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ORIGINAL ARTICLE

Randomized Trial of a Community-based Alcohol-related HIV Risk-reduction Intervention for Men and Women in Cape Town South Africa

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Abstract
Background HIV is devastating southern Africa and alcohol use is closely related to HIV transmission risks.
Purpose The current study tested the efficacy of a brief single-session HIV–alcohol risk-reduction intervention for men and women who drink at informal alcohol serving establishments (i.e., shebeens) in South Africa.
Methods A randomized community field trial recruited men (N=117) and women (N=236) through outreach and chain referrals. Participants received either: (a) 3-h theory-based behavioral HIV–alcohol risk-reduction intervention that focused on skills training for sexual negotiation and condom use or (b) 1-h HIV–alcohol information/education control group. Participants were followed up for 3 and 6 months post-intervention with 89% retention.
Results The risk-reduction intervention demonstrated significantly less unprotected intercourse, alcohol use before sex, numbers of sex partners, partners met at drinking establishments and greater condom use relative to the control group. However, intervention effects were moderated by alcohol use; lighter drinkers demonstrated significantly more intervention gains than heavier drinkers in the risk-reduction condition. Intervention effects occurred at 3 months follow-up and dissipated by 6 months.
Conclusions A brief HIV risk-reduction intervention reduced sexual-risk behaviors among drinkers in South Africa. However, intervention effects were weakest for those who drink heaviest. Our results provide a basis for establishing HIV prevention in alcohol serving establishments in South Africa. Research is needed to identify multi-level intervention models that can reduce risks among heavier drinkers and sustain behavior changes over time.

Keywords alcohol · HIV · South Africa · Prevention

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Introduction

South Africa has the largest HIV epidemic in the world and the majority of HIV infections in South Africa occur in urban townships and informal settlements [1] where alcohol is the most commonly used substance and drinking occurs in relation to sexual-risk behaviors [2]. For many people living in urban areas throughout southern Africa, the places where people drink alcohol are also the places where they meet new sex partners. HIV risks are notably higher for Africans who go to bottle stores, taverns, and informal drinking establishments [3]. The most studied drinking places in relation to HIV risks in Africa are beer halls, where HIV prevalence is as much as two times higher than the general population [4, 5]. Weir et al. [6] found that over 85% of the locations where people meet sex partners in a

Cape Town township serve alcohol, with informal drinking establishments (i.e., shebeens) being among the highest risk venues. More than half of men who drink at shebeens report two or more sex partners in 2 weeks time [2, 6].

HIV-prevention interventions are currently being tested in South Africa, including interventions for people who drink alcohol. A recent trial conducted in a Cape Town sexually transmitted infections (STI) clinic, for example, targeted men and women who drink alcohol in relation to their sexual risks for HIV [7]. This study was among the first to report the outcomes of an HIV risk-reduction intervention for people who drink alcohol and are at risk for HIV infection in South Africa. The results demonstrated a 65% reduction in unprotected vaginal intercourse and 25% increase in condom use. Unfortunately, intervening with STI clinic patients is limited from a primary prevention perspective because individuals who are already receiving STI treatment services have already been exposed to an STI, possibly including HIV. In addition, risk-reduction interventions conducted in clinic settings occur outside of community contexts in which risks occur and, therefore, will likely suffer relapse to unsafe behavior when returning to risk-promoting environments [8].

The current study tested the effects of a brief community-based HIV risk-reduction intervention for men and women who patronize informal drinking establishments (shebeens) in Cape Town South Africa. We developed a theory-based skills-building HIV-prevention intervention delivered to small groups of men and women in a community setting that was similar to interventions demonstrated effective in the US [9–13]. To our knowledge, this is the first randomized trial testing a small-group theory-based HIV- and alcohol-prevention intervention in South Africa. We hypothesized that a brief multi-component and theory-based behavioral skills intervention for HIV/STI risk reduction in men and women who drink at shebeens would demonstrate significantly greater reductions in unprotected intercourse and increased condom use relative to an HIV–alcohol education comparison intervention. In addition, because alcohol is known to complicate HIV risk behaviors and risk reduction in Africa [2], we also tested levels of drinking as a moderating variable of the intervention effects.

Methods

Participants

Participants were 117 men and 236 women recruited from shebeens in a suburban township in Cape Town South Africa. All participants were aged 18 and older, with a median age of 34. In terms of race, 272 (77%) participants self-identified as Coloured (i.e., mixed race), 66 (19%) identified as African or Black, five (1%) as White or Indian, and the remaining ten (24%) participants did not respond to the question about race. Sample size was determined by power analysis using an estimated effect size of $d=0.30$ based on a previous brief HIV-prevention intervention in South Africa [7] and a significance level of $p<0.05$; a sample size of 350 allows for the detection of intervention effects with a power of 0.80

Research Setting and Procedures

The township that participated in the current study is located within 20 km of Cape Town's central business district and was historically populated by mixed race (Coloured) people during the final years of the Apartheid era. This is among the first Cape Town townships to begin racial integration. A significant racial minority group in South Africa (9% population) is known as Coloured and is mainly made up of people who are of mixed race, mostly concentrated in the Western Cape province; 50% of the Western Cape province and the city of Cape Town consist of Coloured persons. The study entry criteria were: age 18 years and older, recruited from a local shebeen, and having drunk alcohol in the previous month.

Participants were recruited through snowball sampling procedures. We met with the owners of four shebeens within 0.5 km of the community center where the study was conducted. Shebeen owners were told about the research objectives and were asked to identify two or three patrons we might recruit into the study. We then used the selected shebeen patrons to inform people they knew from the shebeen about the study opportunity. The shebeen owners also gave us permission to place small flyers in their businesses to announce the study. Potential participants contacted the research site and were scheduled for a group-administered assessment session. Participant recruitment occurred between March and September 2006.

Prior to baseline assessment, participants completed informed consent and were administered measures by research staff familiar with the township and fluent in English and Afrikaans, the former South African national language predominately spoken in this township. The staff members were trained in the research protocol and research ethics. Participants were asked to complete a self-administered survey, with less than 10% of participants requesting assistance. Staff instructed participants on how to complete the survey using an enlarged facsimile. Items and response formats were described section-by-section. Following the baseline assessment, participants completed their randomly assigned intervention condition and were then scheduled for their 3- and 6-month follow-up assessments. Participants were compensated R90 South African Rand (approximately US$15) for their time and effort to complete each assessment. The research was approved by the University of Connecticut Institutional Review Board and

the Human Sciences Research Council in Cape Town's Research Ethics Committee. No adverse events occurred in this trial.

Participant Randomization

We randomly assigned participants to either (a) a single 3-h HIV–alcohol risk-reduction skills intervention or (b) a single 1-h HIV–alcohol education control group. Participants were enrolled in the study and assigned to a randomly determined time-slot yoked to intervention conditions. The field supervisor, who did not perform intervention groups, randomized participants. Therefore, individuals rather than groups were randomly assigned to conditions. For both conditions, groups of eight to ten same gender participants were facilitated by a mixed gender pair of counselors.

HIV–alcohol Risk-reduction Intervention

An adapted version of a social cognitive model of health behavior change was used as the theoretical framework for the risk-reduction skills intervention developed and tested in this research [14].Specifically, the 60-min risk-reduction counseling intervention tested by Kalichman et al. [7] for use with STI clinic patients was expanded to create a 3-h interactive small-group intervention. The elements of the intervention were unchanged, with all of the intervention activities and materials reformatted for delivery in small groups.

The HIV/AIDS information/education component reviewed the facts about HIV transmission and risk behaviors; discussed the local prevalence of HIV; clarified misconceptions; dispelled myths about AIDS using a myths–facts game; and described HIV antibody testing. Because motivating skill enactments is a key concept in Social Cognitive Theory [14] we adapted motivational interviewing techniques that included motivation for change and strengthening commitment to change that have been used in previous interventions [15, 16]. Lapses to unsafe behavior frequently involve alcohol use and alcohol is an important behavioral setting cue. We, therefore, integrated within the motivational component pf the intervention an adapted version of the World Health Organization's (WHO) brief alcohol intervention model. Participants were given their Alcohol Use Disorders Identification Test (AUDIT) score obtained from the baseline assessment in a confidential and personalized brochure and were shown how scores on the AUDIT represent potential hazards of drinking. Decisional balance exercises, including a condoms pros and cons activity and self-confidence ratings for reducing alcohol-related risks, were used to elicit motivating statements from participants. Guided by Social Cognitive Theory [14], these exercises were aimed at reducing positive outcome expectancies to sexual experiences after drinking. Alcohol use in sexual contexts was specifically discussed in relation to risk situations. This element emphasized the importance of alcohol use as a setting characteristic related to risk as well as the role intoxication plays as a barrier to risk reduction.

The final component of the intervention focused on behavioral self-management and sexual communication skills-building exercises. The facilitators engaged participants in a functional analysis of risk behavior by having group members discuss risk situations and cues commonly related to sexual risks. The facilitators introduced the concept of triggers, environmental and cognitive–affective cues for high-risk situations including mood states, substance use, settings, and sexual-partner characteristics [14]. Alcohol was elaborated on as a major trigger for risk behaviors. Participants were asked to think of ways to manage triggers to reduce their risks and discussed methods of rearranging their environment and strategies to reduce their risks by performing specific acts; redirecting sexual activities toward safer sex alternatives, carrying condoms, and avoiding sex after drinking. Practice was conducted in role-plays among group members to increase risk-reduction skills and build self-efficacy for enacting behavioral skills in sexual encounters. Male and female condom use was also instructed and modeled, allowing participants to practice condom application with corrective feedback from the group facilitators and their peers. The workshop ended with a goal-setting exercise and a brief closing ceremony.

HIV–alcohol Education Control Condition

An HIV and alcohol education intervention devoid of motivation and behavioral skills served as the control group. Participants randomized to the control group received the same 1-h of HIV and alcohol education that was included in the first part of the risk-reduction intervention. The HIV–alcohol information group represents an interactive educational experience similar to that commonly used in community education.

Group Facilitator Training and Intervention Quality Assurance

The group facilitators for both conditions consisted of one Coloured man and one Coloured woman with minimal prior intervention experience outside the study protocol. Both facilitators were bilingual in English and Afrikaans languages, and both facilitators delivered the risk-reduction intervention and education control. Groups were conducted separately for men and women. The facilitators were trained using an interactive skills-building approach. US and South African project managers with experience

conducting small-group HIV-prevention interventions conducted the training over a 3-week period that included practice sessions in a different community. To help protect against facilitator drift and maintain fidelity, the intervention was completely manualized and a poster-size flipchart was used to guide the groups through the session content. Both facilitators attended weekly supervision meetings with a project manager to discuss their adherence to the protocol. Fidelity to the intervention and control group content was also monitored by the field supervisor who reviewed session guides with facilitators and debriefed facilitators after completion of each group.

Measures

Measures were administered in English, Afrikaans, and Xhosa (an indigenous African language spoken in the Eastern and Western Cape of South Africa). Assessment staff were blinded to study conditions. Measures included demographic and risk characteristics, alcohol and drug use, primary outcomes (sexual-risk and protective behaviors including drinking in sexual contexts), and secondary outcomes (risk-reduction self-efficacy, alcohol outcome expectancies, behavioral intentions, HIV-prevention knowledge, and AIDS-related stigmas).

Demographic and Risk Characteristics

Participants reported their age, race, years of formal education, whether they were employed, and their marital status. Participants indicated whether they had ever used or had a sex partner who used a condom and whether they had ever given or received money or other material gain in exchange for sex. Participants were asked if they had ever been tested for HIV and the result of their most recent HIV test.

Alcohol and Other Drug Use

To assess global use of alcohol, participants completed the Alcohol Use Disorder Identification Test (AUDIT; [17]), a ten-item self-report instrument that was designed to identify drinkers at risk of developing alcohol problems or who are experiencing alcohol-related problems. AUDIT scores range from 0 to 40, and scores of 8 or above are used to identify individuals who may be at risk or who are experiencing alcohol problems [18]. The AUDIT has shown evidence of reliability and validity in South Africa [19].

Sexual-risk Behaviors

Participants reported their number of male and female sex partners they had in the past 3 months and the frequency of vaginal and anal intercourse occasions in the previous month. We used the past 3 months for partner recall and 1 month for behavioral recall to achieve optimal reliability and with sufficient events for analysis [20]. Numbers of partners and rates of sexual behaviors were recorded using open response formats where participants indicated the number of partners and sex acts. These measures were developed from instruments that have been shown reliable and valid [20, 21]. We calculated consistent condom use as 100% of intercourse occasions protected by condoms and we computed a variable indicating completely protected behavior which was defined by either 100% condom use or sexual abstinence.

Drinking in Sexual Contexts and Meeting Sex Partners at Shebeens

Participants indicated whether they drank alcohol, defined as beer, wine, or other alcoholic beverages, before sex in the previous month. This measure represents frequencies of situational use of alcohol [22]. Responses were made on open formats, with participants indicating the number of occurrences in the previous month. Participants also reported if they had met sex partners at shebeens in the previous month.

Risk-reduction Self-efficacy

A core construct in Social Cognitive Theory is self-efficacy, the belief that one can perform specific actions under specified circumstances. We assessed self-efficacy using five items that asked participants how confident they were in performing HIV risk-reduction behaviors under specific conditions, including “I am confident about suggesting using condoms with new sex partners” and “I am confident that I would remember to use a condom even if I was drinking alcohol”. Items were responded to on 4-point scales, 1 = strongly disagree, to 4 = strongly agree. Items were summed with higher scores representing higher self-efficacy, alpha=0.76.

Alcohol Outcome Expectancies

Consistent with Social Cognitive Theory [14], we adapted an alcohol outcome expectancy measure from items used in previous research [23–25].Two dimensions of alcohol outcome expectancies were assessed; expected loss of control assessed with six items (e.g., “When I’m drinking, I do things I wouldn’t usually do”), alpha=0.71 and expected sexual enhancement, ten items (e.g., “I am a better sex partner after I have been drinking”), alpha=0.70. Items for both measures were presented together in a mixed order and responded to on four-point scales, 1 = strongly disagree to 4 = strongly agree.

Risk-reduction Behavioral Intentions

The Social Cognitive Theory postulates a close temporal relationship between intentions to change behavior and changes in actual behavior [14]. Participants responded to a seven-item measure assessing intentions to avoid drinking before having sex, specifically "I will not drink alcohol before having sex" anchored on a three-point response set ranging from 1 = I will not do, to 3 = I will do. Higher mean responses indicate stronger behavioral intentions, alpha=0.81.

HIV-prevention Knowledge

An eleven-item test was used to assess HIV risk and prevention-related knowledge. Items were adapted from a measure reported by Carey et al. [26] that was previously used in South Africa [7] and reflected information about HIV transmission, condom use, and AIDS-related knowledge. Items were responded to as Yes, No, or Don't Know. The AIDS knowledge test was scored for the number of correct responses, with Don't Know responses scored incorrect, possible range of scores 0 to 11 expressed as the percent correct. The AIDS knowledge test demonstrated heterogeneity of item content as is typical of knowledge tests, alpha=0.68.

AIDS-related Stigmas

Four AIDS-related stigma items were adapted from previous research and developed for use in South Africa [27]. The AIDS stigma items reflected beliefs about negative qualities of people living with AIDS. These items were responded to on a four-point response set, 1 = Strongly disagree, to 4 = Strongly agree, higher scores represent stronger endorsement of stigmas, alpha=0.74.

Data Analyses

We first inspected all outcome variables for distribution properties. Variables that were significantly skewed, particularly rates of sexual behaviors and number of partners, were transformed using the formula $\log_{10}(x+1)$ with non-transformed observed values presented in the tables. This transformation was adopted from several other behavioral intervention trials and it is the most commonly recommended transformation for rates of sexual behaviors [20, 21, 28]. To test for differential attrition across conditions, a 2 attrition (lost vs. retained)×2 condition (risk-reduction skills vs. education control) contingency table chi-square test was performed at each assessment point. We also conducted attrition analyses for differences on baseline measures as recommended by Jurs and Glass [29] using 2 (condition)×2 (attrition) analyses of variance (ANOVAs), where: (a) an intervention effect indicates a breakdown in randomization, (b) an attrition effect signals differences between participants lost and retained, and (c) an attrition× intervention condition interaction indicates differential loss between conditions.

To test the main study hypotheses, we conducted analyses of covariance (ANCOVAs) for all continuous outcome variables. Differences between conditions were examined at the 3- and 6-month follow-ups using 3-month recall for numbers of partners and 1-month retrospective rates of behaviors. Analyses tested for differences between conditions at the follow-ups after controlling for baseline values and potential confounds. Cohen's *d* statistic [30] is reported as an index of effect size for *F* statistics; values of 0.25 represent small effects and those of 0.50 represent medium effects. Comparisons on categorical outcomes were tested using logistic regression adjusting for potential confounds and baseline rates, reporting odds ratios and 95% confidence intervals. In all analyses, participant gender and scores on the AUDIT were entered as factors. For AUDIT scores, we used a cutoff above 8 to indicate potential problem drinking. All main effects and interactions were entered into the analyses. Because there were no gender-by-condition interactions on the outcome variables, we simplified the analysis and included gender as a covariate. However, level of alcohol use did interact with intervention conditions on outcomes and was therefore retained as a moderating variable in the analyses. All final analyses were 2 (condition)×2 (level of alcohol use) factorials controlling for participant gender, education, employment status, marital status and baseline behaviors or scores. We randomized all participants who completed baseline assessments and we included all participants in analyses for which we obtained either one or both follow-up assessments. Individual cell sizes vary due to missing values.

Results

A total of 598 persons contacted the study recruiter, of which 513 attended the study screening session. A total 160 (27%) persons did not drink in the past month and were not eligible for the study. Thus, 353 (59%) persons completed baseline assessments and were included in the outcome analyses. Participants were followed for 3 and 6 months with 89% retention. Figure 1 presents the flow of participants through the study. The mean age for the sample was 34.1 years (SD=10.5), 36% of participants were married, and 83% were unemployed. More than 70% of the sample had AUDIT scores above 8 and more than half had scores above 12, suggesting a high prevalence of problem drinking (see Table 1).

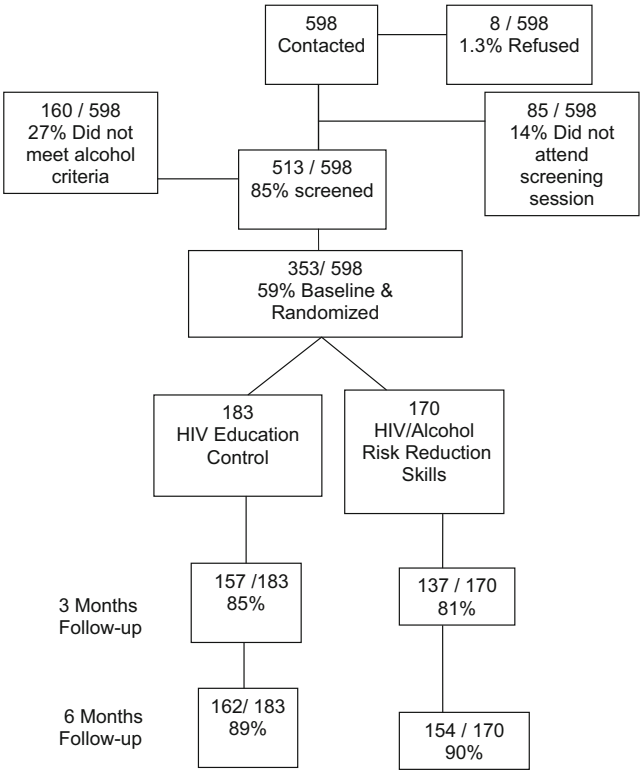

Fig. 1 Flow diagram of participant progress through phases of the randomized trial

Tests for Internal Validity, Confounds, and Bias

Analyses showed that the rate of attrition between the risk-reduction intervention and control condition did not differ at the 3-month follow-up, $X^2(df=1, N=353)=0.54$, $p>0.1$, or the 6-month follow-up, $X^2(df=1, N=353)=0.40$, $p>0.1$. There were no significant differences between conditions on any baseline demographic characteristics or outcome variables, indicating that the randomization scheme achieved balanced groups (see Table 1). There was a significant difference between participants lost to follow-up and those retained on years of education, $F(1,352)=7.8$, $p<0.01$; participants lost to follow-up had more years of education ($M=10.5$, SD=2.2) than participants retained ($M=9.2$, SD=2.2). There were no differences for participant retention on any other demographic characteristic or outcome variable. There were also no condition-by-attrition interactions, demonstrating balanced attrition.

Primary Outcomes: Sexual-risk and Protective Behaviors

Analyses controlling for participant gender, education, employment status, marital status and baseline rates of behaviors on sexual and alcohol risk behavior variables are shown in Tables 2 and 3. We found significant effects of the risk-reduction intervention at the 3-month follow-up on unprotected intercourse, percentage of intercourse occasions protected by condoms, drinking in sexual contexts, consistent condom use and completely protected

Table 1 Characteristics of participants who received the HIV–alcohol education control group and the HIV–alcohol risk-reduction intervention

Characteristic	HIV/alcohol information/education (N=183)				HIV/alcohol reduction skills (N=170)				X^2	t
	N	%	M	SD	N	%	M	SD		
Men	62	34			55	31				
Women	121	67			115	69			0.1	
Race										
Coloured	141	78			131	82				
African	39	20			27	17				
Other	3	2			2	1			2.4	
Unemployed	149	82			141	86			0.6	
Married	62	35			66	40			1.1	
AUDIT score >8	136	74			116	68			1.5	
AUDIT score >12	109	60			88	52			2.1	
History of STI	39	22			27	16			1.7	
Received money for sex	20	11			13	8			1.3	
Given money for sex	13	7			10	6			0.2	
Tested for HIV	102	57			78	47			3.2	
HIV negative	78	77			59	70				
HIV positive	4	4			6	7				
Unknown result	20	19			13	23				
Age			34.1	10.7			34.2	9.7		0.2
Years of education			9.1	2.5			9.2	2.6		0.3
AUDIT score			14.9	8.4			14.2	8.4		0.8

Table 2 Differences in continuous behavioral outcomes between the HIV–alcohol education control group and the HIV–alcohol risk-reduction intervention for lighter and heavier drinking participants

	HIV–alcohol information education				HIV–alcohol risk-reduction skills				F^a	d	F^b	d	F^c	d
	Lighter drinking		Heavier drinking		Lighter drinking		Heavier drinking							
	M	SD	M	SD	M	SD	M	SD						
Unprotected vaginal and anal intercourse														
Baseline	4.0	6.9	4.0	10.0	3.4	5.8	3.6	6.6						
3-months	2.7	4.3	1.9	3.7	1.1	3.6	2.2	3.7	5.6*	0.30	0.6	0.10	13.5**	0.39
6-months	3.4	8.5	2.0	3.2	1.2	2.4	2.4	4.1	2.2	0.19	0.1	0.04	4.1*	0.21
% Intercourse condom protected														
Baseline	56.7	40.6	57.7	38.7	43.8	36.5	52.8	37.9						
3-months	52.0	36.7	66.6	37.6	77.5	33.6	59.3	36.2	6.8*	0.33	0.4	0.08	12.9**	0.38
6-months	65.7	38.9	63.2	36.7	72.2	36.2	58.7	37.7	0.9	0.12	2.2	0.20	1.8	0.14
Alcohol use before sex														
Baseline	2.9	8.8	5.3	15.1	2.2	3.9	5.1	5.4						
3-months	2.1	3.7	2.3	3.9	0.5	1.4	3.5	5.8	4.4*	0.26	2.1	0.20	9.5**	0.32
6-months	2.5	5.6	2.8	4.9	0.7	1.9	2.4	3.9	4.4*	0.26	3.5	0.25	0.9	0.10

Analyses controlling for baseline scores, participant gender, education, employment status, and marital status
*$p<0.05$; **$p<0.01$
[a] Main effect for condition
[b] Main effect for levels of drinking (AUDIT score)
[c] Condition × drinking/AUDIT interaction

Table 3 Differences in categorical behavioral outcomes between the HIV–alcohol education control group and the HIV–alcohol risk-reduction intervention for lighter and heavier drinking participants

	HIV–alcohol information education				HIV–alcohol risk-reduction skills				OR[a]	OR[b]	OR[c]
	Lighter drinking		Heavier drinking		Lighter drinking		Heavier drinking				
	N	%	*N*	%	*N*	%	*N*	%			
Consistent condom use											
Baseline	19	45	48	42	11	31	38	37			
3-months	13	35	56	53	24	67	34	38	3.0*	11.4**	0.3**
6-months	19	56	46	47	22	60	37	42	1.3	1.2	0.7
Completely protected											
Baseline	24	51	68	50	25	50	47	42			
3-months	18	43	72	59	40	77	56	55	2.8**	8.9**	0.3**
6-months	26	63	64	55	37	71	49	49	1.3	1.1	0.7
2+ sex partners [d]											
Baseline	7	15	35	26	6	12	23	20			
3-months	7	16	15	12	3	6	19	18	0.5	0.2	2.7*
6-months	6	15	16	14	4	8	14	14	0.8	0.2	1.6
Met sex partners in shebeens											
Baseline	5	12	36	28	4	8	30	27			
3-months	9	22	24	20	3	6	21	21	0.4***	0.2	2.2*
6-months	7	18	28	24	4	8	22	23	0.5	0.7	1.6

Analyses controlling for baseline scores, participant gender, education, employment status, and marital status
*$p<0.05$; **$p<0.01$; ***$p<0.06$
[a] Main effect for condition
[b] Main effect for levels of drinking (AUDIT score)
[c] Condition × drinking/AUDIT interaction
[d] Partners in the past 3-months

Table 4 Differences in theoretical constructs between the HIV–alcohol education control group and the HIV and alcohol risk-reduction intervention for lighter and heavier drinking participants

	HIV–alcohol information education				HIV–alcohol risk-reduction skills				F^a	d	F^b	d	F^c	d
	Lighter drinking		Heavier drinking		Lighter drinking		Heavier drinking							
	M	SD	*M*	SD	*M*	SD	*M*	SD						
Risk-reduction self-efficacy														
Baseline	17.3	3.7	17.0	3.8	16.5	4.4	17.1	3.9						
3-months	18.7	2.9	18.8	2.4	18.3	3.4	18.3	3.3	0.3	.05	0.8	.07	0.3	.05
6-months	19.2	1.6	18.6	2.7	18.8	2.5	18.5	2.9	0.1	.03	2.2	.14	0.1	.03
Sexual loss of control outcome expectancies														
Baseline	1.7	0.8	2.0	0.9	1.5	0.8	2.1	0.9						
3-months	1.6	0.8	1.7	0.8	1.6	0.8	2.1	0.8	2.1	.15	1.0	.10	0.7	.08
6-months	1.5	0.7	1.7	0.8	1.5	0.7	2.1	0.9	2.5	.16	4.9*	.23	1.5	.13
Sexual enhancement outcome expectancies														
Baseline	1.6	0.8	1.8	0.9	1.3	0.7	1.9	0.9						
3-months	1.5	0.7	1.6	0.8	1.4	0.6	1.7	0.8	0.1	.03	0.1	.03	0.1	.03
6-months	1.4	0.6	1.6	0.8	1.2	0.5	1.7	0.9	0.1	.03	3.4	.20	0.1	.03
Intention to not drink before having sex														
Baseline	2.0	0.8	2.0	0.8	1.8	0.8	1.9	0.7						
3-months	1.9	0.9	2.1	0.8	2.3	0.9	2.2	0.8	7.1**	.28	0.2	.04	2.4	.07
6-months	2.0	0.9	2.2	0.8	2.2	0.8	2.3	0.8	1.4	.12	0.1	.03	0.3	.05
HIV-prevention knowledge														
Baseline	56.0	12.5	52.4	15.1	53.5	12.9	53.2	14.6						
3-months	62.1	6.9	59.0	12.4	60.8	9.1	60.6	9.8	0.1	.03	0.1	.03	1.3	.03
6-months	60.8	9.1	57.3	13.4	58.9	9.0	60.2	9.9	0.1	.03	0.5	.07	3.9*	.21
AIDS-related stigma														
Baseline	5.3	2.1	5.9	3.1	5.1	2.3	5.6	2.9						
3-months	5.2	2.4	5.5	2.9	4.7	2.2	5.3	2.5	1.4	.13	0.2	.04	0.1	.03
6-months	4.9	2.3	5.4	2.9	4.8	2.2	5.2	2.4	1.1	.05	0.3	.06	0.2	.05

Analyses controlling for baseline scores, participant gender, education, employment status, and marital status
*$p<0.05$; **$p<0.01$
[a] Main effect for condition
[b] Main effect for level of drinking (AUDIT score)
[c] Condition × drinking/AUDIT interaction

behavior, and a trend for meeting sex partners in shebeens; the HIV–alcohol risk-reduction intervention demonstrated lower risks than the control group on all variables. However, the only intervention effect to persist at the 6-month follow-up was for drinking in sexual contexts. The only significant main effects for levels of drinking were for consistent condom use and completely protected behavior at the 3-month follow-up; participants who drank heavier were less likely to use condoms consistently and less likely to report complete protection.

There were, however, significant study condition-by-levels of alcohol use interactions for all behavioral outcome variables at the 3-month follow-up. In each case, simple effects tests showed that the risk-reduction intervention delivered to lighter drinkers demonstrated the greatest risk reduction. The only interaction that remained significant at the 6-month follow-up was for unprotected intercourse.

Secondary Outcomes: Social Cognitive Theoretical Constructs

Within-subjects comparisons of each of the follow-up assessments for each theoretical construct compared to

baseline scores showed that in every case the 3- and 6-month scores changed significantly from baseline in a positive direction. Between condition analyses for the theoretical variables controlling for participant gender, education, employment status, marital status, and baseline scores did not demonstrate a pattern of significant outcomes. The only main effect for condition was observed at the 3-month follow-up for intentions to drink less before having sex; the risk-reduction intervention demonstrated stronger intentions. There was also a significant main effect of levels of alcohol use on sexual loss of sex control expectancies; heavier drinkers reported greater expectancies. For the interaction between study condition and level of alcohol use, the only significant finding was for AIDS knowledge test scores, where participants in the education control group who drank heavier showed the lowest knowledge scores at the 6-month follow-up (Table 4).

Discussion

The brief HIV risk-reduction skills-building intervention tested in the current study demonstrated significant short-term reductions in unprotected intercourse, increased use of condoms, and less use of alcohol before sex. However, most of the intervention effects dissipated by 6-months post-intervention. We found no indications for differential intervention effects between men and women. However, all of the observed differences between conditions were moderated by levels of alcohol use; individuals who were at the least risk for problem drinking demonstrated the greatest reductions in HIV risks resulting from the intervention. Lighter drinkers in the risk-reduction intervention decreased their average number of intercourse occasions by 65% and increased their condom use by 77% at the 3-month follow-up and 65% at 6 months. There were also substantial reductions in the use of alcohol before sex that paralleled reductions in meeting sex partners at shebeens. Similar gains were not, however, observed among participants in the control group or among heavier drinkers. The moderating influences of alcohol on our intervention effects were consistent across outcomes and suggest that alcohol use must be addressed at greater intensity than occurred in the current trial.

We observed reductions in risk behaviors and increased protective behaviors across groups and there was no consistent pattern of differences in the observed gains for most of the theoretical constructs. The lack of outcomes for the Social Cognitive Theory constructs is perplexing given the consistent behavioral change outcomes observed. One possible reason for the non-significant outcomes on the theoretical constructs is the variables that we selected to assess. The relatively small number of lighter drinkers also limits our analyses. Another potential explanation for this null finding is the potency of even a minimal intervention, such as a single-hour HIV-education session, in a resource-limited setting [31]. Alternatively, the parallel improvements in the control group may have resulted from contamination. We recruited men and women through chain recruitment from a small number of shebeens in a single community. This procedure may have resulted in participants that influenced each others behavior, contaminating the conditions. Our recruitment method may also have limited the generalizability of the study findings to places outside of the study community.

Another potential limitation of the study was our reliance on self-reported behavior for our primary outcomes. Although our findings are bolstered by the consistent and logical pattern of results observed, caution should be taken in generalizing these results prior to replication. The two groups also differed in the intervention contact time, with the risk-reduction group receiving 3-h and the control group receiving 1-h of contact. Our control group delivered HIV/AIDS education which reduced the potential for demand characteristics and met our ethical obligation to provide at least HIV/AIDS education to all participants. However, the differential contact time does introduce a confound that should be considered when interpreting the results. With these limitations taken into account, we believe that our study findings have implications for HIV prevention in southern Africa.

Brief community-based HIV-prevention interventions can be implemented in resource-limited settings and the current study findings suggest that such interventions alone may have significant short-term effects. Increases in knowledge, reductions in stigma, and changes in beliefs that underlie risk behaviors can be achieved with even a single-hour intervention and behavioral changes can be achieved with a single 3-h workshop. Reductions in risk even over a short period of time can be sufficient to avert infections in a high HIV-prevalence population. However, a single-session workshop ultimately represents an individual-level intervention. Such interventions repeated over time in the same population can ultimately saturate a community with persons motivated to reduce their risks for HIV. Saturating a community with individuals exposed to the same intervention can lead to social structural changes, such as shifts in social norms to support risk-reduction efforts and sustain behavior changes [32, 33]. Multi-level HIV-risk-reduction interventions that include intensive individual risk-reduction interventions as well as structural strategies for altering social norms and community-held beliefs are urgently needed in communities with high HIV prevalence.

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