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Brief and Intensive Behavioral Interventions to Promote Sexual Risk Reduction among STD Clinic Patients: Results from a Randomized Controlled Trial

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Abstract

Objective—To evaluate the separate and combined effectiveness of brief and intensive interventions for sexual risk reduction among patients at a STD clinic.

Method—Patients ($N=1483$; 54% men; 64% African-American; $M=29.2$ years old) from a publicly-funded, walk-in STD clinic participated. Patients completed a baseline assessment, and then were randomized to one of six intervention arms; each arm combined a brief intervention with an intensive intervention. The interventions provided different levels of information, motivational counseling, and behavioral skills training, guided by theory, formative research, and empiric precedent. Follow-up assessments, including STD screening, occurred at 3, 6, and 12 months post-intervention.

Results—Infection rates declined from 18.1% at baseline to 4.5% at 12 months. At a 3-month follow-up, patients reported fewer sexual partners, fewer episodes of unprotected sex, and a lower percentage of unprotected sexual events; they strengthened sexual health knowledge, safer sex attitudes and intentions, and self-efficacy beliefs. No consistent pattern of differential risk reduction was observed among the six intervention conditions, nor was any evidence of decay from 3 to 12 month follow-ups obtained.

Conclusions—Implementing behavioral interventions in a STD clinic was associated with significant reduction of sexual risk behavior, and risk antecedents.

Keywords

randomized controlled trial; sexual risk reduction; HIV prevention; behavior; sexually transmitted disease

INTRODUCTION

Sexually transmitted diseases (STDs) remain highly prevalent. Global estimates suggest 340 million new cases of syphilis, gonorrhea, chlamydia and trichomoniasis,¹ whereas U.S. estimates suggest 19 million new infections, each year.^{2,3} HIV, the most feared STD, undermines the health of 33 million people worldwide, with 1.1 million people infected domestically. The annual incidence of HIV in the U.S. is 56,300, a rate that has remained

stable for the past decade.⁴ Importantly, 84% of new HIV infections result from sexual behavior.⁵

STDs can lead to pelvic inflammatory disease, chronic pelvic pain, infertility, cervical and oropharyngeal cancer among women, and epididymitis, urethritis, and oropharyngeal cancer among men.^{2, 6, 7} Untreated HIV leads to AIDS; current HIV treatments are not curative, require lifelong adherence to costly medications, and incur troublesome side effects. Clearly, HIV and the other STDs remain prevalent, and result in premature morbidity and mortality.

The HIV-STD nexus is important because (1) STDs facilitate the transmission of HIV;^{8, 9} thus, STD prevention and treatment provides a cornerstone of HIV prevention. (2) Clients attending STD clinics often engage in risky sexual practices that heighten risk for HIV (e.g., unprotected sex and sexual partner concurrency),¹⁰⁻¹² and find partners from social networks burdened with STDs.¹³ (3) Clients at urban STD clinics are disproportionately African-American, a population sub-group with the highest incidence of HIV (45% of new HIV infections⁵). (4) Clients attending STD clinics are more likely to be infected with HIV.¹⁴ Given these facts, STD clinics provide an opportune venue for sexual risk reduction and HIV prevention programs.

Sexual risk reduction programs in STD clinics typically feature one of two approaches. Brief interventions usually involve clinic-based, individual counseling.¹⁵ Such interventions can be tailored to individuals, but are constrained by time, space, and staffing limitations, and usually offer only minimal skills training – an intervention component recognized as essential for sustained behavior change.¹⁶⁻¹⁹ In contrast, intensive interventions permit more thorough skills training and are usually conducted in small groups, which allows for peer support and role-play partners, and greater efficiency.^{20, 21} However, intensive interventions are often limited by low client motivation (e.g., ambivalence about the need for risk reduction) and poor attendance.

Despite the promise of brief and intensive interventions, the incidence of HIV in the U. S. has remained stable for the past decade,⁵ suggesting the need for improved intervention approaches. To our knowledge, no one has investigated the combined use of brief and intensive interventions to reduce sexual risk behavior, even though this integration has been efficacious in the context of substance use treatment.²² In the sexual health context, brief motivational interventions might stimulate initial change and help patients to recognize the benefits of attending intensive (skills-based) interventions. A brief motivational intervention also might prepare patients to profit from an intensive intervention and, thereby, optimize response to the latter. In summary, the combined use of a brief, clinic-based intervention with a more intensive intervention may optimize long-term sexual risk reduction.

This randomized controlled trial (RCT) was designed to evaluate a two-step approach to sexual risk reduction. The first step included: (a) a brief informational intervention (B-INFO), or (b) a brief motivational intervention (BMI). We envisioned the B-INFO arm as a high quality “standard” care control condition that meets HIV post-test counseling requirements; and, we hypothesized that receiving a BMI would motivate increased condom use, and improve attendance at a subsequent intensive intervention.²² The second step involved: (a) an intensive informational, motivational, and behavioral skills training (I-IMB) workshop, (b) an intensive informational (I-INFO) workshop (that served as a time-matched comparison intervention), or (c) a no workshop control. We hypothesized that inclusion of skills exercises in the I-IMB workshop would promote more behavior change relative to an intensive informational workshop or no workshop.¹⁶ In addition, we tested hypotheses that the combination of the BMI and I-IMB interventions would lead to greater risk reduction

relative to the other intervention combinations, and that improvement would be greatest at a 3-month follow-up with a gradual dilution of intervention effects from 3 to 12 months.²³

METHODS

Study Design

We designed the study to evaluate the separate and combined effectiveness of brief and intensive interventions for sexual risk reduction. The hypothesized optimal interventions at both steps (i.e., BMI and I-IMB) were contrasted with attention and standard care control conditions in a fully crossed design. Thus, the overall design was a 2 (brief intervention: BMI vs. B-INFO) $\times$ 3 (intensive intervention: I-INFO vs. IMB vs. control) $\times$ 4 (repeated measures: baseline, 3, 6, and 12 months) randomized controlled trial (Figure 1).

Study Registration, Confidentiality, and Ethical Review

We registered the trial at ClinicalTrials.gov (NCT00183573), obtained a Federal Certificate of Confidentiality, and secured IRB approvals from all participating institutions prior to the trial.

Participants

Participants were 795 men and 688 women (M age = 29.2 years; $SD=9.7$). They self-identified as African-American (64%), Caucasian (24%), or other (12%). Most (93%) were not married, 23% were living with a sexual partner, and 58% had ≥ 1 child. Fifty-one percent were unemployed, 62% had a high school education or less, and 57% earned $< \$15,000$ per year. Most self-identified as heterosexual (88%) with an average (median) of 20 lifetime sexual partners. Twenty-two percent reported that they had traded sex in their lifetime.

Procedures

This manuscript provide a general overview of the procedures; a more detailed overview of the study procedures is available elsewhere.²⁴

Screening and recruitment—Patients seeking care at a publicly-funded, walk-in STD clinic in upstate New York were screened by a Research Assistant (RA) for eligibility. Inclusion criteria were: (a) age 18 or older; (b) sexual risk behavior (e.g., multiple sexual partners, inconsistent condom use) in the past three months; and (c) willingness to take an HIV test. Exclusion criteria were (d) mental impairment; (e) receiving substance abuse treatment from an inpatient facility; (f) planning to move in the next year; or (g) already infected with HIV. A total of 5613 patients were screened, with 2683 (48%) meeting eligibility criteria (Figure 2); of these, 1483 (55%) consented to participate and were randomized to an intervention.

Baseline—Patients completed an audio, computer-assisted, self-interview (ACASI), an assessment mode that minimizes socially desirable responding.²⁵ A clinic nurse or nurse practitioner conducted a history and physical exam, obtained specimens per standard clinic protocol for STD testing, and drew blood for rapid HIV testing.

Randomization—Patients were randomly assigned to a brief and an intensive intervention condition using a random number generator. Assignment to BMI or the attention-control video condition (i.e., B-INFO) occurred on an individual level whereas assignment to an intensive intervention occurred at the wave level; that is, a random number was generated

for each two-week period, and all patients recruited during that time were assigned to the same intensive intervention or comparison condition.

Brief intervention (Step 1)—While waiting for lab results, patients received one of two brief interventions. Both required 15 minutes, and were delivered by clinic nurses (not research staff) who received training and ongoing supervision, and followed a manual.

The **brief motivational intervention (BMI)** was stage-based behavioral counseling,²⁶ a counseling approach based on the Transtheoretical Model.²⁷ This intervention was tailored to each patient's circumstances. Open-ended questions were used to understand the patients' life circumstances, sexual risk behaviors, and stage-of-change for risk reduction; counseling appropriate to the patient's stage was delivered; condom use and attendance at the intensive intervention were emphasized. (A detailed intervention manual is available from chb.syr.edu).

The **brief informational intervention (B-INFO)** was delivered with a digital video-disc (DVD); this intervention was designed to serve as a high-quality, standard care control condition. A clinic nurse met briefly with the patient and asked a series of closed-ended questions to assess sexual risk behavior and stage-of-change for risk reduction. Then, the patient viewed the DVD in a private room. The DVD was adapted from a validated intervention,²⁸ and included information about HIV and STDs, testing, and sexual risk reduction options presented in an engaging and culturally-appropriate style. The DVD stated that attending educational and safer sex workshops could help people stay healthy.

After receiving a brief intervention, patients received their lab results and, if indicated, medical treatment. Before exiting the clinic, two-thirds of the patients were invited to attend an intensive intervention. All patients were paid \$20 for completing the baseline, and were reminded that they would be contacted in 3, 6, and 12 months for follow-up assessments.

Intensive intervention (Step 2)—Participants who had been invited to an intensive intervention were called prior to the workshop, and encouraged to attend. Multiple calls were made until the participant was reached. Two intensive interventions were implemented, which were structurally equivalent; that is, both required 4 hours, were delivered in same-sex groups, and occurred at the STD clinic. Child care was available, lunch was served, and attendees were paid \$40. Workshops were led by male and female co-facilitators (at least one of whom was African-American and one of whom was a professional), who received training and ongoing supervision, and followed a manual (available from chb.syr.edu).

The **intensive informational (I-INFO)** workshop included information about HIV/STD transmission, prevention, testing, and treatment. Facilitators distributed cards with statements about HIV and STDs. The participants took turns reading the statements aloud, and the facilitators and participants discussed the accuracy of each statement. Participants also placed cards labeled with different sexual activities along a risk continuum. The intervention concluded with a question-and-answer game-show, during which information covered in the workshop was actively reviewed and rehearsed. This intervention was largely informational.

The **intensive information-motivation-behavioral skills (I-IMB)** workshop was based on theory,^{16, 29} and adapted from empirically-validated interventions.³⁰⁻³⁴ During the information component, participants learned about HIV transmission and prevention. During the motivational component, participants: (a) received local HIV/STD rates (to sensitize them to their risk); (b) watched a video of individuals infected with HIV, and discussed what it would be like if they themselves were infected with HIV; and (c) placed cards with sexual

behaviors along a risk continuum, discussed the factual basis for each appraisal, and reflected on their own sexual behaviors, and where these behaviors fell on the continuum. During the skills component, participants engaged in interactive exercises to learn to (a) identify personal triggers for risky sex; (b) identify strategies for managing triggers; (c) talk with partners about condom use and safer sexual behaviors; and (d) apply a condom (using pelvic and penis models). Role-play exercises gave participants the opportunity to practice skills with facilitators and other participants, and to obtain constructive feedback. The workshop concluded with goal setting exercises and a review.

Patients assigned to the **no intervention (CTRL)** condition were not invited to a workshop.

Follow-up assessments—Participants were contacted by telephone or mail, and encouraged to return for follow-up assessments at 3, 6, and 12 months. At each occasion, they provided a urine sample, completed an ACASI, and were paid \$30. For the urine sample, participants were escorted to a private bathroom, provided with a urine collection container, and instructed on how to collect a specimen. Urine specimens were refrigerated until transported (daily) to a University-based microbiology research laboratory for testing. Patients with positive tests were notified and treated for their infection.

Chart abstraction—At 12 months, clinic and county databases were reviewed for incident STDs resulting from clinic visits between follow-up assessments, and diagnosis and treatment of a STD elsewhere in the county.

Outcome Measures

STD infection was assessed through: (a) urine screening; and (b) review of clinic charts and health department records. Urine specimens were tested for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* using BDProbe Tec ET System Chlamydia trachomatis and Neisseria gonorrhoeae Amplified DNA Assays (BD Biosciences, Sparks, MD), an FDA approved nucleic acid amplification assay.³⁵ Review of records also identified other incident STDs during each follow-up period. Participants who tested positive for gonorrhea, chlamydia, or HIV in each follow-up interval were classified as having a STD.

Sexual risk behavior was assessed with items adapted from previous research.^{31–33} Participants reported, for the past 3 months, the number of male and female sexual partners, and the number of occasions of unprotected and protected vaginal and anal intercourse with steady and non-steady partners. These data yielded seven outcomes: (a) total number of partners, (b) total number of episodes of unprotected sex, (c) number of episodes of unprotected sex with a steady partner, (d) number of episodes of unprotected sex with non-steady partners, (e) percentage of all episodes that were unprotected, (f) percentage of episodes with a steady partner that were unprotected, and (g) percentage of episodes with non-steady partners that were unprotected.

Theoretical antecedents of risk behavior were assessed by self-report. (a) Information was assessed using 28 items from the HIV Knowledge Questionnaire,³⁶ the STD Knowledge Questionnaire,³⁷ and a measure of HIV testing knowledge ($\alpha = .83$). (b) Motivation was assessed with three variables: (i) Behavioral intentions were assessed with 4 items;³¹ participants were presented with a scenario and asked to report their likelihood of engaging in risk reduction behaviors (e.g., “I would refuse to have sex if we didn't use a condom”). Higher scores indicate stronger intentions to reduce risk ($\alpha = .64$). (ii) Condom attitudes were assessed with 5 items (e.g., “Sex with a condom can still be pleasurable”) from validated measures.^{38–39} Higher scores indicate more favorable attitudes toward condom use ($\alpha = .70$). (iii) Risk reduction attitudes (e.g., “Having one steady sexual partner is enough for me”) were assessed with 14 items developed for this study. Higher scores

indicate more favorable attitudes toward risk reduction ($\alpha = .70$). (c) Behavioral skills were assessed with 19 items. (i) Interpersonal skills were measured with the Condom Influence Strategy Questionnaire⁴⁰ ($\alpha = .89$). (ii) Self-efficacy to avoid sexual risk with a steady partner and (iii) a non-steady partner were assessed with previously validated risk scenarios. 41 Participants reported how confident they would be insisting on safer sexual practices with both partner types (α s = .71 and .74, respectively).

Workshop attendance was documented by research staff at each session.

Statistical Analyses

Sample size was determined *a priori* for primary outcomes (i.e., risk behavior, STD infection); we expected 30% attrition and a .20 effect size (and a 20% difference in the rate of incident STDs among conditions). For 80% power and a Type I error rate of 5%, power analyses suggested at least 1500 participants (250 in each study condition) were needed to detect the anticipated intervention effects.

An intent-to-treat approach was used in which participants were analyzed in their assigned intervention condition regardless of whether they attended a workshop.

To determine whether intervention group or time was associated with the rate of incident infections, generalized multilevel models using a logit link were conducted using HLM 6 for Windows.⁴² Across the four assessments, participants who tested positive for gonorrhea, chlamydia, or HIV were coded as 1; participants who had only negative STD tests were coded as 0. Population-averaged results are reported.

To determine whether intervention group or time was associated with risk reduction outcomes, generalized estimating equations (GEE)⁴³ were conducted for count measures (specifying a poisson distribution), and linear mixed models were conducted for measures that were normally distributed using SAS.

All analyses represented change using a piecewise linear function (i.e., one slope for change from baseline to 3 months, and a second slope for 3 months to 12 months) because we hypothesized that risk reduction would be greatest from baseline to 3 months, with modest decay in benefits from 3 months to 12 months.

For the linear mixed models analysis of the normally distributed outcomes, the intercept and both slopes were allowed to vary randomly across participants; if there was no variability across participants in one or more of these parameters, the parameter(s) was constrained to be equal across participants. Predictors for all analyses were: brief intervention; intensive intervention; and brief-by-intensive interaction. All participants who provided data on at least one occasion were included in the analyses.

Exploratory analyses tested whether intervention effects varied as a function of gender, race/ethnicity, baseline risk status, and substance use.

RESULTS

Preliminary Analyses

There were no adverse events associated with any of the interventions, or study procedures. As reported previously,⁴⁴ logistic regression analyses compared patients who consented to participate with those who declined. These analyses indicated that consenting to participate was associated with female sex (OR = 1.86; 95% CI .156—2.22), non-Caucasian race (OR = 2.16; 95% CI 1.77—2.62), having completed at least some college (OR = 1.70; 95% CI

1.41—2.06), being a returning patient (OR = 1.21; 95% CI 1.01—1.45), and having a greater number of sexual partners in the past 3 months (OR = 6.95; 95% CI 4.17—11.58) (all $ps < .05$).

Retention and attrition—Across conditions, retention rates at 3, 6, and 12 months were 73%, 74%, and 70%, respectively (Figure 2). The pattern of retention (12 month completers vs. non-completers) did not moderate the intervention effects.

Planned Outcome Analyses

Baseline means (M s) and standard deviations (SD s) for the baseline variables by condition appear in Table 1.

STD infection—At baseline, 269 of 1483 patients (18.1%) were diagnosed with gonorrhea or chlamydia. The counts of incident infections at 3, 6, and 12 months were 101/1115 (9.1%), 94/1093 (8.6%), and 46/1013 (4.5%), respectively (Figure 3, panel a). There was a significant decrease in the odds ratio (OR) of being diagnosed with a STD from baseline to 3-months, OR = .87 (95% CI .79—.95), $t(1482) = -3.08$, $p < .001$, but no significant change from 3-months to 12-months, OR = .99 (95% CI = .94—1.04), $t(1482) = -0.39$, $p > .05$. The intervention conditions did not predict differences among the odds ratio changes (all $ps > .05$); that is, the reduction in new infections was observed only relative to baseline and not among conditions.

Means and standard deviations for the **sexual risk behavior outcomes** appear in Table 2. Overall, there were no differences among intervention conditions from baseline to 3 months, and no consistent pattern of intervention effects from 3 to 12 months. There were significant changes over time for all of the sexual behavior outcomes.

The **number of partners** decreased from 2.82 at baseline to 2.10 at 3 months ($\beta = -0.09$, $Z = -4.68$, $p < .0001$; Figure 3, panel b). The slope from 3 to 12 months also differed from zero ($\beta = -0.02$, $Z = -2.46$, $p < .05$) as patients reduced the number of partners from 2.10 (3 months) to 2.07 (6 months) to 1.90 (12 months).

The **total number of episodes of unprotected sex** decreased from 17.24 at baseline to 11.84 at 3 months ($\beta = -0.15$, $Z = -4.43$, $p < .0001$; Figure 3, panel c). The number of episodes of unprotected sex with a *steady partner* decreased from 13.97 episodes at baseline to 9.38 episodes at 3 months ($\beta = -0.16$, $Z = -4.08$, $p < .0001$), and the number of episodes of unprotected sex in the past 3 months with a *non-steady partner(s)* decreased from 2.79 episodes at baseline to 1.01 episodes at 3 months ($\beta = -0.29$, $Z = -7.39$, $p < .0001$). The slope from 3 to 12 months did not differ from zero.

The **percentage of episodes of unprotected sex** decreased from 66% of episodes at baseline to 50% of episodes at 3 months ($\beta = -0.16$, $t = -5.65$, $p < .0001$; Figure 3, panel d). The percentage of episodes of unprotected sex with a *steady partner* decreased from 56% at baseline to 44% at 3 months ($\beta = -0.09$, $t = -2.77$, $p < .01$) whereas the percentage of episodes of unprotected sex with a *non-steady partner(s)* decreased from 38% to 19% ($\beta = -0.22$, $t = -7.09$, $p < .0001$). The slope from 3 to 12 months did not differ from zero for these variables.

Means and standard deviations for the **psychological antecedents of risk behavior** appear in Table 3. For all variables, scores improved from baseline to 3 months (all $ps < .01$; see Table 3 and Figure 4). For the motivational and skills outcomes, improvements were generally equivalent across conditions with no consistent pattern of intervention effects. For the knowledge measure, however, patients in the I-INFO ($M_{BL} = 67\%$; $M_3 = 78\%$; $\beta = 0.05$,

$t = 5.03, p < .0001$) and I-IMB groups ($M_{BL} = 68\%$; $M_3 = 78\%$; $\beta = 0.03, t = 3.63, p < .001$) showed a steeper improvement from baseline to 3 months compared to the CTRL group ($M_{BL} = 67\%$; $M_3 = 72\%$; see Figure 4, panel b).

Workshop attendance did not differ as a function of brief intervention: BMI = 57% and BINFO = 55%, $\chi^2(1, N = 987) = 0.38$. However, as reported previously,⁴⁵ attendance did differ as a function of patient characteristics; that is, patients who did not attend were more likely to be younger (OR = .95; 95% CI .93—.96), male (OR = 1.78; 95% CI 1.33—2.37), Caucasian (OR = 2.18; 95% CI 1.55—3.01), and employed (OR = 1.76; 95% CI 1.33—2.34). Attendance did not differ as a function of sexual risk characteristics.

Exploratory Analyses

Exploratory Analyses confirmed that response to the intervention did not vary as a function of gender, race/ethnicity, baseline sexual risk, or baseline substance use.

DISCUSSION

This RCT tested whether a unique two-step approach that combined a brief intervention with an intensive group-based intervention would reduce sexual risk behavior and incident STDs among patients seeking care at a STD clinic. Overall, four new findings were obtained.

1. Patients in all six conditions appear to have benefited. Across the intervention conditions, there was a consistent pattern of lower STD rates, reduced sexual risk behavior, and improved risk reduction knowledge, attitudes, and skills (Figures 3 and 4). This pattern of improvement was consistently observed over 12 months and across multiple outcomes; gains were observed on variables that are immune to social demand (i.e., incident STDs, knowledge). The decrease in STDs from baseline to 3 months should be interpreted cautiously, because baseline data include both new and existing infections (i.e., prevalence) whereas three month data reflect only new infections (i.e., incidence). However, because the majority of patients presented to the clinic with symptoms, it is likely that many of the STDs diagnosed at baseline were recently acquired. In addition, it is unlikely that risk behavior or knowledge gains can be so explained. Overall, the consistent pattern of results suggests that the use of well-designed, theoretically-informed behavioral interventions will help patients to reduce sexual risk behavior and avoid re-infection with a STD. Such an interpretation is also consistent with previous results from both primary-level investigations and meta-analytic integrations.^{46 19 47 48}
2. The pattern of improvement across the six intervention conditions was relatively equivalent. This finding contrasts with the prediction that intensive workshops would facilitate greater risk reduction; however, it is not unprecedented, especially when the comparison conditions are also active risk reduction interventions.^{49 51} Indeed, in this trial, every patient received at least one behavioral intervention, and the majority received two; moreover, all interventions were designed to reduce sexual risk behavior. Because the standard of care requires that all patients who are tested for HIV receive counseling, it would not have been ethical to withhold a behavioral intervention. This ethical necessity led to the use of a study design that is not optimal for demonstrating intervention effectiveness (because the differential effect of a new intervention is often small relative to the absolute amount of change observed).⁵² The equivalent improvement among conditions might also be explained, at least in part, by the fact that all patients (a) received comprehensive medical services at a progressive STD clinic and (b) completed a comprehensive baseline assessment that elicited detailed information regarding their sexual history, attitudes, motivations, and behavior. Little is known about reactivity resulting from

detailed sexual health assessments; however, research on other health behaviors indicates that detailed assessments can prompt behavior change.⁶⁴⁻⁶⁶ Thus, the detailed baseline assessment coupled with receipt of comprehensive medical services and an active comparison intervention may help to explain the equivalent pattern of improvement across conditions observed in this trial. Further research is needed to determine whether detailed sexual assessments result in behavior change. Disentangling such reactivity from true intervention effects is needed to develop realistic expectations of intervention effectiveness when implemented in contexts that do not include detailed, sexual assessments.

3. Contrary to research in the treatment of substance use,²² the BMI did not improve attendance at the intensive interventions (i.e., compared to the B-INFO intervention). This finding might indicate that the BMI we implemented was not effective; alternatively, it is possible that the practical strategies we used to encourage attendance (e.g., offering child care, telephoning participants to prompt attendance, providing food and a financial incentive for attendance) may have been so encouraging that they eclipsed the benefits of the BMI. Future research might investigate the effects of a BMI on receipt of further services without the ancillary encouragement we provided.
4. The effects observed at the initial 3-month follow-up did not appear to decay over the ensuing 9 months. Indeed, patients continued to reduce the number of partners from 3 to 12 months; moreover, we detected no significant decay on the other outcomes. The lack of decay is encouraging, and may reflect the enduring influence of the interventions. However, because patients were reassessed and re-tested for STDs for the entire study, it is also possible that these ongoing assessments prompted continued vigilance regarding risk reduction and, in this sense, served (inadvertently) as intervention booster sessions. Previous research²³ has not found this, but our data do not allow us to draw strong inferences regarding this finding.

Study Strengths and Limitations

These findings should be interpreted mindful of study strengths and limitations. Strengths include the use of a large and diverse sample; multimodal assessment using ACASI, biologic testing, and chart abstraction; a year-long follow-up; theoretically-guided interventions implemented by well-trained, culturally sensitive facilitators; and careful data analyses using an intent-to-treat approach.

The primary study limitation is the lack of a pure, no treatment control condition. However, ethical obligations require that all patients receive counseling as the standard of care. In addition, the trial was implemented at a progressive clinic where the standard of care was already quite high. A second limitation involves the use of self-report to measure risk behavior and its antecedents; self-report is vulnerable to cognitive limitations and social influence. However, use of ACASI minimizes the demands associated with interviews and problems due to low literacy.^{53, 54} Third, as noted earlier, baseline testing detected STDs over a potentially longer period (i.e., lifetime) than the follow-up window (i.e., 12 months). Fourth, recruitment was limited to persons 18 years of age and older; it is possible that inclusion of adolescents, who are more vulnerable to STDs, may have provided a more sensitive test of intervention effectiveness. Fifth, biological testing was limited to gonorrhea and chlamydia; testing for a wider range of STDs would have provided for a more sensitive test of intervention effectiveness. Finally, patients were recruited from a single clinic, so generalization to other clinics and settings cannot be assumed and should be investigated.

Suggestions for Future Research

This research suggests several directions for future investigation. First, research might evaluate the effects of detailed assessments on risk awareness and behavior change. One interpretation for the equivalent effects observed across conditions is the sensitizing effects of the baseline assessment. Previous research has demonstrated that detailed assessment of health behaviors can lead to increased risk awareness and behavior change.^{55, 56} Disentangling assessment reactivity from intervention effects is important; indeed, generalizability of prevention intervention results to contexts that do not include detailed research assessments relies upon this. This important question can be addressed with a Solomon four-group design.⁵⁷

Second, brief and intensive interventions can be improved. To optimize their feasibility and effectiveness, such interventions should target the behaviors that drive the epidemic, and be attractive to participants. In this regard, research has identified partner concurrency as an important driver of STD epidemics;^{58 59} research also indicates that some men define masculinity, in part, by a man's ability to attract multiple partners.⁶⁰ Despite findings such as these, most interventions emphasize condom use (or negotiated safety) rather than partner reduction; to our knowledge, there are no empirically-validated interventions for heterosexual males promoting partner reduction or monogamy.

Conclusions

The consistent pattern of risk reduction observed across outcome measures, patients, and intervention conditions provides evidence that behavioral interventions can strengthen patients' knowledge, motivation, and skills, reduce sexual risk behavior, and decrease the likelihood of infection with a STD. Research needs to identify the active ingredients of such interventions, and clarify the differential benefits afforded by detailed assessments, STD testing, and brief and intensive interventions. Research also needs to identify ways to further supplement the gains achieved with biomedical and behavioral interventions. Investigation of community-based programs, media campaigns, and other structural interventions is needed.

STDs in the U. S. have been referred to as a hidden epidemic.⁶¹ Yet, the morbidity resulting from HIV and other STDs as well as the escalating cost of providing care to those afflicted have been recognized by health care providers, administrators, and policy makers. Cooperation across levels of influence is needed because efforts to reduce HIV/STD incidence and morbidity need to be comprehensive and multifaceted;⁶² thus, improved access to screening and medical care, more universal access to sexual health education, candid public communications, and improved behavioral interventions should all play a role in risk reduction. Only with such a multifaceted approach can we hope to reduce the burden of HIV and other STDs in the U. S. and globally

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	Intervention Arms					
	1	2	3	4	5	6
Step 1: Brief Intervention	B-Info	B-Info	B-Info	BMI	BMI	BMI
Step 2: Intensive Intervention	Control	I-Info	I-IMB	Control	I-Info	I-IMB

BMI = Brief Motivation Intervention; B-Info = Brief Informational Intervention. Step 2

interventions: I-INFO = Intensive Informational Intervention; I-IMB = Intensive Informational,

Motivational, and Behavioral Skills Intervention.

Figure 1.

The six intervention arms formed by crossing a step 1 (brief) intervention with a step 2 (intensive) intervention.

BMI indicates brief motivational intervention; B-INFO, brief informational intervention; CTRL, no workshop; I-INFO, intensive informational workshop; I-IMB, intensive informational, motivational, and behavioral skills training workshop.

Figure 2.
Flow of Study Participants

a. STD rates

b. Number of partners reported by patients for the past three months.

c. Number of occasions of unprotected sex reported by patients for the past three months.

d. Percentage of occasions of unprotected sex reported by patients for the past three months.

Figure 3.
STD infection and Sexual Behavior Outcomes

a. Knowledge scores (% correct), averaged across conditions.

b. Knowledge scores (% correct), by intensive condition.

c. Condom Attitudes, averaged across conditions; higher scores reflect more positive attitudes toward condoms.

d. Risk Reduction Attitudes, averaged across conditions; higher scores reflect more positive attitudes towards sexual risk reduction.

e. Behavioral Intentions, averaged across conditions; higher scores reflect stronger intentions to engage in risk reduction.

f. Condom Influence Strategies, averaged across conditions; higher scores reflect more interpersonal persuasion skill.

Figure 4.
Psychological Antecedents of Sexual Risk Behavior

TABLE 1

Baseline Demographic and Sexual Behavior Variables by Intervention Condition

Characteristic	Condition							
	BMI I-Info	BMI I-IMB	BMI Control	B-Info I-Info	B-Info I-IMB	B-Info Control	B-Info I-IMB	B-Info Control
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Age (years)	30.2 (10.1)	27.6 (8.8)	28.3 (9.5)	29.4 (9.9)	28.8 (9.1)		28.8 (9.1)	30.7 (10.2)
Children (number)	1.6 (1.8)	1.4 (1.7)	1.3 (1.7)	1.7 (2.0)	1.4 (1.7)		1.4 (1.7)	1.7 (2.0)
Sexual partners (lifetime)	33.7 (36.0)	31.5 (36.2)	31.8 (33.5)	34.2 (37.1)	33.1 (35.1)		33.1 (35.1)	32.4 (35.8)
STD treatment (lifetime)	3.6 (4.4)	3.3 (4.0)	2.7 (3.3)	3.4 (4.0)	3.1 (3.5)		3.1 (3.5)	3.5 (3.9)
Alcohol Use Disorder Identifications Test (AUDIT)	6.9 (8.4)	6.8 (7.3)	7.0 (8.0)	7.3 (8.5)	6.5 (7.6)		6.5 (7.6)	6.9 (7.9)
Drug Abuse Screening Test (DAST)	1.8 (2.6)	1.9 (2.5)	1.7 (2.5)	2.1 (2.8)	1.9 (2.5)		1.9 (2.5)	2.1 (2.8)
Alcohol use (number of standard drinks per week)	7.5 (13.7)	7.8 (11.6)	8.6 (13.7)	8.5 (17.3)	7.3 (12.4)		7.3 (12.4)	8.4 (16.1)
Drug use (number drugs used) ^a	0.9 (0.9)	1.0 (1.0)	1.0 (1.0)	1.0 (1.0)	1.1 (1.1)		1.1 (1.1)	0.9 (1.0)
	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>		<i>n (%)</i>	<i>n (%)</i>
Gender (female)	120 (48)	111 (46)	105 (42)	121 (50)	125 (50)		125 (50)	106 (43)
Race (African-American)	166 (66)	158 (65)	152 (61)	159 (65)	153 (61)		153 (61)	159 (64)
Ethnicity (Hispanic)	24 (10)	26 (11)	24 (10)	20 (8)	17 (7)		17 (7)	18 (7)
Education (high school or less)	162 (65)	155 (64)	167 (67)	147 (60)	143 (57)		143 (57)	145 (59)
Unemployed	131 (52)	126 (52)	132 (53)	119 (49)	127 (51)		127 (51)	125 (50)
Income (< \$15,000 per year)	143 (57)	147 (60)	143 (58)	135 (55)	136 (54)		136 (54)	133 (54)
Marital status (% married)	17 (7)	10 (4)	15 (6)	20 (8)	17 (7)		17 (7)	19 (8)
Living status (% living with partner)	60 (24)	53 (22)	54 (22)	59 (24)	57 (23)		57 (23)	62 (25)
Sexual orientation (heterosexual)	209 (84)	214 (88)	222 (90)	216 (89)	225 (90)		225 (90)	220 (89)
Used condom at last intercourse	62 (27)	71 (30)	69 (29)	60 (26)	63 (26)		63 (26)	55 (23)
STD (diagnosed at baseline)	42 (17)	49 (20)	49 (20)	45 (18)	47 (19)		47 (19)	37 (15)
Sex trading, lifetime	56 (23)	51 (21)	43 (18)	54 (22)	55 (22)		55 (22)	61 (25)

^a past 3 months

TABLE 2
Raw Means (Standard Deviations) of Sexual Behavior Outcomes, by Intervention Condition and Assessment Occasion

Variable	Intervention Condition	Baseline <i>M (SD)</i>	3-Month Follow-up <i>M (SD)</i>	6-Month Follow-up <i>M (SD)</i>	12-Month Follow-up <i>M (SD)</i>
Sexual partners (number) ^a	BMI I-Info	2.8 (2.3)	2.1 (1.9)	2.1 (2.0)	2.0 (1.7)
	BMI I-IMB	2.7 (2.0)	2.0 (1.8)	2.0 (1.8)	2.0 (1.4)
	BMI Control	2.9 (2.3)	2.2 (1.8)	2.1 (2.0)	1.9 (1.5)
	B-Info I-Info	2.7 (2.1)	1.9 (1.8)	1.9 (1.7)	1.7 (1.3)
	B-Info I-IMB	2.8 (2.3)	2.0 (1.8)	2.1 (2.2)	1.9 (1.6)
Unprotected sex (number of episodes) ^a	B-Info Control	3.0 (2.8)	2.2 (2.1)	2.1 (1.8)	1.9 (1.5)
	BMI I-Info	15.3 (19.2)	12.1 (16.6)	11.3 (16.3)	13.1 (17.8)
	BMI I-IMB	16.7 (21.1)	12.3 (17.0)	14.4 (19.2)	15.7 (22.1)
	BMI Control	16.5 (20.1)	10.6 (15.4)	14.2 (19.9)	14.0 (19.7)
	B-Info I-Info	20.4 (24.2)	12.0 (16.6)	15.1 (20.3)	13.9 (19.6)
	B-Info I-IMB	18.6 (21.3)	12.5 (17.2)	14.1 (19.8)	15.0 (20.8)
	B-Info Control	16.4 (21.3)	10.5 (15.1)	10.6 (15.2)	11.6 (17.9)
Unprotected sex (number of episodes, steady partner) ^a	BMI I-Info	12.3 (17.9)	9.8 (13.8)	9.5 (15.2)	11.2 (16.4)
	BMI I-IMB	14.1 (20.5)	9.9 (14.7)	12.8 (18.4)	13.3 (20.0)
	BMI Control	12.7 (18.9)	8.4 (13.3)	12.6 (19.0)	11.9 (17.8)
	B-Info I-Info	16.3 (22.6)	9.7 (13.8)	12.5 (18.2)	11.6 (16.9)
	B-Info I-IMB	15.4 (20.5)	10.2 (14.6)	12.0 (18.0)	13.0 (18.5)
	B-Info Control	13.4 (20.4)	8.2 (12.5)	8.3 (13.6)	9.5 (15.5)
	BMI I-Info	2.4 (3.7)	0.9 (1.7)	1.2 (2.4)	1.0 (1.7)
Unprotected sex (number of episodes, non-steady partners) ^a	BMI I-IMB	2.5 (4.1)	1.0 (1.7)	1.1 (2.2)	1.1 (1.8)
	BMI Control	3.2 (4.9)	1.0 (1.7)	1.1 (2.2)	0.9 (1.7)
	B-Info I-Info	3.2 (4.7)	0.9 (1.6)	1.3 (2.5)	0.9 (1.7)
	B-Info I-IMB	2.9 (4.3)	0.9 (1.7)	1.3 (2.5)	0.8 (1.5)
	B-Info Control	2.8 (4.0)	0.9 (1.6)	1.4 (2.6)	1.0 (1.8)
Unprotected sex (percentage of episodes) ^a	BMI I-Info	65.3 (34.1)	51.5 (41.0)	51.4 (41.1)	56.2 (41.5)
	BMI I-IMB	63.6 (33.0)	51.0 (40.5)	57.5 (39.9)	54.3 (40.5)

Variable	Intervention Condition	Baseline	3-Month Follow-up		6-Month Follow-up		12-Month Follow-up	
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	
Unprotected sex (percentage of episodes, steady partner) ^a	BMI Control	61.5 (32.7)	44.6 (38.6)	51.9 (40.6)	54.6 (40.5)			
	B-Info I-Info	71.2 (32.8)	52.5 (40.0)	55.0 (40.4)	56.5 (40.7)			
	B-Info I-IMB	68.1 (32.4)	47.8 (39.8)	52.3 (40.8)	56.8 (40.7)			
	B-Info Control	66.4 (33.1)	51.2 (41.0)	49.5 (38.5)	53.0 (39.8)			
	BMI I-Info	54.5 (43.7)	47.3 (44.5)	45.0 (44.9)	49.8 (46.2)			
	BMI I-IMB	54.2 (43.0)	43.5 (44.5)	53.6 (44.9)	47.2 (45.7)			
	BMI Control	52.0 (42.2)	38.1 (42.7)	46.8 (45.4)	49.1 (45.0)			
	B-Info I-Info	59.6 (43.7)	47.8 (44.3)	50.6 (45.2)	52.8 (44.5)			
Unprotected sex (percentage of episodes, non-steady partner(s)) ^a	B-Info I-IMB	59.4 (42.8)	44.2 (44.0)	49.1 (45.2)	55.4 (45.0)			
	B-Info Control	53.4 (44.7)	45.8 (45.1)	43.2 (43.6)	48.8 (44.9)			
	BMI I-Info	38.9 (41.3)	19.8 (34.5)	20.7 (36.2)	21.0 (35.7)			
	BMI I-IMB	34.1 (37.0)	18.4 (32.9)	21.2 (34.6)	18.9 (32.2)			
	BMI Control	33.4 (37.3)	18.2 (30.3)	18.6 (32.7)	18.3 (31.8)			
	B-Info I-Info	41.0 (41.2)	18.1 (32.3)	21.5 (35.4)	17.9 (32.9)			
	B-Info I-IMB	36.7 (40.1)	18.2 (32.7)	19.6 (34.2)	16.3 (30.8)			
	B-Info Control	40.7 (39.1)	18.5 (32.6)	21.0 (33.6)	18.7 (32.5)			

^a past 3 months

TABLE 3
Raw Means (Standard Deviations) of Theoretical Antecedents by Condition and Across Assessment Occasions

Variable	Intervention Condition	Baseline	3-Month Follow-up	6-Month Follow-up	12-Month Follow-up
HIV Knowledge (% correct)	BMI I-Info	65.9 (19.1)	76.9 (16.5)	77.1 (16.5)	77.1 (18.2)
	BMI I-IMB	67.5 (18.0)	77.7 (15.2)	78.3 (13.6)	77.6 (15.8)
	BMI Control	66.8 (20.0)	72.1 (18.8)	72.4 (17.8)	71.9 (19.2)
	B-Info I-Info	67.3 (18.9)	78.5 (16.4)	78.5 (15.6)	78.2 (17.1)
	B-Info I-IMB	68.7 (18.7)	79.7 (13.8)	80.2 (14.8)	81.1 (14.4)
Behavioral Intentions (1-4)	B-Info Control	66.7 (20.6)	72.6 (18.9)	74.8 (18.6)	74.6 (19.2)
	BMI I-Info	3.0 (0.7)	3.0 (0.6)	3.1 (0.7)	3.1 (0.7)
	BMI I-IMB	3.0 (0.6)	3.1 (0.6)	3.1 (0.7)	3.1 (0.6)
	BMI Control	3.0 (0.7)	3.0 (0.7)	3.1 (0.7)	3.1 (0.7)
	B-Info I-Info	2.9 (0.7)	3.2 (0.7)	3.1 (0.7)	3.1 (0.7)
Condom Attitudes (1-6)	B-Info I-IMB	2.9 (0.7)	3.2 (0.6)	3.2 (0.7)	3.2 (0.7)
	B-Info Control	2.9 (0.7)	3.1 (0.7)	3.1 (0.7)	3.1 (0.7)
	BMI I-Info	4.4 (1.0)	4.5 (1.0)	4.6 (0.9)	4.6 (0.9)
	BMI I-IMB	4.5 (0.9)	4.7 (0.9)	4.7 (0.9)	4.7 (0.9)
	BMI Control	4.5 (0.9)	4.6 (0.8)	4.6 (0.9)	4.6 (0.9)
Risk Reduction Attitudes (1-6)	B-Info I-Info	4.5 (0.9)	4.6 (0.9)	4.7 (0.9)	4.6 (0.9)
	B-Info I-IMB	4.4 (0.9)	4.7 (0.9)	4.7 (0.9)	4.6 (1.0)
	B-Info Control	4.4 (1.0)	4.6 (1.0)	4.6 (1.0)	4.6 (1.0)
	BMI I-Info	4.8 (0.6)	4.9 (0.6)	4.9 (0.6)	4.9 (0.6)
	BMI I-IMB	4.7 (0.6)	4.9 (0.6)	5.0 (0.6)	5.0 (0.5)
Condom Influence Strategies (1-5)	BMI Control	4.8 (0.5)	4.9 (0.5)	4.8 (0.5)	4.9 (0.5)
	B-Info I-Info	4.8 (0.6)	5.0 (0.6)	4.9 (0.6)	4.9 (0.6)
	B-Info I-IMB	4.8 (0.6)	5.0 (0.5)	5.0 (0.6)	5.0 (0.6)
	B-Info Control	4.8 (0.6)	4.9 (0.6)	4.9 (0.6)	4.9 (0.6)
	BMI I-Info	2.4 (1.1)	2.6 (1.2)	2.5 (1.3)	2.4 (1.2)
	BMI I-IMB	2.4 (1.1)	2.7 (1.1)	2.6 (1.2)	2.7 (1.3)
	BMI Control	2.5 (1.1)	2.8 (1.2)	2.7 (1.2)	2.6 (1.2)

Variable	Intervention Condition	Baseline	3-Month Follow-up	6-Month Follow-up	12-Month Follow-up
	B-Info I-Info	2.3 (1.2)	2.6 (1.2)	2.6 (1.2)	2.4 (1.3)
	B-Info I-IMB	2.4 (1.1)	2.7 (1.2)	2.6 (1.2)	2.5 (1.2)
	B-Info Control	2.3 (1.1)	2.5 (1.2)	2.6 (1.2)	2.5 (1.2)
Self-Efficacy (steady partner) (0-10)	BMI I-Info	7.4 (1.9)	8.0 (1.6)	7.8 (1.7)	8.0 (1.6)
	BMI I-IMB	7.7 (1.8)	8.2 (1.6)	8.0 (1.9)	8.3 (1.5)
	BMI Control	7.6 (1.8)	8.1 (1.5)	7.9 (1.7)	7.9 (1.8)
	B-Info I-Info	7.5 (1.9)	7.8 (1.8)	8.1 (1.7)	8.0 (1.8)
	B-Info I-IMB	7.5 (1.9)	8.1 (1.7)	8.0 (1.8)	8.0 (1.9)
Self-Efficacy (non-steady partner) (0-10)	B-Info Control	7.4 (2.0)	7.8 (2.0)	7.8 (1.9)	7.9 (1.9)
	BMI I-Info	7.9 (1.9)	8.4 (1.6)	8.3 (1.6)	8.3 (1.6)
	BMI I-IMB	8.2 (1.7)	8.5 (1.5)	8.5 (1.6)	8.6 (1.5)
	BMI Control	8.2 (1.7)	8.4 (1.4)	8.1 (1.8)	8.2 (1.7)
	B-Info I-Info	8.1 (1.8)	8.3 (1.7)	8.4 (1.4)	8.5 (1.6)
	B-Info I-IMB	8.0 (1.7)	8.5 (1.5)	8.5 (1.5)	8.5 (1.6)
	B-Info Control	7.8 (1.9)	8.3 (1.8)	8.2 (1.7)	8.3 (1.6)