

PRELIMINARY EFFICACY OF A COMPUTER-DELIVERED HIV PREVENTION INTERVENTION FOR AFRICAN AMERICAN TEENAGE FEMALES

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This study translated SiHLE (Sisters Informing, Healing, Living, and Empowering), a 12-hour Centers for Disease Control and Prevention evidence-based group-level intervention for African American females 14-18 years of age, into a 2-hour computer-delivered individual-level intervention. A randomized controlled trial ($n = 178$) was conducted to examine the efficacy of the new Multimedia SiHLE intervention. Average condom-protected sex acts (proportion of vaginal sex acts with condoms, last 90 days) for sexually active participants receiving Multimedia SiHLE rose from $M = 51\%$ at baseline to $M = 71\%$ at 3-month follow-up ($t = 2.06, p = .05$); no statistically significant difference was found in the control group. Non-sexually active intervention group participants reported a significant increase in condom self-efficacy ($t = 2.36, p = .02$); no statistically significant difference was found in the control group. The study provides preliminary support for the efficacy of a computer-delivered adaptation of a proven HIV prevention program for African American teenage women. This is consistent with meta-analyses that have shown that computer-delivered interventions, which can often be disseminated at lower per-capita cost than human-delivered interventions, can influence HIV risk behaviors in positive fashion.

African American women have been disproportionately affected by HIV/AIDS since the beginning of the epidemic. Over half (56%) of women living with HIV/AIDS in the United States are African American, and in 2006 the rate of new HIV infection for Black women was nearly 15 times as high as that of white women and nearly 4 times that of Hispanic/Latina women (Centers for Disease Control and Prevention [CDC], 2011b). Currently, HIV disease is the fourth-leading cause of death

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of African American women aged 25-34, most of whom likely contracted HIV as adolescents (CDC, 2011c).

In response to the impact of the HIV/AIDS epidemic on African American women and other heavily affected communities, researchers and practitioners have developed nearly 70 interventions that have been scientifically demonstrated to be effective in reducing HIV risk-related behaviors (CDC, 2009). Several of these CDC-defined evidence-based programs specifically target African American women, including Wingood and DiClemente's popular suite of group level interventions for adult (SISTA), HIV+ (WILLOW) and teenage (SiHLE—Sisters Informing, Healing, Living and Empowering) women (DiClemente & Wingood, 1995; DiClemente, Wingood, & Harrington, 2004; Wingood & DiClemente, 1998; Wingood & DiClemente, 2006; Wingood et al., 2004). These efficacious and culturally appropriate programs are enhanced by the existence of user-friendly replication kits (CDC, 2008) and trainings through the CDC's Diffusion of Evidence-based Interventions (DEBI) initiative (CDC, 2011a, Collins, Harshbarger, Sawyer, & Hamdallah, 2006). Despite these resources, the widespread implementation of evidence-based HIV prevention interventions—and the ensuing potential reductions in risk behaviors and HIV infections—has been impeded owing to financial constraints, staff and agency capacity, poor implementation fidelity, and recruitment and retention issues (Bell et al., 2007; Dworkin, Pinto, Hunter, Rapkin, & Remien, 2008; Harshbarger, Simmons, Coelho, Sloop, & Collins, 2006; Norton, Amico, Cornman, Fisher, & Fisher, 2009; Rotheram-Borus, Swendeman, & Chovnick, 2009).

Recent advances in information technology have enabled the development of a new wave of computer-delivered HIV prevention and sexual health interventions that variously combine interactive media elements such as websites, multimedia presentations, animations, audio and video clips, games and social networking applications (Downs et al., 2004; Ito, Kalyanaraman, Ford, Brown, & Miller, 2008; Noar, 2008; Swendeman & Rotheram-Borus, 2010; Tortolero et al., 2010; UNAIDS, 2010). Several of these interventions have demonstrated efficacy in reducing HIV risk behaviors among African American young women. In 2007, Lightfoot, Comulada and Stover conducted a three-arm trial (computer intervention, face-to-face group, and control) of a computer-delivered intervention for youth aged 14–18. At 3-month follow-up, students who received the computer intervention were significantly less likely to engage in sexual activity ($t = 2.43$, $p = .02$) compared with those in the small-group condition, and participants in the computer based ($t = 2.67$; $p < .01$) and small-group ($t = 2.15$, $p = .03$) conditions had fewer sexual partners than did those in the control condition. In 2009, Grimley and Hook tested a computer-delivered intervention with primarily African American sexually transmitted infection (STI) clinic patients and at a 6-month follow-up found more consistent condom use and lower STI incidence (32% consistent condom use for participants in the computer-delivered intervention vs 23% for participants in the control arm; $p = 0.03$). Most recently, Wingood, Card and associates (Card et al., 2011; Wingood et al., 2011) conducted a randomized controlled trial of SAHARA, a 2-hour computer-delivered adaptation of the CDC-DEBI evidence-based SISTA program, and found that women in the intervention arm (computer-delivered intervention plus a 20-minute small-group discussion) reported a significantly higher percentage of condom protected sex acts (intervention = 85.3%; $SD = 10.1$) than those in the control arm (control = 52.8%; $SD = 9.5$, $p = .03$) and were more likely to use condoms consistently for vaginal (odds ratio [OR] = 5.9; $P < .039$) and oral sex (OR = 13.83; $p < .037$) compared to women in a general health information control condition.

These studies, as well as a comprehensive 2009 meta-analysis by Noar, Black, and Pierce, suggest that computer-delivered interventions have the potential to be at least as effective as human-delivered interventions in influencing HIV risk behaviors. In addition, computer-delivered interventions can often be disseminated and implemented more easily than face-to-face programs, as they:

- **Decrease program costs:** Once a computer-delivered HIV prevention intervention is developed, delivery expenses are relatively low as less training, preparation and staff time are required than in human-delivered interventions (Downs et al., 2004; Wienhardt, Mosack, & Swain, 2007).
- **Increase program fidelity:** Content and administration remain the same every time an effective computer-delivered intervention is delivered, in contrast to the frequent delivery variations in human-delivered interventions that may jeopardize the positive outcomes associated with the original evidence-based programs (Bell et al., 2007; Norton et al., 2009; Rotheram-Borus, Swendeman, & Chonnick, 2009).
- **Facilitate the exploration of sensitive topics:** Research has shown that people are often more comfortable interacting with a computer than with other people when considering sensitive topics (Di Noia, Schinke, & Pena, 2004), and computer-delivered programs permit users to practice communication and refusal skills with little or no embarrassment (Castro, Barrera, & Martinez, 2004; Evans, Edmundsen-Drane, & Harris, 2006).
- **Reach low literacy populations:** Audio and graphics components can reach individuals with limited literacy skills (Fotheringham, Wonnacott, & Owen, 2000; Weinhardt, Mosack, & Swain, 2007).
- **Support diverse delivery modalities:** Computer-delivered interventions can be delivered through multiple technologies including desktop and laptop computers, cell phones, portable media players (e.g., iPOD), and tablet computer players (e.g., iPAD), enabling participants to access interventions at the most convenient times and locations (Swendeman & Rotheram-Borus, 2010).

The current study translated SiHLE (Sisters Informing Healing Living and Empowering), a four-session CDC-DEBI group-level HIV prevention intervention for teenage African American females aged 14-18, into a 2-hour computer-delivered individual intervention called Multimedia SiHLE. The objective of this study was to evaluate the preliminary efficacy of Multimedia SiHLE in enhancing HIV-protective sexual behaviors and psychosocial outcomes among these young women over a 3-month follow-up period.

METHODS

PARTICIPANTS

African American females, aged 14-18, who lived in the San Francisco Bay Area were eligible to participate in the study. Both sexually initiated and non-sexually initiated young women were included in the study, because both groups are typically present in programs working with African American teenage females. Nichols Research, a contracted market research firm, led recruitment efforts under the supervision of the project's principal investigator. Recruitment strategies included e-mails to likely participants from Nichols Research's extensive database, ads on Craigslist

and Nichols's Facebook and Twitter accounts, flyers at schools, and referrals from contacted individuals. The recruitment team spoke with approximately 275 young African American women, of whom 178 completed assent and parental consent forms and were enrolled in the study. Most came from Alameda and Contra Costa counties, with the remainder from Solano and Santa Clara counties. Enrolled participants received a \$50 gift card for completing the first session and \$25 in cash for completing the follow-up survey.

STUDY DESIGN

The study used a randomized controlled trial design. Prior to recruitment and data collection, Sociometrics' full institutional review board approved the outcome study. Upon meeting eligibility criteria, participants were alternately assigned to either (a) the 2-hour computer-delivered Multimedia SiHLE HIV prevention intervention or (b) a 65-minute general health education session (the "control group") consisting of two computer-delivered videos on diet and nutrition. The study's main hypothesis was that, relative to the control condition, the Multimedia SiHLE condition would promote condom protected sex acts (a higher percentage of condom use during vaginal sex acts) among sexually active participants in the 3 months following the intervention. It was also hypothesized that, relative to the control condition, the Multimedia SiHLE condition would promote condom self-efficacy among study participants who were not yet sexually active.

INTERVENTION METHODS

SiHLE is a social skills intervention aimed at reducing HIV sexual risk behaviors among African American teenage females aged 14-18. The intervention is based on social cognitive theory (Bandura, 1994) and the theory of gender and power (Wingood & DiClemente, 2000) and consists of four 3-hour group sessions delivered in community-based settings. One adult and two peer health educators (aged 18-21) facilitate program delivery. The four sessions build HIV risk reduction knowledge and seek to enhance communication, condom use, and relationship skills through behavioral skills practice, group discussions, lectures, role-playing and take-home exercises. SiHLE is included in CDC's DEBI library and Sociometrics' Program Archive on Sexuality Health and Adolescence (PASHA) (Card, Lessard, & Benner, 2007).

With funding from the National Institute of Mental Health, Sociometrics translated SiHLE into a multimedia software program delivered through two 1-hour computer sessions directly to African American female teens aged 14-18. Multimedia SiHLE covers all of the original SiHLE intervention's core elements yet takes only one sixth the time to deliver. Session 1 centers on enhancing ethnic and gender pride, personal values development, HIV/AIDS and STI transmission and epidemiology, HIV risk factors prevalent among African American teenage females, partner selection, and risk reduction strategies. Session 2 focuses on communication skills, sexual decisionmaking, correct and consistent condom use, and healthy versus unhealthy relationships. Each session is broken into smaller modules that require 2-8 minutes to complete. All modules include full narration and at least one video segment, with participants controlling pacing through pause and play buttons. Two teenage female health educators narrate Multimedia SiHLE, and videos of young female friends simulate the small group discussions and modeling exercises of the original intervention. Games, quizzes, and simulated role-plays further facilitate learning and skills

development. Table 1 provides the contents for the final version of Multimedia SiHLE and a short description of each module.

For the outcome study, Multimedia SiHLE's two 1-hour-long sessions were administered in one sitting at research facilities in Fremont (Alameda County), Concord (Contra Costa County), and Sunnyvale (Santa Clara County). Participants were offered a break between the two sessions. Each participant had access to a separate laptop computer with headphones, and dividers were placed between each workstation to maximize privacy. Participants returned to one of the three research facilities to complete the 3-month postintervention survey.

Participants in the control condition completed a 65-minute-long general health education session consisting of two computer-delivered videos on diet and nutrition—*Fat Like Me: How to Win the Weight War* (ABC News, 2003, 40 minutes) and *Portion Size Me, Too! How to Make Healthy Fast-Food Choices* (Grant & Thomas, 2006, 25 minutes). Each participant had access to a separate laptop computer with headphones to watch the videos. Participants returned to one of the three research facilities to complete the 3-month postintervention survey.

MEASURES

Data collection occurred at baseline and at a 3-month follow-up via pen and paper. The two instruments were identical and assessed sociodemographic characteristics, past sexual behaviors, HIV knowledge, condom use self-efficacy, sexual communication self-efficacy, sexual communication frequency, contraceptive use, and sexual behaviors in the past 3 months. Participants also completed a user satisfaction questionnaire immediately after viewing the control videos or Multimedia SiHLE. Unique codes, rather than names, were used on all surveys to protect participant confidentiality.

User Satisfaction Questionnaire. The user satisfaction instrument had seven questions addressing participants' impressions of Multimedia SiHLE or the control condition videos in seven domains: enjoyableness, ease of understanding, interest, attractiveness, importance, usefulness, and informativeness. The items were scored on a 1-5 Likert-type scale, with higher scores indicating greater satisfaction with the product. Each item was preceded by the stem "Please tell us how you felt about what you viewed today by rating the materials on the following items."

Psychosocial Outcomes. All measures were adapted from scales previously developed and validated for young African American women by the original program developers (DiClemente et al., 2004; DiClemente & Wingood, 1995; Wingood et al., 2004; Wingood & DiClemente, 1998). The HIV knowledge scale ($\alpha = .62$) contained nine true/false items. Higher scale scores indicate greater HIV knowledge. An example from the knowledge scale is "Having an STD increases a person's risk of getting HIV." The condom use self-efficacy scale ($\alpha = .90$) contained eight items, with responses ranging from 1 (a lot) to 5 (none). Higher scores indicate greater self-efficacy in using condoms correctly. An example of a condom use self-efficacy item is "How much of a problem would it be for you to take a condom off before your partner loses his erection?" Two sexual communication self-efficacy scales (five items for each partner type) assessed participants' comfort in discussing sexual topics with new sexual partners ($\alpha = .73$) and boyfriends/steady sexual partners ($\alpha = .78$). The items were scored on a 4-point Likert-type scale (1 = very hard, 2 = hard, 3 = easy, 4 = very easy). Higher partner communication scale scores indicated

greater perceived self-efficacy in communication with partners on sexual topics. An example of an item from this scale is "How hard is it for you to ask how many sex partners he has had?" Finally, a sexual communication frequency scale ($\alpha = .81$) addressed sexually active participants' actual communication with partners on sexual topics. The items were scored on a 4-point scale (0 = never, 1 = 1-3 times, 2 = 4-6 times, 3 = 7 or more times). Higher scores indicate more frequent communication with partners on sexual health issues.

Behavioral Outcomes. The primary behavioral outcome was percentage of condom protected vaginal intercourse acts in the 3 months postintervention. Participants were first asked, "About how many times did you have vaginal sex in the last three months?" Responses to this question served as the denominator in calculating the percentage of condom protected vaginal intercourse acts. Participants were then asked, "About how many of the times you had vaginal sex in the last 3 months did you use a condom?" Responses to this question served as the numerator in calculating the proportion of condom protected vaginal sex acts.

STATISTICAL ANALYSES

At baseline, descriptive statistics were calculated for sociodemographic characteristics, psychosocial variables and sexual behaviors. Scale reliability (internal consistency) was measured using Cronbach's alpha. Differences were assessed using independent sample *t* tests for continuous variables and chi-square analyses for categorical variables. Outcomes at 3-month postintervention were examined using paired *t* tests for continuous variables and chi-square analyses for categorical variables. Analyses were also made on subsamples of sexually initiated and non-sexually initiated participants.

RESULTS

In total, 178 young African American women provided assent and parental consent and enrolled in the study. Ninety-one participants (51.1%) were randomly assigned to the computer-delivered HIV prevention condition, and 87 (48.9%) to the diet and nutrition control condition. Of the 91 participants in the intervention arm, 83 (91.2%) completed the 3-month follow-up assessment. Of the 87 participants in the control arm, 79 (90.8%) completed the 3-month follow-up assessment.

At baseline, participants were on average 15.8 years of age, with a range of 14 to 19. Ninety-four percent were currently full-time students, 1.1% were part-time students, and 4.5% were not enrolled in school. Approximately 8% of participants had at some time dropped out or been expelled from school. Nearly all (98.3%) were single and lived mostly with their mother (53.4%), their father and mother (29.8%), another relative (7.3%), their father (5.1%) or in another living situation (4.5%). About 30% lived with someone on welfare, and 15.7% had a job, with the majority working less than 10 hours per week. A little over half of participants reported ever having sex (52.2%), 7.9% ever being pregnant, 3.4% ever having an STI, and 1.7% having living children. Among participants who reported having had sex ($n = 93$), 41.6% reported using birth control the last time they had sex. When asked to identify what type of contraception they had used most often in the past 6 months, the three most common methods listed were condoms (42.1%), birth control pills (13.7%), and Depo-Provera (8.4%); 22.1% indicated "none" as their most common

TABLE 1. SiHLE Activities in (Original) Group and (New) Multimedia Formats

Original Four-Session Group Health-Educator-Delivered SiHLE	New Two-Session Individual Computer-Delivered Multimedia SiHLE
<p>Session 1: My Sistas...My Girls</p> <p>Welcome, introductions, motto, and ground rules</p> <p>Discussion of positive aspects of being an African American young woman and role models</p> <p>Readings from African American poetry</p> <p>Introduction to African American culture through art (painting, music, crafts, jewelry)</p> <p>Personal values clarification activity/exploration of impact of personal values on future goals.</p> <p>Session 2: It's My Body</p> <p>Welcome, introductions, motto</p> <p>Discussion of influence of personal values on pictograph activity</p> <p>Impact of contracting an STI, discussion of how STI spread</p> <p>Introduction to HIV/AIDS, including myths and facts. Levels of risk.</p> <p>Introduction to lowering risk by using condoms, choosing less risky activities or being abstinent</p> <p>Introduction of condom application and acronym "OPRaH" (Open, Pinch, Roll, and Hold)</p> <p>Jeopardy game to review and reinforce STI knowledge</p>	<p>Session 1: SiHLE Sistas</p> <p>Narrated introduction, poetry reading, video clips introducing Sistas and computer tutorial on how to use the program.</p> <p>Presentation of positive aspects of being an African American woman and videos of Sistas discussing their role models</p> <p>[See above]</p> <p>Values clarification overview, "click and drag" values prioritization activity, and thought questions (screen freezes so user can think about answers)</p> <p>Video clips of Sistas discussing their personal values</p> <p>Presentation of STI facts in text, icons, and audio followed by interactive STI roulette game</p> <p>Presentation of HIV/AIDS transmission information via text and audio; interactive quiz with feedback reinforces responses</p> <p>HIV/STI risk reduction: Douching, Jeopardy game, media influences discussion, and video clips of Sistas stating how they lower their HIV/STI risk</p> <p>Discussion of dating followed by boyfriend and prom date selection games</p> <p>Presentation of AMOUR five-step risk reduction model—Abstinence, Masturbation, Oral sex, Uninfected partners, Regular condom use</p> <p>[Information covered in Session 2]</p> <p>[Information covered in STI roulette game above]</p>

Session 3: Communication...and Condom Skills

Greeting, icebreaker and motto
 Readings from African American poetry
 Review of STI facts, levels of risk, and risk activities
 Passive, aggressive and assertive communication styles; role-plays to practice assertive communication. Role-play scenarios to reinforce.
 Demonstration of steps for condom application. Do's and don'ts of condom use.
 Discussion and demonstration of the effects of alcohol on judgment and body functions.

Session 4: Relationships and Power

Greeting, icebreaker and motto
 Examination of characteristics of healthy and unhealthy relationships, including abuse (power and control imbalances)
 Breaking up with an abusive partner, including early warning signs of violence and seeking help
 Presentation of information about community resources for students in unhealthy relationships

Review of material covered in sessions 1-4
 Graduation ceremony

Session 2: Communication, Condoms, and Relationships

Welcome and Session 2 overview.
 Poetry reading in Session 1.
 [Information covered in Session 1].
 Examples of communication styles presented in text, images and audio format and role-play thought questions.
 Presentation and video clips of five step AMOUR assertive communication model for negotiating safer sex followed by Excuses and Comeback game.
 Video demonstration and review of how to use male condom - "OPRaH" (Open, Pinch, Roll, and Hold) acronym. Video demonstration and review of how to use female condom - RING (Remove, Insert, Now twist, Get a Tissue) acronym. Presentation of lubricants in text, image and audio.
 Narration of effects of alcohol followed by video of Sistas spinning one Sista in a chair and then having her attempt to apply a condom to a penis model.
 Ask Sista Shamika - video clips of Sistas giving their advice in response to two scenarios about condom use, alcohol, and relationships.
 Examination of characteristics of healthy and unhealthy relationships via text, pictures, and audio followed by interactive knowledge-based game on healthy/unhealthy relationships
 Presentation of behaviors to be aware of, warning signs of dating violence and ways to seek help via text, pictures, and audio
 Presentation of information about community resources for students in unhealthy relationships
 Discussion of qualities of healthy relationships via text, pictures and audio
 Overview of topics covered. User can select topic to repeat specific activities from Session 1 or Session 2.

Note. STI = sexually transmitted infection.

contraceptive practice. There were no statistically significant differences observed at baseline for sociodemographic characteristics, psychosocial variables, contraceptive practices, or sexual behaviors between the control and intervention conditions.

Overall satisfaction with the intervention and control sessions was assessed using a 5-point Likert scale (1 = least favorable, 5 = most favorable). Participants rated the computer-delivered intervention more favorably than the control condition videos in terms of all seven satisfaction categories, including usefulness (4.86 vs. 4.46, $p < .001$), importance (4.81 vs. 4.47, $p = .03$), interest (4.24 vs. 3.74, $p = .001$), enjoyment (4.06 vs. 3.45, $p < .001$), and attractiveness (4.36 vs. 3.20, $p = .01$).

Average percentage condom use for participants in the computer-delivered HIV prevention intervention rose from $M = 51\%$ at baseline to $M = 71\%$ at 3-month follow-up, $t(20) = 2.06$, $p = .05$; 95% confidence interval (CI): .00, .40. There was no significant change in percentage condom use for vaginal sex among control group participants. In addition, HIV/STI knowledge among participants in the intervention group rose from $M = 5.08$ at baseline to $M = 6.81$ at 3-month follow-up (9-point scale), $t(82) = 8.58$, $p < .001$, 95% CI: 1.32, 2.12, and non-sexually active participants in the intervention group reported an increase in condom self-efficacy from $M = 22.64$ at baseline to $M = 25.86$ at 3-month follow-up (40-point scale), $t(35) = 2.36$, $p = .02$, 95% CI: 0.45, 6.00.

Participants in the control group also demonstrated a significant increase in HIV/STI knowledge from $M = 5.29$ at baseline to $M = 5.86$ at 3-month follow-up, $t(75) = 2.93$, $p < .01$, 95% CI: 0.18, 0.95. However, their 3-month follow-up knowledge scores were lower than those of Multimedia SiHLE participants ($M = 5.86$ [control] vs. $M = 6.81$ [Multimedia SiHLE], $t(157) = 3.11$, $p < .01$), and they did not achieve significant changes in condom self-efficacy.

Neither the intervention nor control groups reported significant differences at 3-month postintervention on (a) the two sexual communication self-efficacy scales, (b) the sexual communication frequency scale, or (c) the number of baseline virgins who reported becoming sexually active in the 3 months postintervention (three participants from the control condition and two participants from the SiHLE condition became sexually initiated during the 3-month intervention period). A more detailed presentation of the outcome data is provided in Table 2.

DISCUSSION

This study provides preliminary support for the efficacy of a computer-delivered adaptation of an evidence-based group level HIV prevention intervention for young African American women aged 14-18. Participants receiving the computer-delivered intervention demonstrated an increase in HIV/STI knowledge, the number of times condoms were used for vaginal sex, and the percentage of condom use during vaginal sex acts. The finding of significantly increased percentage of condom use during vaginal sex acts is particularly noteworthy given the relative brevity (2 hours) of the computer-delivered intervention and the small sample size. Non-sexually initiated participants in the computer-delivered intervention also significantly increased their condom self-efficacy, suggesting that they may be more likely to use condoms when they become sexually active.

Study limitations include a short follow-up period and reliance on self-reported data. A longer follow-up period (e.g., 12-24 months) would permit the detection of delayed sexual debut among participants receiving the computer-delivered HIV pre-

TABLE 2. Outcome Study Data Summary

	Multimedia SiHLE													
	<i>n</i>	Base M	3-mth M	Δ^a	<i>t</i> (<i>df</i>)	95% CI	<i>p</i> Value	<i>n</i>	Base M	3-mth M	Δ^a	<i>t</i> (<i>df</i>)	95% CI	<i>p</i> Value
Mediators														
Knowledge Scale (out of 9)	83	5.08	6.81	+1.72 (19%)	8.58 (82)	(1.32, 2.12)	<.001	76	5.29	5.86	+0.57 (6%)	2.93 (75)	(0.18, 0.95)	< 0.01
Condom Use Self-Efficacy Scale (out of 40)—All Participants	79	27.39	28.84	+1.44 (4%)	1.62 (78)	(-0.33, 3.22)	.11	79	26.01	27.30	+1.29 (3%)	1.72 (78)	(-0.20, 2.78)	.09
Condom Use Self-Efficacy (out of 40)—Non-sexually initiated	36	22.64	25.86	+3.22 (8%)	2.36 (35)	(0.45, 6.00)	.02	40	25.48	25.25	-0.23 (-1%)	-0.28 (39)	(-1.85, 1.40)	.78
Sexual Communication Self-Efficacy Scale (out of 20) – New Partners	83	17.06	17.33	+0.27 (1%)	.84 (82)	(-0.37, 0.90)	.41	78	17.24	17.37	+0.13 (1%)	0.53 (77)	(-0.35, 0.60)	.60
Sexual Communication Self-Efficacy Scale (out of 20) – Steady Partners	83	17.45	17.82	+0.37 (2%)	1.31 (82)	(-0.20, 0.94)	.20	78	17.33	17.69	+0.36 (2%)	1.35 (77)	(-0.17, 0.89)	.18
Behaviors														
Sexual Communication with Partners (out of 12) (sexually initiated only)	38	5.55	5.08	-0.47 (-4%)	-0.72 (37)	(-1.81, 0.87)	.48	37	4.95	5.36	+0.41 (3%)	0.73 (36)	(-0.72, 1.53)	.47
Number of Vaginal Sex Acts Last 90 Days (sexually initiated only)	43	7.33	8.51	+1.18	0.81 (42)	(-1.78, 4.12)	.43	39	7.90	7.67	-0.23	-0.12 (38)	(-4.11, 3.65)	.91
Number of Vaginal Sex Acts with Condoms Last 90 Days (sexually initiated only)	43	2.67	5.53	+2.86	2.01 (42)	(.02, 5.71)	.05	39	4.79	4.67	-0.13	-0.07 (38)	(-4.02, 3.76)	.95
Proportion of Vaginal Sex Acts with Condoms Last 90 Days (sexually initiated who have had vaginal sex in the last 90 days only)	21 ^b	.51	.71	+0.20 (20%)	2.06 (20)	(0.00, 0.40)	.05	17 ^c	.72	.57	-0.16 (-16%)	-1.65 (16)	(-0.36, 0.05)	.12

Note. ^aPercentage in parentheses is improvement or decline relative to scale maximum. ^bIn the 3-month postintervention survey, 22 intervention arm sexually initiated participants reported no vaginal sex in the last 3 months. ^cIn the 3-month postintervention survey, 22 control arm sexually initiated participants reported no vaginal sex in the last 3 months.

vention intervention. In addition, future studies assessing the impact of computer-delivered HIV interventions could also address a wider set of behavioral outcomes, including STI infections, anal sex, oral sex, and partner violence.

The efficacy of Multimedia SiHLE may derive from its foundation in a CDC-defined evidence-based HIV prevention intervention specifically developed for young African American women. The computer-delivered version retains the original intervention's Afro-centric focus, theoretical framework and core elements, and its video and interactive components simulate the peer dynamics of the face-to-face program. The computer-delivered adaptation is further grounded within multimedia education best practices and resonated with participants, as evidenced by their rating of the computer-delivered intervention as more useful, important, interesting, enjoyable and attractive than the control condition videos, with each characteristic achieving 4 or better on a 5-point scale.

Central to creating a successful multimedia adaptation of a face-to-face program is the recognition that computer-based programs should be significantly shorter than their face-to-face counterparts, both in terms of total running time and the length of individual components. In our adaptation of the SiSTA/SiHLE/WILLOW trilogy, we found that 2-3 hours was the maximum length for a computer-based intervention that could be viewed in one sitting. Although developers may be reluctant to significantly edit presentations and activities from the original program, such transformation is essential for a computer-based intervention, because most individuals' attention spans are significantly shorter when watching computer-based content than in participating in face-to-face groups. Presenting a mix of formats (e.g., videos, graphic presentation with voiceover narrator, quizzes, role-play, list creation, and drop-and-drag activities) is an excellent strategy to maintain viewer engagement. When making editing and formatting decisions, the original program core elements and logic model provide a useful guide; so long as they are followed, the exact length and format of the activities is less important. It is also important to be judicious in the use of video and graphically intensive interactive activities. Although such features are typically appealing to most users, our experiences recruiting community-based organizations for our usability studies of computer-based products has revealed that many community-based organizations have computers with insufficient memory and processor speed to upload or play lengthy modules with these features at an acceptable speed. It is advisable to break up the content into multiple, shorter modules as we did with Multimedia SiHLE. Finally, it is essential that computer-based programs maintain the cultural, linguistic and aesthetic specificities of their target communities. For SiHLE, we worked with a team of African American teenage females who participated in storyboard development, reviewed design decisions and performed as the "Sistas" in the final multimedia product.

Computer-delivered HIV prevention interventions can play an important role in increasing access to proven programs and reducing HIV and STIs in diverse populations, including young African American women. Although there are many evidence-based HIV prevention programs, their widespread dissemination is limited by the significant time commitment, financial resources, and staff training required for successful implementation. Computer-delivered interventions offer an effective method for taking evidence-based programs directly to at risk populations, and their multiple delivery modalities (e.g., desktop and laptop computers, cell phones, portable media players) support implementation in a wide range of settings, including community-based and faith-based organizations, private residences, schools, libraries, and correctional facilities. These advantages are not limited to HIV/STI pro-

grams, and given the continued growth and dissemination of new communication technologies throughout the United States and the world, computer-delivered interventions offer new possibilities for cost-effective and user-friendly health promotion activities.

REFERENCES

- ABC News (Producer and Director). (2003). *Fat like me: How to win the weight war*. New York: Author.
- Bandura, A. (1994). Social cognitive theory and exercise of control over HIV infection. In DiClemente, R.J. & Peterson, J. (Eds.), *Preventing AIDS: Theories and methods of behavioral interventions* (pp. 25-59). New York: Plenum.
- Bell, S. G., Newcomer, S. F., Bachrach, C., Borawski, E., Jemmott, J. B., III, Morrison, D., et al. (2007). Challenges in replicating interventions. *Journal of Adolescent Health, 40*(6), 514-520.
- Card, J.J., Kuhn, T, Solomon, J., Benner, T., Wingood, G.M., & DiClemente, R.J. (2011). Translating an effective group-based HIV prevention program to a program delivered primarily by a computer: Methods and outcomes. *AIDS Education and Prevention, 23*(2), 159-174.
- Card, J. J., Lessard, L., & Benner, T. (2007). PA-SHA: Facilitating the replication and use of effective adolescent pregnancy and STI/HIV prevention programs. *Journal of Adolescent Health, 40*(3), 275.e1-14.
- Castro, F.G., Barrera, M., & Martinez, C.R. (2004). The cultural adaptation of prevention interventions: Resolving tensions between fidelity and fit. *Prevention Science 4*(1), 41-45.
- Centers for Disease Control and Prevention. (2008). Replicating Effective Programs Plus. Retrieved February 14, 2011, from http://www.cdc.gov/hiv/topics/prev_prog/rep/.
- Centers for Disease Control and Prevention. (2009). Compendium of Evidence-Based HIV Prevention Interventions. Retrieved February 14, 2011 from <http://www.cdc.gov/hiv/topics/research/prs/evidence-based-interventions.htm>.
- Centers for Disease Control and Prevention. (2011a). *Diffusion of Effective Behavioral Interventions (DEBI)*. Retrieved February 14, 2011, from <http://effectiveinterventions.org/en/home.aspx>
- Centers for Disease Control and Prevention. (2011b). *HIV among African Americans*. Retrieved February 14, 2001, from <http://www.cdc.gov/hiv/topics/aa/>
- Centers for Disease Control and Prevention. (2011c). *Leading Causes of Death by Age Group, Black Females—United States, 2006*. Retrieved February 14, 2011, from http://www.cdc.gov/women/lcod/06_black_females.pdf.
- Collins, C., Harshbarger, C., Sawyer, R., & Hamdallah, M. (2006). The diffusion of effective behavioral interventions project: Development, implementation, and lessons learned. *AIDS Education and Prevention, 18*(4 Suppl. A), 5-20.
- DiClemente, R.J. & Wingood, G.M. (1995). A randomized controlled trial of an HIV sexual risk reduction intervention for young African-American women. *Journal of the American Medical Association, 274*, 1271-1276.
- DiClemente, R.J., Wingood, G.M. & Harrington, K.F. (2004). Efficacy of an HIV prevention intervention for African-American adolescent girls: A randomized controlled trial. *Journal of the American Medical Association, 292*, 171-179.
- Di Noia, J., Schinke, S.P., & Pena, J.B. (2004). Evaluation of a brief computer-mediated intervention to reduce HIV risk among early adolescent females. *Journal of Adolescent Health 35*(1), 62-64.
- Downs, J. S., Murray, P. J., de Bruin, W., Penrose, J., Palmgren, C., & Fischhoff, B. (2004). Interactive video behavioral intervention to reduce adolescent females' STD risk: A randomized controlled trial. *Social Science and Medicine, 59*(8), 1561-1572.
- Dworkin, S. L., Pinto, R. M., Hunter, J., Rapkin, B., & Remien, R. H. (2008). Keeping the spirit of community partnerships alive in the scale up of HIV/AIDS prevention: Critical reflections on the roll out of DEBI (Diffusion of Effective Behavioral Interventions). *American Journal of Community Psychology, 42*(1), 51-59.
- Evans, A.E., Edmundsen-Drane, E.W., & Harris, K.K. (2006). Computer-assisted instruction: An effective instructional method for HIV prevention education? *Journal of Adolescent Health, 26*, 244-251.
- Fotheringham, M.J., Wonnacott, R.L., & Owen, N. (2000). Computer use and physical inactivity in young adults: Public health perils and potentials for new information technologies. *Annals of Behavioral Medicine, 22*(4), 269-275.

- Grant, P., & Thomas, A. (Producers and Directors). (2006). *Portion size me, too!* Owatonna, MN: Learning ZoneXpress.
- Grimley, D.M., & Hook, E.W., III. (2009). A 15-minute interactive, computerized condom use intervention with biological endpoints. *Sexually Transmitted Diseases*, 36(2), 73-78.
- Harshbarger, C., Simmons, G., Coelho, H., Sloop, K., & Collins, C. (2006). An empirical assessment of implementation, adaptation, and tailoring: The evaluation of CDC's national diffusion of VOICES/VOCES. *AIDS Education and Prevention*, 18, 184-197.
- Ito, K. E., Kalyanaraman, S., Ford, C. A., Brown, J. D., & Miller, W. C. (2008). "Let's talk about sex": Pilot study of an interactive CD-ROM to prevent HIV/STIs in female adolescents. *AIDS Education and Prevention*, 20(1), 78-89.
- Lightfoot, M., Comulada, S.W., & Stover, G. (2007). Computerized HIV prevention for adolescents: Indications of efficacy. *American Journal of Public Health*, 97(6), 1027-1030.
- Noar, S.M. (2008). Behavioral interventions to reduce HIV-related sexual risk behavior: Review and synthesis of meta-analytic evidence. *AIDS and Behavior*, 12(3), 335-353.
- Noar, S.M., Black, H.G. & Pierce, L.B. (2009). Efficacy of computer technology-based HIV prevention intervention: A meta-analysis. *AIDS*, 23, 107-115.
- Norton, W.E., Amico, K.R., Cornman, D.H., Fisher, W.A. & Fisher, J.D. (2009). An agenda for advancing the science of implementation of evidence-based HIV prevention interventions. *AIDS and Behavior*, 13, 424-429.
- Rotheram-Borus, M. J., Swendeman, D., & Chonnick, G. (2009). The past, present, and future of HIV prevention: integrating behavioral, biomedical, and structural intervention strategies for the next generation of HIV prevention. *Annual Review of Clinical Psychology*, 5, 143-167.
- Swendeman, D., & Rotheram-Borus, M.J. (2010). Innovation in sexually transmitted disease and HIV prevention: Internet and mobile phone delivery vehicles for global diffusion. *Current Opinion in Psychiatry*, 23(2), 139-144.
- Tortolero, S. R., Markham, C. M., Peskin, M., Shegog, R., Addy, R. C., Escobar-Chaves, S., et al. (2010). It's your game: Keep it real. Delaying sexual behavior with an effective middle school program. *Journal of Adolescent Health*, 46(2), 169-179.
- UNAIDS. (2010). *Talking about a revolution: HIV Prevention focus for UNAIDS social media initiative*. Retrieved on February 14, 2011, from <http://unaids.org/?p=1474#more-1474>.
- Weinhardt, L.S., Mosack, K.E., & Swain, G.R. (2007). Development of a computer-delivered risk-reduction counseling intervention: Acceptability and preferences among low-income patients at an urban sexually transmitted infection clinic. *AIDS and Behavior*, 11(4), 549-56.
- Wingood, G.M., Card, J.J., Er, D., Solomon, J., Braxton, N., Lang, D. Seth, P., Cartreine, J. & DiClemente, R.J. (2011). Preliminary efficacy of a computer-delivered HIV intervention for African-American women. *Psychology & Health*, 26(2), 223-234.
- Wingood, G.M. & DiClemente, R.J. (1998). Gender-related correlates and predictors of consistent condom use among African-American women: A prospective analysis. *International Journal of ST/AIDS* 9, 139-145.
- Wingood, G.M. & DiClemente, R.J. (2000). Application of the theory of gender and power to examine HIV-related exposures, risk factors and effective interventions for women. *Health Education and Behavior*, 27, 539-565.
- Wingood, G.M. & DiClemente, R.J. (2006). Enhancing adoption of evidence-based HIV interventions: Promotion of a suite of HIV prevention interventions for African American women. *AIDS Education and Prevention*, 18(Suppl. A), 161-170.
- Wingood, G.M., DiClemente, R. J., Mikhail, I., Lang, D. L., Hubbard-McCree, D., Davies, S. L., et al. (2004). A randomized controlled trial to reduce HIV transmission risk behaviors and STDs among women living with HIV: The Willow program. *Journal of Acquired Immune Deficiency Syndromes*, 37, S58-S67.

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