d* for ease of comparison between the categories. The pooled standard deviation (SD) served as the denominator in the ES calculation, when it was available, or, in a minority of cases, another form of SD (e.g., the SD of the paired comparisons) was used because the pooled SD was not available and could not be calculated from the report. Other available statistical information (e.g., *F* or *t* values) was used instead or as a supplement to means and SDs [130]. In calculating the effect sizes, we used statistics that controlled for baseline differences. If a study reported a significant difference on an outcome between the studied groups at baseline and did not control for this difference in analyses of the post-intervention outcomes, we omitted the outcome in question. When studies reported odds ratios, we transformed them to *d* using the Cox transformation [131]. Within a follow-up measurement assessment, when the questions implied different intervals (e.g., previous week vs. previous month), we used the data from the interval that best matched the period since the end of the intervention.

The sign of each effect size was set so that it was positive when the outcome favored risk reduction and effect sizes were corrected for sample size bias [132]. Forty-eight reports provided statistics separately by different groupings (e.g., by gender or race). When this

occurred, effect sizes from each grouping were included in the analysis. As such, some studies contributed more than one effect size for the same outcome. Effect sizes were calculated on the measures provided at the first available follow-up after the intervention. When available, we also calculated *d* for condom use, following the same procedures as above. Analyses followed fixed- and random-effects assumptions [133] to evaluate the mean tendencies for each outcome variable, and fixed-effects assumptions to test whether features of the studies could explain variability in the magnitude of effect sizes [134].

Results

Description of Studies

Participants—The included studies appeared between 1989 and 2003. On average, samples were 50% male, Black (including Africans and Americans) (54%), and 24.8 years old. Most studies (84%) were conducted in the U. S., with the majority (70%) of these studies conducted in medium to large cities. Across studies, 76% of participants were sexually active.

Design—The majority of studies (59%) involved random assignment of individuals whereas 18% involved random assignment of groups. The remaining studies (23%) matched participants in the intervention and control conditions on at least one variable. The majority of studies (98%) used a pre- and post-test design and included an average of 2.1 (*SD*=1.4) follow-ups after baseline data collection. The present analyses used measures taken at the first follow-up, which occurred at a mean of 15.2 weeks (range, 0–104 weeks) from the intervention (0 weeks implies the first follow-up was < 7 days post-intervention. Generally, the first follow-up occurred less than one week after the intervention in lengthier interventions where behavior change was occurring during the intervention.

Interventions—Most interventions (74%) provided HIV counseling and testing, and 97% provided HIV education. Forty-five percent provided condom information, 41% taught condom use skills, and 74% distributed condoms to participants. A majority of the interventions included interpersonal skills training (e.g., negotiation skills; 66%) and intrapersonal skills training (e.g., self-management to avoid risky sex; 58%). Interventions averaged 8 participants per session, met for 3 sessions of 75 minutes each, for a total of approximately 4 hours.

Frequency markers and condom use—Because previous meta-analyses have found an intervention effect on condom use, we examined the links among the sexual frequency outcomes and condom use. Interventions that improved condom use also reduced the number of partners (r = .22, P = .035) and number of sexual occasions (r = .49, P = .003). There was no significant link between ESs for sexual activity status and condom use (r = −.14, P = .382).

Intervention Impact on Sexual Frequency Outcomes

The first set of analyses examined whether the behavioral interventions impacted the three markers of sexual frequency. As Table 1 depicts, these analyses indicated that, overall, intervention programs neither increased nor decreased participants' number of sexual occasions or number of partners relative to the control conditions, but that the interventions did decrease risk for the outcome of sexual activity status (d_+s = 0.026 fixed effects, 0.044 random effects). For all three categories of sexual frequency, the hypothesis of effect size homogeneity was rejected, as hypothesized. Therefore, moderator tests were conducted on each effect separately in order to examine our hypotheses that study features related to this variability.

Moderators of Intervention Impact on Number of Occasions

We first investigated moderators of the impact of interventions on number of sexual occasions. All demographic characteristics were individually entered into a regression analysis as predictors of number of sexual occasions. The number of sexual occasions increased less when samples included more Blacks ($\beta = .434$, $P < .0001$).

Intervention effectiveness within samples containing various HIV-risk groups was also examined. Of particular interest were men who have sex with men (MSM), injection drug users (IDU), those known to engage in sex trading or prostitution, and alcohol users. None of these sample characteristics moderated intervention impact on number of sexual occasions.

We also examined intervention content as moderators of intervention impact on number of sexual occasions, including the amount of HIV-related information; condom use, interpersonal and intrapersonal skills; and motivational enhancement were investigated. Of these, motivational enhancement and intrapersonal skills moderated the impact of interventions on number of sexual occasions ($\beta = .527$, $P < .0001$ and $\beta = .235$, $P < .05$, respectively).

Multivariate model—We then entered each significant univariate moderator mentioned above into a multiple predictor model. In this multiple predictor model, mean effect sizes for each variable were assessed at the mean level of the other predictors. This analysis revealed that proportion of Blacks within a sample remained a significant moderator of the impact of interventions on number of sexual occasions. As before, when samples included more Blacks, interventions decreased the number of sexual occasions. The amount of motivational enhancement included in an intervention also remained a significant moderator. As the duration of the motivational component increased, interventions became more effective at reducing the number of sexual occasions (Table 2).

Moderators of Intervention Impact on Number of Sexual Partners

The same analytic strategy was used to examine moderators of intervention impact on number of partners. When there were fewer females in the samples, interventions had a more positive impact ($\beta = -.155$, $P < .04$). In addition, interventions were more successful at reducing numbers of partners in samples that included more MSM ($\beta = .158$, $P < .04$) and more individuals known to engage in sex trading ($\beta = .153$, $P < .04$). As before, intervention content also impacted intervention effectiveness. When interventions included a higher dosage of inter- or intrapersonal skills, participants were more likely to reduce the number of partners ($\beta = .238$, $P < .01$ and $\beta = .270$, $P < .001$, respectively).

Multivariate model—We then entered each significant univariate moderator into a multiple regression model. When all variables were considered simultaneously, gender and age were no longer significant moderators of the impact of interventions on number of sexual partners (Table 3); all other moderators remained significant. As before, interventions were more successful at reducing the numbers of partners in samples that included more MSM and more individuals known to engage in sex trading.

Moderators of Intervention Impact on Sexual Activity Status

The final set of analyses examined moderators of intervention impact on sexual activity status. When samples included more Whites, interventions had a larger, positive impact on sexual activity status ($\beta = .259$, $P < .02$). Sexual activity status was also more positively impacted when samples included more MSM ($\beta = .217$, $P < .03$), more IDU ($\beta = .317$, $P < .01$), and more alcohol users ($\beta = .372$, $P < .001$). When interventions included more HIV information and intrapersonal skills training, sexual activity status was more likely to reflect abstinence ($\beta = .276$, $P < .01$ and $\beta = .392$, $P < .001$, respectively).

Multivariate model—Significant univariate predictors were then simultaneously entered into a multiple regression analysis. This analysis revealed that interventions were more successful at impacting sexual activity status when samples included more MSM, and when the total amount of HIV information and intrapersonal skills training was greater (Table 4).

Intervention Characteristics and Sexual Frequency Outcomes

Condom-related features—We investigated the impact of providing condoms to study participants and allowing participants to directly or indirectly learn condom use skills such as negotiation or proper use on sexual frequency, number of partners, and sexual activity status. None of these intervention features impacted any of the effects of interest, suggesting that teaching individuals about condoms does not result in more acts of intercourse, have more sexual partners, or begin having intercourse earlier (all *p*s > .20).

Information, behavioral skills, motivation (IMB) components

In order to examine the impact of the IMB components on the three frequency-related outcomes, indicators of HIV-related information, motivation, and behavioral skills were entered simultaneously as predictors of each outcome separately. Consistently, interventions that included more of the IMB components were most successful at reducing number of sexual occasions and number of sexual partners (Figure 1). The same pattern was not observed for sexual activity status.

Comment

This quantitative synthesis evaluated the extent to which HIV-related interventions influence three sexual frequency outcomes: number of sexual occasions, number of partners, and sexual activity status. We focused on studies with rigorous controls because such studies provide the strongest and most interpretable evidence regarding the effects of HIV risk reduction programs. In total, 174 studies, including 206 interventions and nearly 120,000 participants qualified for the review. With this large sample, analyses showed that, in general, interventions neither increased nor decreased the number of sexual occasions and the number of partners. These findings provide reassurance that HIV-risk reduction interventions do *not* inadvertently increase the number of sexual occasions or sexual partners. Moreover, the results indicated that sexual activity was reduced overall (Table 1). As we expected, the overall average magnitude of intervention effects on each of these frequency dimensions was small (d_+s ranging from −0.004 to 0.044) and much smaller than that observed in past meta-analyses of condom use and similar risk behaviors (e.g., d_+s ranging from 0.07 to 1.31) [126,127,135–139]. Yet more important is the fact that the magnitude of studies' effects on frequency-related outcomes varied widely; when interventions included particular features or focused on particular risk groups, sexual risk reduction via number of sexual occasions, number of sexual partners, and sexual activity status was more likely.

Conditions Related to Reduced Sexual Frequencies

Several sample and intervention features explained variability in sexual frequency outcomes. Our analysis revealed two significant moderators of intervention impact on *number of sexual occasions*: proportion of Black participants within the sample and amount of motivational enhancement provided. Interventions were more successful at reducing the number of sexual occasions when samples included more Black participants. One might wonder whether the explanation for this finding is that interventions occurring in African nations, where the threat of HIV is higher than in the United States, have greater success at reducing number of sexual occasions. In our database only four studies that targeted number of sexual occasions occurred in African nations, and, of those, two were highly successful at reducing the number of sexual occasions, and two were not. Most of the studies targeting number of sexual occasions as an

outcome occurred within the United States. As such, it does not appear that this is the sole explanation for this finding.

A second possible explanation for this finding involves the increased risk perception that may exist among Blacks. It is now widely recognized that, in the United States, Blacks have been disproportionately affected by HIV and AIDS; epidemiologic data indicate that approximately 50% of the new HIV infections in 2003 occurred among Blacks [140], even though Blacks made up only 12% of the United States population in the 2000 census. Moreover, research indicates that concern about HIV tends to be high(er) among Blacks [141], and perceptions of the local prevalence of HIV/AIDS predicts number of sex partners, sexual risk practices, rates of STIs, and HIV testing history [142]. This phenomenon, referred to as "intuitive epidemiology," likely involves an increased vulnerability or risk perception, a construct implicated in many theoretical models of health behavior change [143]. This increased vulnerability to HIV among Blacks may increase the relevance of HIV risk reduction programs for this population sub-group, partially explaining the greater intervention success.

Interventions that included larger motivational components were more successful at reducing the number of sexual occasions. This finding suggests that risk reduction interventions work at least in part by engaging intrinsic motivation for self-protection. This interpretation is consistent with a growing body of evidence indicating the motivational approaches to health behavior change can be more effective than traditional health education and psychotherapeutic interventions [144]. Indeed, motivational approaches have shown considerable promise as stand-alone or supplemental interventions for traditionally intractable problems such as smoking [145], alcohol misuse [146], and drug use [147,148]. Several studies have demonstrated the value of a motivational intervention in the context of HIV risk reduction as well [30,149,150]. Future research should more fully investigate the types of motivational enhancement that are most successful at reducing the number of sexual occasions and explore the psychological mechanisms by which motivational approaches influence behavior change.

Skills training was an important intervention feature when number of sexual partners was a targeted outcome. Interventions with longer interpersonal and intrapersonal skills training components were more effective at reducing the number of sexual partners. Negotiating a safe sexual relationship with a partner requires skill [151,152]. Individuals who lack the ability to skillfully decline a partner's advances may be at greater risk for unintended sexual advances, including unprotected sex. When individuals are actively taught how to handle a sexual proposition, they are better able to refuse intercourse with additional partners [58].

Interventions were also more successful at reducing the number of sexual partners when samples included more MSM or individuals involved in sex trading, two groups traditionally viewed as high risk for HIV. When samples included more MSM, interventions were more likely to result in a reduction of the number of sexual partners. One possible mechanism for this finding is the increased awareness of HIV in these sub-groups, consistent with the explanation provided earlier for Black participants. Overall, these results suggest that interventions are efficacious with those who recognize their vulnerability to HIV.

The amount of HIV information within an intervention also significantly influenced the interventions' impact on sexual activity status. When interventions included more information about HIV and more intrapersonal skills training, the risk reduction impact of interventions on sexual activity status was enhanced consistent with the IMB model [18]. Self-management skills, a type of intrapersonal skills, play a role in sexual activity status. Managing one's emotions and substance use, and avoiding risky situations are important skills for individuals who have engaged in risky sexual encounters in the past, but would now like to avoid these situations.

Evaluation of the influence of condom-related intervention features on the three frequency-related outcomes of interest indicated that none of these features moderated the impact of interventions on number of sexual occasions, number of partners, or sexual activity status. This finding should provide reassurance that increased numbers of sexual occasions, larger numbers of partners, and more likely sexual activity are not iatrogenic effects of providing condoms or training in condom use skills and interpersonal negotiation skills.

Sexual Frequency Reduction as a Prevention Alternative

Overall, interventions that included informational, motivational, and behavioral skills components, consistent with the IMB model, [18,19] were more likely to influence frequency outcomes than were interventions that did not include all three IMB model components. The number of sexual occasions was significantly reduced after exposure to an hour (or more) of motivational training. Similarly, studies that included six hours of interpersonal skills training or three hours of intrapersonal skills training were the most successful at reducing the number of sexual partners. Studies were most successful at influencing sexual activity status when they included six hours of HIV information and at least one hour of intrapersonal skills training. The need for different doses of diverse types of training may be due, in part, to the level of skill participants already have upon entering into the intervention. Research should investigate the dynamic interplay among various types of HIV risk reduction intervention content and participants' initial information, motivation, and behavioral skills levels, ensuring that no critical component is omitted [153].

Overall, after 20+ years of studying HIV and designing related interventions, it is clear that progress toward risk prevention is being made. The results of this synthesis suggest that targeting frequency-related outcomes is another avenue by which HIV-transmission risk can be reduced. Though condom use has been touted as the primary and most beneficial sexual risk reduction outcome, interventions that integrate key elements of behavioral theory are also successful at reducing frequency-related outcomes for some population sub-groups.

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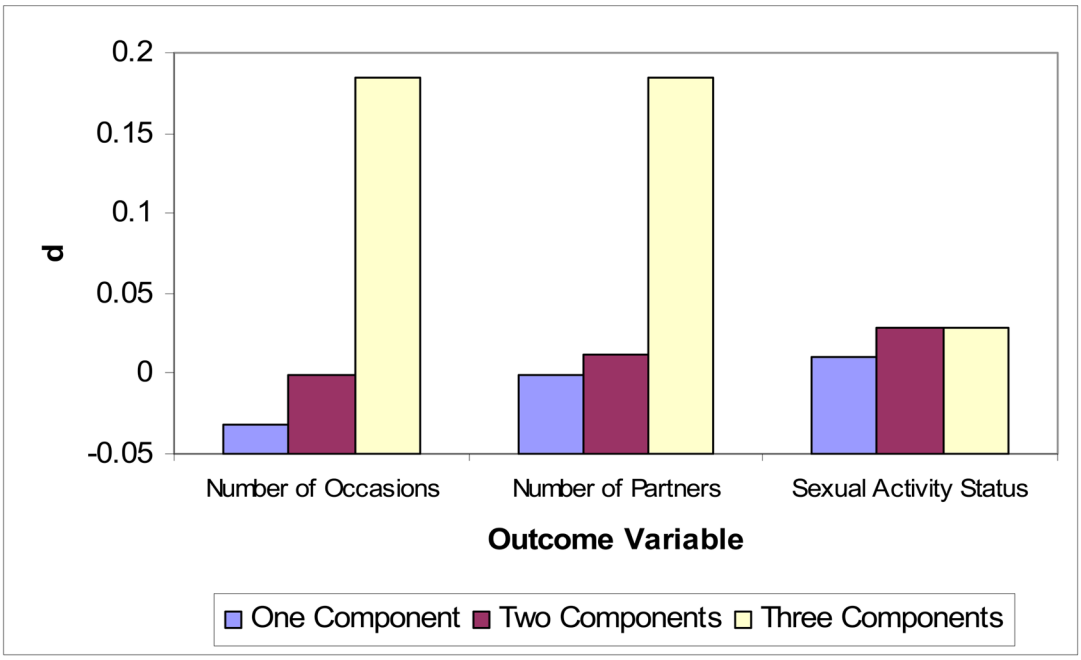

Figure 1.
The Impact of Information, Motivation, Behavioral Skills Components on Number of Occasions, Number of Partners, and Sexual Activity Status

Table 1

Efficacy of interventions to promote risk reduction at studies' first follow-up assessments

Outcome	*k*	Weighted mean d_+ (and 95% confidence interval)		Homogeneity of effect sizes	
		Fixed effects	Random effects	*Q*	*P*
Number of Sexual Occasions	42	−0.004 (−0.033, 0.025)	0.010 (−0.042, 0.061)	92.07	<.001
Number of sexual partners	107	0.008 (−0.012, 0.028)	0.009 (−0.020, 0.039)	185.79	<.001
Sexual Activity Status	49	0.026 (0.002, 0.050)	0.044 (0.003, 0.084)	103.92	<.001

Note. Each effect size (*d*) was weighted by the inverse of its variance. *k* = number of studies. Confidence intervals not including zero reflect significant intervention effects.

Q = Homogeneity within categories; *P* = probability; when statistically significant, implies differences within the distribution of effect sizes.

Table 2

Multivariate model of intervention impact on number of sexual occasions (k = 42)

Variable	Level*	Adjusted Mean ES (95% CI)**	β	p
Proportion Black within Sample	0%	−0.025 (−0.072, 0.022)	0.276	.033
	100%	0.116 (0.012, 0.221)		
Motivational Enhancement Component	0 hours	−0.005 (−0.042, 0.041)	0.470	<.001
	1 hour	0.151 (0.073, 0.230)		
	2 hours	0.303 (0.148, 0.458)		
	3 hours	0.454 (0.220, 0.689)		

Note. Effect sizes (*d* values) are positive for results that favor the intervention group. Analyses are based on fixed-effects assumptions; each effect size (*d*) was weighted by the inverse of its variance. *CI* = confidence interval. *k* = number of studies. *P* = probability.

Number of sexual occasions was modeled as the dependent variable in a multiple regression model, with each listed study dimension simultaneously entered as an independent variable.

* Levels symbolize representative values along the continuous levels observed.

** Each adjusted mean ES is reported at the mean level of each other study dimension.

Table 3

Multivariate model of intervention impact on number of sexual partners (k = 107)

Variable	Level*	Adjusted Mean ES (95% CI)**	β	p
Proportion MSM	0%	0.001 (−0.023, 0.025)	0.277	<.001
	100%	0.252 (0.121, 0.383)		
Proportion Involved in Sex Trading	0%	−0.001 (−0.026, 0.025)	0.231	.002
	100%	0.409 (0.151, 0.667)		
Interpersonal Skills Component	0 hours	−0.021 (−0.050, 0.009)	0.351	<.001
	3 hours	0.008 (−0.016, 0.032)		
	6 hours	0.036 (0.012, 0.061)		
	9 hours	0.065 (0.034, 0.095)		
Intrapersonal Skills Component	0 hours	−0.009 (−0.034, 0.015)	0.272	<.001
	3 hours	0.050 (0.016, 0.083)		
	6 hours	0.109 (0.048, 0.169)		
	9 hours	0.168 (0.077, 0.259)		

Note. Effect sizes (d values) are positive for results that favor the intervention group. Analyses are based on fixed-effects assumptions; each effect size (d) was weighted by the inverse of its variance. *CI* = confidence interval. k = number of studies. *P* = probability.

Number of partners was modeled as the dependent variable in a multiple regression model, with each listed study dimension simultaneously entered as an independent variable.

* Levels symbolize representative values along the continuous levels observed.

** Each adjusted mean ES is reported at the mean level of each other study dimension.

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Table 4

Multivariate model of intervention impact on sexual activity status (k = 49)

Variable	Level*	Value of d (95% CI)**	β	p
Proportion MSM	0%	0.056 (0.026, 0.086)	.222	.024
	100%	0.235 (0.083, 0.388)		
Information Component	0 hours	0.041 (0.008, 0.073)	.302	.002
	3 hours	0.047 (0.016, 0.078)		
	6 hours	0.053 (0.023, 0.083)		
	9 hours	0.059 (0.029, 0.088)		
Intrapersonal Skills Component	0 hours	0.022 (−0.002, 0.046)	.386	<.001
	1 hour	0.127 (0.072, 0.181)		
	2 hours	0.232 (0.128, 0.336)		
	3 hours	0.336 (0.181, 0.492)		

Note. Effect sizes (*d* values) are positive for results that favor the intervention group. Analyses are based on fixed-effects assumptions; each effect size (*d*) was weighted by the inverse of its variance. *CI* = confidence interval. *k* = number of studies. *P* = probability.

Sexual activity status was modeled as the dependent variable in a multiple regression model, with each listed study dimension simultaneously entered as an independent variable.

* Levels symbolize representative values along the continuous levels observed.

** Each adjusted mean ES is reported at the mean level of each other study dimension.