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Sexual Risk Avoidance and Sexual Risk Reduction Interventions For Middle School Youth: A Randomized Controlled Trial

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Abstract

Purpose—To evaluate the efficacy of two, theory-based, multi-media, middle school sexual education programs in delaying sexual initiation.

Methods—Three-armed, randomized controlled trial comprising fifteen urban middle schools; 1,258 predominantly African-American and Hispanic 7th grade students followed into 9th grade. Both programs included group and individualized, computer-based activities addressing psychosocial variables. The risk avoidance (RA) program met federal abstinence education guidelines; the risk reduction (RR) program emphasized abstinence and included computer-based condom skills-training. The primary outcome assessed program impact on delayed sexual initiation; secondary outcomes assessed other sexual behaviors and psychosocial outcomes.

Results—Participants were 59.8% female, mean age 12.6 years. Relative to controls, the RR program delayed any type of sexual initiation (oral, vaginal or anal sex) in the overall sample (adjusted odds ratio [AOR]: 0.65, 95% CI: 0.54–0.77), among females (AOR: 0.43, 95% CI: 0.31–0.60) and African-Americans (AOR: 0.38, 95% CI: 0.18–0.79). RR students also reduced unprotected sex at last intercourse (AOR: 0.67, 95% CI: 0.47–0.96), past three months' frequency of anal sex (AOR: 0.53, 95% CI: 0.33–0.84) and unprotected vaginal sex (AOR: 0.59, 95% CI: 0.36–0.95). The RA program delayed any sexual initiation among Hispanics (AOR: 0.40, 95% CI: 0.19–0.86), reduced unprotected sex at last intercourse (AOR: 0.70, 95% CI: 0.52–0.93) but increased the number of recent vaginal sex partners (AOR: 1.69, 95% CI: 1.01–2.82). Both programs positively impacted psychosocial outcomes.

Conclusions—The RR program positively impacted sexually inexperienced and experienced youth; the RA program delayed initiation among Hispanics and had mixed effects among sexually experienced youth.

Keywords

Adolescents; sexual behavior; intervention studies; health education; educational technology; pregnancy; sexually transmitted infection; urban populations

Adolescent births and sexually transmitted infections (STIs) remain serious public health issues. Although the US teen birth rate fell to an all-time low in 2009, it remains the highest among all developed countries.[1, 2] National data indicate that one in four adolescent females (14–19 years) has an STI.[3] Early sexual debut increases the risk of pregnancy and STI.[4, 5] Nationally, 15% of 7th graders have experienced sexual intercourse.[6] These findings emphasize the need for effective sexual education for early adolescents.

For over a decade, a public policy debate has centered around the age-appropriateness and efficacy of different approaches to adolescent sexual education, with some advocating a risk avoidance (abstinence-only or abstinence-until-marriage) approach,[7] and others advocating a risk reduction (abstinence-plus) approach.[8] Both approaches have been used to develop programs for middle schoolers with a small number demonstrating positive behavior change.[9–16] Although these results are promising, two studies used quasi-experimental designs,[9, 10] limiting conclusions about program effectiveness; only two assessed programs meeting federal guidelines for abstinence education;[9, 11, 17] and three impacted specific subgroups of youth only.[11, 15, 16]

Given this limited evidence, further studies are needed to examine the efficacy of both approaches with middle school youth. This study took an effective risk reduction (RR) program, *It's Your Game...Keep It Real*, [14] and developed a parallel risk avoidance (RA) program, comparable in duration, delivery, and theoretical framework, to further examine how both approaches impact middle school students. The primary hypothesis tested whether students, who received either the RR or the RA intervention, would delay sexual initiation into 9th grade relative to controls. Secondary hypotheses tested intervention effects on other sexual behaviors and psychosocial factors.

METHODS

Study Design and Participants

A randomized controlled trial was conducted from 2006–2010 in fifteen urban middle schools in a large south-central US school district. Seventy-eight percent of students were classified as economically disadvantaged. Assignment of schools to one of three conditions (5 to the RA condition, 5 to the RR condition, and 5 to a control condition) was conducted prior to baseline assessment using a multi-attribute randomization protocol, accounting for school size, racial/ethnic composition (percent of African-American and Hispanic students), and geographic location.[18]

Assuming 15% of controls would initiate any type of sex by 9th grade, 25% attrition, intra-school correlations=0.005, and $\alpha=0.05$ (two-tailed), an initial sample size of 1,500 7th grade students was estimated to provide 80% power to detect 10% pairwise differences in sexual

initiation between intervention and control conditions at 9th grade follow-up. Students were recruited to reach a quota of 100 per school.

School personnel identified classes in which the majority of 7th graders were enrolled. Sixty percent selected home room, 40% physical education. Sixty percent of students returned a parental consent, 83% with permission to participate. Of those students, 93% (n=1,742) completed the baseline survey. No significant differences in recruitment occurred across study conditions.

Ninth-grade surveys were completed by 1,333 students (23.5% attrition). Students who were lost-to-follow-up were more likely to be male ($p<.05$), older ($p<.001$), and sexually experienced at baseline ($p<.001$), with no significant differences across conditions.

Students, who completed baseline and 9th grade surveys, were eligible for analysis. Seventy-five students were excluded due to missing or inconsistent responses, leaving 1,258 for analysis. The University of Texas Health Science Center's Institutional Review Board and the school district's Office of Research Accountability approved the study.

Interventions

Both the RA and RR programs were based on an existing middle school program, *It's Your Game...Keep It Real*. [14] Both programs were developed using a systematic design process, Intervention Mapping, [19] and were grounded in social cognitive theories. [20, 21] Social cognitive theory emphasizes interactions between personal (e.g., behavioral knowledge, perceived self-efficacy), environmental (e.g., exposure to risky situations), and behavioral influences (e.g., dating relationships). [20] The theory of planned behavior emphasizes interactions between behavioral beliefs, normative beliefs (e.g., the beliefs of influential others, such as peers or parents), intentions, and behavior. [21] RA and RR activities were designed to positively impact behavioral knowledge, self-efficacy, behavioral and normative beliefs, intentions, and environmental factors related to healthy dating relationships and delayed sexual initiation.

Both programs comprised 24, 50-minute lessons, with twelve lessons in 7th grade and twelve lessons in 8th grade. Each program integrated group-based classroom activities with individual journaling and computer-based activities. Computer activities included a virtual world interface, educational activities (e.g. interactive skills-training exercises, peer role model videos) tailored by gender and sexual experience, and "real world"-style teen serials with online student feedback. Both programs included six home-works to facilitate parent-child communication.

Seventeen of the 24 RA lessons contained virtually identical activities to the RR program but framed to reinforce abstinence-until-marriage beliefs versus abstinence-until-older (age and relationship not specified) beliefs. Both programs included medically accurate statements about condoms.

Despite these similarities, the two programs had several key differences. Consistent with federal abstinence education guidelines, [17] RA activities targeted beliefs about the benefits of abstinence-until-marriage, and the benefits of marriage and parenting-within-marriage.

Four lessons addressed these topics. The RA program also incorporated elements of character development and future orientation. Three lessons addressed character qualities and their influence on healthy relationships and decision-making. Conversely, the RR program targeted beliefs about the benefits of abstinence-until-older, promoted self-respect and responsibility, and included activities addressing knowledge and self-efficacy regarding condom and contraceptive use. Sexually experienced 7th-graders received tailored computerized activities regarding condoms/contraception; all 8th-graders received computerized skills-based activities practicing steps for correct condom use and an activity rating the advantages and limitations of different contraceptive methods.

Experts in RA and RR programming extensively reviewed both programs to ensure that content was consistent with each approach. Both were pilot-tested to ascertain youths' comprehension and satisfaction.

Control condition students received their regular health classes, which varied by school.

Facilitator Training

Hired facilitators were assigned to the RA or RR program based on personal preference to ensure program commitment. The majority was African-American or Hispanic with college degrees; all had experience working with adolescents. Facilitators received a 5-day training, which modeled RA or RR lessons by skilled trainers and provided teaching practice. Facilitators received technical support throughout implementation.

Data Collection

Data were collected using laptop computers via an audio-computer-assisted self-interview (ACASI) at baseline, immediately post 8th grade intervention to assess short-term psychosocial outcomes (16 months post-baseline) and in 9th grade to assess long-term psychosocial and behavioral outcomes (26 months post-baseline). ACASI systems are reliable for obtaining sensitive information on sexual risk-taking.[22, 23] Surveys were conducted in a quiet location (e.g., school library). Headphones were provided; laptops were positioned so screens were not visible to others.

Primary Outcome Measure

The primary outcome for students who reported no lifetime sexual experience at baseline was the effect of the RA and RR interventions on delayed sexual initiation (a composite variable comprising initiation of oral, vaginal, or anal sex) at the 9th grade follow-up, relative to the control condition.[14]

Secondary Outcome Measures

Sexual Behaviors—Secondary outcomes included intervention effects on delayed initiation of oral, vaginal, and anal sex specifically, and on reduced sexual risk behavior in 9th grade: 1) unprotected sex at last vaginal intercourse; 2) past 3 months' frequency of oral, vaginal, and anal sex; 3) past 3 months' frequency of vaginal or anal sex without a condom; 4) number of lifetime sexual partners; and 5) past 3 months' number of sexual partners. All measures were previously utilized with urban youth.[14, 15, 24]

Psychosocial Measures—Impact on targeted psychosocial factors was assessed, including behavioral knowledge (STI/HIV and condom use); perceived self-efficacy (refusing sex, using condoms, negotiating condom use); behavioral beliefs (about abstinence and abstinence-until-marriage; reasons for not having sex; condom use); normative beliefs (friends' and parents' perceived beliefs about sex; friends' perceived sexual behavior); intentions (for having oral or vaginal sex; remaining abstinent through high school and until-marriage; using condoms; getting tested for STI/HIV if at risk); environmental factors (exposure to risky situations that could lead to sex; parental communication about sexual topics); and character traits (character qualities [e.g., responsibility], and future orientation [e.g., having plans for one's future]) (Table 1). All measures were previously utilized with urban youth.[11, 15, 25–31]

Demographic Measures

Demographic factors that influence sexual behavior (gender, age, race/ethnicity, family structure, and school grades) were assessed.[32–34] Race/ethnicity was collapsed into 3 categories: African-American, Hispanic, and “Other,” which included White, Asian, and non-Hispanic multiracial youth.

Analysis Approach

Non-response weighting was used to adjust for bias due to non-random attrition. Significant baseline differences between intervention and control conditions were observed for all demographic factors (excluding gender) and for sexual behavior. Control condition students were more likely to be sexually experienced at baseline than RA or RR students (Table 2). These differences were controlled for in subsequent analysis.

Generalized linear models for continuous and binary data were used to compare treatment conditions. A standard set of covariates was entered into each model for all comparisons: gender, race/ethnicity, age at baseline, family structure, time between measures, school-level sexual experience at baseline, and for psychosocial outcomes, baseline measure of outcome. The estimated standard errors were adjusted for intra-class correlations through the use of random effects models in case students within the same schools did not produce independent observations. Wald tests were used to determine statistical significance, set at $p < .05$.

Separate models were fit comparing RA to control youth, and RR to control youth, for both the overall sample and stratified by gender and race/ethnicity. Students who were sexually experienced at baseline were excluded from analyses of sexual initiation. Students who were sexually inexperienced in 9th grade were coded as protected for other sexual behavior analyses.

Given baseline imbalances in demographics and sexual behavior between study conditions, a post-hoc sensitivity analysis was conducted to examine the impact of individual schools on the primary outcome. This analysis replicated the final model for intervention versus control conditions, removing schools one at a time, to examine the impact on the overall comparison. This helped to assess how school-level factors may have impacted program outcomes.

RESULTS

Participant Characteristics

Participants were 59.8% female, 39.3% African-American, and 48.4% Hispanic, with a mean age of 12.6 (SD = 0.76) years at baseline. At baseline, 11.7% reported having any type of sex (Table 2).

Intervention exposure

On average, students in both interventions attended 15–16 of the 24 lessons (RA: mean=15.2, SD=6.74; RR: mean=16.0, SD=6.23, $p=.087$). RA and RR implementation occurred concurrently, ranging from 4–6 weeks per grade.

Intervention effects

Delayed sexual initiation—Comparing students in the RA and control conditions, in the overall sample there were no significant differences in delaying any type of sexual initiation or in delaying initiation of oral, vaginal, or anal sex specifically. In sub-group analyses, Hispanic RA students were 60% less likely to initiate any type of sex ($p<.05$) or vaginal sex, specifically ($p<.05$), relative to controls. Female RA students were 44% less likely to initiate oral sex ($p<.05$); male RA students were 74% more likely to initiate oral sex ($p<.05$), relative to controls. (Table 3)

Comparing students in the RR and control conditions, in the overall sample RR students were about 35% less likely to initiate any type of sex ($p<.01$) or vaginal sex, specifically ($p<.05$). In sub-group analyses, African-American RR students were 62% less likely to initiate any type of sex ($p<.05$) and 68% less likely to initiate vaginal sex, specifically ($p<.01$). Female RR students were about 55% less likely to initiate any type of sex, or oral or vaginal sex, specifically (all $p<.01$), relative to controls.

Other sexual behaviors—Relative to controls, RA students were 30% less likely to engage in unprotected sex at last vaginal intercourse, either by using a condom or abstaining from sex ($p<.05$). RA students, however, were 69% more likely to report 2 or more vaginal sex partners in the past three months ($p<.05$) (Table 3).

Relative to controls, RR students were 33% less likely to engage in unprotected sex at last vaginal intercourse, either by using a condom or abstaining from sex ($p<.05$). RR students were also less likely to engage in frequent vaginal sex ($p=.049$), anal sex ($p<.01$), and vaginal sex without a condom ($p<.05$) in the past 3 months.

Psychosocial outcomes—Immediately post-8th grade RA intervention, 10 out of 23 psychosocial outcomes were statistically significant in a positive direction, 1 was significant in a negative direction, and 12 were non-significant. RA students had significantly greater HIV/STI knowledge, more positive beliefs about waiting to have sex and abstinence-until-marriage, perceived their friends to have more positive beliefs about waiting and to engage in less risky behavior, reported more reasons for not having sex, fewer intentions to have vaginal sex in the next year and greater intentions to remain abstinent through high school

and until marriage and to get tested for HIV/STI, relative to controls. Conversely, RA students had significantly lower condom knowledge. In 9th grade, RA students maintained statistically significant outcomes for 4 out of 23 outcomes (greater HIV/STI knowledge, more positive beliefs about abstinence-until-marriage and friends' beliefs about waiting, more reasons for not having sex, and perceived parental beliefs about waiting to have sex). Additionally, RA students reported significantly greater condom use self-efficacy and intentions relative to controls. No outcomes were statistically significant in a negative direction. (Table 4).

Among RR students, immediately post-8th grade intervention, 10 out of 23 psychosocial outcomes were statistically significant in a positive direction, 1 was significant in a negative direction, and 16 were non-significant. RR students had greater condom use knowledge and refusal self-efficacy, reported more positive beliefs about abstinence-until-marriage and more reasons for not having sex, perceived their friends to have more positive beliefs about waiting, reported greater intentions to remain abstinent through high school and until-marriage and to get tested for HIV/STI, greater parental communication about sexual topics and more positive character qualities, relative to controls. Conversely, RR students perceived their parents to have more permissive beliefs about sex. In 9th grade, RR students maintained statistically significant outcomes for 5 out of 23 outcomes (greater condom use knowledge, more positive beliefs about abstinence-until-marriage, more reasons for not having sex, greater intentions to remain abstinent through high school and to get tested for HIV/STI). Additionally, RR students reported greater condom use self-efficacy and intentions relative to controls. No outcomes were statistically significant in a negative direction (Table 4).

Given baseline imbalances between study conditions, the post-hoc sensitivity analysis examined whether any particular school held undue influence on the primary outcome (delayed sexual initiation). Examining the comparison between RA and control schools, the result remained non-significant with the removal of each school. However, the effect size varied depending on which school was removed (0.67 to 1.27) indicating that the overall result was possibly variable by school (Table 5). Comparing RR to control schools, the original result remained significant for each of the school omissions except for two (Schools 9 and 13). However, the effect sizes remained relatively constant (0.61 to 0.68) indicating that no one school unduly influenced the overall result. Schools 9 and 13 were two of the larger schools; thus, the lack of significance may have been due more to sample size reduction than to other school-level factors.

DISCUSSION

This study evaluated the efficacy of two, theory-based sexual education programs designed to delay sexual initiation among middle school students. At ninth-grade follow-up, the RR program effectively delayed any sexual initiation defined as initiation of oral, vaginal or anal sex, and delayed vaginal sex specifically in the overall sample. Subgroup analysis indicated differential effects by gender and race/ethnicity. The RR program delayed initiation of oral and vaginal sex among females and initiation of vaginal sex among African-Americans. The RR program also reduced other sexual behaviors including unprotected sex at last vaginal intercourse, either by using a condom or abstaining from sex, and frequency of recent

vaginal sex, unprotected vaginal sex, and anal sex. This is the second randomized trial to demonstrate the efficacy of the risk reduction version of *It's Your Game*. [14] These findings corroborate evidence from previous studies that middle school programs emphasizing abstinence and condom skills-training can effectively delay sexual initiation [14, 15] and may positively impact sexually experienced youth. [12, 13, 16]

The RA program positively impacted Hispanic and female students. Specifically, Hispanics delayed overall sexual debut and initiation of vaginal sex; females delayed initiation of oral sex. RA students were also less likely to engage in unprotected sex at last vaginal intercourse, either by using a condom or by abstaining from sex. These findings support evidence from previous studies that middle school programs emphasizing abstinence,[10, 12, 13] and more specifically abstinence-until-marriage,[9] can effectively delay sexual initiation among subsets of youth and may positively impact sexually experienced youth. [11] However, adverse effects among males and sexually experienced students are worrying and warrant further investigation to understand how males and sexually experienced youth process risk avoidance messages to better tailor activities to their needs.

Although many psychosocial outcomes were not significantly impacted, both interventions had a positive, sustained impact on selected psychosocial factors. Aligned with program-specific content, at 9th-grade follow-up RA students reported more positive beliefs about abstinence-until-marriage, perceived their friends and parents to have less permissive beliefs about sex, and had more reasons for not having sex relative to controls; RR students reported more reasons for not having sex, greater intentions to remain abstinent through high school, and greater condom use knowledge, self-efficacy, and intentions relative to controls. Furthermore, the RA program positively impacted condom-related psychosocial outcomes, including condom use self-efficacy and intentions, while the RR intervention positively impacted beliefs about abstinence-until-marriage. Although the latter findings were unexpected as these topics were not explicitly covered in each respective curriculum, they may reflect the fact that both programs provided repeated messages about responsible sexual behavior, provided medically accurate information about condoms, and reiterated abstinence as the healthiest choice for middle schoolers. These findings may allay concerns that risk avoidance programs negatively impact condom use intentions [11] and that risk reduction programs undermine abstinence messages and endorse sexual activity.[35]

Both interventions utilized a multi-media approach which is critical for youth engagement. [36] To our knowledge, these programs represent the only effective middle school sex education programs to incorporate substantial technological innovation aside from video components. Technology-based interventions offer the ability to tailor activities by sexual experience, particularly important in middle schools where sexually experienced students may require different instruction compared to non-sexually experienced students.

Both interventions incorporated characteristics of effective sexual health education programs.[37, 38] Both were theory-based, addressed recognized psychosocial factors, included age-appropriate instructional methods, lasted a sufficient duration, and were implemented with fidelity by trained facilitators. These findings highlight the benefits of implementing programs that incorporate characteristics of effective interventions.

Despite rigorous planning in terms of study design and implementation, several limitations should be noted. The study utilized self-reported data which may be subject to under- or over-reporting; however, ACASI systems provide more valid and reliable data for sensitive topics.[22] Parental consent was required; thus, youth most at risk of early sexual initiation may have been excluded and generalizability is restricted to youth who would opt-in to a sexual education program. Despite using a multi-attribute randomization protocol, baseline imbalances in demographics and prevalence of sexual behavior between study conditions may have biased outcomes away from the null hypothesis. However, multi-level modeling and inclusion of a school-level sexual prevalence covariate helped to adjust for this school-level impact. Furthermore, post-hoc sensitivity analysis suggested that individual school-level factors did not markedly impact observed intervention effects. Use of multiple analytical comparisons without a corresponding statistical adjustment raises the possibility that some outcomes achieved significance by chance. Although the study was conducted in one school district, it is the seventh largest in the US; thus, findings may generalize to other large, urban districts. Finally, these results assessed both interventions' impact through 9th grade only; it is unknown how these programs may impact future sexual behavior.

Despite these limitations, the results are encouraging. Among middle school students who are virgins, a risk reduction approach that emphasizes abstinence and contains condom skills-training can significantly delay sexual initiation into 9th grade. It may also reduce sexual risk behaviors among sexually experienced youth. A risk avoidance approach that emphasizes abstinence-until-marriage can have a positive impact among Hispanic and female students; however, it may have mixed effects on male and sexually experienced youth. Given the need to address the potentially negative consequences of teen pregnancy and HIV/STIs, both risk avoidance and risk reduction approaches may have a role to play in early adolescent HIV, STI and pregnancy prevention. Findings also reiterate the importance of implementing programs that are grounded in behavior change theory and tailored to their intended populations.

CONCLUSION

The RR program positively impacted sexually inexperienced and experienced students. The RA program positively impacted sexually inexperienced Hispanic and female students and had mixed effects among males and sexually experienced youth. Given the potentially negative consequences of early sexual involvement, both risk avoidance and risk reduction approaches may have a role to play in HIV, STI, and pregnancy prevention among early adolescents. Widespread implementation of evidence-based, middle school sexual education programs should be encouraged.

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Table 1

Scale information for psychosocial variables

Construct	# of Items	Sample Item	Response Format	α^a
Behavioral knowledge				
STI signs and symptoms knowledge	6	A person with an STD can have no symptoms at all.	True, false, or not sure	0.60
HIV/STI knowledge	5	Some STDs put you at higher risk of getting infected with HIV.	True, false, or not sure	0.49 <i>b</i>
General condom knowledge	6	Condoms can be punctured if sharp objects like scissors are used to open the package.	Yes, no, or not sure	0.65
Perceived self-efficacy				
Self-efficacy to refuse sex	7	Imagine you are alone with someone you like very much. Could you stop them if they wanted to have vaginal sex with you, but you did not want them to do that?	4-point scale (Definitely could not to Definitely could)	0.86
Self-efficacy to use condoms	3	If you wanted to get a condom, how sure are you that you could go to the store and buy one?	4-point scale (Definitely could not to Definitely could)	0.63
Self-efficacy to negotiate condom use	2	Imagine that you and your boyfriend or girlfriend have been having sex but have not used condoms. You really want to start using condoms. How sure are you that you could tell your partner you want to start using condoms?	4-point scale (Definitely could not to Definitely could)	0.75
Behavioral and normative beliefs				
General beliefs about waiting to have sex	4	I believe people my age should wait until they are older to have sex.	4-point scale (Strongly disagree to Strongly agree)	0.78
Beliefs about abstinence until marriage	6	I believe having sex before marriage is wrong.	4-point scale (Strongly disagree to Strongly agree)	0.84
Reasons for not having sex	16	Because I might get a sexually transmitted disease.	Yes/No	NA <i>c</i>
Friends' perceived beliefs about waiting to have sex	3	Most of my friends believe people should wait until they are older before they have sex.	4-point scale (Strongly disagree to Strongly agree)	0.75
Friends' perceived sexual behavior	4	How many of your friends have had oral sex?	None, few, some, most	0.76
Perceived parental beliefs about waiting to have sex	3	My parent or parents believe people my age should wait until they are older before they have sex.	4-point scale (Strongly disagree to Strongly agree)	0.57
Beliefs about condoms	3	I believe condoms should always be used if a person my age has sex.	4-point scale (Strongly disagree to Strongly agree)	0.87
Behavioral intentions				
Intention to have oral sex in the next year	1	How likely is it that you will have oral sex in the next year?	5-point scale (Not at all likely to Definitely likely)	NA
Intention to have vaginal sex in the next year	1	How likely is it that you will have vaginal sex in the next year?	5-point scale (Not at all likely to Definitely likely)	NA

Construct	# of Items	Sample Item	Response Format	α^a
Intention to remain abstinent until end of high school	1	How likely is it that you will remain sexually abstinent (that is, not have sex) from now until the end of high school?	5-point scale (Not at all likely to Definitely likely)	NA
Intention to remain abstinent until marriage	1	How likely is it that you will remain sexually abstinent from now until marriage?	5-point scale (Not at all likely to Definitely likely)	NA
Intention to use condom in the next 3 months	1	How likely is it that you will use a condom if you have sex in the next 3 months?	5-point scale (Not at all likely to Definitely likely)	NA
Intention to get tested for HIV/STI if at risk	2	If you thought you were at risk for HIV, would you go get tested for HIV?	Yes, no, or not sure	NA
Environmental factors				
Exposure to risky situations that could lead to sex	5	In the past 3 months, how often have you gone to, or remained at, a party where alcohol was being used?	4-point scale (Never to 6 or more times)	0.83
Parental communication about sexual topics	3	How many times has your parent ever talked to you about waiting to have sex until you are older?	3-point scale (We've never talked about it to We've talked about it lots of times)	0.87
Character traits				
Character qualities	5	Before I act, I think about how my actions reflect my character.	4-point scale (Strongly disagree to Strongly agree)	0.78
Future orientation	4	I have plans for my future.	4-point scale (Strongly disagree to Strongly agree)	0.80

^aReliability indices were calculated using baseline data.

^bThe scale was developed to assess HIV/STI-related facts addressed in the interventions. These facts were multi-dimensional, as reflected by the low Cronbach's alpha.

^cScore reflects number of reasons chosen.

NA = Not applicable.

Table 2

Baseline comparability of Risk Avoidance, Risk Reduction, and control conditions among the analyzed cohort (n=1,258).*

Demographic Characteristics	Risk Avoidance (n=462)		Risk Reduction (n=359)		Control (n=435)		Total Sample (n=1,258)		RA vs. C p-value	RR vs. C p-value
	n	%	n	%	n	%	n	%		
Female	296	64.1	198	55.3	256	58.8	751	59.8	0.10	0.31
Race/Ethnicity									<0.01	0.01
African-American	163	35.2	132	36.7	200	45.9	494	39.3		
Hispanic	229	49.5	193	53.8	187	42.9	609	48.4		
Other	70	15.3	34	9.5	49	11.2	153	12.2		
Age in years: Mean (SD)	458	12.6 (0.74)	355	12.7 (0.73)	432	12.7 (0.79)	1,245	12.6 (0.76)	<0.01	0.54
Parents/Guardians in home									<0.01	0.03
Living with 2 parents	169	37.8	108	31.2	103	24.5	380	31.3		
Living with 1 parent and 1 step parent	173	38.6	158	45.8	229	54.2	560	46.0		
Living with 1 parent	49	10.9	20	5.9	30	7.2	99	8.2		
Living with someone other than parent	57	12.8	59	17.2	60	14.2	177	14.5	<0.01	<0.01
Self-Reported Grades in School										
Mostly A's and B's	226	48.9	154	43.0	148	34.1	529	42.1		
Mostly B's and Cs	189	40.9	177	49.3	238	54.8	604	48.1		
Mostly C's & D's/D's & F's	47	10.2	28	7.7	48	11.1	123	9.8		
Reported Sexual Behaviors										
Risk Avoidance (n=462) Risk Reduction (n=359) Control (n=435) Total (n=1,258)										
	n	%	n	%	n	%	n	%	RA vs. C p-value	RR vs. C p-value
Ever had sex (any sex)	35	7.9	31	9.4	72	17.7	138	11.7	<0.01	<0.01
Sex in past 3 months (any sex)	21	4.8	17	5.1	52	12.9	90	7.7	<0.01	0.10
Type of sex										
Oral sex^a										
Ever had oral sex	20	4.5	14	4.0	35	8.7	69	5.7	0.02	<0.01
Oral sex in past 3 months	10	2.3	9	2.6	27	6.7	46	3.9	<0.01	<0.01
Vaginal sex^b										
Ever had vaginal sex	29	6.4	28	7.9	68	15.8	124	10.1	<0.01	<0.01
Vaginal sex in past 3 months	19	4.1	14	4.1	46	10.8	80	6.5	<0.01	<0.01

Reported Sexual Behaviors	Risk Avoidance (n=462)		Risk Reduction (n=359)		Control (n=435)		Total (n=1,258)		RR vs. C p-value	
	n	%	n	%	n	%	n	%		
Vaginal sex w/o condom in past 3 mo.	7	1.5	5	1.5	22	5.2	35	2.8	< 0.01	
Anal sex^c										
Ever had anal sex	8	1.7	6	1.8	17	4.2	31	2.6	0.05	
Anal sex in past 3 mo.	4	0.9	4	1.1	9	2.3	17	1.4	0.19	
Anal sex w/o condom in past 3 mo.	4	0.9	4	1.1	13	3.3	21	1.8	0.03	

* Analyzed cohort comprised students who completed baseline and 9th-grade follow-up surveys. All analyses presented were adjusted for non-response.

^a Oral sex was defined as, "When someone puts his or her mouth on their partner's penis, vagina, or anus/butt or lets their partner put his or her mouth on their penis, vagina, or anus/butt."

^b Vaginal sex was defined as, "When a boy puts his penis inside a girl's vagina; some people call this 'making love' or 'doing it.'"

^c Anal sex was defined as, "When a boy puts his penis in his partner's anus or butt."

Table 3

Adjusted odds ratios for Risk Avoidance and Risk Reduction interventions versus the control condition for sexual initiation, by total sample and by gender and race/ethnicity, and for other sexual behaviors.

	Risk Avoidance vs. Control		Risk Reduction vs. Control	
	n ^a	AOR ^b (95% Confidence Interval)	n ^a	AOR ^b (95% Confidence Interval)
Any sexual initiation				
Total sample ^c	735	0.82 (0.51, 1.34)	627	0.65 (0.54, 0.77)**
Hispanic ^c	368	0.40 (0.19, 0.86)*	317	0.72 (0.39, 1.34)
African-American ^c	279	1.06 (0.45, 2.49)	255	0.38 (0.18, 0.79)*
Males	244	1.31 (0.89, 1.92)	226	1.33 (0.97, 1.83)
Females	491	0.68 (0.31, 1.49)	401	0.43 (0.31, 0.60)**
Initiation of specific types of sex				
Oral sex				
Total sample	735	0.85 (0.53, 1.35)	627	0.69 (0.44, 1.06)
Hispanic ^c	368	0.46 (0.21, 1.01)	317	0.73 (0.36, 1.48)
African-American ^c	279	1.31 (0.62, 2.78)	255	0.53 (0.19, 1.45)
Males	244	1.74 (1.08, 2.80)*	226	1.39 (0.85, 2.28)
Females	491	0.56 (0.32, 0.97)*	401	0.44 (0.26, 0.75)**
Vaginal sex				
Total sample	735	0.76 (0.43, 1.35)	627	0.64 (0.45, 0.93)*
Hispanic ^c	368	0.39 (0.18, 0.88)*	317	0.76 (0.40, 1.46)
African-American ^c	279	0.88 (0.33, 2.35)	255	0.32 (0.15, 0.67)**
Males	244	1.09 (0.67, 1.78)	226	1.21 (0.78, 1.90)
Females	491	0.65 (0.25, 1.69)	401	0.45 (0.30, 0.67)**
Anal sex				
Total sample	735	0.95 (0.54, 1.66)	627	0.83 (0.26, 2.62)
Hispanic ^c	368	0.39 (0.13, 1.19)	317	0.78 (0.25, 2.42)
African-American ^c	279	1.47 (0.77, 2.79)	255	1.23 (0.33, 4.65)

	Risk Avoidance vs. Control		Risk Reduction vs. Control	
	n ^d	AOR ^b (95% Confidence Interval)	n ^d	AOR ^b (95% Confidence Interval)
Males	244	1.93 (0.85, 4.40)	226	1.66 (0.47, 5.85)
Females	491	0.46 (0.18, 1.14)	401	0.50 (0.20, 1.30)
Other types of sexual behavior^g				
Unprotected sex at last vaginal intercourse ^h			843	0.70 (0.52, 0.93)*
Number of times having sex in the last 3 months: 2 or more versus 1 or none			725	0.67 (0.47, 0.96)*
Oral sex			816	0.77 (0.55, 1.09)
Vaginal sex			840	1.15 (0.75, 1.77)
Anal sex			821	0.41 (0.15, 1.08)
Number of times having sex in the last 3 months without a condom: 1 or more versus 0			741	0.97 (0.74, 1.28)
Vaginal sex			780	0.97 (0.39, 2.45)
Anal sex			815	1.01 (0.66, 1.53)
Number of lifetime partners: 2 or more versus 1 or none			837	1.07 (0.58, 1.98)
Oral sex			821	0.94 (0.53, 1.65)
Vaginal sex			704	1.23 (0.91, 1.65)
Anal sex			720	0.79 (0.14, 1.08)
Number of partners in the last 3 months: 2 or more versus 1 or none			707	2.10 (0.06, 4.51)
Vaginal sex			742	1.69 (1.01, 2.82)*
Anal sex			618	1.15 (0.60, 2.22)
				Unable to estimate ^f

^aExcludes students who reported any type of sexual intercourse at baseline.

^bAOR = adjusted odds ratio. An odds ratio less than 1 indicates that more participants in the intervention condition delayed sexual initiation relative to the control condition. Each analysis was adjusted for gender, race/ethnicity, age, family structure, time between measures, and school level sexual experience at baseline.

^cDue to small sample sizes, the racial/ethnic comparisons did not include the “other” subgroup.

^dAnalyses included students who were not sexually experienced, coded as 0 (protected).

^eSample sizes vary due to missing data.

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_f AOR = adjusted odds ratio. An odds ratio greater than 1 indicates that more participants in the intervention condition engaged in the sexual behavior compared to participants in the control condition. Each analysis was adjusted for gender, race/ethnicity, age, family structure, school level sexual experience at baseline, and baseline measure of outcome.

_g Due to small sample sizes, subgroup analyses were not conducted by gender and race/ethnicity for other sexual behaviors.

_h 0 = used a condom at last vaginal intercourse or abstained from sex.

_i Analyses had little precision and power due to small sample sizes.

* p < 0.05,

** p < 0.01

Psychosocial outcomes for the Risk Avoidance and Risk Reduction interventions versus the control condition at 8th- and 9th-grade follow-ups, among the analyzed cohort (n = 1,258) ^a

Table 4

Psychosocial variables ^b	8 th Grade				9 th Grade			
	Risk Avoidance vs. Control		Risk Reduction vs. Control		Risk Avoidance vs. Control		Risk Reduction vs. Control	
	n ^c	Beta coefficient <i>d</i>						
Behavioral knowledge								
STI signs and symptoms knowledge	820	0.30	756	0.04	794	0.02	701	0.00
HIV/STI knowledge	910	0.13 [*]	823	0.11	864	0.11 [*]	752	0.07
General condom knowledge	936	-0.04 [*]	844	0.11 ^{**}	894	0.00	780	0.09 ^{**}
Perceived self-efficacy								
Self-efficacy to refuse sex	914	0.07	821	0.11 ^{**}	869	0.01	762	0.02
Self-efficacy to use condoms	906	-0.02	816	0.07	861	0.07 ^{**}	757	0.14 ^{**}
Self-efficacy to negotiate condom use	927	-0.04	834	-0.02	879	0.03	771	0.00
Behavioral and normative beliefs								
General beliefs about waiting to have sex	948	0.23 ^{**}	848	0.07	903	0.07	783	0.05
Beliefs about abstinence until marriage	927	0.35 ^{**}	830	0.20 [*]	885	0.24 ^{**}	760	0.10 ^{**}
Reasons for not having sex ^e	942	0.13 ^{**}	843	0.08 ^{**}	892	0.09 ^{**}	777	0.02 ^{**}
Friends' perceived beliefs about waiting to have sex	943	0.31 ^{**}	842	0.19 [*]	903	0.07 [*]	784	0.03
Friends' perceived sexual behavior	919	-0.09 [*]	824	-0.04	883	0.05	765	-0.06
Perceived parental beliefs about waiting to have sex	943	0.03	845	-0.06 ^{**}	902	0.07 [*]	779	-0.07
Beliefs about condoms	923	0.00	832	0.01	877	0.07	766	0.07
Behavioral intentions								
Intention to have oral sex in the next year	954	-0.02	855	-0.02	907	0.03	786	-0.07
Intention to have vaginal sex in the next year	952	-0.15 [*]	855	-0.06	906	0.09	787	0.09
Intention to remain abstinent until end of high school	951	0.38 [*]	854	0.22 [*]	905	0.17	788	0.15 [*]
Intention to remain abstinent until marriage	952	0.40 [*]	854	0.20 [*]	905	0.17	788	0.14
Intention to use condom in the next 3 months	927	-0.10	833	-0.04	883	0.14 ^{**}	771	0.08 [*]

	8 th Grade			9 th Grade		
	n ^c	Beta coefficient ^d	n ^c	Beta coefficient ^d	n ^c	Beta coefficient ^d
Psychosocial variables^b						
Intention to get tested for HIV/STI if at risk	906	0.08**	822	0.09*	868	-0.02
Environmental factors						
Exposure to risky situations	917	-0.05	832	-0.01	876	0.04
Parental communication about sexual topics	887	0.06	793	0.11**	843	0.03
Character traits						
Character qualities	927	0.12	838	0.14**	875	0.05
Future orientation	906	-0.02	814	-0.02	857	-0.03

^aAll models adjusted for gender, race/ethnicity, age, family structure, time between measures, school level sexual experience at baseline, and baseline measure of outcome.

^bAll psychosocial variables are coded as protective factors except for perceived friends' sexual behavior, exposure to risky situations, oral sex intentions, and vaginal sex intentions.

^cSample sizes vary due missing data.

^dBeta coefficients for these models are interpreted as the difference in adjusted means for each psychosocial variable.

^eScore reflects number of reasons chosen.

* p < 0.05,

** p < 0.01

Table 5

Sensitivity analysis for primary outcome of sexual initiation.

<u>Avoidance vs. Control</u>	
n	AOR ^a p-value
735	0.82 0.44
Original estimate	
School removed (prevalence of sexual experience at baseline)	
<i>Avoidance schools</i>	
School #1 (0.13)	690 0.76 0.30
School #2 (0.03)	670 0.89 0.51
School #3 (0.05)	642 0.81 0.46
School #4 (0.06)	583 0.78 0.37
School #5 (0.21)	681 0.67 0.24
<i>Control schools</i>	
School #11 (0.20)	675 0.78 0.28
School #12 (0.23)	692 0.82 0.34
School #13 (0.10)	617 1.27 0.23
School #14 (0.14)	679 0.82 0.49
School #15 (0.24)	686 0.82 0.45
Reduction vs. Control	
n	AOR ^a p-value
627	0.65 < 0.01
Original estimate	
School removed (prevalence of sexual experience at baseline)	
<i>Reduction schools</i>	
School #6 (0.06)	589 0.61 < 0.01
School #7 (0.03)	567 0.65 0.02
School #8 (0.16)	584 0.66 0.03
School #9 (0.11)	530 0.68 0.13
School #10 (0.11)	564 0.66 < 0.01
<i>Control schools</i>	

	<u>Reduction vs. Control</u>	
	AOR ^a	p-value
School #11 (0.20)	0.66	0.01
School #12 (0.23)	0.66	0.02
School #13 (0.10)	0.68	0.19
School #14 (0.14)	0.61	0.01
School #15 (0.24)	0.64	< 0.01

^aAOR = adjusted odds ratio. Each analysis was adjusted for gender, race/ethnicity, age, family structure, time between measures, and school level sexual experience at baseline.