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Effects of HealthWise South Africa on Condom Use Self-efficacy

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Abstract

The present study examines the impact of the HealthWise South Africa prevention intervention on condom use self-efficacy. Students from the Cape Town area were assessed at the beginning and end of each school year, beginning in the 8th grade and ending in the 11th. The intervention was delivered in 12 lessons during the 8th grade and 6 lessons during the 9th grade. Using three-level multiphase mixed-effects models, we found that HealthWise had a statistically significant positive effect on condom use self-efficacy, although effects differed for boys and girls. HealthWise had an effect during the first phase of the intervention (8th grade) for girls and during the second phase (9th grade) for boys. We speculate that the gender differences occur because the 8th grade lessons of the intervention taught skills such as discussion, decision making, and negotiation, which may be more salient to girls, and a 9th grade lesson explicitly focused on condom use within the context of sexual relationships, which may have been more salient to boys.

Keywords

Condom use self-efficacy; Multiphase model; Prevention intervention; South Africa

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HIV/AIDS and other sexually transmitted infections (STIs) and unwanted pregnancy are pressing public health concerns for adolescents in South Africa. South Africa has one of the highest prevalence rates for HIV/AIDS and other STIs. Shisana et al. (2005) report that more than 50% of 11th grade students in South Africa have engaged in sexual intercourse. Of these, 10% report having had an STI and 13% report having either been pregnant or impregnated someone else. Further, they report that approximately 10% of 15–24 year-olds and approximately 23% of 25–29 year-olds in South Africa are infected with HIV. Delaying the initiation of sexual activity and the correct and consistent use of condoms may help to reduce prevalence rates.

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HealthWise South Africa is a comprehensive, risk-reduction life skills curriculum for adolescents in South Africa. It is a collaborative effort between faculty members at The Pennsylvania State University, University of the Western Cape, and University of Cape Town aimed at reducing youth risk behaviors (see Caldwell et al. 2004 for details). The HealthWise program, while based on principles from other prevention programs (see Caldwell et al. 2004), was specifically developed for the South African context. A pilot year involved eliciting feedback from both teachers and students to assure that it was culturally appropriate and fit both the environment of the schools and the normal mode of teacher delivery and training. Although it is beyond the scope of the current paper to fully discuss this issue, a detailed description of the process used and changes made in ensuring the curriculum was culturally appropriate can be found in Wegner, Flisher, Caldwell, Vergani and Smith (2008).

In developing the program, the HealthWise team matched the objectives of HealthWise to the South African-mandated “Life Orientation” (LO) objectives, for which there are no published grade 8 or 9 curricula. These LO objectives include substance use prevention and sexual risk reduction (including abstinence), in addition to training in life skills such as anger management, goal setting, and dealing with peer pressure.

The overall goals of the HealthWise curriculum are to (1) reduce the transmission of HIV/AIDS and other STIs, (2) reduce drug and alcohol abuse, and (3) increase positive use and experience of free and leisure time. HealthWise has previously been shown to have an effect on substance use (e.g. cigarette smoking, alcohol use) and perceived availability of condoms (Smith et al. 2008). No known school-based prevention trial in South Africa has reported a similar impact on condom availability or substance use. The HealthWise lessons focused on the myths and realities of drug use, including alcohol, cigarettes, and marijuana. The intervention also included lessons on self-awareness, decision making, managing anxiety and anger, conflict resolution, motivation, and avoiding risky sexual behavior, which included a demonstration in the correct use of a condom. Finally, the intervention included lessons on planning healthy free time leisure activities, including exploring free time activities, roadblocks to participating in activities, and establishing connections in the community.

Theoretical Foundation

The theoretical foundation for this program was built on the recognition that understanding vulnerability, risk, and protection must be framed in a developmental systems perspective (Bronfenbrenner 1979, 1995; Bronfenbrenner & Morris 1998; Ford & Lerner 1992; Gottlieb 1992; Lerner & Walls 1999; Sameroff 1983). Ecological systems theory (e.g., Bronfenbrenner 1995) is part of the family of developmental systems theories and provided the meta-theoretical perspective for the HealthWise program. HealthWise is based on a positive youth development approach and is concerned with understanding and influencing how youth engage with their social settings, and how that affects risk and protective factors (Catalano, Hawkins, Berglund, Pollard & Arthur 2002; Pittman, Diversi & Ferber 2002).

Although ecological systems theory provides a meta-theoretical frame, HealthWise is based on additional, specific theories of intervention that allow us to model and understand specific processes associated with behavior change. In particular, important theories to our project are self-determination theory (e.g., Baldwin & Caldwell 2003; Ryan & Deci 2000a, 2000b); theories of optimal arousal, including flow, sensation seeking, and boredom (e.g., Caldwell, Darling, Payne & Dowdy 1999; Caldwell, Smith & Weissinger 1992; Csikszentmihalyi 1990; Iso-Ahola & Crowley 1991); social learning theory (e.g., Bandura

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1977a); self-efficacy (e.g., Bandura 1977b); initiative (Larson 2000); and interest development (Deci 1992).

Figure 1 depicts the overall theoretical model of the study. As mentioned, the core of the program is ecological systems theory, from which four general approaches emanated: (1) self-awareness; (2) skill development; (3) knowledge, analysis, and synthesis; and (4) community integration. Figure 1 shows selected lesson components, selected proximal outcomes, and selected theoretical pathways to risk protection. Table 1 provides an example of the way in which we operationalized the curriculum in terms of specific learning activities, process evaluation, and related measures for the two main lessons of interest to this paper. Our proximal and distal outcomes are also noted. This process was followed for all lessons, and these lessons were also mapped onto the LO learning objectives as put forth by the school board. Due to learner burden, we could not measure all related proximal outcomes that we wanted to.

Specific to this study are condom use intentions (Beaudoin 2007) and condom use self-efficacy, which is one of the most important factors in negotiating condom use (Hendriksen, Petifor, Lee, Coates & Rees 2007). Self-efficacy is a belief or confidence in one's ability to take specific action, such as condom use. Self-efficacy was originally part of the Health Belief Model, a psychological model that attempts to explain and predict health behaviors (Mahoney, Thombs & Ford 1995). Self-efficacy differs from knowledge in that individuals may know how to use a condom but they may not feel confident in their ability to do so. People with high condom use self-efficacy feel comfortable buying a condom, feel like they know how to use a condom correctly, and feel confident in their ability to ask their partner to use a condom.

Self-efficacy results in an increase in intention to use a condom as well as an increase in actual condom use (Baele, Dusseldorp & Maes 2001). Several studies have shown that condom use self-efficacy is positively related to condom use frequency (Basen-Engquist & Parcel 1992; Heinrich 1993; Svenson, Oestergren, Merlo & Rastam 2002) and consistency (Baele et al. 2001; Beaudoin 2007; Mahoney et al. 1995; Pallonen, Timpson, Williams & Ross 2009; Tassiopoulous, Kapiga, Sam, Ao, Hughes & Seage 2009). Self-efficacy is also related to STD and HIV testing (Beaudoin 2007).

Interventions aimed specifically at increasing condom use self-efficacy have yielded mixed results (see Mize, Robinson, Bockting & Scheltema 2002 for a review), which is not surprising given that a number of HIV and condom use self-efficacy intervention studies have been criticized on methodological and conceptual grounds (Beaudoin 2007). In this study, HealthWise included common components found in other interventions (e.g., self-esteem, assertiveness, verbal skills, and confidence) in addition to factoring in important cultural norms and values. These components were delivered in both Grades 8 and 9. The present study investigates whether the HealthWise intervention increases condom use self-efficacy and whether the effect differs for boys and girls.

In the four HealthWise schools, the Life Orientation (LO) teachers were given 2 days of training in the curriculum for Grade 8 lessons, and then again for Grade 9 lessons. Follow-up support was also provided as needed. All LO teachers were asked to keep a log of lessons delivered, time spent on the lessons, and a record of their own and their students' positive or negative reactions. Evaluation of the process data is not presented here due to space limitations, but data analyses (see Caldwell et al. 2008) suggest that although teachers in one school had higher levels of implementation fidelity, all teachers exhibited satisfactory to excellent fidelity.

Method

Participants

The participants were from Mitchell's Plain, a low-income, densely populated urban setting near Cape Town that was established as a township during apartheid. The mean age of all participants at baseline was 14.0 (*SD*=.86) years. Fifty-one percent of the sample was female. Most participants identified themselves as Coloured (mix of Asian, European, and African ancestry; 86%), with the rest of the students identifying as Black (9%), White (4%), Indian or other (<1%). At baseline, 5% of eligible participants (*n*= 130) were absent for the survey administration. Another 3% of eligible participants (*n*=81) either did not provide assent or had parents who denied consent for participation.

Participants (*N*=2,429) were students from nine high schools (grades 8–12) from Mitchell's Plain. Each high school had 1,000–1,300 students. The schools were selected in the following manner: Of the 25 high schools in the Mitchell's Plain area, 6 were excluded from consideration for the pilot phase due to concerns about their ability to participate due to frequent principal and teacher turnover, as well as school based violence and crime. Of the remaining 19 schools, 4 were randomly selected and recruited to pilot the intervention; all agreed to participate. The same four schools that participated in the pilot phase became the treatment schools in this trial. For this trial, five additional control schools, all of which agreed to participate, were subjectively matched to the treatment schools on size and religion of the student population, and economic and housing conditions.

Procedure

The study was approved by the Institutional Review Boards of the universities affiliated with this study. Passive parental consent and adolescent assent procedures were used. Students were assessed at the beginning and end of each school year, beginning in 8th grade. Assessments continued until the beginning of 11th grade for a total of seven measurement occasions. The data were collected using personal digital assistants (PDAs) during school hours and required approximately 30 min to complete. Survey items addressed the main intervention components, including attitudes, skills, and behaviors. The intervention was delivered in 12 lessons during the 8th grade and 6 lessons during the 9th grade, with each lesson requiring approximately three 50-min sessions. The lessons regarding condom use and sexual behavior occurred primarily during the 8th grade (i.e., after the baseline measurement occasion). Some of the skills related to condom use self-efficacy such as assertiveness, self-awareness, and managing risky situations were presented during several lessons in the 8th grade. The lesson on relationships and sexual behavior was delivered in 9th grade. This lesson in particular emphasized the need to use condoms if not abstaining and to be both faithful and honest with sexual partners. Thus, the intervention took place between baseline and measurement occasion one and again between measurement occasions two and three. Measurement occasion three represents the first true post-intervention measurement.

Measures

Condom Use Self-efficacy—Condom use self-efficacy was measured as the mean of the responses to the following four items: I am confident that I could put a condom on myself or my partner, I am able to use a condom correctly, I can convince my partner to use a condom, and I can talk to my sexual partner about using a condom. Response options were on a 5-point Likert scale which ranged from "strongly disagree" to "strongly agree." The coefficient alpha for the measure is .74 with confidence intervals (CIs; Maydeu-Olivares, Coffman & Hartmann 2007) of .72–.75.

Statistical Analyses

As mentioned above, the HealthWise intervention was not truly randomly assigned. Thus, there are possible confounders of both intervention assignment and condom use self-efficacy. Adjustments for confounders historically have been made by analysis of covariance (ANCOVA; Shadish, Cook & Campbell 2002), and more recently by methods involving propensity scores (Rosenbaum 2002). We used a logistic propensity model to obtain the predicted probabilities of receiving the intervention given measured baseline confounders. These predicted probabilities are the propensity scores defined as $\pi = P(tx = 1|X)$ and estimated as

$$\widehat{\pi}=\frac{exp(X^T\widehat{\beta})}{1+exp(X^T\widehat{\beta})}$$

where X are baseline confounders, π is the propensity score, $\hat{\beta}$ are the estimated coefficients from a logistic regression, and tx is an indicator for the intervention condition (i.e. $tx= 0$ refers to the control group and $tx=1$ refers to the HealthWise group). Propensity scores balance confounders in the following sense: In any subset of the population in which the propensity scores are constant, treated and untreated participants have identical distributions for the measured confounders (Rosenbaum & Rubin 1983). The balancing property of the propensity score has led to many propensity based techniques for estimating intervention effects, including matching (Rosenbaum & Rubin 1985), subclassification (Rosenbaum & Rubin 1984) and inverse-propensity weighting (Robins, Rotnitzky & Zhao 1995). Once we obtained the estimated propensity scores, we used subclassification in which the strata were based on quintiles of the propensity scores. We then performed the following analysis in each stratum and took the weighted average across the strata, defined as

$$\sum_{\mathrm{s}=1}^{5}\left(\theta_s\frac{n_s}{n}\right)$$

for the estimates and as

$$\sum_{s=1}^{5}\left(\widehat{\mathrm{var}}_{\mathrm{s}}\left(\frac{n_s}{n}\right)^2\right)$$

for the standard errors, where s is the stratum indicator, ns is the sample size in a given stratum s, n is the overall sample size, θ_{s} is the estimate of the effect in a given stratum s, and $\mathrm{var}_{\mathrm{s}}$ is the variance of the estimate in a given stratum s.

We fit a multiphase linear mixed-effects model (Cudeck & Klebe 2002; Fitzmaurice, Laird & Ware 2004; Ram & Grimm 2007; Singer & Willett 2003) using SAS PROC MIXED in each of the five strata. Three levels of nesting were included in the model: repeated measures nested in individuals who were in turn nested in schools. Because observations on individuals within a given school are likely to be more correlated than observations on individuals in two different schools, a third level of nesting was required. Likewise, observations for a given individual are expected to be more correlated than observations on two different individuals. The full-information maximum likelihood estimation (MLE) procedure used for fitting the models allows for missing data in the outcome variable under the assumption that it is missing at random (MAR; Little & Rubin 2002). This assumption means that the missingness may be due to observed variables, but it cannot be due to unobserved variables. Hence, the missingness is ignorable given the observed data. Although the MAR assumption cannot be verified or contradicted in a given data set, simulation studies have shown that estimates are somewhat robust to violations of this assumption and similar to those obtained using multiple imputation (e.g., Collins, Schafer & Kam2001). The advantage of MLE is that it averages over any missing data and makes use of all available observed data. MLE also does not require that individuals be measured at the same occasions (Fitzmaurice et al. 2004; Singer & Willett 2003). Therefore, we included individuals in the analysis if they had a response on the outcome variable on at least one measurement occasion. Only six individuals were excluded because they had no data on the outcome, resulting in a sample size of 2,423.

As mentioned previously, the lessons regarding sexual risk and condom use occurred primarily during the 8th grade, which was followed in 9th grade by lessons on sexual risk and relationships. We used a multiphase model because there are two distinct phases regarding condom use. The first phase consisted of the three measurement occasions that occurred prior to the implementation of the 9th grade intervention; the second phase consisted of the four measurement occasions following the implementation of the 9th grade intervention.

During the first phase, the model included a random intercept at the school level and a random intercept at the individual level, which allows individuals to vary in their initial level of condom use self-efficacy. During the second phase, the model included a random slope for time, which allows individuals to vary in the change in condom use self-efficacy over time. For the first phase, the model included main effects for gender, time, and treatment condition and interaction effects of time by gender, time by treatment, gender by treatment, and time by gender by treatment. For the second phase, the model included a main effect for time, and interaction effects for time by gender, time by treatment, and time by gender by treatment. The equation for the model is given as

$$\begin{aligned} Y = {} & \beta_0 + \beta_1 t + \beta_2 tx + \beta_3 gender \\ & + \beta_4 gender^* tx \\ & + \beta_5 gender^* t \\ & + \beta_6 t^* tx \\ & + \beta_7 gender^* tx^* t \\ & + \beta_8 max(t-2,0) + \beta_9 max(t-2,0)^* tx \\ & + \beta_{10} max(t-2,0)^* gender \\ & + \beta_{11} max(t-2,0)^* gender^* tx \end{aligned}$$

where the max operator limits the second line to the second phase, Y is the condom use self-efficacy outcome, t represents time, tx represents the intervention condition, gender is an indicator of gender (i.e. 0=females and 1=males), and the β'*s* are coefficients to be estimated. The model-predicted trajectories are then obtained by inserting estimates and the observed data for gender, treatment condition, and time.

Results

This section will be organized in the following manner. First, we present the observed mean trajectories. Second, we present the propensity model. Third, we present the multi-phase three-level mixed-effects model results from the first phase followed by results from the second phase. We are particularly interested in the three-way interactions from the mixed-effects models, as these address the research hypothesis of whether the HealthWise

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intervention increases condom use self-efficacy and whether the effect differs for boys and girls.

Descriptives

The observed mean scores on the condom use self-efficacy measure by gender and intervention group are presented in Fig. 2. At baseline, the figure shows that boys have higher condom use self-efficacy than girls. Otherwise, there do not appear to be any baseline differences between the intervention and control conditions.

Propensity Model

We predicted assignment to the intervention using the following covariates in a logistic regression model: dummy variables for language spoken at home, religion, and race; participation in leisure activities; knowledge of where to go to play sports, get help with school work, or have fun; leisure attitudes, motivations, and beliefs; boredom or lack of interest with leisure activities; lifetime use of alcohol, cigarettes, and marijuana; whether they had ever engaged in heavy petting and vaginal sex; and whether they had ever refused to have sex because they or their partner did not have a condom. The propensity models also included items that measured leisure self-efficacy, development of new leisure interests in the previous 6 months, parental control and support for autonomy over leisure activities, family automobile ownership, and tap water and electricity availability at home. We tested the fit of the logistic link by testing the significance of the squared linear predictors in a second model. The inclusion of this extra covariate was not significant, indicating that the logistic link did fit (Hinkley 1985). Boxplots of the estimated logit propensities by intervention condition are shown in Fig. 3. The boxplots illustrate that there is a significant amount of overlap in the propensities for the conditions. The mean propensity for the intervention condition was .46 and the mean propensity for the control condition was .39. We then used the estimated propensity scores to define five strata based on quintiles and repeated the multiphase mixed-effect model in each stratum (Rosenbaum & Rubin 1984). Space limitations prevent us from presenting balance diagnostics and further information about the propensity model, but these may be obtained by contacting the first author.

Mixed-Effects Model

The average estimates across the five strata weighted by the sample size in each stratum are presented in Table 2[1]. We begin with the results from the first phase of the multiphase mixed-effects model. The parameter estimates, standard errors, and significance tests are given in the top half of Table 2. The random intercept at the individual level was significant (.347, $p<.001$) such that individuals varied in their initial level of condom use self-efficacy. The random intercept at the school level was not significant (.006, $p=.144$), indicating that there was not significant variability among schools in the mean initial level of condom use self-efficacy. The control and intervention groups did not differ at baseline in their condom use self-efficacy as indicated by the non-significant main effect for treatment (−.019, $p=.752$), which is expected since the intervention had not yet occurred and since we used a propensity model. The main effect for time was significant (.135, $p<.001$), such that condom use self-efficacy increased over time for all students. The main effect for gender was statistically significant (−.241, $p<.001$), such that boys had greater condom use self-efficacy than girls at baseline (see Fig. 2). The gender by treatment interaction was not significant (−.011, $p=.888$). Since the treatment had not yet been implemented, this non-significant interaction as well as the non-significant main effect for treatment indicates that there were

[1]We have not presented effect sizes for the mixed-effects model because to our knowledge there are not standard effect sizes for models of this complexity (i.e., three levels of nesting, multiphase, mixed effects).

no baseline differences between the two treatment groups. The treatment by time (−.005, p=.882) and gender by time (−.025, p=.376) interactions were also not significant. However, the gender by time by treatment interaction was significant (.087, p=.049). As shown in Fig. 2, the significant three-way interaction indicates that for girls, the intervention group increased in condom use self-efficacy more than the control group on average during the first phase. This finding will be discussed in further detail later.

For the second phase of the multiphase mixed-effects model, the treatment by time (.01, p=.828) and gender by time (.038, p=.349) interactions were not significant. The gender by time by treatment interaction was significant (−.122, p=.05). During the second phase, the trajectory for the boys in the HealthWise intervention increases compared to the boys in the control group and girls (see Fig. 2). The random slope at the individual level for the second phase was statistically significant (.007, p<.001), such that individuals varied in their rate of change in condom use self-efficacy during the second phase.

Discussion

Overall, regardless of intervention condition and gender, condom use self-efficacy increased over time for this sample. Among girls in the intervention group, there is a larger increase during the first phase, compared to girls in the control group and boys. These findings indicate that the HealthWise intervention has a positive effect on condom use self-efficacy for the girls during the first phase. During the second phase, there was again a significant three-way interaction but this time the boys' condom use self-efficacy increased over time to a greater extent than the boys in the control group and the girls.

Gender Differences

Several studies on gender differences in condom use self-efficacy have shown that women have greater condom use self-efficacy than men (e.g., Dekin 1996; Parsons, Halkitis, Bimbi & Borkowski 2000), although a few studies have found no gender differences (e.g., Reis & Stephens 1998; Wulfert & Wan 1993) and a few have found that men have greater condom use self-efficacy (Carroll 1991; Farmer & Meston 2006). Although men have behavioral control over the use of condoms, condom use self-efficacy in women may reflect the ability to communicate about safe sex behaviors and convince their partners to use a condom (Bryan, Aiken & West 1997; Soet, Dilorio & Dudley 1998; Treise and Weigold 2001). Typically, women play a more proactive role in these negotiations (Carter, McNair, Corbin & Williams 1999). Sterk, Klein, and Elifson (2003) found that better sexual communication predicted condom use self-efficacy in a sample of women. Previous research has suggested that a female's perception of condom use self-efficacy may rely more on her ability to effectively and convincingly communicate the desire to use a condom (Soet et al. 1998; Treise & Weigold 2001). Another study has suggested that communication about condom use, especially with first partners, was a significant predictor of condom use (Beaudoin 2007).

It is possible that the HealthWise girls increased their condom use self-efficacy during the first phase because they responded better to the sexual risk and condom use self-efficacy lesson due to its emphasis on both technique and knowledge as well as communication. In addition, they may have responded better to the 8th grade HealthWise content that emphasized discussion, decision making, and negotiation across various risky situations (not just sex). This potential explanation would be supported by much of the literature cited in the previous paragraph.

The increase in condom use self-efficacy in the intervention boys compared to the girls and control boys during the second phase may possibly be attributed to an increase in their maturity levels as well as lesson content. For example, they may have responded better to the lesson in the 9th grade that explicitly focused on relationships, sexual behavior, and condom use. This lesson included a role play involving negotiating the use of a condom in a sexual relationship. This role play may have boosted the condom use self-efficacy of the boys by giving them more self-confidence in how to handle a discussion about condom use. It may also be because the boys were more emotionally and physically mature at this point and better able to respond to a partner's expressed desire to use a condom. Thus, there may have been a developmental lag between genders and ability to use and process the information. Given that boys physically mature slower than girls at this age, it is plausible that their ability to process the information in this lesson was more suited to this second year of the curriculum, when almost all of the boys would have been 1 or 2 years post-puberty.

In the present study, boys had greater condom use self-efficacy than girls both at baseline and throughout the study. Frequency of intercourse has been found to be positively associated with condom use self-efficacy (Heinrich 1993) and relationship duration has been negatively associated with condom use self-efficacy (Raj & Pollack 1995). In addition, the association between age and condom use self-efficacy may be moderated by sexual experience, which increases with age (Heinrich 1993). Among our sample, a greater percentage of boys had had sexual intercourse (defined as vaginal intercourse) than girls at baseline. However, when sexual intercourse was included as a covariate in the model, it was not significant.

Condom Use Self-efficacy and Condom Use

Many studies reviewed for this paper have focused on condom use self-efficacy. However, a question remains: Does condom use self-efficacy predict condom use? Although several previous studies have found a significant relationship between condom use self-efficacy and condom use (Baele et al. 2001; Basen-Engquist & Parcel 1992; Heinrich 1993; Svenson et al. 2002), several other studies have not (Crosby et al. 2001; Farmer & Meston 2006).

In our case, the current findings suggest that the HealthWise intervention did increase condom use self-efficacy for both boys and girls, although the timing differed. We also reported previously that HealthWise had a positive effect on the perceived availability of condoms (as well as a positive effect on lowering cigarette use and alcohol consumption) using data gathered through the fifth wave of data collection (Smith et al. 2008). Despite these two positive findings, neither that set of analyses, nor separate analyses through seven waves of data, however, indicate a direct effect of HealthWise on reported frequency of condom use.

It is possible that, indeed, the HealthWise intervention does not have a direct effect on condom use. Given our two positive condom-related findings, however, we conjecture that perhaps there is a measurement issue. The use of condoms in these analyses, measured as never, sometimes, or always, did not include the sexual context as a potential modifier of use. Moreover, the specificity of the sexual encounter, including use of other contraception, the status of the partner, and refusal to have sex without a condom were not addressed. Future analyses will aggregate across the three cohorts exposed to the program to address these questions in the context of the most recent sexual experience.

Limitations

There are several limitations of the study described above. First, condom use self-efficacy may not result in actual condom use. Second, we do not know the definitive reason for the gender differences in condom use self-efficacy, although further research should investigate these reasons. Finally, propensity score models assume that all confounders of intervention assignment and the outcome are measured and included in the propensity model and the MLE of the mixed-effects model assumes that missing data are MAR. Of course, neither of these assumptions can be verified or contradicted because both involve unmeasured variables.

Conclusion

The findings reported here suggest that condom use self-efficacy was positively influenced by the HealthWise intervention, although differently, for boys and girls. Combined with the results presented by Smith et al. (2008), HealthWise may be a promising program to reduce both sexual and substance use risk among low-income adolescents in Cape Town, South Africa and perhaps elsewhere. The gender differences reported here also suggest that lessons with sexual content may need to be tailored more specifically to different learning styles, and perhaps delivered differently to girls and boys. Overall, however, this program is among the very few school-based programs that have been evaluated and shown promise in South Africa, or the African continent (Kaaya, Mukoma, Flisher & Klepp 2002; Mukoma & Flisher 2007).

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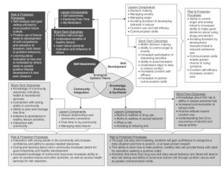

Fig. 1.

Health wise program model: selected components and outcomes

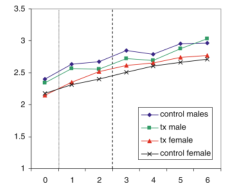

Fig. 2.

Observed mean scores on the condom use self-efficacy measure by gender and intervention group. tx represents the intervention group. Measurement occasions are on the *x*-axis and the condom use self-efficacy score is on the *y*-axis. The dotted vertical line between the baseline (coded as zero) and measurement occasion one represents the 8th grade intervention. The dashed vertical line between measurement occasions two and three represents the 9th grade intervention

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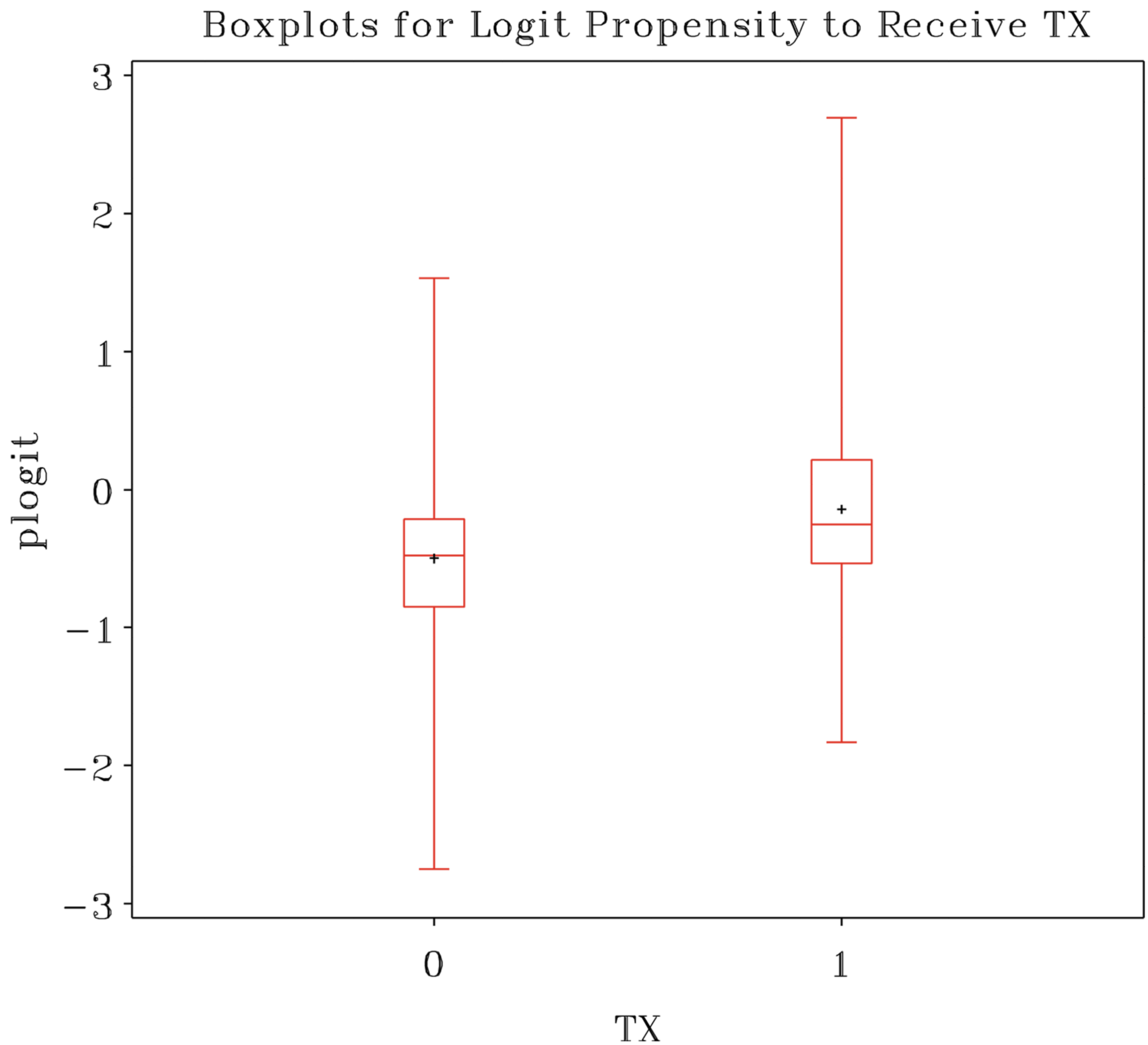

Fig. 3.
Boxplots of the logit propensity to receive the intervention by observed intervention condition (0=control and 1=HealthWise intervention)

Table 1

Logic model for selected HealthWise lessons

ACTIVITIES

Grade 8, Lesson 10 – Avoiding Risky Sexual Behavior

1. Demonstrate knowledge about how to avoid sexual risk, including pregnancy.
    - Define sexual abstinence and low- and high- risk sexual activity.
    - Discuss challenges to avoiding sexual risk.
    - Identify low-and high-risk behaviors using Worksheet 10.1, "Low-Risk/High-Risk Sexual Behaviors."
    - Participate in index card exercise to understand how STIs and HIV are spread.
    - Understand the role of condoms in preventing STIs and HIV.
    - Participate in 12-step exercise to understand the correct way to put on a condom.
    - Using Overhead 10.1, understand the elements of the ABCD model.
2. Demonstrate personal value of being safe in potential sexual situations.
    - Complete Worksheet 10.1. Reflect on and analyze the importance of avoiding high risk behaviors.
    - Discuss the importance of using condoms to avoid STIs and HIV.
    - Discuss the importance of the ABCD model.
3. Shape peer norms regarding value of being sexually safe.
    - Discuss with peers the advantages of remaining abstinent or avoiding sexual risk.
    - Discuss with peers the importance of preventing the spread of STIs and HIV.
    - Discuss with peers the importance of using condoms to prevent pregnancy, STIs and HIV.
4. Demonstrate skills for being personally sexually safe.
    - Complete Worksheet 10.1 and set personal goals for sexual abstinence or low risk sexual involvement.
    - Complete condom exercise and practice skills needed to effectively use a condom.
5. Believe in ability to abstain or practice safe sex.
    - Condom use self-efficacy (ability to obtain and use condoms).
    - Abstinence from sexual activity.

Grade 9, Lesson 5 – Relationships and Sexual Behavior

1. Demonstrate knowledge about healthy relationships and sexual behavior.
    - Describe characteristics of a healthy relationship.
    - Explain the ABCD model by referring to Overhead 5.1, "ABCD Model."
    - Understand the elements of a successful relationship by referring to Overhead 5.2, "Elements for a Successful Relationship."
2. Demonstrate personal value regarding healthy relationships and sexual behavior.
    - Complete Worksheet 5.1, "Qualities of an Ideal Partner," to understand what a healthy romantic relationship looks like and identify qualities they look for in an ideal partner.
    - Complete Worksheet 5.2, "Reasons for Abstaining or Becoming Physically Intimate."
3. Shape peer norms regarding value of healthy relationships and sexual behavior.
    - Discuss with peers reasons for being abstinent.
    - Discuss with peers reasons for becoming physically intimate.
4. Demonstrate communication skills for building and maintaining healthy relationships, and for being faithful in sexual relationships.
    - Practice the use of honest communication, relationship building, and planning statements in a role play.

5. Believe they have the skills for building and maintaining healthy relationships.
    - Will be confident they could be faithful in sexual relationships.

PROCESS MEASURES

1. Which activities did you undertake for this lesson? [check list provided]
2. Approximately how much time was spent on each of the activities you undertook? [checklist provided]
3. How many contact periods did it take to complete this learning experience?
    - Number of periods
    - Duration of each period in minutes
4. To what extent were the activities implemented as set out in the curriculum? [checklist provided]
    - Exactly as planned
    - To a large extent
    - Only to a small extent
    - Not at all
    - Didn’t undertake this activity
5. If you did not implement any of the activities, what are the reasons for this?
6. If in question 5 above you have not mentioned any difficulties experienced in implementing any of the activities, please state these here.

PROXIMAL OUTCOME MEASURES[1]

- Tongue kissing is low risk behaviour.
- The best way to use a condom is to leave some space at the tip for sperm.
- Traditional African medicine has a cure for HIV/AIDS.
- If an older man wants to have sex with a younger girl, it is her duty to have sex with him.
- It is okay for a girl to suggest condom use to a sexual partner.
- It is okay for girls my age to carry condoms if they plan to have sex.
- It is okay for boys my age to carry condoms if they plan to have sex.
- I believe it is okay for people my age to not have sex (abstain).
- Most of my friends think I should not have sex.
- How often have you discussed condoms with your friends?
- I can get condoms.
- I feel confident that I could put a condom on myself or my partner.
- I am able to use a condom correctly.
- I can convince my partner to use a condom.
- I can talk to my sexual partner about using a condom.
- If I did not have sex, I would know other ways of expressing love to my partner.

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[1]The proximal outcomes related to these lessons included sexual risk knowledge, sexual myths, sexual norms, and condom use self-efficacy. The distal outcomes of the study were to (a) reduce substance use, (b) reduce sexual risk behavior, and (c) reduce the co-occurrence of the two.

Table 2

Parameter estimates, standard errors (SEs), and test statistics for the multiphase mixed-effects model with subclassification on propensities

Effect	Estimate	*SE*	*Z*	*p*
First Phase				
Intercept	2.41	.039	62.66	<.001
tx	−.019	.061	−.315	.752
Gender	−.241	.051	−4.73	<.001
Time	.135	.020	6.823	<.001
Gender × tx	−.011	.078	−.141	.888
tx × Time	−.005	.032	−.148	.882
Gender × Time	−.025	.029	−.886	.376
Gender × tx × Time	.087	.044	1.97	.049
(School) Intercept variance	.006	.004	1.46	.144
(Individual) Intercept variance	.347	.014	24.25	<.001
Second Phase				
Time	−.063	.024	−2.66	.008
tx × Time	.01	.046	.217	.828
Gender × Time	.038	.040	.937	.349
Gender × tx × Time	−.122	.063	−1.96	.05
Slope variance	.007	.002	4.11	<.001
Level 1 residual variance	.472	.008	59.26	<.001

tx represents the intervention effect