Translation of a comprehensive health behavior intervention for women living with HIV: the SMART/EST Women's Program

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Cite this as: *TBM* 2013;3:416–425
doi: 10.1007/s13142-013-0213-4

Abstract

Translation of behavioral interventions into community settings for people living with HIV/AIDS can decrease the risk of comorbid conditions. This study was designed to determine whether a multiple health behavior intervention for women with HIV/AIDS could be effectively translated into community health centers (CHCs), delivered by CHC primary care staff. Health Resources and Services Administration-supported CHCs in Miami, FL, and the New York metropolitan area participated. Six health behavior domains were assessed at baseline, 6 months, and 12 months post-intervention: nutrition, physical activity, sexual risk behavior, alcohol use, drug use, and tobacco use. Behavioral outcomes were compared between research staff-led and CHC staff-led intervention groups. Research staff and CHC staff outcomes were similar for the majority of outcomes. Results indicate that complex, multicomponent behavioral interventions can be translated into community-based settings with existing CHC staff and can produce clinical effects similar to those achieved by research staff.

Keywords

HIV/AIDS, Women, Translation, Behavioral intervention, Risk behavior, Effectiveness, Dissemination and implementation, Fidelity

INTRODUCTION

Translational research aims to test the effectiveness of converting evidence-based scientific findings into routine clinical practice (e.g., clinical services delivered in community-based primary health-care settings and public health programs) [1]. Translational research has addressed a variety of medical conditions (e.g., cardiovascular disease, diabetes, and HIV/AIDS) and has been applied to medical, behavioral, and biobehavioral interventions (e.g., the Diabetes Prevention Program) [2]. Translation of behavioral interventions for people living with HIV/AIDS (PLWHAs) that addresses multiple risk behaviors is especially appropriate, as PLWHAs have been identified as being at increased risk of comorbid health conditions, such as cardiovascular and pulmonary diseases, depression,

Implications

Practice: The Stress Management and Relaxation Training/Expressive-Supportive Therapy Women's Program (SWP) can be implemented in community-based practice, utilizing existing community health center staff with diverse education levels and training backgrounds, and achieves improved health outcomes in women living with HIV.

Policy: Existing service delivery models need to be expanded to include evidence-based multiple health behavior interventions such as SWP as a reimbursable standard of care.

Research: Future implementation research should develop SWP for large-scale dissemination as an evidence-based behavioral intervention.

diabetes, and addiction [3, 4]. In addition, psychiatric disorders have also been associated with decrements in essential health behaviors for PLWHAs (e.g., antiretroviral medication adherence [5–9] and medical appointment attendance [10, 11]) and with poorer overall mental health and quality of life [12, 13].

The Stress Management and Relaxation Training/Expressive-Supportive Therapy (SMART/EST) Women's Program (SWP), developed in 1997 and conducted in Miami, FL, New York City, and Northern New Jersey, was designed to enhance the overall quality of life and health status of culturally diverse disadvantaged women living with case-defined AIDS (i.e., CD4 cell count of <200 cells/μL or presence of at least one AIDS-defining opportunistic infection [14]). The program was subsequently adapted to include all women living with HIV and translated linguistically and culturally from English into Spanish and Creole. A healthy lifestyle program targeting multiple health risk behaviors was incorporated, and the program was found to reduce stress/distress and depression and anxiety, decrease HIV viral load, and enhance coping and self-efficacy, while improving health status and quality of life [15–22]. Between 2007 and 2011, a translation of this evidence-

based research program was implemented and evaluated in five urban community health centers (CHCs) in Miami, New York City (NY), and Northern New Jersey (NJ) [23].

The program was translated and evaluated using Glasgow's RE-AIM model [24], which outlines five components required for effective translation from academic to community settings: reach, effectiveness, adoption, implementation, and maintenance. The translation demonstrated that the intervention could be translated to CHCs, conducted by CHC primary care staff, and sustained at four of the five participating CHCs, meeting the criteria for adoption, implementation, and maintenance [22]. The current study examines *effectiveness*, here being the impact of the intervention on multiple health behavior outcomes when comparing research staff-led (RES-Led) and CHC staff-led (CHC-Led) intervention groups. It was hypothesized that research and CHC staff, after completing didactic and experiential training with clinical supervision, would achieve similar outcomes in reduction of risk behaviors across six "healthy living" domains (nutrition, physical activity, sexual risk behavior, alcohol use, drug use, and tobacco use).

METHODS

Prior to the onset of study activities, institutional review board (IRB) approval was obtained from the University of Miami (UM; Miami) IRB and the Clinical Directors Network (CDN; NY and NJ) IRB. All study procedures followed were in accordance with the ethical standards of the responsible committees on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. All participants provided written informed consent in English or Spanish prior to enrollment.

Sites and staff

Five Health Resources and Services Administration-supported Community Health Centers serving women living with HIV/AIDS in Miami (two sites) and the NY metropolitan area (two NYC sites and one Northern NJ site) were selected to participate in the SWP translation. Each site identified qualified staff to receive training by UM and CDN research staff. Following training, UM or CDN research staff members were assigned to each site to conduct initial groups (designated RES-Led groups), with research staff functioning as group leaders and CHC staff who had undergone training by UM/CDN serving as coleaders. After completion of two cohorts of group sessions, the research and CHC staff switched roles for the next two cohorts, with the CHC staff serving as group leaders and the research staff serving as coleaders, while providing clinical supervision to the CHC staff (the initial four cohorts are designated as RES-Led). The final four cohorts (CHC-Led) involved only CHC staff who had completed training and implementation, now serving as trainers for additional

site staff, using the SWP manual, training DVDs, and session checklists as didactic materials, and providing clinical supervision and feedback to new CHC trainees, modeled on the training they received previously from the research staff.

Translation

The translation process used the RE-AIM model to assess clinical and organizational translation and has been previously described [21]. The model included the selection, training, and technical support of qualified CHC staff that would be systematically trained to ultimately assume independent leadership of the program. This "train the trainer" model has been used in a variety of health-care settings [25]. Health-care providers, counselors, social workers, and health educators ($n=14$) with education ranging from associate's to master's and doctoral degrees were trained by research staff to teach other providers and then returned to their CHCs to disseminate the training to other staff members. The training strategy was designed to create and expand a replenishable reservoir of competent trainers and group leaders to provide the clinical services to implement the program, as well as to continue training new group leaders on site, thereby enhancing sustainability.

Participants and assessment

Four hundred and twenty-eight ($n=428$) women living with HIV/AIDS, aged 18 years and older, were sequentially enrolled in an observation-only control group ($n=64$), followed by experimental group ($n=364$). Women in the experimental group were sequentially assigned to participate in RES- or CHC-Led groups. Participants were followed from baseline (T1) to 6 months (T2) and 12 months (T3) post-intervention. All analyses considered three time points where available (T1, T2, and T3), and in those cases in which the participant missed one follow-up visit, the latest value was analyzed as the last measurement [TL = latest (T2 or T3)]. The total sample had a retention rate [(T2 or T3) + (T2 and T3)/total T1 assessments] of nearly 80 % (77 %), with equivalent rates in Miami (77 %) and NY/NJ (77 %). The mean person-months of follow-up, using TL, were 12.5 ± 4.1 ; mean person-months were 11.5 ± 3.3 (Miami) and 13.7 ± 4.7 (NY/NJ) ($p < 0.0001$).

Assessments

All participants completed structured assessments using an audio computer-assisted self-interview system with headphones and a touch screen in order to enhance honesty in reporting sensitive high-risk behavior (e.g., illegal substance use [26, 27]). Assessments included health and risk behaviors drawn from the Behavioral Risk Factor Surveillance System (<http://www.cdc.gov/brfss>; including well-validated items for assessing physical activity and tobacco use), the adapted sexual risk behavioral assessment sched-

ule for adult [28] (sexual behavior and substance use prior to sex), and the COPE [29] (alcohol or drug use for emotional relief or problem solving) (for a detailed description of assessments, see Weiss et al. [22]). In addition, the Stages of Change (SOC) [30] score was assessed for each health behavior. Stages of Change scores provided means to characterize progress from risky behaviors to healthy behaviors. The Stages of Change scores were ranked lowest to highest on a five-point scale ranging from pre-contemplation (1 = not intending to take action in the next 6 months), contemplation (2 = considering the possibility of changing the behavior sometime in the next 6 months), preparation (3 = actively making plans to change the behavior within the next 6 months), action (4 = changing the behavior), and maintenance (5 = maintained the health behavior change for 6 months).

Intervention

The SWP has been described previously [22]. The program was developed within a cognitive behavioral stress management (CBSM) plus expressive supportive therapy [31] framework (CBSM+). The theoretical model was conceptualized to increase self-efficacy and enhance coping responses, medication adherence, and perceptions of social support, while reducing anxiety, depression, and sexual risk behavior. Within the model, these elements predicted improved overall quality of life and health status. The program utilized a group behavioral intervention format, a delivery method that has previously been found to reduce distress [32–34], improve health [35], and decrease risk behavior [36–38]. The group intervention consisted of a total of 16 weekly, 2-h sessions, with the initial ten sessions focused on CBSM+ followed by six sessions on healthy lifestyles, targeting medication adherence, nutrition, physical activity, sexual risk behavior, and alcohol and drug use. Though smoking use was not directly targeted in the intervention, it was theorized that the intervention might also result in tobacco use reduction.

Research-led and community health center-led groups

Participants were enrolled consecutively into RES-Led groups ($n=196$) and CHC-Led groups ($n=168$) after completion of the baseline assessment. Each site conducted both RES- and CHC-Led groups. Collectively, the sites conducted 16 RES-Led groups and 16 CHC-Led groups. Two-hundred and six participants ($n=206$) from Miami participated in RES-Led ($n=119$) and CHC-Led ($n=87$) groups. One-hundred and fifty-eight participants ($n=158$) from NY/NJ participated in RES-Led ($n=77$) and CHC-Led ($n=81$) groups.

Statistical analyses

Analyses included univariate analyses to describe the frequencies of health behaviors at each time

point. Correlation analyses, using Spearman's rank correlation test, a nonparametric test for statistical dependence between two ranked variables, were conducted to assess the baseline associations among and between health behavior items and SOC outcomes. Repeated measures logistic regression models using PROC GENMOD were constructed in three stages. The first stage included time as the only predictor. In the second stage, facilitator type and an interaction term between facilitator type and time were added to the stage 1 models. In the third stage, geography and two-way interaction terms between time and geography and facilitator type and geography and a three-way interaction term among time, facilitator type, and geography were added to stage 2 models. The three-way interaction was dropped from final models if it was not significant. If evidence of a significant multiplicative interaction between time and facilitator type was observed, the models were stratified by facilitator type (i.e., one model for RES-Led and one model for CHC-Led) and compared. Odds ratios and 95 % confidence intervals (CIs) for the stage 1 models containing time as the only predictor are presented. Chi-square statistics and corresponding p values for generalized score tests (utilizing generalized estimating equations) are presented for all parameters in the stage 3 multivariable models (including main effects, two- and three-way interactions where necessary). Adjusted odds ratios and their 95 % CIs presented for the time effect are presented in models stratified by facilitator type. All analyses were considered statistically significant with a two-tailed significance level of 0.05 or confidence interval not containing the null value of 1.0. No adjustments have been made here for multiple comparisons. All analyses were carried out with SAS 9.2 (SAS Institute, Cary, NC).

RESULTS

Participants' baseline characteristics by geography and condition

Participants were a mean age of 45.1 ± 9.1 years. Most women were African-American (59 %), and 23 % were Hispanic, and the majority were born in the USA (83 %). Most participants were unemployed (84 %) and receiving supplemental security income with the status of being disabled (61 %); most women reported an annual income of less than \$10,000 (85 %). About half of participants (57 %) had completed less than 12 years of education. Sixty-three percent was single and 86 % had children, and most women reported sexual intercourse as the source of HIV infection (78 %).

The majority of participants reported high-risk behavior for a number of healthy living items: regular exercise SOC (60.6 % not yet engaging in or no intention of engaging in regular and moderate physical activity in the next 6 months), physical activity in the past month (60.6 % nonactive), unprotected vaginal sex (50.4 % reporting unprotected

ed vaginal sex with a main partner in the past month), responsible drinking SOC (63.1 % not yet engaging in or have no intention of engaging in responsible drinking behavior in the next 6 months), street drug use SOC (66.7 % not yet engaging in or have no intention of engaging in abstinence or harm reduction in the next 6 months), current frequency of smoking (56.0 % currently smoking), and tobacco quitting SOC (66.9 % have not quit or have no intention of quitting tobacco in the next 6 months or more). In contrast, a smaller proportion of participants (i.e., less than 50 %) reported high-risk behavior for five health living items: balanced diet SOC (43.0 % not yet consuming or no intention of consuming a balanced in the next 6 months), safer sex SOC (35.3 % not yet engaging in or no intention of engaging in safe sex practices in the next 6 months), substance use before sex (29.6 %), using alcohol or drugs to feel better (25.7 %), and using alcohol or drugs to solve problems (22.9 %).

Participants in Miami were more likely than those in NY/NJ to report being disabled ($\chi^2=6.77$, $p<0.01$). Miami participants were more likely to report current sexual activity ($\chi^2=10.57$, $p<0.01$) and to have a history of substance abuse treatment ($\chi^2=16.04$, $p<0.0001$). Participants enrolled in the RES-Led groups were more likely to report infection by sexual transmission than those in the CHC-Led groups ($\chi^2=9.24$, $p<0.05$). Participants in RES-Led groups were also more likely to be in active or maintenance stages of change for safe sex ($\chi^2=9.19$, $p<0.01$), alcohol use ($\chi^2=3.87$, $p<0.05$), drug use ($\chi^2=14.41$, $p<0.01$), and tobacco quitting ($\chi^2=5.56$, $p<0.05$) than participants in clinic-led groups (demographic data and baseline behaviors are not displayed in table form).

Baseline correlations

In order to examine the potentially interrelated nature of the six domains of healthy living (nutrition, physical activity, sexual risk behavior, alcohol use, drug use, and tobacco use) and the SOC scores, correlations were conducted. Several healthy living behaviors and SOC were significantly intercorrelated; the strongest positive correlations were between responsible drinking and street drug SOC scores (greater readiness to change harmful drinking was associated with more readiness to change harmful drug use; Spearman's $r=0.69$, $p<0.001$). Moderate positive correlations were found between regular exercise SOC and balanced diet SOC (Spearman's $r=0.39$, $p<0.0001$). Weak positive correlations were found between additional 19 pairs of healthy living items. Weak but significant positive correlations were also found between using alcohol or drugs to feel better (Spearman's $r=0.14$, $p=0.006$) and using alcohol or drugs to solve problems (Spearman's $r=0.13$, $p=0.02$), tobacco quitting SOC (Spearman's $r=0.23$, $p=0.001$) and current frequency of smoking (Spearman's $r=0.11$, $p=0.03$), and safe sex SOC (Spearman's $r=0.15$, $p=0.005$).

Six healthy living items were inversely associated: street drug use SOC was negatively correlated with using

alcohol or drugs to feel better (Spearman's $r=-0.12$, $p=0.02$), using alcohol or drugs to solve problems (Spearman's $r=-0.12$, $p=0.02$), current frequency of smoking (Spearman's $r=-0.16$, $p=0.002$), and unprotected vaginal sex (Spearman's $r=-0.24$, $p=0.007$). Responsible drinking SOC was negatively correlated with the use of alcohol or drugs to feel better (Spearman's $r=-0.10$, $p=0.05$) and with use of alcohol or drugs to solve problems (Spearman's $r=-0.14$, $p=0.009$). Most of these discordant correlations involved drug use, alcohol use, tobacco use, and safer sex.

Health behavior change over time

Several health behaviors improved in comparison with baseline across four domains: nutrition, physical activity, sexual intercourse, and tobacco use. From baseline to follow-up, significant improvements were made in readiness to change unbalanced diet [odds ratio (OR) (T2 vs T1)=1.4, 95 % CI 1.0–1.8; OR (T3 vs T1)=1.9, 95 % CI 1.4–2.6], physical inactivity over the previous month [OR (T2 vs T1)=0.7, 95 % CI 0.5–1.0; OR (T3 vs T1)=0.6, 95 % CI 0.5–0.8], more than one sexual partner in the past year [OR (T2 vs T1)=0.6, 95 % CI 0.4–0.9; OR (T3 vs T1)=0.4, 95 % CI 0.3–0.6], and current smoking [OR (T2 vs T1)=0.8, 95 % CI 0.6–1.0; OR (T3 vs T1)=0.6, 95 % CI 0.5–0.8]. In contrast, there were two negative changes (i.e., decline in healthy behavior from baseline to follow-up) in readiness to change harmful drinking [OR (T2 vs T1)=0.9, 95 % CI 0.7–1.3; OR (T3 vs T1)=0.7, 95 % CI 0.5–0.8] and the use of alcohol or drugs to know what to do [OR (T2 vs T1)=1.6, 95 % CI 1.1–2.1; OR (T3 vs T1)=1.2, 95 % CI 0.9–1.7] (see Table 1 for details).

Comparison of RES-Led versus CHC-Led group outcomes over time

For the most part, changes in the health behaviors did not differ between RES- and CHC-Led groups in multivariable models adjusting for geography. No significant differences between behavioral change outcomes by facilitator type were observed in 10 of 14 health behaviors examined. Significant interactions between facilitator type and time were found for four health behaviors: readiness to change unbalanced diet (chi-square=7.7, p value 0.02), more than one sex partner in the past year (chi-square=10.4, p value 0.005), readiness to change unsafe sex (chi-square=7.4, p value 0.03), and use of alcohol or drugs to know what to do (chi-square=7.5, p value 0.02) (see Table 2 for details).

Models stratified by facilitator type revealed negative changes in readiness to change unsafe sex [OR (T2 vs T1)=0.8, 95 % CI 0.4–1.9; OR (T3 vs T1)=0.3, 95 % CI 0.1–0.6] and use of alcohol or drugs to feel better [OR (T2 vs T1)=4.8, 95 % CI 1.7–13.3; OR (T3 vs T1)=1.5, 95 % CI 0.8–2.9] and an improvement in readiness to change lack of regular exercise among the research-led groups [OR (T2 vs T1)=2.2, 95 % CI 1.2–3.9; OR (T3 vs T1)=2.0, 95 % CI 0.9–4.5]. Among the CHC-Led groups, a

Table 1 | Main effects for all participants

HL6 domain	Improvement	Health behavior	No.	Baseline (% high risk)	Behavioral change						<i>p</i> value for time effect
					T2 vs baseline			T3 vs baseline			
					OR	Lower CI	Upper CI	OR	Lower CI	Upper CI	
Nutrition	Improved	Readiness to change unbalanced diet (SOC)	277	43.0	1.36	1.01	1.82	1.89	1.38	2.60	0.003
	Improved	Physical inactivity in the past month (BRFSS)	277	60.6	0.72	0.54	0.95	0.64	0.49	0.84	0.003
	No change	Readiness to change lack of regular exercise (SOC)	277	60.6	1.00	0.75	1.32	1.04	0.78	1.40	0.95
Sexual intercourse	Improved	More than 1 sex partner in the past year (SAQ)	277	16.4	0.62	0.43	0.87	0.40	0.27	0.61	0.0001
	No change	Unprotected vaginal sex in the past month (SAQ)	59	50.4	0.74	0.46	1.20	0.72	0.44	1.19	0.34
	No change	Readiness to change to change unsafe sex (SOC)	277	35.3	1.06	0.78	1.44	0.96	0.70	1.33	0.86
Alcohol use	No change	At least 1 drink in the last 30 days (BRFSS)	277	29.8	1.03	0.78	1.35	1.28	0.97	1.68	0.20
	Did not improve	Readiness to change harmful drinking (SOC)	277	63.1	0.94	0.70	1.07	0.68	0.49	0.80	0.04
	No change	Readiness to change street drug use (SOC)	277	66.7	0.97	0.72	1.29	0.71	0.51	0.99	0.09
Drug use	No change	Substance use before sex (SAQ)	71	29.6	0.95	0.56	1.59	0.85	0.53	1.38	0.80
	No change	Use alcohol/drugs to feel better (COPE)	277	25.7	1.14	0.84	1.56	1.42	1.03	1.96	0.10
	Did not improve	Use alcohol/drugs to know what to do (COPE)	277	22.9	1.56	1.13	2.17	1.24	0.90	1.70	0.02
Tobacco use	Improved	Current smoking (BRFSS)	277	56.0	0.78	0.64	0.96	0.62	0.49	0.77	0.002
	No change	Readiness to quit tobacco use (SOC)	277	66.9	1.06	0.79	1.44	0.90	0.65	1.25	0.63

The *p* value for time effect is the *p* value of the generalized score statistic (chi-square) for GEE analysis

SOC stages of change [30], *BRFSS* Behavioral Risk Factors for Social Science, *SAQ* Sexual Activity Questionnaire

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Table 2 | Facilitator effects

HL6 domain	Health behavior	Model parameters for multivariable RM logistic regression—chi-square (<i>p</i> value)							
		Time	Facilitator type	Geography	<i>T</i> × <i>F</i>	<i>T</i> × <i>G</i>	<i>F</i> × <i>G</i>	<i>T</i> × <i>F</i> × <i>G</i>	
		RES-Led vs CHC-Led	(Miami vs NY/NJ)						
	Desired result	Significant	Not significant	Significant	Not significant	Significant	Not significant	Not significant	
Nutrition	Readiness to change unbalanced diet (SOC)	31.19 (<0.0001)	3.89 (0.05)	5.59 (0.02)	5.45 (0.07)	19.29 (<0.0001)	1.24 (0.27)	–	
	Readiness to change lack of regular exercise (SOC)	6.55 (0.04)	4.66 (0.03)	8.69 (0.003)	7.74 (0.02)	4.90 (0.09)	1.91 (0.17)	6.85 (0.04)	
	Physical inactivity in the past month (BRFSS)	2.91 (0.23)	0.93 (0.33)	0.25 (0.62)	1.46 (0.48)	2.39 (0.30)	1.55 (0.21)	–	
Sexual intercourse	More than 1 sex partner in the past year (SAQ)	8.60 (0.01)	0.02 (0.88)	0.82 (0.37)	10.43 (0.005)	4.27 (0.12)	0.34 (0.56)	–	
	Unprotected vaginal sex in the past month (SAQ)	0.52 (0.77)	0.23 (0.63)	0.22 (0.64)	0.43 (0.81)	0.86 (0.65)	0.09 (0.77)	–	
	Readiness to change unsafe sex (SOC)	11.14 (0.004)	17.23 (<0.0001)	1.22 (0.27)	7.39 (0.03)	18.34 (<0.0001)	8.77 (0.003)	6.65 (0.04)	
Alcohol use	At least 1 drink in the last 30 days (BRFSS)	3.05 (0.22)	3.80 (0.05)	0.00 (0.97)	1.43 (0.49)	6.61 (0.04)	0.95 (0.33)	–	
	Readiness to change harmful drinking (SOC)	13.39 (0.001)	28.32 (<0.0001)	20.14 (<0.0001)	1.03 (0.60)	9.1 (0.01)	31.23 (<0.0001)	–	
	Readiness to change street drug use (SOC)	15.34 (0.0005)	37.23 (<0.0001)	21.44 (<0.0001)	5.05 (0.08)	8.45 (0.02)	25.68 (<0.0001)	–	
Drug use	Substance use before sex (SAQ)	1.28 (0.53)	0.53 (0.47)	0.25 (0.61)	1.83 (0.40)	1.59 (0.45)	0.00 (0.99)	–	
	Use alcohol/drugs to feel better (COPE)	4.16 (0.13)	0.00 (0.96)	2.36 (0.12)	0.01 (1.00)	5.53 (0.06)	1.64 (0.20)	–	
	Use alcohol/drugs to know what to do (COPE)	11.97 (0.0003)	1.3 (0.04)	4.08 (0.04)	7.52 (0.02)	6.84 (0.03)	1.6 (0.21)	6.18 (0.04)	
Tobacco use	Current smoking (BRFSS)	12.61 (0.002)	0.93 (0.34)	1.32 (0.25)	0.85 (0.65)	7.64 (0.02)	3.35 (0.07)	–	
	Readiness to quit tobacco use (SOC)	2.72 (0.26)	13.25 (0.0003)	3.30 (0.07)	3.84 (0.15)	0.74 (0.69)	8.1 (0.004)	–	

En dash indicates a three-way interaction term dropped from the final model due to nonsignificance

T time, *F* facilitator type, *G* geography, *SOC* Stages of Change [30], *BRFSS* Behavioral Risk Factors for Social Science, *SAQ* Sexual Activity Questionnaire

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T time, *F* facilitator type, *G* geography, *SOC* Stages of Change [30], *BRFSS* Behavioral Risk Factors for Social Science, *SAQ* Sexual Activity Questionnaire

decrease in the odds of multiple sex partners was observed [OR (T2 vs T1)=0.4, 95 % CI 0.2–0.6; OR (T3 vs T1)=0.4, 95 % CI 0.2–0.7] (see Table 3 for details).

DISCUSSION

This study was designed to determine whether an evidence-based behavioral intervention targeting multiple health behavior outcomes for women living with HIV could be effectively translated into community health centers (CHCs), delivered by trained CHC staff.

Overall, the intervention was associated with improvement in behavioral outcomes, and these outcomes were comparable between groups led by research and CHC staff on the majority of behavior domains (i.e., nutrition, physical activity, sexual risk reduction and tobacco use).

Overall, no significant differences between behavioral change outcomes were observed in 9 of 12 outcomes examined, and the interaction term between group leader condition, time, and geography was not significant on the majority of outcomes, indicating only a minimal effect associated with the study location. In accordance with the primary study hypothesis, these results indicate that the intervention was effectively conducted by trained CHC staff and that the dissemination and implementation process was successful.

To our knowledge, this is the first study to examine the translation of a group health behavior intervention for HIV+ women from the research to primary care setting. Using the train the trainer model, the trained CHC staff also offers the capacity for community health centers to become self-sustaining in the provision of the intervention as well as to serve as training resources for other CHCs in the region. Results suggest that CHCs are appropriate settings for delivering group behavioral services, such as the SMART/EST Program. In addition, study outcomes support the research to practice translation of CBSM+ interventions delivered in groups and suggest that primary care trainees from a variety of different educational and professional backgrounds can effectively deliver manualized, structured group CBSM+ interventions. Clearly, while reducing risk behaviors and promoting healthy behaviors among people living with HIV is within reach, the logistic and financial infrastructure necessary to implement and sustain effective behavioral interventions is still evolving [39]. Existing service delivery models need to be expanded to include evidence-based multiple health behavior interventions as a reimbursable standard of care.

Some differences were identified between reported behaviors and associated stages of change scores (i.e., exercise and unsafe sex). However, it appears that while participants' behavior may have been changing, the participants themselves may not have interpreted

these changes as being indicative of a desire to change. Similarly, while some participants may have expressed a perception of actively changing health behaviors, that change was not reflected in their assessment of their actual behavior. Both interpretations suggest limitations associated with the comparison of the various measures (e.g., measurement error), given differences between participants' perception of their behavior and intentions.

As noted, results indicated that some differences existed between geographic locations. These differences may reflect individual differences between participants (e.g., levels of substance use, physical activity, and sexual risk behavior), trainers (e.g., previous training experience), or providers (e.g., academic level or personal experiences), or they may reflect differences at the community health center level or regional differences in community health treatment algorithms. However, while these outcomes may be due in part to the heterogeneous nature of the sample and sites, obtained outcomes may also be more representative of real-world primary care settings.

The intervention was not associated with reductions in alcohol and drug use for coping with problems by either facilitator group; however, substance use associated with sex did reduce in both groups. Outcomes suggest that the intervention may be useful but is not sufficient to impact those participants with active addiction or dependence. Current interventions associated with addiction (e.g., 28-day treatment programs) may be necessitated for patient populations with entrenched substance use behaviors. In addition, measures of improvement in alcohol use, less than one drink in 30 days, may be overly restrictive and unrealistic. Finally, changes in sexual behavior with steady partners may be more difficult to achieve than reductions in multiple partnering. These results should be used to further define the clinical populations for whom the intervention may be most useful.

Consistent with previous studies, this study achieved and maintained improvements in health behaviors among women participating in the behavioral group intervention (e.g., sexual risk behavior [40]). It is important to note that participants did not receive any compensation for study attendance, and as such, the intervention was fully integrated as a clinical service. Interestingly, while decreases in one area of unhealthy behavior (e.g., tobacco use) are often associated with compensatory increases in another area (e.g., food intake), participants in this study did not appear to engage in compensatory behavior. In addition, while behavioral interventions that target high-risk individuals (those engaging in the most unhealthy behaviors) or those currently expressing a desire to change are likely to result in the greatest benefit; overall, women participating appeared to experience benefit. However, while the sample size of this study precluded analyses targeting outcomes among high-risk individuals, future translational studies

Table 3 | Time effect in multivariable models stratified by facilitator type

Table 3 Time effect in multivariable models stratified by facilitator type														
Health behavior	Improvement	RES-Led behavioral change			Improvement			CHC-Led behavioral change			Improvement			
		T2 vs baseline			T3 vs baseline			T2 vs baseline			T3 vs baseline			
		95 % CI			95 % CI			95 % CI			95 % CI			
		aOR	Lower CI	Upper CI	aOR	Lower CI	Upper CI	aOR	Lower CI	Upper CI	aOR	Lower CI	Upper CI	
Readiness to change lack of regular exercise (SOC) ^a	Improved	2.20	1.23	3.93	2.01	0.91	4.48	No change	0.90	0.57	1.42	0.98	0.62	1.57
More than 1 sex partner in the past year (SAQ)	No change	1.09	0.67	1.79	0.50	0.25	0.99	Improved	0.35	0.21	0.60	0.41	0.23	0.73
Readiness to change unsafe sex (SOC) ^a	Did not improve	0.81	0.35	1.85	0.26	0.12	0.57	No change	1.07	0.55	2.07	0.93	0.45	1.92
Use of alcohol/drug to know what to do (COPE) ^a	Did not improve	4.78	1.73	13.26	1.49	0.76	2.92	No change	0.96	0.51	1.82	1.40	0.57	3.42
All models are adjusted for geography														
^a aOR adjusted odds ratio, SOC Stages of Change [30], SAQ Sexual Activity Questionnaire														
^a Models include an interaction term between time and geography														

should be powered to focus on those at the greatest risk as well as those with some intention to change. Finally, as the major objective of this study was to determine whether the translation strategy employed could result in clinical services producing comparable health behavior outcomes, analyses presented do not include comparisons of the intervention versus control conditions or examine effect sizes or dose response associated with the intervention. Future research could address the potential ordering effect that may have been associated with the study design, as research-led groups consistently preceded community health center-led groups.

Translation and implementation of community-based multiple health behavior group interventions for people living with HIV can play an important role in reducing morbidity associated with comorbid conditions (e.g., cardiovascular disease) that can lead to increased disability and premature death. Despite the variety of challenges to implementation that have been documented at the organization, provider, and intervention levels [41–45], this translation was effective in achieving health behavior change at the community health center level. By providing services targeting multiple chronic health conditions in the settings where persons living with HIV receive their primary medical care, they can take full advantage of the increased longevity associated with improved medication and treatment.

Acknowledgments: The authors gratefully acknowledge the support for these studies from the Centers for Disease Control and Prevention (CDCR18PS000829 and NIH/NIMH R01MH55463 and R01MH61208). Also acknowledged for their support are the CHCs and staff participating in the study, the Borinquen Health Care Center (FL), Special Immunology Clinic at Jackson Memorial Hospital (FL), Bedford-Stuyvesant Family Health Center (NY), Morris Heights Health Center (NY), Jersey City Family Health Center (NJ), and the research facilitators providing training and interventions in Miami, New York, and New Jersey, including Olga Villar-Loubet, Psy.D.; Barbara Warren, Psy.D.; and Jessica Pesantez, Psy.D.

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