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Evaluation of a Prevention Intervention to Reduce HIV Risk among Angolan Soldiers

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Abstract

We developed and evaluated a military-focused HIV prevention intervention to enhance HIV risk-reduction knowledge, motivation, and behaviors among Angolan soldiers. Twelve bases were randomly assigned to HIV prevention or control conditions, yielding 568 participants. HIV prevention participants received training in preventing HIV (4.5 days) and malaria (0.5 days). Control participants received the reverse. Monthly booster sessions were available after each intervention. We assessed participants at baseline, three and six months after the training. HIV prevention participants reported greater condom use and less unprotected anal sex at three months, as well as greater HIV-related knowledge and perceived vulnerability at three and six months. Within-group analyses showed HIV prevention participants increased condom use, reduced unprotected vaginal sex, and reduced numbers of partners at both follow-ups, while control participants improved on some outcomes at three months only. A military-focused HIV prevention intervention may increase HIV-related knowledge, motivation, and risk reduction among African soldiers.

Keywords

HIV prevention; military; AIDS; Africa; men

INTRODUCTION

HIV, the human immunodeficiency virus, can pose a significant threat to a country's stability and security, particularly when the country's military has high rates of infection (Altman, 2003; Heineken, 2001; Tripodi and Patel, 2004; Yeager and Kingma, 2001). Soldiers, many of whom are young sexually-active men, are at great risk of acquiring and spreading HIV. Their mobility within and outside their country gives them access to a large number of sexual partners (Sopheab et al., 2006). Soldiers are often separated from wives and girlfriends and seek sex with temporary partners. Their status – as respected men, with steady employment – may make

them attractive to many women. In particular, commercial sex workers may recognize that the soldiers not only want sex but also have money to pay for it (Shefer and Mankayi, 2007). In addition, for many soldiers, their sense of virility and masculinity is closely tied to having multiple sexual partners (Shefer and Mankayi, 2007).

Soldiers' sexual behaviors, then, may have significant implications for HIV infection for themselves and their wives and girlfriends (Gorbach et al., 2000; Morris et al., 1996). If the soldiers engage in coercive sex, as is common in many conflict settings, they may put additional people at risk for HIV infection (Skjelsbaek, 2001). Prevention interventions targeted at this group are critical and important components of national and international HIV/AIDS prevention strategies.

Despite the need for effective, military-focused HIV/AIDS prevention interventions, systematic evaluations of such interventions have only been published about militaries in the U.S. and Thailand. The results of these interventions have been mixed (Russak et al., 2005). Improvements in HIV/AIDS-related attitudes and knowledge were only sometimes accompanied by reductions in risky sexual behaviors (e.g., Boyer et al., 2001; Jenkins et al., 2000). Different types of interventions were assessed in these studies. In general, interventions that had the greatest impact in helping soldiers reduce risk included intensive, multiple sessions over several days and were supported by the military leadership (Booth-Kewley et al., 2002; Boyer et al., 2001; Celentano et al., 2000; UNAIDS, 2004).

Interventions designed for militaries in high- or moderate- resource countries, such as the U.S. and Thailand, however, may not be effective for militaries in resource-limited settings. The militaries of resource-limited countries, such as many countries in sub-Saharan Africa, may have very different needs. For example, soldiers in these countries face different day-to-day stressors, such as poverty, low levels of education, and the substantial financial needs of immediate and extended family. As a result, they may need different skills and support systems to choose and maintain safer sexual behaviors. In addition, these militaries may not have the physical and human infrastructure to implement and sustain complicated, intricate and/or high-tech interventions (such as a computer-based intervention).

Thus, an effective and sustainable HIV/AIDS prevention intervention for soldiers in resource-limited countries must be culturally appropriate, tailored to their specific realities, and based on sound behavior change principles. Such prevention interventions must account for the unique issues of military life, such as mobility, the ease of acquiring alcohol and finding new sexual partners on or near the bases, power differences based upon rank, their strong sense of camaraderie, and their unique societal role as protectors of the nation (Ortiz et al., 2005).

Angola, in southern Africa, is illustrative of many resource-limited countries in sub-Saharan Africa. Several years after the end of a 27-year civil war, the country is rebuilding under the weight of extreme poverty and a destroyed infrastructure. According to the UNDP 2006 Human Development Report, 38% of Angolans are undernourished and only 31% have access to improved sanitation (UNDP, 2006). Infant mortality is 154 per 1000 live births, compared to 9 per 1000 live births in more developed countries. Under-five mortality is 260 per 1000 live births, compared to 10 per 1000 live births in more developed countries. On average, the life expectancy for Angolans is 40.7 years, compared to 77.7 in more developed countries.

A behavioral surveillance study of HIV risk behaviors among the Angolan Armed Forces found significant levels of high-risk behaviors (Bing et al., 2007). Over two-thirds of soldiers had two or more partners in the previous 12 months and fewer than 40% of soldiers who engaged in sex with a casual partner used a condom during their last sexual encounter with a casual partner. Though the prevalence of HIV in the Angolan military is estimated to be less than 5% (Angolan Armed Forces, 2005), the leadership of the Angolan military has expressed concern

that the rate of HIV infection may quickly increase as post-war mobility and cross-border traffic increase. Thus, there is both the need and the political will for an effective HIV prevention intervention in the Angolan military.

In this paper, we present findings from a group randomized controlled intervention trial evaluating the effectiveness of a five-day military-focused HIV prevention intervention. The intervention was developed collaboratively by researchers from the Angolan Armed Forces and the Charles Drew University of Medicine and Science and was designed specifically for Angolan military personnel. The primary goals of this study were to assess the impact over time of an HIV-focused prevention intervention (treatment) and a non-HIV-focused health promotion intervention (control) on HIV-related knowledge, motivations, and behaviors.

METHOD

HIV Prevention Intervention

The HIV prevention intervention followed the framework of Fisher and Fisher's Information, Motivation, and Behavioral Skills (IMB) model of behavior change (Fisher and Fisher, 1992; Fisher et al., 1994). This model suggests that changes in HIV risk behaviors are preceded by a combination of factors: individuals must become *informed* about HIV prevention and transmission, be *motivated* to change their sexual risk behaviors, and taught the *behavioral skills* to initiate and effectively reduce HIV-related risk behaviors.

To adapt the model to the Angolan military context, we conducted eight focus groups with soldiers. The methods and major findings of these groups are reported elsewhere (Ortiz et al., 2005). In these discussions, we learned, among other things, that soldiers desired greater HIV/AIDS education, more training in how to use condoms, and increased availability of condoms. Soldiers reported that having multiple sexual partners was common, especially when they were transferred to far-off locations. They also stated that alcohol increased the tendency to have commercial partners and to not use condoms. Focus group participants stated that interactive and visually-based materials would be most appropriate for soldiers – many of whom have low levels of literacy.

Using the information we gained from the focus group discussions, we designed a five-session HIV prevention intervention that addressed soldiers' expressed concerns about HIV/AIDS and desire for more information about the disease, as well as covered all dimensions of the IMB model. Specifically, information about HIV/AIDS included descriptions of the symptoms and stages of HIV, AIDS, and other sexually transmitted infections (STIs); myths and realities of HIV and STI transmission; ways to prevent HIV and STI infection; treatment for AIDS and STIs; and effects of alcohol on sexual decision-making (see Table I for a brief description of each session). Motivation to prevent HIV focused on increasing personal and social motivation. Increasing personal motivation involved increasing one's desire to keep oneself and one's family safe, as well as align one's perceptions of vulnerability to possible HIV infection with their actual level of risk. To increase social motivation, the HIV prevention intervention underscored that intervention participants were collectively engaged in a new war – the war against HIV/AIDS. Participants were encouraged to see themselves as 'HIV/AIDS warriors.' The development of behavioral skills focused on avoiding sex when under the influence of alcohol, negotiating condom use with a sexual partner, and practicing the correct way to put on a condom. Key behaviors to prevent HIV were summarized as "Rules of Engagement": abstinence, mutual fidelity with one partner, condom use, not sharing razors, and teaching these rules to friends and family. During the HIV prevention intervention, it was emphasized to these male participants that all sexual acts, whether with women or men, should be protected. At the end of the HIV prevention intervention, soldiers were also given a one-hour presentation on malaria prevention; this information was condensed from the control intervention.

Several pedagogical techniques were used to strengthen the HIV prevention intervention, based on the recommendations of soldiers in the focus groups that materials should be interactive and visually-based. First, the HIV prevention intervention was designed to be interactive. Facilitators used question-and-answer and role-playing activities to engage the participants. Educational games were used to review HIV prevention information. Second, to assist low-literacy participants in learning, the intervention was delivered in both auditory and visual formats. Facilitators verbally instructed participants about HIV prevention, aided by illustrated flip charts. A comic book was used as a teaching tool. This comic book, developed with input from soldiers, told the story of a young Angolan soldier whose actions put him at risk for becoming infected with HIV. The third pedagogical technique was to train participants to reinforce what they had learned about HIV/AIDS by informally discussing what they learned in the intervention with their peers, friends, and family members. Participants in the HIV prevention intervention were each given their own copy of the comic book and encouraged to use it in their informal peer education.

Participants were invited to attend optional monthly, informal booster sessions for five months following the completion of the HIV prevention intervention. During each one-hour session, facilitators reviewed the content of the HIV prevention intervention, led participants to discuss their recent experiences with HIV prevention (e.g., were they able to practice consistent condom use, mutual fidelity, and reduction of number of partners), and whether they had recently talked with others about HIV/AIDS. Participants received pamphlets and additional comic books and condoms. They were encouraged to distribute the materials to their peers, friends, and family.

Control Intervention

The control intervention (non-HIV focused) was also comprised of five sessions, focusing primarily on malaria prevention. Another health topic was chosen so that all participants would receive potentially life-saving education, regardless of the condition to which they were randomized. Malaria ranks alongside HIV/AIDS among the top five common causes of death among people in Angola (World Health Organization, 2006). In addition, malaria prevention behaviors do not overlap with HIV prevention behaviors and thus, the malaria prevention content should not impact HIV-related risk behaviors. This intervention was based on the Angolan Armed Forces' existing malaria prevention programs; the malaria prevention material was organized into the five-day intervention by the director of malaria programs in the Angolan Armed Forces.

In the fifth session of the control condition, soldiers were given a one-hour presentation on HIV prevention. The one-hour presentation was similar to the standard HIV prevention intervention that is regularly delivered to Angolan military personnel. It was in lecture format and included a condom demonstration. It did not address motivation or condom negotiation. Participants in the control intervention were invited to attend optional monthly booster sessions on malaria prevention.

Implementation of Interventions

From March 2005 through December 2005, the group randomized controlled trial was implemented on 12 military bases in Angola. Eight bases were located either in the capital city of Luanda or within 80 km of Luanda. Two bases were in the southern province of Huila, and two were located in the northern province of Malanje.

Bases were matched by region and were in geographically separated locations to minimize contamination between bases. Within each base pair, one base was randomly assigned, using

a coin toss, to receive the HIV prevention intervention and the other, the control intervention. The interventions in each base pair were administered concurrently.

The HIV prevention and control interventions were delivered in four-hour sessions on five consecutive days by two separate teams of trained local, civilian facilitators. Facilitators were intensively trained prior to the start of the interventions. One supervisor, also a local civilian and also intensively trained, traveled with each team of facilitators to ensure that facilitators adhered to the protocols. Problems in protocols were noted and rectified before the next day's activities. In addition, supervisors reiterated to participants that their participation in the intervention was completely voluntary and that they could leave at any time.

The HIV prevention and the control interventions were equivalent in number and length of sessions. This balanced design ensured that participants in the two conditions received equivalent amounts of attention during their interventions (Mayo, 1933).

Participants were randomly sampled. The sensitivity of military personnel data prevented non-military research staff from obtaining a sampling frame at each base. Instead, base commanders were given explicit instructions on how to sample people from their base. These included an explanation of probability and generalizability, as well as examples of how to obtain a random sample. For military sensitivity reasons, the civilian research staff were not permitted by the Angolan Armed Forces to supervise or report on recruitment or sampling. A maximum of 48 participants were sampled from each base. Facilitators remained at each base for two weeks, administering the intervention to 24 participants the first week and 24 participants the second week.

Data Collection

Participants were interviewed at baseline, prior to receiving their assigned intervention. They were followed and interviewed again three and six months after the completion of the five days of intervention.

Because of the low levels of literacy among participants, all interviews were verbally administered by trained local, civilian interviewers. Interviewers were extensively trained to administer the interviews in a professional, non-judgmental manner. One supervisor, also a local civilian, traveled with each team of interviewers to ensure that participants understood that participation was voluntary and that interviewers completed the survey packets correctly. The interviews were conducted in Portuguese – the national language of Angola. The baseline interview lasted approximately one hour, while each follow-up interview lasted approximately 40 minutes.

Informed consent was obtained prior to every interview. Participants were assured that their participation was voluntary and that no one in the military would have access to their specific responses.

Among the items assessed in the baseline interview were demographics, knowledge about HIV/AIDS, perceived personal vulnerability to HIV/AIDS, sexual behavior in the past three months, and alcohol consumption before sex.

HIV/AIDS knowledge—Knowledge about HIV/AIDS prevention was assessed by the number of correct answers to 11 yes-or-no questions ($\alpha = 0.85$). Questions covered transmission of HIV/AIDS and methods of prevention. The questions were based on the Family Health International Behavioral Surveillance Survey (Family Health International, 2000) and modified to include local myths about HIV transmission.

Perceived vulnerability to HIV/AIDS—Motivation to prevent HIV/AIDS was measured by three items focusing on perceived vulnerability to HIV/AIDS infection. In these items, participants were asked whether they agreed that they themselves, people similar to themselves, and Angolan soldiers, in general, were at risk for becoming infected with HIV/AIDS. These items map onto specific aspects of perceived vulnerability to HIV infection that were addressed in the intervention; these were drawn from previous research done elsewhere (Boyer, et al., 2001).

HIV/AIDS risk behaviors—Participants were asked about their sexual behavior in the *past three months* with four, mutually-exclusive partner categories: live-in partners, girlfriends, occasional partners, and commercial partners. *Live-in partners* were defined as regular partners with whom participants lived. *Girlfriends* were regular partners but with whom participants did not live. *Occasional partners* were defined as partners with whom participants had sex occasionally but who were not commercial sex workers. *Commercial partners* were partners with whom participants exchanged money for sex. Participants were asked with how many of each type of partner they had sex in the past three months. They were asked the frequency with which they had vaginal sex with each type of partner, the frequency with which they had anal sex with each type of partner, as well as the frequency of condom use during vaginal sex and anal sex with each type of partner.

Using the measures above, participants' risk for HIV infection in the past three months was operationalized in four different ways: 1) the frequency of condom use during vaginal sex with girlfriends and occasional and commercial partners, 2) the number of unprotected vaginal sex acts per month across all partners, 3) the number of people engaging in unprotected anal sex with live-in partners and girlfriends, and 4) the total number of occasional and commercial partners.

The first HIV risk outcome, frequency of condom use during vaginal sex with girlfriends and occasional and commercial partners, was calculated across all three partner types and at each time point. Participants were categorized according to their highest risk behavior – that is, their least frequent condom use – with any of the three partner types. For example, if a participant 'rarely' used condoms with his girlfriend but 'sometimes' used condoms with an occasional partner, he was categorized as 'rarely' using condoms. Participants who did not have sex with any of the aforementioned partners were included in the same low-risk category as those who 'always' used condoms with all partner types.

Second, the number of unprotected vaginal sex acts per month with girlfriends, occasional and commercial partners was estimated separately for each partner type and at each time point. This was done by multiplying participants' reported frequency of vaginal sex per partner type by the proportion of sexual acts in which a condom was not used with that partner type. A log ($x+1$) transformation was applied to the number of unprotected vaginal sex acts before analyses were conducted.

Third, the numbers of people who engaged in unprotected anal sex with live-in partners and with girlfriends were calculated at each time point. Participants who did not have anal sex with any of the aforementioned partners were included in the same low-risk category as those who 'always' used condoms. Analyses did not include anal sex with occasional and commercial partners because the reported rate was too low. Additionally, it was not practical to calculate number of risky anal sex acts in the past month because of the low frequency of anal sex overall.

Fourth, the total number of occasional and commercial partners was a sum of each participant's reported number of occasional and commercial partners. A log($x+1$) transformation was also applied to number of partners before analyses were conducted.

Alcohol consumption before sex—One item was used to assess alcohol consumption before sex. Participants were asked how frequently they had consumed any alcohol less than two hours before sex in the past month.

Questionnaires in the follow-up interviews covered these same topics, excluding demographics.

Statistical Analysis

A hierarchical mixed linear model with random subject effects was used to compare changes in mean outcomes between and within the HIV prevention and control groups at three and six months (Weiss, 2005). The primary outcomes using this type of analysis were HIV knowledge, number of unprotected vaginal sex acts, number of occasional and commercial partners, and alcohol consumption before sex. Prior to analysis, skewed data were transformed $\log(x+1)$ to approximate normality. All models were fit using SAS Proc Mixed (SAS Institute, Cary NC) and adjusted for location, rank, age, and time served in military.

A hierarchical logistic model with random subject effects was used to compare perceived personal vulnerability to HIV infection between and within HIV prevention and control groups at three and six months. Models were fit using SAS Proc Glimmix and were adjusted for location, rank, age, and time served in military. Z-tests were used to compare proportions of people who decreased their risky behaviors in the HIV prevention and control conditions at three months and at six months. Follow-up tests were conducted separately for HIV prevention and control conditions. McNemar's test was used to compare the number of people who increased condom use during vaginal sex with the number of people who decreased condom use during vaginal sex between baseline and the three and six month time points. McNemar's test was also used to compare the number of people who decreased with the number of people who increased in unprotected anal sex acts between baseline and the three and six month time points.

All analyses were intent-to-treat analyses. If a subject did not supply data for a particular follow up visit, their data were still included in the hierarchical analyses.

RESULTS

A total of 568 male soldiers from the Angolan Armed Forces were interviewed at baseline. Of those, 280 participated in the HIV prevention intervention and 288 participated in the control intervention. Retention rates at both follow-up interviews were high (87.3%, at three months and 86.4% at six) and did not differ significantly across HIV prevention and control conditions.

Sample characteristics are displayed in Table II. Most participants were either privates or sergeants. Participant ages ranged from 18 to 51 with an average of 29 years. The sample had significant military experience; nearly 97% were in the military during the civil war that ended three years prior to the start of the study. Educational attainment was low, with nearly 90% of the sample completing the equivalent of eighth grade or less. Nearly three-quarters of the participants were not married (72.4%) and most had children (81.3%). Control participants were more likely than HIV prevention participants to be officers, to be older, and to have been in the military for a greater number of years (see Table II).

Sexual Behavior at Baseline

At baseline, recent sexual activity with two or more partners in the past three months was high (42.5%). Of those participants, half (49.8%) had a live-in partner and at least one girlfriend.

Vaginal sex was the most commonly reported form of sexual activity; 85.9% of participants reported having vaginal sex at least once in the past three months. Less than 20% of the participants reported they had engaged in anal sex at least once in the past three months, primarily with their live-in partners and girlfriends. One percent reported having anal sex (insertive or receptive) with another male. Because the rate of anal sex with other males was so low, subsequent analyses focus on vaginal and anal sex with women.

Condom use during vaginal or anal sex was generally low, with the lowest rate among live-in partners (13.5%). Rates of using a condom at least some of the time with girlfriends, occasional and commercial partners were 45.2%, 40.8% and 60.6%, respectively.

Impact of Interventions on HIV/AIDS-related Knowledge

Mean scores for all outcomes at each time point are shown in Table III.

Between-groups analyses revealed that participants in the HIV prevention intervention reported significantly higher HIV/AIDS knowledge compared to baseline than control participants at three months, $t = 6.08$, $p < .01$, and at six months, $t = 3.67$, $p < .01$ (Table IV).

Within-group analyses showed that HIV prevention intervention participants showed significant increases in HIV/AIDS knowledge after three and six months, $t = 16.47$ and 18.61 , p 's $< .01$, respectively. In the control condition, participants also showed significant increases in HIV/AIDS knowledge at both time points, $t = 8.09$ and 13.32 , p 's $< .01$.

Impact of Interventions on Perceived Vulnerability to HIV

Between-groups analyses showed there was a significantly greater increase among HIV prevention intervention participants in perceived vulnerability of people similar to oneself to HIV infection than control participants at three months, $t = 2.23$, $p < .05$ and at six months, $t = 2.53$, $p < .05$. Between-groups analyses also showed a significantly greater increase among HIV prevention intervention participants in perceived vulnerability of Angolan soldiers to HIV infection than control participants at three months, $t = 3.14$, $p < .01$ and at six months, $t = 2.50$, $p < .05$. There were no differences between the groups in perceived vulnerability of oneself to HIV infection at three or six months.

Within-group analyses of the HIV prevention intervention group showed significant increases in perceived vulnerability for people similar to oneself at six months, $t = 3.90$, $p < .01$ and in perceived vulnerability for Angolan soldiers at three and six months, $t = 2.94$, $p < .01$ and $t = 4.14$, $p < .01$, respectively. There was a significant increase in perceived vulnerability of oneself to HIV infection in the HIV prevention intervention group at six months, $t = 1.92$, $p \leq .05$. (Table IV). In contrast, within-group analyses of the control group showed a reduction in perceived vulnerability of people similar to oneself to HIV infection at three months, $t = -2.49$, $p < .05$; no significant changes were found in any of the other perceived vulnerability outcomes at three or six months.

Impact of Interventions on Condom Use

Between-group analyses showed that at three months, among those who changed in their level of condom use during vaginal sex, the proportion of participants who increased condom use was significantly higher in the HIV prevention intervention group than in the control group ($Z = 2.51$, $p < .01$). This difference was no longer significant at the six-month follow-up.

McNemar tests conducted within-groups showed that, in the HIV prevention intervention group, a greater number of participants increased ($n = 67$) than decreased their condom usage during vaginal sex ($n = 27$) at three months ($\chi^2 = 17.02$, $p < .01$, $df = 1$) and at six months (n

= 67 vs. n = 34; $\chi^2 = 10.78$, $p < .01$, $df = 1$). This was true in the control condition only at six months (n = 73 vs. n = 33; $\chi^2 = 15.09$, $p < .01$, $df = 1$).

Impact of Interventions on Number of Unprotected Vaginal Sex Acts

There were no significant differences between the HIV prevention and control conditions on number of unprotected vaginal sex acts three or six months after the intervention.

However, results from the within-group analyses revealed that compared to baseline, HIV prevention intervention participants reported fewer unprotected vaginal sex acts with girlfriends at three months ($t = -2.15$, $p < .05$), with occasional partners at three and six months ($t = -2.41$, $p < .05$ and $t = -3.31$, $p < .01$, respectively), and with commercial partners at three and six months ($t = -1.98$, $p < .05$ and $t = -2.61$, $p < .01$, respectively; Table V). In contrast, compared to baseline, control group participants reported significantly fewer unprotected vaginal sex acts only with occasional partners at three and six months ($t = -3.01$, $p < .01$ and $t = -3.59$, $p < .01$, respectively), but not with girlfriends and commercial partners at either follow-up period.

Impact of Interventions on Unprotected Anal Sex Acts

Between-group analyses showed that at three and six months, the proportion of participants who *reduced* their number of unprotected anal sex acts with live-in partners was significantly higher in the HIV prevention intervention group than in the control group ($Z = 2.41$, $p < .01$ and $Z = 2.91$, $p < .01$, respectively). No between-group effects were found for reduction in unprotected anal sex acts with girlfriends at three or six months.

McNemar tests conducted within-groups showed that, in the HIV prevention intervention, a greater number of participants reduced their number of unprotected anal sex acts with live-in partners than increased at three months ($\chi^2 = 8.05$, $p < .01$, $df = 1$) and at six months (n = 23 vs. n = 3; $\chi^2 = 15.38$, $p < .01$, $df = 1$). In the control group, there was no reduction in unprotected anal sex with live-in partners at three or six months after the intervention. However, with girlfriends, both the HIV prevention and control groups showed a significant reduction in unprotected anal sex at the six-month follow-up. No changes in unprotected anal sex with girlfriends were seen at three months in either group.

Impact of Interventions on Number of Occasional and Commercial Partners

There were no significant differences between the groups on number of occasional and commercial partners at three or six months after the intervention.

However, in the within-group analyses, the HIV prevention group showed a significant reduction in the number of occasional and commercial partners from baseline ($M = 0.32$) to three months ($M = 0.16$) and from baseline to six months ($M = 0.14$), $t = -2.72$ and -3.04 , respectively, p 's $< .01$. In contrast, analyses in the control group showed a reduction in number of occasional and commercial partners only at six months ($M = 0.37$ vs. $M = 0.21$), $t = -2.20$, $p < .05$.

Impact of Interventions on Alcohol Consumption before Sex

There were no significant between- or within-group differences in alcohol consumption before sex at either three or six months.

DISCUSSION

Findings at baseline show that Angolan soldiers engage in a number of high-risk behaviors that may put them at risk for HIV infection. A large proportion of them had multiple sexual partners in the preceding three months and few used condoms.

As predicted by the Information, Motivation, and Behavior (IMB) model, the HIV prevention intervention group, compared to the control group had significant improvements over time in HIV/AIDS knowledge, perceived vulnerability to HIV infection and some of the behavioral outcomes.

Compared to those in the control intervention, HIV prevention intervention participants had more knowledge of HIV/AIDS three and six months after baseline, perceived people similar to themselves and Angolan soldiers to be more vulnerable to HIV at three and six months, reduced unprotected anal sex with live-in partners at three and six months, and were more likely to have increased condom use during vaginal sex at three months. Significant between-groups differences were not found for the other parameters measured.

It is possible that the lack of significant between-group differences in some of the other outcomes may be due to the observed improvements in both the HIV prevention and control groups. Nevertheless, improvements were often larger for the HIV prevention intervention group than the control group. In fact, the HIV prevention group reduced the number of unprotected vaginal sex acts with girlfriends, occasional and commercial partners, reduced unprotected anal sex with girlfriends, as well as reduced the total number of occasional and commercial partners, compared to baseline.

While it is not clear exactly why the control group also showed improvement on some of the behavioral outcomes, two environmental factors may offer some explanation. Approximately halfway through the study, the Angolan National Institute for the Fight against AIDS initiated radio campaigns designed to promote mutual fidelity and the use of condoms, encourage HIV testing, and reduce stigma. Around the same time, the Angolan Armed Forces, with support from the Global Fund, expanded its HIV prevention activities in areas where several of study bases were located. In addition, the assessment itself may have had some impact on the control group. To be asked about one's sexual behaviors in such a detailed and systematic format would have been a very unusual experience for these men (Gale, 2004). The uniqueness of the interview experience, as well as the half-day of HIV education we provided in the control intervention, may have led control participants to become more attentive to the national HIV prevention campaign and may have stimulated them to reduce their risk behaviors (Dworkin et al, 2006).

However, the fact that the HIV prevention intervention group showed more consistent improvements in knowledge, motivation, and behavior than the control group suggests that the HIV prevention intervention group may have received benefits above and beyond that which the control group received from the national HIV prevention activities.

Though the HIV prevention intervention also focused on reducing alcohol consumption before sex, neither the HIV prevention nor control conditions showed reductions on this outcome. The assessment of alcohol consumption before sex consisted of a single question and had a one-month time frame; thus, it may not have been sufficiently sensitive to detect changes in the frequency of alcohol consumption prior to sex.

Though a five-session group intervention may be challenging to implement in a civilian setting, where the demands of daily living compete for time, it is feasible to do so in a military setting, where soldiers can be relieved of other duties to participate. In addition, the group intervention

is consistent with military culture, which encourages activities that strengthen group cohesion and camaraderie.

The group randomized design may have minimized contamination across HIV prevention and control conditions. Randomizing individuals to conditions would have led to HIV prevention and control participants being on the same base. However, because bases, not individuals, were randomized, there were some differences between HIV prevention and control groups at baseline. It is possible that these differences may have impacted the uptake of the intervention in each group. Importantly, though, there were no differences between the HIV prevention and control groups on their baseline knowledge, motivation, and risk behaviors.

Other limitations included a reliance on self-report data about sexual behaviors, and an overrepresentation of military bases in the capital city. Self-report data may have been biased by participants' ability to recall their sexual behaviors in the past three months, as well as by the possibility that they gave socially desirable, rather than completely accurate, responses. That most of the bases were located in the capital city may have biased the sample towards soldiers who have more access to other sources of HIV/AIDS information, such as the national radio campaign.

The findings from this study suggest some future areas of research to improve HIV prevention interventions for military men. In the present study, the degree of HIV risk reduction differed across partner types. Reduction of HIV risk with occasional and commercial partners was found more frequently than with girlfriends and live-in partners. Future studies should explore the perception of sex and related to it, the perception of condom use among soldiers, with each of these types of partners (see Boyce et al., 2007). Interventions then may be able to address the specific issues within male soldiers' sexual relationships with regular and non-regular partners more effectively. Future interventions may also explore ways to involve women partners, thus opening up opportunities to discuss gender roles and its impact on the negotiation of sex, condom use, faithfulness, and other HIV-related risk behaviors (see Kurpius and Lucart, 2000; Shefer and Mankayi, 2007).

In sum, this study presents evidence that militaries, even in resource-limited post-conflict countries, can provide effective HIV prevention to their soldiers. Though the HIV intervention presented in this paper is intensive and spans multiple sessions, the structure of militaries allows for intensive prevention training, as well as repeated follow-up sessions – techniques that are not easily implemented in civilian or non-workforce sectors. In addition, military culture can be leveraged to facilitate HIV prevention: military hierarchy, following orders through the chain of command, perception of soldiers as protectors of family and nation, and respect of soldiers by the general population. Such military-focused interventions, when supported by military commanders in countries with high rates of HIV, may help transform soldiers into positive agents of change, spreading HIV prevention messages throughout the country.

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REFERENCES

- Altman D. AIDS and security. *International Relations* 2003;17(4):417–427.
- Angolan Armed Forces. Behavioral and Serological Surveillance Survey (BSS) 2004: Angolan Security Forces. Luanda, Angola: Angolan Armed Forces; 2005.

- Bing EG, Ortiz DJ, Ovalle-Bahamon RE, Cheng KG, Huang FH, Ernesto F, et al. HIV/AIDS behavioral surveillance among Angolan military men. 2007 Available from <http://www.springerlink.com/content/104828/>.
- Booth-Kewley S, Shaffer RA, Minagawa RY, Brodine SK. Effectiveness of two versions of a sexually transmitted diseases/human immunodeficiency virus prevention program. *Military Medicine* 2002;167(3):254–259. [PubMed: 11901577]
- Boyce P, Huang Soo Lee M, Jenkins C, Mohamed S, Overs C, Paiva V, Reid E, Tan M, Aggleton P. Putting sexuality (back) into HIV/AIDS: Issues, theory and practice. *Global Public Health* 2007;2(1): 1–34. [PubMed: 19280385]
- Boyer CB, Shafer MA, Shaffer RA, Brodine SK, Ito SI, Yniguez DL, et al. Prevention of sexually transmitted diseases and HIV in young military men: Evaluation of a cognitive-behavioral skills-building intervention. *Sexually Transmitted Diseases* 2001;28(6):349–355. [PubMed: 11403194]
- Celentano DD, Bond KC, Lyles CM, Eiumtrakul S, Go VF, Beyrer C, et al. Preventive intervention to reduce sexually transmitted infections: A field trial in the Royal Thai Army. *Archives of Internal Medicine* 2000;160(4):535–540. [PubMed: 10695694]
- Dworkin SL, Exner T, Melendez R, Hoffman S, Ehrhardt AA. Revisiting "success": Posttrial analysis of a gender-specific HIV/STD prevention intervention. *AIDS and Behavior* 2006;10(1):41–51. [PubMed: 16570217]
- Family Health International. Behavioral Surveillance Surveys: Guidelines for Repeated Behavioral Surveys in Populations at Risk of HIV. Arlington, Virginia: Family Health International; 2000.
- Fisher JD, Fisher WA. Changing AIDS-risk behavior. *Psychological Bulletin* 1992;111(3):455–474. [PubMed: 1594721]
- Fisher JD, Fisher WA, Williams SS, Malloy TE. Empirical tests of an information-motivation-behavioral skills model of AIDS-preventive behavior with gay men and heterosexual university students. *Health Psychology* 1994;13(3):238–250. [PubMed: 8055859]
- Gale EAM. The Hawthorne studies - a fable for our times? *QJM: An International Journal of Medicine* 2004;97(7):439–449. [PubMed: 15208432]
- Gorbach PM, Sopheab H, Phalla T, Leng HB, Mills S, Bennett A, et al. Sexual bridging by Cambodian men: potential importance for general population spread of STD and HIV epidemics. *Sexually Transmitted Diseases* 2000;27(6):320–326. [PubMed: 10907906]
- Heineken L. HIV/AIDS, the military and the impact on national and international security. *Society in Transition* 2001;32(1):120–127.
- United Nations Development Programme. Human Development Report 2006. New York, NY: 2006.
- Jenkins PR, Jenkins RA, Nannis ED, McKee KT Jr, Temoshok LR. Reducing risk of sexually transmitted disease (STD) and human immunodeficiency virus infection in a military STD clinic: Evaluation of a randomized preventive intervention trial. *Clinical Infectious Diseases* 2000;30(4):730–735. [PubMed: 10770736]
- Kurpius SER, Lucart AL. Military and civilian undergraduates: Attitudes toward women, masculinity, and authoritarianism. *Sex Roles* 2000;43(3–4):255–265.
- Mayo, E. The human problems of an industrial civilization. Boston, MA: Division of Research, Graduate School of Business Administration, Harvard University; 1933.
- Morris M, Podhisita C, Wawer MJ, Handcock MS. Bridge populations in the spread of HIV/AIDS in Thailand. *AIDS* 1996;10(11):1265–1271. [PubMed: 8883589]
- World Health Organization. Mortality Country Fact Sheet: Angola. 2006 [Retrieved April 23, 2007]. from http://www.who.int/whosis/mort/profiles/mort_afro_ago_angola.pdf
- Ortiz DJ, Bing EG, Boyer CB, Russak SM, De Deus FJ, Ernesto F. Evidence-based recommendations for prevention of human immunodeficiency virus and sexually transmitted infections in the Angolan Armed Forces: Challenges and opportunities at the end of 30 years of war. *Military Medicine* 2005;170(4):327–332. [PubMed: 15916304]
- Russak SM, Ortiz DJ, Galvan FH, Bing EG. Protecting our militaries: A systematic literature review of military human immunodeficiency virus/acquired immunodeficiency syndrome prevention programs worldwide. *Military Medicine* 2005;170(10):886–897. [PubMed: 16435765]

- Shefer T, Mankayi N. The (hetero)sexualization of the military and the militarization of (hetero)sex: Discourses on male (hetero)sexual practices among a group of young men in the South African military. *Sexualities* 2007;10(2):189–207.
- Skjelsbaek I. Sexual violence and war: Mapping out a complex relationship. *European Journal of International Relations* 2001;7(2):211–237.
- Sopheab H, Fylkesnes K, Vun MC, O'Farrell N. HIV-related risk behaviors in Cambodia and effects of mobility. *Journal of Acquired Immune Deficiency Syndromes* 2006;41(1):81–86. [PubMed: 16340478]
- Tripodi P, Patel P. HIV/AIDS, peacekeeping and conflict crises in Africa. *Medicine, Conflict and Survival* 2004;20(3):195–208.
- UNAIDS. HIV/AIDS prevention and control: An experience of the Royal Thai Army in Thailand. Copenhagen, Denmark: UNAIDS; 2004.
- Weiss, RE. *Modeling Longitudinal Data*. New York: Springer; 2005.
- Yeager RD, Kingma SJ. HIV/AIDS: Destabilising national security and the multi-national response. *Revue Internationale des Services de Santé des Forces Armées* 2001;74(1):3–12.

Table I**HIV prevention Intervention Sessions**

Session 1	Session 2	Session 3	Session 4	Session 5
<ul style="list-style-type: none"> Assessing personal risk for HIV infection Ground rules of participating in intervention Introduction to HIV/AIDS comic book HIV/AIDS in Africa, in Angola, and in Angolan military Basic biology of sex Introduction to HIV and AIDS Play game to review material 	<ul style="list-style-type: none"> Transmission of HIV Stages of AIDS Importance of HIV testing Ways to prevent HIV transmission Introduce the Rules of Engagement How to use a condom Practice putting condom on penis model Practice teaching first section of comic book Homework: Obtain a condom and bring to next session 	<ul style="list-style-type: none"> Play game to review how to put on a condom Review how HIV is transmitted STIs: symptoms, transmission, and treatment Relationship of STIs to HIV/AIDS Role-play condom negotiation Practice teaching second section of comic book Homework: Talk to someone about condom use 	<ul style="list-style-type: none"> Review how HIV is transmitted Alcohol and sexual behavior Games to illustrate effect of alcohol on behavior Role-play sexual negotiation when drinking Play game to review material from entire intervention Practice teaching third and last section of comic book Homework: Teach comic book to someone outside of the intervention 	<ul style="list-style-type: none"> One hour presentation on malaria prevention Review of HIV/AIDS intervention Play game to review material from entire intervention HIV/AIDS warrior graduation ceremony

Table II

Group sample characteristics

	HIV Prevention	Control	
	% (n)	% (n)	χ^2
Region of country			
Luanda	66 (184)	67 (192)	0.1
Huila	17 (48)	17 (48)	
Malanje	17 (48)	17 (48)	
Rank			
Privates	35 (97)	32 (93)	6.4*
Sergeants	61 (171)	58 (167)	
Officers	4 (12)	10 (28)	
Age			
18–25	34 (96)	23 (65)	11.1**
26–32	47 (131)	51 (146)	
33+	19 (53)	27 (77)	
# of years in military			
≤ 3 years	4 (11)	2 (7)	9.1*
4–9 years	50 (139)	39 (113)	
10–13 years	29 (81)	33 (96)	
14 + years	18 (49)	25 (72)	
Education			
0–4 years	23 (63)	28 (80)	7.5
5–6 years	32 (90)	38 (109)	
7–8 years	33 (93)	24 (69)	
9–12 years	12 (34)	10 (30)	
Marital status			
Married	29 (81)	26 (76)	0.5
Not married	71 (199)	74 (212)	
Has Children			
Yes	79 (220)	84 (242)	2.8
No	21 (60)	16 (46)	

*
p ≤ .05**
p ≤ .01

Table III

Outcomes by Condition and Time Point

Outcome	HIV prevention Group			Control Group		
	Baseline	3-months	6-months	Baseline	3-months	6-months
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
HIV/AIDS-related knowledge	8.0 (1.5)	9.6 (1.1)	9.8 (1.1)	7.9 (1.7)	8.7 (1.4)	9.2 (1.4)
Number ^d of unprotected vaginal sex acts with girlfriends in past 3 months	2.1 (4.6)	1.2 (2.5)	1.6 (4.0)	2.2 (4.8)	2.0 (4.5)	1.8 (4.7)
Number ^d of unprotected vaginal sex acts with occasional partners in past 3 months	.5 (1.7)	.2 (1.2)	.1 (.9)	.7 (2.6)	.4 (2.4)	.2 (1.0)
Number ^d of unprotected vaginal sex acts with commercial partners in past 3 months	.2 (1.2)	.1 (.6)	.04 (.4)	.2 (2.0)	.04 (.4)	.2 (1.8)
Average number of occasional and commercial partners in past 3 months	.3 (.9)	.2 (.5)	.1 (0.5)	.4 (1.7)	.3 (1.2)	.2 (1.1)
Alcohol consumption before sex in past month	1.3 (0.8)	1.2 (0.7)	1.2 (0.6)	1.3 (0.8)	1.3 (0.7)	1.2 (0.6)
	%	%	%	%	%	%
Percent who perceived that people similar to oneself are vulnerable to HIV infection	60	62	75	69	60	70
Percent who perceived that Angolan soldiers are vulnerable to HIV infection	64	74	79	73	68	76
Percent who perceived themselves to be vulnerable to HIV infection	83	85	88	82	79	85
Percent who increased condom use during vaginal sex in past 3 months	n/a	27	27	n/a	20	30
Percent who decreased condom use during vaginal sex in past 3 months	n/a	11	14	n/a	17	14
Percent who reduced unprotected anal sex acts with live-in partners in past 3 months	n/a	7	9	n/a	4	3
Percent who increased unprotected anal sex acts with live-in partners in past 3 months	n/a	2	1	n/a	5	3
Percent who reduced unprotected anal sex acts with girlfriends in past 3 months	n/a	5	6	n/a	8	9

Outcome	HIV prevention Group			Control Group		
	Baseline	3-months	6-months	Baseline	3-months	6-months
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Percent who increased unprotected anal sex acts with girlfriends in past 3 months	n/a	2	1	n/a	4	1

^a untransformed

Table IV

Changes in knowledge and motivation

	Mean change from baseline (SE)		Change in HIV prevention group minus change in control group (SE)
	HIV prevention group	Control group	
Knowledge			
At 3 months	+ 1.5** (.09)	+ .75** (.09)	.80** (.13)
At 6 months	+ 1.7** (.09)	+ 1.2** (.09)	.49** (.13)
Perceived vulnerability of people similar to oneself to HIV infection			
At 3 months	+ .02 (.04)	− .10* (.04)	.12* (.05)
At 6 months	+ .15** (.04)	+ .01 (.04)	.14* (.05)
Perceived vulnerability of Angolan soldiers to HIV infection			
At 3 months	+ .11** (.04)	+ .15 (.04)	.16** (.05)
At 6 months	− .05** (.04)	+ .02 (.04)	.13* (.05)
Perceived vulnerability of oneself to HIV infection			
At 3 months	+ .01 (.03)	− .03 (.03)	.04 (.04)
At 6 months	+ .05 (.03)*	+ .02 (.03)	.03 (.04)

*
p ≤ .05**
p ≤ .01

Table V

Changes in proportion of unprotected vaginal sex acts

	Changes in % of unprotected vaginal sex acts from baseline (SE)		% change in HIV prevention group minus % change in control group(SE)
	HIV prevention group	Control group	
Girlfriends			
At 3 months	– 13.0% * (6.1)	+ 2.0% (6.0)	– 15.0% (8.6)
At 6 months	– 9.4% (6.1)	– 12.0% (6.1)	+ 2.7% (8.6)
Occasional partners			
At 3 months	– 9.1% * (3.8)	– 11.0% ** (3.7)	+ 2.0% (5.3)
At 6 months	– 12.0% ** (3.7)	– 13.0% ** (3.7)	+ 1.1% (5.3)
Commercial partners			
At 3 months	– 4.2% * (2.1)	– 2.7% (2.1)	– 1.5% (2.9)
At 6 months	– 5.5% ** (2.1)	– 1.0% (2.1)	– 4.4% (3.0)

*
p < .05**
p < .01