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Group-Based HIV Risk Reduction Intervention for Adolescent Girls: Evidence of Feasibility and Efficacy

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Abstract

The purposes of this pilot study were (a) to assess the feasibility of a community-based, small group HIV risk reduction intervention with adolescent girls, and (b) to obtain preliminary evidence of the efficacy of this theoretically-guided intervention using a controlled design. The feasibility of the intervention was demonstrated by successfully implementing it with 33 sexually-active, single girls. Preliminary evidence of the efficacy of the intervention was obtained using a randomized trial with 62 sexually-active, single girls. Data obtained at a 3-month follow-up assessment showed that girls who received the HIV-related intervention improved their HIV-related knowledge and enhanced their motivation for risk reduction compared to girls who received a control (health promotion) intervention. Effect sizes suggest that the HIV intervention also reduced several risk behaviors (e.g., vaginal sex without a condom, giving oral sex, and alcohol and drug use before sex). Challenges to implementation and suggestions for intervention enhancement are discussed.

Keywords

HIV prevention; adolescent girls; risk reduction; randomized controlled trial; pilot

Adolescent girls are increasingly at risk for acquiring HIV and AIDS. Recent data confirm that the overall male to female ratio of reported AIDS cases is approximately 8:1, but in adolescents the ratio is less than 3:1 (Centers for Disease Control, 2000). The majority (89%) of all heterosexually-acquired HIV infections in adolescents now occur in girls (Centers for Disease Control, 2004). Adolescent girls also have higher rates of gonorrhea and chlamydia than similarly aged males or older persons of either sex (Padian, Shiboski, Glass, & Vittinghoff, 1997). These statistics are especially relevant because sexually transmitted infections (STIs) are known to facilitate the transmission of HIV. The purpose of this study was to pilot test an HIV risk reduction intervention for this at-risk group.

In an integrative review of the adolescent HIV prevention intervention literature, 23 randomized controlled trials (RCTs) assessing behavioral outcomes were critiqued, and the summary of findings provides evidence for the efficacy of these interventions (Pedlow & Carey, 2003). These studies took place in a variety of settings including schools, health care

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facilities, and community sites. However, only four of these studies were efficacy trials that used a time- and contact-matched control condition. Several reporting or methodological limitations were summarized by Pedlow and Carey. For example, most authors did not report effect sizes, and few addressed the theoretical mediators of risk reduction. These authors also noted that some at-risk groups were not well-represented in these studies, and that the maintenance of intervention gains has not been demonstrated.

Despite the obvious threat that HIV poses to adolescent girls, only five randomized controlled trials assessing behavioral outcomes have been conducted to evaluate HIV risk reduction interventions developed specifically for adolescent girls (Mansfield, Conroy, Emans, & Woods, 1993; Orr, Langefeld, Katz, & Caine, 1996; Workman, Robinson, Cotler, & Harper, 1996; Shrier et al., 2001; Koniak-Griffin et al., 2003). Three of these studies are interventions provided to individuals. Mansfield et al. used a small, predominantly female sample ($n=90$ youth; 83 [90%] females) and found no differences 2 months after the intervention on condom use, abstinence, number of partners, or new STIs between an individual HIV education and counseling intervention and standard care control condition provided by physicians. The use of different data collection methods at the pre- and 2-month post-assessments (i.e., pre-intervention data were collected in person, and most of the post-intervention data were collected by telephone) makes the interpretation of these findings difficult. Also, because several males were included in the sample, the intervention probably was not developed specifically for adolescent females.

Orr et al. (1996) reported outcomes from a brief, individualized intervention with 209 at-risk females (14–19 years old) attending STI and family planning clinics. Participants received a 15-minute skill-based intervention or a time-matched educational control condition. The intervention included information and individualized skills training with modeling, rehearsal, and feedback of condom application and negotiation skills. Self-reported condom use increased at 6 months among those receiving the intervention, but there were no differences in rates of chlamydia at this follow-up.

Shrier and colleagues (2001) also conducted an RCT with 123 females aged 14–22 who had been diagnosed with an STI. Females were randomized to the standard care control condition or the experimental condition that consisted of a videotape and individualized counseling for condom use. Boosters were provided at 1, 3, and 6 months following the initial intervention. Girls in the standard care control group were more likely to have sex with a secondary partner at 6 months than those in the individual safer-sex intervention. Results of this study are difficult to interpret due to the lack of a time-matched control condition, low participation rate, high attrition rates, and ceiling effects on several assessment measures.

In two studies group-based (rather than individual) interventions for girls were investigated. Workman and colleagues (1996) recruited 60 seventh grade girls from a parochial school and compared an HIV risk reduction intervention to a time-matched control condition. The intervention emphasized responsible and safe sexual expression during 12 30-minute sessions. Participants in the control condition also attended 12 small-group sessions, but these focused on marriage, parenting, and other topics. At a 1-week follow-up, there were no differences between groups in HIV preventive behaviors. However, the follow-up interval was unusually brief, and probably inadequate to detect behavior change. Moreover, the authors did not establish baseline equivalence between groups, and most participants were not sexually active at baseline. These limitations raise questions about the validity of the results.

Koniak-Griffin et al. (2003) recruited 497 young, largely Latina mothers who had a steady relationship with the fathers of their babies, and compared an HIV prevention intervention to a health promotion control condition. The intervention emphasized maternal protectiveness,

sexual responsibility and accountability, and political awareness as a way to decrease sexual risk taking. Participants in the experimental group demonstrated improved HIV knowledge, stronger intentions to use condoms, and a decrease in the number of sex partners at the 6-month follow-up. These findings may be explained partially by differences between the two groups, that is, 70% of the experimental group were pregnant compared to 30% of the controls. In addition, although randomization took place at the school district level, analyses occurred at the individual level. This study does, however, provide some evidence for the efficacy of a small-group intervention for adolescent girls.

Because there is only limited (and often methodologically flawed) evidence from controlled trials to demonstrate the efficacy of a female-focused, group-based HIV risk reduction intervention for adolescent girls, we sought to pilot test such an intervention in a community setting with sexually active girls. We had two goals: first, to establish the feasibility of our intervention, and second, to obtain preliminary evidence of its efficacy. Achieving these two goals would provide a basis for larger scale projects.

It is generally agreed that HIV-prevention programs can be strengthened when guided by theory and when informed by formative research. Evidence suggests that integrating motivational approaches into behavioral skills-based HIV prevention interventions can enhance the effectiveness of such interventions (Carey et al., 1997; Carey & Lewis, 1999). In this regard, the current study was guided by the Information-Motivation-Behavioral Skills (IMB) Model (Fisher & Fisher, 1992, 2000). In their model, Fisher and Fisher specified the determinants of HIV-risk behavior and related behavioral change. They proposed that sexual risk and preventive behaviors result from information about HIV prevention and transmission, motivation to reduce risk, and behavioral skills specific to HIV prevention, and that information and motivation are partially mediated by the behavioral skills needed to influence the initiation and maintenance of HIV preventive behavior (Fisher, Fisher, Williams, & Malloy, 1994; St. Lawrence et al., 1995; Fisher, Fisher, Misovich, Kimble, & Malloy, 1996). Several correlational studies have supported this framework (Fisher et al., 1994, 1996; Fisher, Williams, Fisher, & Malloy, 1999).

An IMB-based intervention was also tested in two randomized controlled trials with adult women (Carey et al., 1997, 2000, 2004). In the 1997 study, 102 economically-disadvantaged women were randomized to either an HIV risk reduction intervention or a wait list control and were reassessed at 3 and 12 weeks post-intervention. These women increased their HIV-related knowledge and motivation to reduce risk and reduced substance use prior to having sex and unprotected vaginal sex. In the second RCT (Carey et al., 2000), 102 predominantly African-American women were randomized to an HIV risk reduction intervention or health-promotion control group. The results indicated that HIV-related knowledge and motivation were enhanced, and participants engaged in fewer risk behaviors (i.e., refused unprotected sex, increased condom use, and discussed condom use and HIV testing with partners) compared to the control participants at 3 and 12 weeks post-intervention. Carey et al. (2004) provided further evidence of the efficacy of an IMB-based risk reduction intervention with women (and men) living with a persistent and severe mental illness.

We adapted the intervention evaluated in these earlier studies to make it appropriate for adolescent girls, following recommendations for developmental tailoring (Pedlow & Carey, 2004). As an initial step in modifying this intervention, focus groups were conducted with 30 at-risk adolescent girls in order to enhance the cultural, gender, and developmental relevance of the intervention and to pilot test the measures and ascertain recruitment and retention strategies (Morrison-Beedy, Carey, Aronowitz, Mkandawire, & Dyne, 2002a,b). Community and clinical experts also were consulted regarding these issues as well as marketing of the program. In the modified intervention we employed: (a) developmentally appropriate

intervention strategies such as games, interactive group activities, and skits; (b) a variety of learning modalities (e.g., verbal, visual, experiential); (c) repeated exposure to important constructs (i.e., information, motivation, behavioral skills) in each session; (d) explicit and concrete terms and guidelines; and (e) argot, colloquial language, and mannerisms familiar to adolescent girls. Based on findings from a meta-analysis of successful adolescent HIV-prevention behavioral interventions (Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003), we included skills building in negotiating lower risk sexual encounters with partners; role-playing to increase communication with partners regarding sexual risk reduction; promoting, acquiring, and using condoms; and reducing the frequency of high-risk sexual practices.

Specifically, we planned to assess the feasibility of the intervention as well as our ability to access, recruit, and retain participants. We also sought to estimate the effect sizes from our intervention in preparation for conducting a randomized controlled trial. Although our sample size was intentionally small, we hypothesized that there would be improved (a) HIV-related information, (b) motivation to reduce risk, (c) behavioral skills, and (d) HIV-preventive behaviors among girls in the HIV risk reduction intervention compared to girls in the general health promotion control.

METHOD

Setting and Sample

Recruitment took place at an urban family planning center (Planned Parenthood of Rochester/Syracuse Region, Inc.) in central New York State that provides services (e.g., clinical, educational, social) to economically disadvantaged teens. The girls were recruited using posters in the waiting room and outreach within the clinic by trained research assistants. Participants were not restricted to patients receiving clinical services at the site but also included girls receiving educational services, those enrolled in teen support groups, and those recruited through word-of-mouth. The majority of girls ($n=129$; 80%) approached at the site consented to participate. The reasons cited most frequently for nonparticipation were: residence in distant locations (48%); job, school, or other conflict (42%); or desire to or became pregnant (9%).

The 129 unmarried girls, aged 15–19, who completed the pre-intervention survey met the following study inclusion criteria: sexually active with a male partner in the past 3 months, not pregnant and no births within the past 3 months, and able to participate in an English-language intervention. The mean age of the 62 intervention and control group participants was 17.3 years ($SD=1.4$, range 15–19), 28% were low-income (i.e., received free school-lunch program), and 53% stated they worked outside their home ($M=15.6$ hrs/wk, $SD=9.1$). Fifty-nine percent were White, 29% Black, 10% Hispanic, and 2% Asian. General risk factors included having had two or more sex partners in the past year (53%), reporting a history of STIs (15%) or previous pregnancy (21%), and having a sex partner who injected drugs (11%). These girls also reported other risk behaviors over the 3 months prior to the study, including 39% having drunk alcohol before sex and 15% having taken drugs before sex. Although anal sex was assessed, it was reported by fewer than 5% of the sample; therefore, data on anal sex are not described further.

Measures

Prior to this study the measures were refined (Morrison-Beedy et al., 2002a,b) to be developmentally appropriate and theoretically linked, and to minimize the burden on participants. The measures also were tested for readability, clarity, and ease of administration by 10 adolescent girls not a part of the current study.

Participants completed a self-administered questionnaire. The self-report measures included the following: demographics, HIV-related knowledge, motivation (risk perception, general

readiness to change sexual behaviors, behavioral intentions to reduce risk, pros and cons of condom use), behavioral skills (confidence in condom use), and risk-related behaviors (sexual risk behaviors and substance use).

Information

HIV Knowledge Questionnaire (HIVKQ)—The HIVKQ was used to assess knowledge regarding transmission and prevention of HIV (Carey, Morrison-Beedy, & Johnson, 1997). This measure contains 45 items with *true*, *false*, or *I don't know* answer options. Answers are scored as correct or incorrect; *I don't know* answer choices are scored as incorrect, and higher scores indicate greater HIV-related knowledge. Total percent correct scores were used for analysis. Factor analyses with diverse samples indicate the measure contains a single factor and ample evidence for both content and construct validity for the measure has been assembled (Carey et al., 1997). This measure has been demonstrated to have internal consistency reliability ($\alpha=.78-.93$) in samples of adolescent girls and low-income women (Carey et al., 1997; Jaworski & Carey, 2001). In this study, HIVKQ scores were internally consistent at both pre intervention ($\alpha=.90$) and 3-month follow-up ($\alpha=.89$).

Motivation

Risk perception—Participants were asked to complete five items designed to assess their general perception of HIV risk using a 6-point Likert-type scale with answer choices ranging from 0=*no risk at all* to 5=*extremely at risk*, with higher mean scores indicating greater perceived risk. Participants responded to the following types of questions: “Based on your sexual behaviors over the past year, how much do you think you are at risk for getting HIV?” and “I sometimes suspect I have been exposed to HIV.” Construct validity has been established for this scale (Morrison-Beedy, Carey, Lewis, & Aronowitz, 2001; Morrison-Beedy, Carey, & Aronowitz, 2003), and in past use it was found to be internally consistent ($\alpha=.75$; Morrison-Beedy, Carey, & Lewis, 2002). It was internally consistent in this study, with adequate levels of reliability at pre-intervention ($\alpha=.71$) and 3-month follow up ($\alpha=.77$).

Readiness to change risky behaviors—General readiness to change risky sexual behaviors was assessed by the HIV Index of Readiness Scale (HIVIR; Morrison-Beedy, 1997). The HIVIR consists of eight Likert-type items scored on a 5-point scale ranging from *strongly disagree* to *strongly agree*, with higher mean scores indicating greater motivation to change risk behaviors. Participants responded to the following type of questions: “I think that I need to change some of my sexual behaviors.” Evidence of criterion and construct validity has been established (Morrison-Beedy, 1997; Morrison-Beedy et al., 2003) as well as internal consistency ($\alpha=.87$; Morrison-Beedy et al., 2002). In this study, the measure was internally consistent at pre- ($\alpha=.79$) and post-intervention ($\alpha=.84$).

Behavioral intentions—Intention to engage in risk-reduction behaviors was assessed with a 9-item scale (Carey et al., 1997, 2000). After reading details of a high-risk situation, participants were asked to indicate how likely they would be to engage in several risk-reduction interpersonal and self-management strategies (e.g., use a condom, avoid drugs or alcohol before sex). The 5-point Likert-type responses range from 1=*definitely will not do* to 5=*definitely will do*, with higher mean scores indicating increased intentions to reduce risk. An example of these items is “I will wait to see what my partner says we should do about condoms.” Versions of this scale have been widely used in previous studies (Kalichman, Somlai, & Adair, 1996), with adequate levels of internal consistency ($\alpha=.88-.93$), and construct validity has been demonstrated (Carey et al., 1997, 2000). In this study, behavioral intention scores were internally consistent at pre- ($\alpha=.74$) and post-intervention ($\alpha=.74$).

Pros and cons of condom use—The potential advantages and disadvantages of condom use behaviors were measured by two 5-item measures of the Pros and Cons of Condom Use originally developed by Velicer and colleagues (Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995), and validated for condom use (Redding, Rossi, Velicer, & Prochaska, 1989; Prochaska et al., 1994). Women were asked to rate how important each of the items was in deciding to use condoms every time they had sex with their partner. Examples of the Likert-type scale items measured from 1=*not at all important* to 5=*very important* were: “I would be safer from disease” (Pro) and “It makes sex feel unnatural” (Con). Higher mean scores indicate higher perceived advantages (Pros) or disadvantages (Cons) for condom use. Previous work has shown these measures to be internally consistent ($\alpha=.85-.90$ for pros; $\alpha=.87-.89$ for cons; Morrison-Beedy & Lewis, 2001). Cronbach alphas for internal consistency ranged from .67–.75 (cons) to .69–.82 (pros) in this study.

Behavioral Skills

Confidence in condom use—A 5-item measure developed by Galavotti et al. (1995) was used to assess confidence in condom use. Participants were asked to rate how confident they would be using condoms every time they had sex. Each item was rated on a 5-point scale with responses ranging from 1=*not at all confident* to 5=*extremely confident*; higher mean scores indicated greater confidence for using condoms. Situations presented for condom use confidence included “When you have been using alcohol or drugs” and “When you are already using another form of birth control.” Adequate levels of internal consistency have been documented ($\alpha=.87-.88$), and construct validity has been established for this measure (Galavotti et al., 1995). Alphas for this sample were pre- ($\alpha=.82$) and post-intervention ($\alpha=.84$).

Behavior

Sexual risk behaviors—Nine items were used to record the frequency of the following behaviors over the past 3 months: unprotected and protected vaginal and anal intercourse, giving and receiving oral sex, the number of male and female sexual partners in the past 3 months, and number of times talked with partner about safer sex. These items, which have been used previously (Kalichman, Rompa, & Coley, 1996; Carey et al., 1997, 2000), were assessed using an open-ended count format and a time period matching the post-intervention follow-up to enhance memory recall.

Substance use—Previous researchers have also suggested that substance use before sex may increase the likelihood of high-risk behaviors (Gordon & Carey, 1996; Gordon, Carey, & Carey, 1997). Therefore, two items, using open-ended count format, were used to determine the number of times in the past 3 months participants had used (a) drugs or (b) alcohol before sex.

Procedures

Screening, assessments, and incentives—Once participants met initial inclusion criteria (age 15–19, unmarried) and expressed interest, they were escorted to a private area near the waiting room to be screened for full inclusion criteria. They then completed the assent process. Investigators have identified the constraint that parental consent may have on the recruitment of adolescent girls from sexual health or family planning agencies (Reddy, Fleming, & Swain, 2002). Requiring mandatory parental consent at sites providing sexual health care may undermine a girls' legally protected right to confidential reproductive health services and may place some girls at risk. Our study risk was minimal, and protection of the rights and welfare of the participants was always our team's primary concern. Thus, following approval by IRB, we obtained assent from all of the girls but not consent from their parents;

however, we strongly encouraged the girls to give their parents information forms that mirrored the assents so that they could discuss their participation with their parents. This allowed girls to participate without parental consent if they felt it would place them at risk.

The 129 girls who assented completed self-administered paper surveys in private rooms. Trained research assistants were available to assist the girls, complete tracking information, and provide them with study payment. Participants were paid \$10 for completing the survey and were randomized to groups at that time. However, participants were not told which group they were enrolled in until they attended the first intervention session. Of the 129 who completed the survey, 62 girls (48%) participated in the intervention (both HIV-prevention and control groups), 62 (100%) completed all intervention sessions, and 48 participants (78%) completed the 3-month follow-ups.

Overview of the Intervention and Control Groups

Two trained female interventionists facilitated both the HIV and control groups. The facilitators were both nurses, one was young (in her mid 20s) and African-American, and the other was older (in her mid 40s) and Caucasian. To ensure the quality and consistency of the interventions, the facilitators received standard training from the PI, used written intervention manuals (available by contacting first author), and had routine observation and feedback. Both interventions consisted of four 2-hour sessions and were implemented in small groups of 6–8 participants to provide group members sufficient time to role-play and practice other behavioral skills and receive feedback on these activities. Each session included take-home activities for participants to complete for the next session.

Sessions were held in the community education rooms at the family planning center. Groups met after school hours to: (a) facilitate the attendance of school-age participants and (b) decrease safety concerns of holding groups in the evening. Participants were paid \$15 per intervention session attended to offset travel, babysitting, and lost wages; refreshments were also provided.

HIV risk reduction intervention (IMB)—The intervention was guided by the IMB model (Fisher & Fisher, 2000) and included HIV-related information and behavioral skills components combined with motivational enhancement strategies. It was designed to (a) provide correct, current HIV-related information that is necessary to appraise risk, (b) increase motivation to change risky behaviors, and (c) provide behavioral skills training that is ultimately necessary to reduce risk. Specifically, the informational component provided current HIV-related information regarding transmission and prevention as well as consequences of infection. The motivational component focused on helping the participants understand why changing their risky behaviors was desirable and building a commitment to change. Concerns that influence sexual behavior motivation as well as motivation related to life's goals, personal and community values, and other trans-situational influences were presented.

The behavioral skills component focused on sexual assertiveness skills, improving self-efficacy and negotiating condom use or other safer sex practices with their partners, and identifying high-risk situations. It also included opportunities to prepare the girls to buy, keep, and use condoms, eroticize safer sex, and counter negative attitudes regarding condoms. Included in these sessions were opportunities for role-playing and receiving positive reinforcement and feedback from both facilitators and other participants. This was intended to modify social norms and generate other risk reduction options identified by group members. These sessions were modified from a previously developed intervention for adult women (Carey et al., 1997, 2000) so that the intervention was relevant to adolescent girls and developmentally appropriate (Morrison-Beedy et al., 2002a,b).

Health promotion control group—The comparison condition was structurally equivalent, (i.e., provided equivalent professional attention, time, and group support). Similar to the HIV risk reduction intervention, this intervention used group exercises and therapeutic processes. It was also manualized. However, the control intervention did not target sexual or HIV-related behaviors. Instead, it addressed anger management, caffeine use, and nutrition, topics not addressed in the HIV risk reduction intervention group.

Follow-Up Assessments

Data collection occurred 3 months following the last group session. Participants were reminded of the group follow-ups by telephone, mail, or email. The girls were paid \$15 to attend the follow-up assessment and complete confidential, self-administered surveys.

Data Analyses

We examined intervention effects using data from the 62 participants who assented and attended the HIV-prevention and control intervention sessions. For analyses on the 45 HIVKQ information items, we converted responses to percent correct. Raw response on each of the items from the motivation and behavioral skills measures were summed, and then divided by the number of items to provide a mean item score for each measure. Intervention effects between pre- and post-intervention assessments were analyzed using the generalized estimating equations (GEE; Liang & Zeger, 1986; McCullagh & Nelder, 1989) approach for modeling repeated measures data. GEE are appropriate for modeling count data as well as continuous and binary variables. In addition, GEE efficiently handles missing data, so that all available data can be used in data analyses. Thus, although only 48 of the 62 had completed the post-treatment assessment, data from all 62 participants were used in the analyses to provide estimates of intervention effect. Intervention differences were analyzed by performing appropriate contrasts and associated Chi-square statistics at pre-intervention and 3-month post-assessment.

Because the sample was small, effect sizes were calculated to guide future research. Effect sizes were calculated using post-treatment data¹. For the *continuous* variables (i.e., variables that can take any value), effect sizes were calculated by subtracting the control group mean from the HIV-risk reduction group mean and dividing the difference by the pooled standard deviation of the two groups. For *count* variables (i.e., variables that take on non-negative integers as 0, 1, 2, 3, ... *n*) and *binary* variables (i.e., variables that take on only the values 0 and 1), the variance depends on the mean response and cannot be estimated by pooling data from the two groups; therefore, instead of using the pooled standard deviation of the two groups, for these variables, the variance of the group mean difference was estimated using the variance functions of the respective Poisson and Bernoulli models (McCullagh & Nelder, 1989). For interpretation purposes, effect sizes of .2, .5, and .8 were defined to be small, medium, and large effects (Cohen, 1992).

RESULTS

Because not all of those who consented were able to attend the HIV-prevention or control intervention groups, we first compared those who consented and attended the intervention or control sessions (*n*=62) versus those who consented but did not attend any intervention or control sessions (*n*=67) on all demographic, risk behavior, and antecedent variables. These analyses revealed no differences between groups (based on a Type I error of .05) for the

¹For randomized trials, differences between conditions at baseline typically represent random minor sampling variability, and do not require statistical adjustment (e.g., with analyses of covariance), and effect sizes calculated with post-treatment data from randomized trials are unbiased, even in the presence of significant baseline differences (e.g. Diggle, Liang, & Zeger, 1996).

following variables: demographics (age, race, hours worked per week, risk behavior, pregnancy history, and STI history); HIV-related knowledge, motivation (risk perception, readiness to change, behavioral intentions, pros and cons of condom use); behavioral skills (confidence in condom use); and sexual risk behaviors.

Next, we compared participants who attended the HIV intervention group ($n=33$) to those who attended the control group ($n=29$) for any pre-intervention differences between groups. There were no observed differences with respect to demographics, HIV-related knowledge, or motivation. However, girls in the HIV intervention differed on behavioral skills in that they had higher levels of confidence in condom use ($M=4.0$, $SD=1.0$) than did girls in the control ($M=3.2$, $SD=1.1$) at pre-intervention ($\chi^2(1, n=62)=8.82$, $p < .01$).

The results for the pre- and post-repeated measures obtained with the GEE for antecedent and behavioral variables are reported in Tables 1 and 2. At the 3-month follow-up, the HIV group scored significantly higher than the control group on knowledge and confidence in condom use, and lower on the cons of condom use (Table 1). Note that as a significant between-group difference was observed for confidence in condom use at pre-intervention, we performed a test for group by time interaction to assess the effect of pre-intervention difference on post-intervention assessment for this variable. This interaction was not statistically significant ($\chi^2(1, n=62)=.52$, $p=.47$), indicating that post-intervention difference for confidence in condom use could have been influenced by the difference at pre-intervention.

Actual risk behavior scores within the HIV group were lower relative to the control group at 3-month post-intervention (Table 2), but none of these risk behavioral outcomes were significantly different between groups at conventional statistical levels except for “talked with partner about safer sex.” Control participants talked with partners about safer sex more often than did HIV risk reduction intervention participants.

Effect size estimates for antecedent and risk behavior outcomes are shown in Tables 1 and 2, respectively. Effect sizes ranging from $d=.26$ to $.63$ were noted on 4 of the 7 antecedent variables, with a medium effect ($d=.63$) for HIV-related information. Small effects for the HIV intervention were identified for behavioral intentions, cons of condom use, and confidence in condom use ($d=.26-.35$). Small effect sizes ($d=.26-.48$) in the predicted direction were noted for 4 of the 7 behavioral variables: vaginal sex without a condom, giving oral sex, the use of alcohol or drugs before sex. The effect size for talking with partner about safer sex was $.35$.

DISCUSSION

Results of this pilot study demonstrate the feasibility of conducting a group-based community HIV risk reduction intervention for at-risk female adolescents. Moreover, the results also indicate that several theoretically-suggested antecedents of risk behavior change were moderately improved by an IMB-guided intervention developed specifically for adolescent girls, as indicated by small effect sizes from the intervention on five of eight behavioral outcomes in the 3 months following the intervention; all but one (talked with partner about safer sex) were in the predicted direction.

A critical first step in implementing this intervention work with adolescents was accessing, recruiting, and retaining these participants. We began by identifying a site where we could access sexually active adolescent girls without stigmatization. Prior experience led us to believe that a family planning health care agency would provide access to this at risk population. This agency was well known for offering confidential health-related services for adolescent girls, and for offering social and educational support services; thus, there is no stigma associated with attendance. In our case, this setting also was located near public transportation and close to several urban schools. The majority of girls consented to participate. Of those who did not

consent, most cited work or school conflicts as their reason for refusal, not disinterest in the intervention. Many of the girls told us that using a teen friendly site in which confidentiality regarding sexual issues is stressed was a factor that motivated them to participate.

Although we succeeded in recruiting girls for our study, only 50% were able to attend the intervention and control sessions. In our efforts to facilitate the attendance of school-aged girls by offering the sessions during daytime hours, we may have inadvertently excluded girls who worked during the day. Offering both daytime and evening sessions might improve retention rates in samples of working and nonworking adolescents. However, once participants attended the initial sessions, they stayed with the program. Of the 62 girls who participated in the groups, 100% completed their sessions and rated the groups positively.

We predicted greater improvement in HIV-related information, motivation to reduce risk, behavioral skills, and HIV-preventive behaviors for the girls in the HIV risk reduction intervention compared to girls in the general health promotion intervention. Indeed, the HIV intervention did significantly increase knowledge and improve motivation, as reflected in fewer cons (negative aspects) of condom use for the intervention group than the control group at 3 months, an important antecedent of behavioral change. Behavioral intentions to reduce risk were not statistically higher in HIV prevention intervention participants than in control participants, although there was a small effect size. These modest improvements in knowledge and motivation are similar to findings from the adult intervention from which this intervention was developed (Carey et al., 1997, 2000) and from Koniak-Griffin's (2003) intervention with adolescent mothers. However, on average, both groups demonstrated a modest decline in condom use confidence at the 3-month post-intervention assessment. For the intervention group decline in condom use confidence may reflect a more realistic appraisal of the challenges of safer sex negotiation and practice following the intervention; for the control group, this finding may reflect girls' experiences following ineffective discussions with sexual partners regarding condom use. However, these interpretations will require further (qualitative) inquiry.

The HIV prevention intervention also was designed to decrease behaviors that place adolescent girls at risk for HIV. The effect sizes estimated for these outcomes were consistent with the intervention goals. Overall, small effect sizes indicate that the HIV prevention intervention group engaged in five of the eight risk behaviors less frequently than the control group, a positive outcome given the age of the participants. Our intervention also included strategies to decrease events that might precipitate unsafe sexual choices such as the use of alcohol or drugs. That the HIV risk reduction intervention group reduced substance use as an outcome, was also encouraging. Again, these decreases in risk behavior (i.e., substance use, unprotected vaginal sex) reflect findings identified in the initial intervention with adult women (Carey et al., 1997) yet not found in other interventions with adolescent girls (Mansfield et al., 1993; Orr et al., 1996; Workman et al., 1996; Shrier et al., 2001; Koniak-Griffin et al., 2003). However, the HIV risk reduction intervention participants talked less frequently with their sexual partners about safer sex than did control participant. This may reflect the fact that fewer sexual episodes occurred in the intervention group, and thus fewer chances for discussion, or it may be that the HIV risk reduction intervention participants more effectively discussed these issues with their partners thereby decreasing the need to repeat such discussions. Future studies with larger samples should help to clarify the intervention's effect on these risk behaviors.

A major limitation of this pilot study is the small sample and the limited power to detect differences between groups on most variables. However, the effect sizes observed for the antecedent and behavioral outcomes are encouraging. A second limitation involved the attrition rates observed; that is, of the 129 girls recruited, 62 attended the HIV and control intervention groups, and 48 attended the 3-month post-intervention session. Attrition in part reflected many participants' relocation, and our inability to track them. In future research, we plan to develop

a more resilient tracking system that includes multiple forms of participant contact. Similarly, our pilot was conducted during after-school hours, and many interested girls could not attend because of work-related conflicts; offering interventions sessions at varied times might have increased our participation rate, albeit at the expense of reducing feasibility by increasing the cost of the intervention.

A third limitation involved our reliance upon self-reported data. Self-report can be vulnerable to socially desirable response set, but we sought to reduce this by not requiring parental consent and stressing the confidential nature of the assessment. The diverse and frequent risk behaviors reported by the participants suggested that we were at least partially successful in our efforts to reduce biased reporting. Another challenge to sexual health research with adolescents is the relatively infrequent nature of the behaviors studied; such data can present difficulties during data analyses (Schroder, Carey, & Venable, 2003). Future longitudinal work will provide an extended period of time for opportunities for sexual behavior to occur. Assessing the number of sexual partners (both steady and secondary) in future work also will broaden our understanding of the impact of this intervention, as significant improvements in this outcome were noted by Koniak-Griffin et al. (2003) and Shrier et al. (2001) in their interventions.

The encouraging findings from this pilot study coupled with the limited number of HIV risk reduction interventions tested in this at-risk population suggest that further evaluation with a larger sample is warranted. Future research also should include longer follow-up to assess the stability of behavioral change over time. Incorporating other ways to supplement the written self-report data, such as biological measures, can be considered. We conclude that small group, HIV risk reduction interventions, when guided by theory and offered in trusted community settings, have considerable promise for at-risk adolescent girls; such interventions must be studied further, and refined, to help reduce rates of HIV and other STIs in this vulnerable population.

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Table 1

Pre- and Post-Intervention for Antecedent Variables, Means, Standard Deviations (SD), and Effect Sizes^a Between HIV Intervention (*n*=33) and Control (*n*=29) Groups

	Pre-Intervention	3 Months Post-Intervention	
	Mean (SD)	Mean (SD)	Effect Size
Information			
Knowledge			
HIV	.75 (.18)	.91 (.10)	.63
Control	.74 (.15)	.77 (.12)	
Chi-square (<i>p</i> -value) ^b	.06 (.80)	10.23 (<.001)	
Motivation			
Risk perception			
HIV	.81 (.67)	.98 (.64)	.08
Control	.95 (.89)	.87 (.66)	
Chi-square (<i>p</i> -value)	.48 (.49)	.27 (.60)	
Readiness			
HIV	3.49 (.72)	3.28 (.86)	.01
Control	3.48 (.90)	3.30 (.56)	
Chi-square (<i>p</i> -value)	.01 (.93)	.01 (.93)	
Behavioral intentions			
HIV	4.21 (.65)	4.39 (.57)	.26
Control	3.90 (.81)	4.04 (.77)	
Chi-square (<i>p</i> -value)	2.75 (.10)	2.92 (.09)	
Pros of condom use			
HIV	4.61 (.50)	4.54 (.54)	.01
Control	4.48 (.62)	4.55 (.46)	
Chi-square (<i>p</i> -value)	.91 (.34)	.01 (.94)	
Cons of condom use			
HIV	1.73 (.77)	1.59 (.52)	.35
Control	1.87 (.76)	2.09 (.86)	
Chi-square (<i>p</i> -value)	.50 (.48)	4.58 (.03)	
Behavioral skills			
Confidence			
HIV	4.01 (1.0)	3.71 (1.11)	.32
Control	3.17 (1.1)	3.03 (1.02)	
Chi-square (<i>p</i> -value)	8.82 (<.01)	4.24 (.04)	

^aEffect size estimates for post-intervention assessments calculated using GEE analyses: .2=small, .5=medium, and .8=large.

^bChi-square statistics for testing equal mean differences between HIV and control groups within pre- and post-intervention (3 months follow-up) based on GEE analyses.

Table 2

Pre- and Post-Intervention for Sexual Behavior Variables Means^a and Effect Sizes^b Between HIV Intervention (*n*=33) and Control (*n*=29) Groups

	Pre-Intervention	3-Months Post-Intervention	
	Mean	Mean	Effect Size
Vaginal sex with condom			
HIV	5.8	6.3	.16
Control	8.1	13.2	
Chi-square (<i>p</i> -value) ^c	.61 (.43)	.44 (.50)	
Vaginal sex without condom			
HIV	5.4	4.3	.26
Control	7.6	6.0	
Chi-square (<i>p</i> -value)	.35 (.55)	.79 (.38)	
Received oral sex			
HIV	5.2	5.8	.04
Control	8.1	6.3	
Chi-Square (<i>p</i> -value)	.92 (.34)	.01 (.91)	
Gave oral sex			
HIV	2.9	2.4	.41
Control	5.6	8.8	
Chi-square (<i>p</i> -value)	1.22 (.27)	1.74 (.19)	
Alcohol use before sex			
HIV	1.3	1.1	.48
Control	2.3	4.0	
Chi-square (<i>p</i> -value)	1.19 (.28)	2.50 (.11)	
Drug use before sex			
Intervention	.6	.4	.29
Control	.2	.9	
Chi-square (<i>p</i> -value)	1.06 (.30)	.65 (.42)	
Male sex partners			
HIV	1.5	1.3	.11
Control	2.0	1.6	
Chi-square (<i>p</i> -value)	2.27 (.13)	.55 (.46)	
Talked w/partner about safer sex			
HIV	2.5	1.9	.35
Control	3.1	4.5	
Chi-square (<i>p</i> -value)	.25 (.61)	4.15 (.04)	

^a Poisson distribution was used to model means, as data on sexual behavior outcome variables was reported in terms of counts (number of times) and with this model, the standard deviation estimate is equal to the mean.

^b effect size estimates for post-intervention assessments calculated based on GEE analyses: .2= small, .5=medium, and .8=large.

^c Chi-square statistics for testing equal mean differences between HIV and control groups within pre- and post-intervention (3 months follow-up) based on GEE analyses.