

Preliminary efficacy of a computer-based HIV intervention for African-American women

Gina M. Wingood^{a*}, Josephina J. Card^b, Deja Er^a, Julie Solomon^b,
Nikia Braxton^a, Delia Lang^a, Puja Seth^a, Jim Carreine^c and
Ralph J. DiClemente^c

^aDepartment of Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, Atlanta, GA, USA; ^bSociometrics Corporation, Palo Alto, CA, USA; ^cHarvard Medical School, Brigham and Women's Hospital, Boston, MA, USA

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This study evaluated the preliminary efficacy of a computer-based HIV intervention to enhance HIV-protective sexual behaviours, based on a randomised controlled trial among 135 African-American women, 21–29 years of age, seeking services at Planned Parenthood in Atlanta, GA. Participants were randomised either to a control session two, 60-minute computer-based HIV intervention sessions administered on a laptop computer that each concluded with a 15-minute small group session or to a control session of general health information including discussion on HIV prevention. Relative to controls, participants in the computer-based HIV intervention were more knowledgeable about HIV/STD prevention and reported higher scores on the measure of condom use self-efficacy at 3 months post-intervention; they also reported a higher percentage of condom-protected sex and were more likely to use condoms consistently for vaginal sex (odds ratio, OR = 5.9; $p < 0.039$) and were more likely to use condoms consistently for oral sex (OR = 13.83; $p < 0.037$). This relatively brief intervention provides preliminary support that an evidence-based group-based HIV prevention intervention for young African-American women can be adapted to a computer-based HIV intervention.

Keywords: computer-based; HIV prevention intervention; health promotion; sexual risk; HIV prevention; behaviour change

Introduction

Recent advances in information technology have opened up opportunities for developing interactive computer-based interventions (interventions delivered primarily or exclusively through computers). The term *interactive media* incorporates a wide range of products, including text-based websites, video games, audio clips, interactive and linear video, graphics, animations and Web 2.0 applications that enable social networking. Interactive media can now be delivered via a variety of technologies, including computers, cell phones and personal media player

*Corresponding author. Email: gwingoo@emory.edu

(such as the iPod, providing audio, video, text and graphics playback with some interactivity) (Norman et al., 2007; US Department of Health and Human Services, 2006).

Several computer-based HIV interventions have been shown to positively influence mediators of HIV-related sexual behaviour, such as AIDS-related knowledge, self-efficacy (e.g. for engaging in safer sex practices) and/or behavioural intentions. Their target populations have included injection drug users (Marsch & Bickel, 2004), sexually transmitted infection (STI) clinic patients (Weinhardt, Mosack, & Swain, 2007), adolescent females (Di Noia, Schinke, & Pena, 2004; Downs et al., 2004) and high-risk adolescents and young adults (Ito, Kalyanaraman, Ford, Brown, & Miller, 2008; Thomas, Cahill, & Santilli, 1997). Other computer-based HIV interventions have demonstrated efficacy in reducing HIV risk behaviours. In 2007, Lightfoot, Comulada and Stover conducted a three-arm trial of a computer-based HIV preventive intervention, versus small groups versus a control condition in reducing HIV risk practices among students 14–18 years of age. At 3-month follow-up, students in the computer-based arm were significantly less likely to engage in sexual activity and they reported fewer sexual partners. In 2009, Grimley and Hook conducted a trial to test the efficacy of a computer-based HIV intervention to increase condom use and reduce incident STIs among primarily African-American STI clinic patients. At the 6-month follow-up visit, 32% of the participants in the intervention condition versus 23% of the participants in the comparison consistent condom use ($p=0.03$). Additionally, at 6-month follow-up, the STI incidence declined to 6% in the intervention versus 13% in the comparison condition ($p=0.04$). Furthermore, meta-analyses have been conducted which also illustrate the efficacy of interactive media programme in preventing HIV or STIs in adolescents (Noar, Black, & Pierce, 2009; Portnoy, Scott-Sheldon, Johnson, & Carey, 2008).

There are numerous challenges and benefits to using computer-based HIV interventions. While computer-based HIV interventions have shown promise in achieving positive behavioural outcomes, there is often a high start-up cost to implement computer-based HIV interventions as it can be costly to purchase computers. Additionally, on-site computer-based HIV interventions may not always be feasible as considerable facility space is required to implement these interventions, and technical support is often required to programme the computer. Other challenges may include computer literacy levels which may vary among users (Gurak & Lannon, 2004; Pequegnat et al., 2007). However, computer-based interventions also have the potential to provide greater access and exposure to effective programming, and to ultimately affect significant reductions in risk behaviours and HIV infection as they can:

- *Decrease the cost of HIV intervention delivery:* Once a computer-based HIV intervention is developed, the cost to service agencies of delivering it is relatively low in comparison to an in-person intervention. A single CD-ROM, for example, is much cheaper to produce than a set of hardcopy program materials and therefore can be produced at a significantly lower cost. Furthermore, a single CD-ROM can provide all of the intervention materials needed by hundreds or even thousands of participants, without the need for repeated purchases of workbooks or pamphlets. Additionally, computer-based programs require far less staff training, preparation and

delivery time to operate than in-person interventions (Downs et al., 2004; Fotheringham, Wonnacott, & Owen, 2000; Thomas, Cahill, & Santilli, 1997; Weinhardt, Mosack, & Swain, 2007).

- *Increase fidelity of program delivery:* Content and administration remain the same every time a program is delivered by a computer, in contrast to the variations that commonly result when it is delivered by people, particularly when staff turnover is high (Marsch & Bickel, 2004).
- *Increase appeal of the intervention to the target population:* There is evidence that people are more comfortable interacting with a computer than with other people about sensitive health topics (Di Noia et al., 2004), and computers can afford opportunities to practice communication and refusal skills with little or no embarrassment (Castro, Berrera, & Martinez, 2004; Evans, Edmundsen-Drane, & Harris, 2006). In addition, the novelty of receiving information through a new medium may make messages received through that medium more attractive, especially when dynamic graphics and sound are employed (Fotheringham, Wonnacott, & Owen, 2000). Computer-based interventions can also be accessed according to a more flexible schedule than in-person interventions, and an audio component can be incorporated to reach those with limited literacy skills (Fotheringham, Wonnacott, & Owen, 2000; Weinhardt, Mosack, & Swain, 2007).

This study adapted a CDC-defined evidence-based HIV intervention for young adult African-American women known as SISTA (DiClemente & Wingood, 1995), to create a computer-based HIV intervention known as *SISTAs Accessing HIV/AIDS Resources At a click* (SAHARA). The objective of this study is to evaluate the preliminary efficacy of SAHARA to enhance HIV-protective sexual behaviours and mediators among African-American women over a 3-month follow-up period.

Methods

Participants

African-American women, 21–29 years of age, reporting unsafe sex with a male sexual partner in the prior 3 months and seeking services at Planned Parenthood in Atlanta, GA, were eligible to participate in the study. The recruitment team contacted 722 women and screened a total of 506 that fit the age range and criteria of the study. Of these individuals, 346 were not eligible to participate in the study. The primary reasons that participants were not eligible included their being married or living with their partner (35%) and not being sexually active or using condoms 100% of the time (34%). Thus, from April 2006 through March 2007, 160 women screened as eligible and 84.5% ($N = 135$) completed baseline assessments and were randomised to study conditions (Figure 1).

Study design

The study used a randomised controlled trial design. Assignment to conditions was conducted subsequent to baseline assessment using concealment of allocation procedures defined by protocol and compliant with published recommendation (Schulz, 1995). Prior to enrolment, a randomisation scheme was generated using

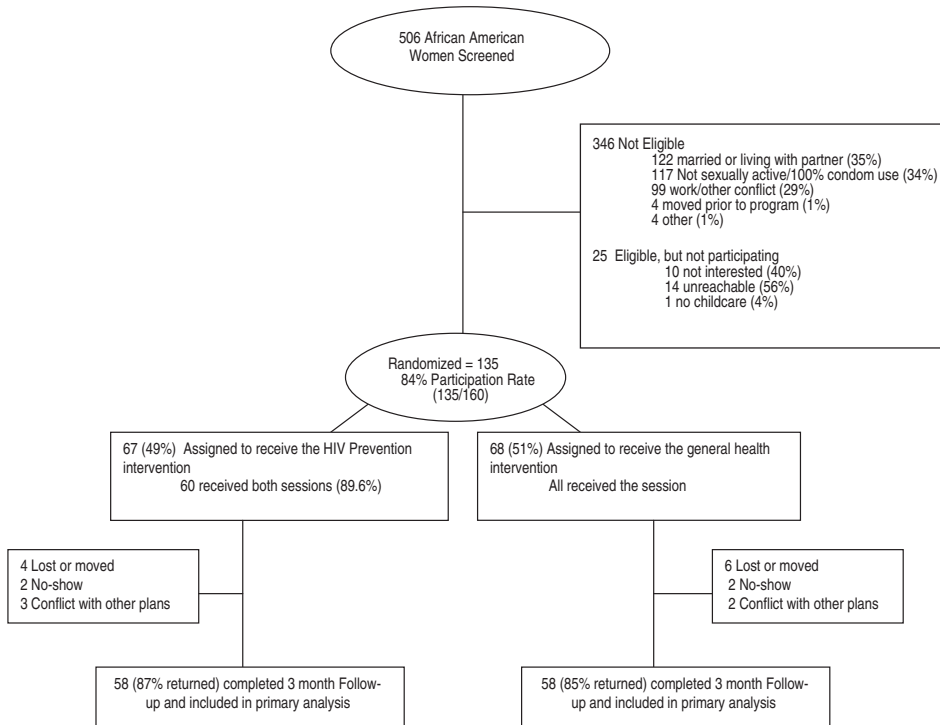


Figure 1. Allocation diagram.

computer-generated block randomisation. As participants completed baseline assessments, sealed opaque envelopes were used to execute assignments. Participants were randomly assigned to the computer-based HIV intervention or a health promotion condition using a 1:1 intervention-to-comparison randomisation allocation.

Participants were randomised to either a single 60-minute group session of general health information which included discussion on HIV prevention ($N=68$), or two, 60-minute interactive computer-based HIV intervention sessions administered on consecutive Saturdays by a laptop computer ($N=67$). Each of these computer-based sessions concluded with a 15-minute small group session. Once a cohort of six participants was identified as interested and eligible, they were randomised to study conditions. Participants in both conditions were compensated \$50 for attending study sessions. The Emory University Institutional Review Board approved the study prior to implementation.

Intervention methods

The computer-based HIV intervention, SAHARA was adapted from a CDC-defined evidence-based HIV intervention for African-American women known as SISTA (DiClemente & Wingood, 1995). The SISTA HIV intervention was guided by social cognitive theory (Bandura, 1994) and the theory of gender and power (Wingood & DiClemente, 2000) and emphasises ethnic and gender pride by discussing positive

attributes and accomplishments of African-American women. It also builds HIV risk-reduction knowledge and seeks to enhance communication, condom use and relationship skills by modelling the skills, allowing for role play of the skills in different scenarios and enhancing norms supportive of partner involvement in safer sex (DiClemente & Wingood, 1995).

A pilot study was conducted with the beta prototype of the computer-based HIV intervention with African-American women, 18–29 years of age. Based on the feedback participants provided in the pilot study, revisions were made to the beta prototype. These revisions were implemented yielding the gamma SAHARA prototype used in the larger trial ($N=135$). The five, 2-hour SISTA sessions, were accommodated in two, 60-minute interactive computer-based sessions and two 15-minute small group sessions. The gamma computer-based HIV intervention prototype focused on retaining fidelity to the underlying theory and core elements of the group administered SISTA and employing science-based best practices in multimedia health education (Stempler, 1997).

The two computer-based sessions were conducted on consecutive Saturdays at the participating clinic. The first computer-based session focused on enhancing ethnic and gender pride, by observing vignettes of participants discussing the joys and challenges of being an African-American woman; by observing female models read poetry by African-American female poets, by asking participants to identify African-American female role models and by asking participants to prioritise their personal values. The first part of this session was designed to enhance the cultural congruence of HIV prevention efforts for African-American women. Additionally, this session highlighted the proportion of African-American women living with HIV in Atlanta and discussed the HIV risk factors prevalent among African-American women. The second computer-based session offers communication skills and realistic choices in sexual decision making, the importance of consistent condom use is also discussed and modules illustrating correct condom use skills and assertive communication approaches are included in this session. Examples of interactive vignettes include activities that allow participants: to provide responses to true and false statements on HIV prevention, to select female models who demonstrate negotiating safer sex using assertive communication as opposed to passive or aggressive communication, to select female models who use condoms correctly on a dildo, to choose components of relationships characterised as healthy (i.e. trust and respect), to identify high-risk sexual behaviours that enhance women's HIV vulnerability and to choose hypothetical male partners who they would be interested in dating and provide responses for why they would be interested in dating or not dating a particular male. (See the appendix in the online repository for illustrations of the intervention content.)

After participants completed the two, 60-minute computer-based HIV intervention sessions on laptop, they participated in a 15-minute small group session implemented by an African-American female health educator. The small group sessions which were administered in the same room as the computer sessions provided an opportunity for participants to role play and receive feedback on condom use and communication skills. Coupling an interactive computer-based intervention with a small group session consisting of four to six participants has been shown to enhance health promoting behaviours relative to either a computer-based intervention alone or counselling alone (Chen & Yeh, 2006).

The control condition

The control group was facilitated by a trained African-American female facilitator (this facilitator was different than the facilitator who implemented the computer-based HIV intervention). Participants in this condition received a 1 hour group session which consisted of 15-minutes general health information and a 30-minute video on the importance of HIV prevention for African-American women produced by the CDC. For 15 minutes, the facilitator answered questions participants had pertaining to the HIV prevention video. All participants in this condition also received brochures on proper nutrition and HIV prevention for African-American women. The control condition was designed to represent usual care regarding clients typical exposure to HIV prevention education at Planned Parenthood.

Measures

Data collection occurred at baseline and at 3-month follow-up. The baseline assessment was administered via Audio Computer Administered Survey Interview (ACASI) and assessed sociodemographics, HIV knowledge, condom use self-efficacy, communication frequency and condom barriers using scales previously validated with African-American women. To enhance confidentiality, codes rather than names were used, none of the facilitators had access to ACASI information, and to minimise potential interviewer bias, ACASI monitors were blind to participants' condition. At the 3-month follow-up, participants were reassessed with similar measures. To enhance accurate reporting of sexual behaviour, we used the Timeline Followback methods that incorporated recall-enhancing (i.e. using a 90-day calendar) to provide visual cues to aid in retrospective recall of sensitive behaviour (M.P. Carey, K.B. Carey, Maisto, Gordon, & Weinhardt, 2001). There is evidence for the feasibility, reliability and validity of this method for enhancing recall of HIV-associated sexual behaviour (Carey et al., 2001).

Psychosocial mediators

The HIV knowledge scale ($\alpha=0.70$) was adapted from a previous HIV knowledge scale developed by the study authors (DiClemente & Wingood, 1995), contained 10 items, and responses were reported as either true or false. Higher scale scores indicated greater HIV knowledge, an example of a scale item is 'Having an STD increases a person's risk of getting HIV'. The condom use self-efficacy scale (Wingood & DiClemente, 1998a) ($\alpha=0.89$) contained nine items and responses ranged from 1 (A lot) to 5 (None). Lower scale scores indicated greater self-efficacy in using condoms correctly, an example of a scale item is 'How much of a problem would it be for you to unroll a condom fully to the base of the penis'. The Condom Barriers Scale ($\alpha=0.86$) is a subscale of the Condom Attitude Scale (Sacco, Levine, Reed, & Thompson, 1991). The Condom Barrier Scale contains eight items and responses ranged from 1 (Strongly Agree) to 5 (Strongly Disagree). Lower scale scores indicated greater perceived beliefs that using condoms during sexual intercourse would be a barrier; an example of a scale item is 'Condoms don't feel good'. The frequency of partner communication assessed the frequency that participants discussed sexual topics. Lower frequency scores indicated that participants communicated less frequently about sexual topics. An example of a scale item

is 'In the past month, how many times did you introduce a discussion about using condoms'.

HIV risk behaviours

The primary outcome, consistent condom use during vaginal sex in the prior 90 days, was calculated as condom use during every episode of vaginal intercourse (100% of the time) with a main partner. Consistent condom use was chosen as the primary outcome measure because findings from prospective studies indicating that condoms, when used consistently can provide a 70–100% reduction in the risk of HIV transmission. Specifically, findings from the European Study Group on Heterosexual Transmission of HIV observed no seroconversions among couples who used condoms consistently, while the seroconversion rate among inconsistent condom users was significantly higher (4.8 per 100 person-years) (De Vincenzi, 1994). Furthermore, consistent condom use has been used as a primary outcome in several CDC-defined evidence-based HIV interventions for African-American women (DiClemente & Wingood, 1995; DiClemente, Wingood, & Harrington, 2004).

The ACASI also assessed the proportion of condom-protected vaginal intercourse acts in the prior 90 days. This item was assessed by first asking participants, 'In the past 90 days, how many times did you have vaginal intercourse?' Responses to this question would serve as the denominator in calculating the variable proportion of condom-protected vaginal intercourse acts. Subsequently, participants would be asked, 'In the past 90 days, when you had vaginal intercourse how many of these times was a condom used?' Responses to this question would serve as the numerator in calculating the variable proportion of condom-protected vaginal intercourse acts. Vaginal sex was defined as when a man puts his penis into a woman's vagina. This definition of vaginal sex has been used previously with this target population (DiClemente & Wingood, 1995). Similar questions were posed to participants to assess the proportion of condom-protected oral sex acts in the prior 90 days. Women also reported whether they had a current main partner, this type of partner was defined as, 'A current partner that you have a committed sexual relationship with'.

Statistical analyses

Analysts were blind to intervention arm

Analyses were performed using an intent-to-treat protocol in which participants were analysed in their assigned treatment conditions irrespective of the number of treatment sessions attended (Piantadosi, 1997). At baseline, descriptive statistics were calculated for sociodemographic variables, mediators and, sexual behaviours. Differences between conditions were assessed using Student's *t*-tests for continuous variables and chi-square analyses for categorical variables. Variables for which differences between study conditions approached statistical significance ($p < 0.05$) and which were theoretically or empirically identified as potential confounders and were included as covariates in subsequent logistic regression and ANCOVA analyses.

The computer-based HIV intervention effects analysis from baseline to the 3-month follow-up used logistic regression to compute adjusted odds ratios (ORs) for dichotomous outcomes (consistent condom use) and used linear regression

to computer adjusted means for continuous outcomes (proportion condom use). An indicator for the time period was included in the model to model any unaccounted temporal effects and an indicator for cohort was included in the model to adjust for unaccounted group effects (clustering). This approach yields adjusted OR which assess the effect of the intervention on dichotomous outcomes (consistent condom use), and adjusted mean differences to assess the effects of the intervention on continuous outcomes (proportion condom use). The 95% confidence intervals (95% CI) around the adjusted ORs and the adjusted means and the corresponding *p*-values were also computed. Analyses were performed using STATA statistical software, version 8 (StataCorp, College Station, TX, USA).

Results

Participants were, on average, 24 years of age ($SD = 2.3$), worked 30 hours per week ($SD = 10.9$), and the majority, 85%, were currently in a relationship with a main partner that averaged 17.7 months in length ($SD = 17.3$). The only theoretical covariate included in all models was financial dependence on partners as this variable was significantly different by study condition at baseline. Aside from financial dependence on partners, no other differences between study conditions were observed for sociodemographics, mediators or sexual behaviours (Table 1).

In total, 135 participants were randomised into the study. Specifically, 67 (49.7%) participants were allocated to the computer-based HIV intervention and 68 (50.3%) participants were randomised to the general health condition. Of the 67 participants allocated to the computer-based HIV intervention, 58 (87%) completed the 3-month follow-up assessment. Of the 67 participants allocated to the computer-based HIV intervention, 60 (89.6%) received both intervention sessions. Of the 68 participants allocated to the general health condition, 58 (85%) completed the 3-month follow-up assessment.

Participants' ratings of their overall satisfaction with session implementation and content, assessed using a 5-point Likert scale, indicated comparably high ratings for the computer-based intervention (mean = 4.8; $SD = 0.23$) and control (mean = 4.6; $SD = 0.24$; $p = 0.89$). On a scale ranging from 1 to 5 with higher scores being more favourable participants in the intervention reported that it was credible (mean = 4.5; $SD = 0.68$), captivating (mean = 4.3; $SD = 0.68$) and interactive (mean = 4.4; $SD = 0.83$).

At 3 months post-intervention, adjusting for the baseline value of the mediator and the study cohort, participants randomised to the computer-based HIV intervention were more knowledgeable out HIV/STD prevention (intervention mean = 9.45 ($SD = 0.09$) versus comparison mean = 8.99 ($SD = 0.09$); $p < 0.001$) and reported higher scores on the measure of condom use self-efficacy (intervention mean = 30.81 ($SD = 0.52$) versus comparison mean = 28.96 ($SD = 0.51$); $p < 0.012$).

At 3 months post-intervention, adjusting for the baseline value of the behavioural outcome and the study cohort, participants randomised to the computer-based HIV intervention reported a higher percentage of condom-protected sex acts (intervention per cent = 85.3 ($SD = 10.1$) versus comparison per cent = 52.8 ($SD = 9.5$); 0.03). Additionally, participants randomised to the computer-based HIV intervention were more likely to use condoms consistently for vaginal sex (OR = 5.9; $p < 0.039$) and were more likely to use condoms consistently for oral sex (OR = 13.83; $p < 0.037$).

Table 1. Comparability of Intervention & Comparison Groups at Baseline*.

Variables	General Health Comparison Condition (<i>n</i> = 68)		Risk Reduction Condition (<i>n</i> = 67)		P
	Mean (SD)	Percent (<i>n</i>)	Mean (SD)	Percent (<i>n</i>)	
Demographics					
Age	24.10 (2.35)		24.06 (2.24)		0.913
Education (<i><</i> 2 yrs of college)		35.3% (24)		32.8% (22)	0.763
Living alone		32.4% (22)		34.3% (23)	0.808
Employed		70.6% (48)		70.1% (47)	0.955
Weekly work hours	29.71 (10.92)		30.98 (10.88)		0.571
Hourly wage	11.07 (5.32)		12.41 (6.13)		0.271
Partner pays some expenses		42.9% (24)		23.9% (11)	0.045
Currently in a relationship with a main partner		91.2% (62)		80.6% (54)	0.077
Length of relationship (in months)	19.29 (18.60)		14.85 (16.25)		0.186
Mediators					
STD Knowledge	8.66 (1.04)		8.62 (0.97)		0.839
Condom use efficacy	28.44 (5.55)		27.71 (6.09)		0.470
Condom Barriers	13.63 (3.34)		13.54 (3.40)		0.870
Behaviors (Main Partner)					
Percent condom use past 90 days	0.54 (0.41)		0.48 (0.41)		0.555
Consistent condom use vaginal sex past 90 days		11.3% (7)		9.6% (5)	0.772
Consistent condom use vaginal sex past 30 days		33.3% (13)		25.7% (9)	0.474
Uses method to prevent STD/pregnancy		82.4% (56)		88.1% (59)	0.351

*Continuous variables were assessed using *t*-test and dichotomous variables were assessed using chi-square.

Discussion

This relatively brief intervention provides preliminary support that an evidence-based group-based HIV intervention for young African-American women can be adapted to a computer-based HIV intervention. Participants in the computer-based HIV intervention demonstrated an increase in HIV-preventive mediators, in the proportion of times condoms were used during vaginal intercourse and in the frequency of using condoms consistently. Consistent condom use was selected as the primary outcome based on its clinical and public health significance in preventing HIV seroconversion among couples who used condoms consistently (Sacco et al., 1991). The findings of increased consistent condom use and proportion of condom-protected episodes are particularly noteworthy as most participants were in long-term relationships which can be a barrier for women trying to implement HIV safer sex practices (Wingood & DiClemente, 1998b).

The efficacy of this computer-based HIV intervention may be attributable to the fact that it was based on a CDC-defined evidence-based HIV intervention for young

adult women. The adaptation process remained faithful to the underlying theory and core elements of the group administered SISTA. Additionally, the computer-based HIV intervention employed science-based best practices in multimedia health education. This was reflected in the evaluations in which participants rated the computer-based HIV intervention as captivating, interactive and they felt that the information was presented in a credible manner (Stempler, 1997).

Limitations of the study include reliance on self-report data, a small sample size and short-study follow-up. Given the small sample size of this study, a larger study should be conducted replicating this study and the long-term efficacy of the study should be established. Additionally, while this study is primarily a computer-based HIV intervention, the intervention includes a 15-minute group delivered component which could limit its feasibility for dissemination. Furthermore, participants in the computer-based HIV intervention condition received a greater amount of contact time compared to participants in the control condition. Noar et al.'s (2009) review of computer-based HIV interventions revealed that many of the peer-reviewed published trials either do not have a comparison condition or used a usual care control condition (as in this study) which did not provide an equivalent amount of exposure to computer-based information. Future trials should be designed in which comparison conditions are computer-based and delivered in a dose equivalent to the intervention condition. Additionally, future studies should test the efficacy of the computer-based HIV intervention without the small groups to determine the efficacy of the intervention without these interactive groups. Moreover, future studies should assess the impact of computer-based HIV intervention on reducing STI incidence, on a wider range of sexual behaviours, such as anal sex and concurrency; on mediators associated with HIV protective practices among women such as sexual communication self-efficacy and sexual negotiation skills and, on sexual behaviours engaged in with different types of sexual partners.

Implementing computer-based HIV interventions in community agencies has important implications for increasing African-American women's access to HIV prevention. The five-session group delivered CDC-defined SISTA HIV intervention is CDC's most widely adopted and disseminated HIV intervention for young adult African-American women (White House Meeting on Women and HIV prevention, 2009). SISTA and other CDC-defined evidence-based HIV interventions for African-American women are group-based multi-session interventions, and each group session typically is 1 h in length. These interventions while efficacious can become expensive when implemented on a population level; interventions such as SAHARA may be more feasible to sustain over time. Greater understanding of the adoption and dissemination of computer-based HIV interventions has important public health implications.

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References

- Bandura, A. (1994). Social cognitive theory and exercise of control over HIV infection. In R.J. DiClemente & J. Peterson (Eds.), *Preventing AIDS: Theories and methods of behavioral interventions* (pp. 25–59). New York, NY: Plenum.
- Carey, M.P., Carey, K.B., Maisto, S., Gordon, A.B., & Weinhardt, L.S. (2001). Assessing sexual risk behavior with the Timeline Followback (TLFB) approach: Continued development and psychometric evaluation with psychiatric outpatients. *International Journal of STD and AIDS*, *12*, 365–375.
- Castro, F.G., Berrera, M., & Martinez, C.R. (2004). The cultural adaptation of prevention interventions: Resolving tensions between fidelity and fit. *Prevention Science*, *4*, 41–45.
- Chen, H., & Yeh, M. (2006). Developing and evaluating a smoking cessation program combined with an internet-assisted instruction program for adolescents with smoking. *Patient Education and Counseling*, *61*, 411–418.
- De Vincenzi, I. (1994). A longitudinal study of human immunodeficiency virus transmission by heterosexual partners. *New England Journal of Medicine*, *331*, 341–346.
- 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*, 62–64.
- DiClemente, R.J., & Wingood, G.M. (1999). 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.
- Downs, J.S., Murray, P.J., de Bruin, W.n.B., 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*, 1561–1572.
- 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 of new information technologies. *Annals of Behavioral Medicine*, *22*, 269–275.
- Grimley, D.M., & Hook III, E.W. (2009). A 15-minute interactive, computerized-condom use intervention with biological endpoints. *Sexually Transmitted Diseases*, *36*, 73–78.
- Gurak, L., & Lannon, J.M. (2004). *A concise guide to technical communications* (2nd ed.). New York: Person Longman.
- 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*, 78–89.
- Lightfoot, M., Comulada, S.W., & Stover, G. (2007). Computerized HIV preventive intervention for adolescents: Indications of efficacy. *American Journal of Public Health*, *97*, 1027–1030.
- Marsch, L.A., & Bickel, W.K. (2004). Efficacy of computer-based HIV/AIDS education for injection drug users. *American Journal of Health Behavior*, *28*, 316–327.
- Noar, S., Black, H.G., & Pierce, L.B. (2009). Efficacy of computer technology-based HIV prevention interventions: A meta-analysis. *AIDS*, *23*, 107–115.
- Norman, G.J., Zabinski, M.F., Adams, M.A., Rosenberg, D.E., Yaroch, A.L., & Atienza, A.A. (2007). A review of eHealth interventions for physical activity and dietary behavior change. *American Journal of Preventive Medicine*, *33*, 336–345.

- Pequegnat, W., Rosser, S.B.R., Bowen, A.M., Bull, S.S., DiClemente, R.J., Bockting, W.O., . . . , Zimmerman, R. (2007). Conducting internet-based HIV/STD prevention survey research: Considerations in design and evaluation. *AIDS and Behavior, 11*, 505–521.
- Piantadosi, S. (1997). *Clinical trials: A methodologic perspective*. New York, NY: John Wiley & Sons.
- Portnoy, D.B., Scott-Sheldon, L.A.J., Johnson, B.T., & Carey, M.P. (2008). Computer-delivered interventions for health promotion and behavioral risk reduction: A meta-analysis of 75 randomized controlled trials, 1988–2007. *Preventive Medicine, 47*, 3–16.
- Sacco, W.P., Levine, B., Reed, D.L., & Thompson, K. (1991). Attitudes about condom use as an AIDS-relevant behavior: Their factor structure and relation to condom use. *Psychological Assessment, 3*, 265–272.
- Schulz, K.F. (1995). Subverting randomization in controlled trials. *Journal of the American Medical Association, 274*, 1456–1458.
- Stempler, L.K. (1997). Educational characteristics of multimedia: A literature review. *Journal of Educational Multimedia and Hypermedia, 6*, 339–359.
- Thomas, R., Cahill, J., & Santilli, L. (1997). Using an interactive computer game to increase skills and self-efficacy regarding safer sex negotiation: Field test results. *Health Education and Behavior, 24*, 71–86.
- Weinhardt, L.S., Mosack, K.E., & Swain, G.R. (2007). Development of a computer-based risk-reduction counseling intervention: Acceptability and preferences among low-income patients at an urban sexually transmitted infection clinic. *AIDS and Behavior, 11*, 549–556.
- White House Meeting on Women and HIV Prevention (2009). *Effective HIV prevention interventions for African American women*. Data for the presentation was reviewed by CDC (Dr Miriam Phields) and analyses were conducted by Academy for Educational Development.
- Wingood, G.M., & DiClemente, R.J. (1998a). Gender-related correlates and predictors of consistent condom use among African-American women: A prospective analysis. *International Journal of STD and AIDS, 9*, 139–145.
- Wingood, G.M., & DiClemente, R.J. (1998b). Partner influences and gender-related factors associated with noncondom use among young adult African-American women. *American Journal of Community Psychology, 26*, 29–51.
- 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.