Effects of a School-Based, Theory-Driven HIV And Pregnancy Prevention Curriculum

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CONTEXT: *Although a number of interventions are effective at reducing risky adolescent sexual behavior, it may be possible to make them even more effective by addressing adolescents' approaches to risk-taking.*

METHODS: *Schools were assigned to teach one of three curricula in a quasi-experimental intervention study: the school's standard pregnancy and HIV prevention curriculum; the Reducing the Risk curriculum; or a modified Reducing the Risk curriculum, adapted for high sensation seekers and impulsive decision makers. A sample of 1,944 students from 17 schools was surveyed at three time points between 1995 and 1997. Mixed models regression and logistic regression were used to examine the difference in impact among curricula.*

RESULTS: *Differences in the impact of the original and modified Reducing the Risk interventions were not significant for the total sample or for high sensation seekers and impulsive decision makers separately. Students from both intervention groups demonstrated short-term improvements in knowledge; students who received their schools' standard curriculum were significantly more likely than those assigned to either intervention to have initiated sexual intercourse by the third time point (odds ratio, 2.4).*

CONCLUSION: *More work is necessary to understand the best ways to design classroom messages that will be effective in reducing the risk behaviors of high sensation seekers and impulsive decision makers.*

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Rates of pregnancy and STDs continue to be high among teenagers in the United States, and the incidence of HIV is higher among older teenagers and young adults than among older adults.[1] As a result of these stark social realities, a considerable amount of state and federal resources is dedicated to HIV, STD and pregnancy prevention efforts for both in- and out-of-school youth.[2,3] Out-of-school youth may be at higher risk for these outcomes,[4,5] but the vast majority of adolescents are enrolled in school;[6] therefore, targeting in-school youth in an effort to reduce adolescents' risk opportunities for pregnancy, HIV and other STDs makes sense.[7]

Kirby[8] describes "four generations" of sex education curricula that have been developed to address pregnancy and STDs for in-school adolescents: one using scare tactics to reduce "venereal disease" among teenagers, the second emphasizing contraception and pregnancy prevention, the next focusing on abstinence and perceived norms related to HIV, and the last using skills-based curricula to teach refusal and negotiation skills. Several studies evaluating classroom-based sex or HIV education interventions have found short-term impacts, primarily on knowledge and beliefs.[9–11]

Despite numerous tests of various curricula, few demonstrate positive results of sex education on student behavior. A small number of fourth-generation HIV and sex education programs (e.g., Reducing the Risk; Be Proud! Be Responsible!; and Focus on Kids) have shown positive effects after careful evaluation.[12–15] For instance, in a controlled trial of Reducing the Risk, 29% of curriculum participants reported onset of intercourse 18 months later, compared with 38% of controls.[12]

We suggest two reasons for the limited success of sex education and HIV prevention programs: They generally subscribe to a rational model of decision making, and they assume that all individuals respond similarly to the same kinds of messages. However, a substantial body of evidence demonstrates the role of individual characteristics in risk-taking in regard to substance use, sexual behaviors and combinations of the two.[16–21] Although programs today are designed to teach requisite skills, interventions that are able to attract and hold the attention of target audiences at particularly high risk would likely be even more effective.[22]

We hypothesize that successful interventions like Reducing the Risk could be improved by considering two personality characteristics within the target population, sensation-seeking and impulsivity. High sensation seekers are individuals who tend to choose situations or engage in behaviors that are novel, reduce boredom, lead to disinhibition or are thrilling or adventuresome.[23] In potentially risky situations, impulsive individuals (or impulsive decision makers) act in ways that might not be predicted by rational models of health-related behavior; they act, instead, "without thinking."[24] Because high sensation seekers are attracted to novel, dramatic and

stimulating messages,[25,26] manipulation of a message's "sensation value" may help overcome their resistance to it. Likewise, by tailoring a curriculum to the needs and experiences of impulsive students, it may be possible to make them aware of their impulsivity, offer them opportunities to practice safer responses to risky situations and encourage them to avoid risky situations.

Previous work has shown the importance of targeting high sensation-seeking individuals when delivering successful mass media messages focusing on risk behavior such as substance abuse,[22,23–26] and of focusing on impulsive decision makers when designing messages related to risky sexual behavior.[27] Consequently, we conclude that it might also be important to target these groups in the design of HIV and pregnancy prevention classroom interventions. In this article, we assess whether adapting a successful school-based curriculum to meet the needs of these individuals improves its effectiveness in promoting safer behaviors.

METHODS

The data presented here were collected as part of a three-year longitudinal study that assessed the impact of an HIV, pregnancy and alcohol prevention intervention delivered in classrooms and through the media. (The effects of the media component are reported elsewhere.[28]) Students were followed from the beginning of ninth grade to the end of 11th grade; the main classroom interventions occurred during ninth grade, and a booster classroom intervention occurred during 10th grade. The self-administered survey data presented here are from the first three waves of data, which were collected near the beginning of ninth grade (Time 1), the end of ninth grade (Time 2) and the end of 10th grade (Time 3).

Sample

During the fall of 1995, we invited 17 schools from one district in Cleveland, Ohio, and 11 schools in four districts in and around Louisville, Kentucky, to participate in the study if they taught health education during ninth or 10th grade, had at least 200 ninth-grade students and were racially diverse. (This criterion was established because a significant number of schools in each city were either exclusively black or nearly 100% white.)

Ten high schools in the Louisville area and seven high schools in Cleveland agreed to participate in the study. In schools that declined participation, the administrators typically believed that the content of the survey or curriculum would be too explicit for their communities.

All ninth-grade students in participating schools received parental consent forms. To take part in the study, students had to return the signed form to their teachers and complete an assent form immediately before taking the survey. Consent rates ranged from 50% to 84% at the 17 schools; the overall consent rate was 63% across the three curricula groups (the rates by curricula are currently unavailable).

The total sample size at baseline was 2,647. Of the 76% who completed follow-up, 22 students were missing data on 50% or more of survey items and were excluded from analyses. The final sample thus consisted of 1,944 students.

Interventions

One of three classroom curricula was randomly assigned among schools as part of a matched-pairs design. The three curricula were Reducing the Risk;[29] a modified version of Reducing the Risk, specifically designed for high sensation-seeking and impulsive students; and the schools' standard, non–skills-based HIV prevention curricula.*

•*Curricula.* At the time this study began, Reducing the Risk was one of a small number of curricula recognized by the Centers for Disease Control and Prevention as effective in reducing HIV-related risk behavior.[30] This theoretically based curriculum is designed to enhance students' skills to resist unprotected sex by modeling those skills and then providing students opportunities for practice. The curriculum emphasizes that youth should avoid unprotected intercourse; that the best way to do this is to abstain from sex; and that if they do not abstain from sex, they should use contraceptives (especially condoms) to guard against pregnancy and STDs, especially HIV. The original curriculum[29] is 16–17 class sessions in duration and includes lessons on abstinence, refusal skills, getting and using protection, HIV risk behaviors, and preventing HIV and other STDs.

We modified the curriculum to make it more successful at changing the behavior of high sensation-seeking and impulsive youth. One central goal of this approach is to increase the sensation value of the content and presentation, to heighten attention and increase learning; the second is to provide opportunities for high sensation-seeking and impulsive adolescents to rehearse new responses to situations in which they tend to respond in a risky manner. We therefore sought not only to include information specific to the special needs of the target adolescents, but to provide it in ways more likely to reduce impulsive decisions.

The following changes were made to target Reducing the Risk at high sensation-seeking and impulsive youth: adding audiovisual materials (e.g., short "trigger" videos with music); selectively using peer facilitators to reduce teacher dominance (because high sensation seekers and impulsive decision makers presumably rely more on peers than on adults when making decisions about their behavior); including young people living with HIV as presenters for two lessons; creating more realistic role-playing activities about high-risk situations, incorporating teenagers' suggestions; including more classroom games and prizes; eliminating the parent discussion

*Some schools in the comparison group did not offer any HIV prevention education.

TABLE 1. Characteristics of three school-based HIV and pregnancy prevention curricula evaluated in a randomized, controlled trial, Cleveland and Louisville, 1995–1997

Characteristic	Standard	Reducing the Risk	Modified Reducing the Risk
Number of class sessions	0–15	16–17	16–17
Role-playing	No	Yes	Yes
Risk-simulation activities	No	Yes	Yes
Birth control pricing activity	No	Yes	Yes
Small-group discussion	No	Yes	Yes
Extensive use of videos and music	No	No	Yes
Peer facilitators	No	No	Yes
Young HIV-positive speakers	No	No	Yes
Teenagers' input in creating role-playing activities	No	Limited	Extensive
Games and prizes	No	No	Yes
Parent discussion activity	No	Yes	No
Student videotaping of role-playing activities	No	No	Yes

Note: The standard curriculum was non–skills-based HIV prevention education.

activity (as high sensation-seeking and impulsive students have less close relationships with their parents); and providing students with video cameras to record role-playing activities. Table 1 presents comparisons of the contents of the three curricula.

•*Teacher and peer leader training.* Teachers in both Reducing the Risk groups were required to receive extensive training. Over two and a half days, experienced Reducing the Risk trainers facilitated discussions about sensitive topics relating to HIV prevention, offered tips about increasing effectiveness of teaching methodologies (e.g., through role-playing and small-group work), demonstrated the lessons and tutored teachers in how to present individual lessons. For attending this off-site training, teachers received cash incentives (for after-school and Saturday hours), materials, refreshments and the services of a substitute teacher. Teacher training occurred about 4–6 weeks prior to curriculum implementation.

The selection criteria for peer leaders focused on their sensation-seeking and impulsive decision-making scores (described below). The research team compiled a list of students scoring in the top 60% of both scales, in descending order; teachers were given the opportunity to remove students from the list because of behavior problems, absenteeism or reading ability. From the remaining list, one peer leader was selected for every five students in the class. Peer leaders were required to attend a two-day, out-of-school training facilitated by the same Reducing the Risk trainers. They, too, received modest cash incentives and refreshments for participating. Training included explanation of the role of peer leaders; description of the lessons they would be assisting with; opportunities to practice these tasks; instruction on using video cameras and VCRs; and discussions about attitudes toward HIV and HIV-infected individuals, discomfort with talking about sex and facilitating small-group work. During classes, peer leaders led small-group discussions, videotaped role-playing activities and assisted teachers in classwide games and other activities.

Data Collection

Questionnaires were administered during regular academic classes (generally during health class) by trained research assistants, who gave students a standardized set of verbal instructions. The students' regular classroom teacher was typically present, but was asked to remain as unobtrusive as possible.

Special care was taken to ensure the students' privacy and the confidentiality of their responses, and all relevant procedures were explained to the students. Each student received the questionnaire in a manila envelope bearing a label with the student's name that was peeled off when the student received the packet. Students returned their completed surveys in the original, now unmarked envelopes. A unique code written in ultraviolet ink marked each questionnaire. When surveys were returned to the research facilities, an ultraviolet light made the code visible. A research assistant copied the code onto the questionnaire using regular ink, enabling us to track student responses over the three-year period. To increase privacy, we printed six versions of the survey, using two sequences of questions and three colors.

Students completed the survey, which was designed for the sixth-grade reading level, during class periods of 40–55 minutes (with about half of the 90 or so classes surveyed at each end of that range). Students who needed extra time because of low literacy were allowed to continue until they were finished. Participants received a project T-shirt and a raffle ticket entering them into a prize drawing, and were thanked for their participation.

Survey Measures

Baseline and follow-up surveys assessed demographic factors, sexual behaviors and theoretically derived variables hypothesized to mediate the relationship between the intervention and behavioral outcome.

•*Demographic variables.* A variety of single items measured demographic characteristics. To assess age, we asked students "How old are you now?" (response categories ranged from 12 to 19 or older). Socioeconomic status was measured with one item that asked students how much they paid for school lunch (regular price, reduced price or nothing). To assess relationship status, students were asked "Are you going out with someone regularly?" Finally, to assess educational aspirations, students were asked how far they expected to go in school; responses ranged from 10th or 11th grade to advanced degree.

•*Sexual behaviors.* The primary behavioral outcomes were initiation of sexual intercourse (among those who had been sexually inexperienced at baseline), condom use and alcohol use concurrent with sexual intercourse. Initiation of sexual intercourse was measured using a dichotomous item; respondents indicated whether they had ever had sexual intercourse ("vaginal or anal sex").

Two items measured condom use. Frequency of use was measured with a six-point Likert-type scale that ranged from "never" to "always." In addition, respondents

indicated whether they had used a condom the last time they had intercourse. Alcohol use concurrent with sexual activity was measured using items similar to those for condom use. For questions on condom use and alcohol use concurrent with sexual intercourse, those who indicated that they had never had sexual intercourse were coded as having missing data.

•*Personality characteristics.* Sensation seeking was assessed via a 16-item adolescent version of the Sensation-Seeking Scale (Cronbach's alpha, 0.87).[16] Items (e.g., "I would like to have new and exciting experiences, even if they are illegal" and "I get bored seeing the same kids all the time") were scored on a scale from 1 ("disagree a lot") to 5 ("agree a lot"). An 11-item version of the Decision-Making Style Scale (Cronbach's alpha, 0.76)[16] was used to measure rational versus impulsive decision-making. Items (e.g., "I do the first thing that comes into my mind" and "I consider what effect it will have on my health") were scored on a scale ranging from 1 ("never") to 4 ("always"). For each scale, the score was calculated as the mean of the items. Those who scored above the median within their racial or ethnic group by gender (e.g., black females, Hispanic males) on the Sensation-Seeking Scale were classified as high sensation seekers; those below the median were classified as low sensation seekers. Similarly, those who scored above the median on the Decision-Making Style Scale within their racial or ethnic group by gender were classified as impulsive decision makers; below, as rational decision makers.

•*Knowledge.* Knowledge regarding prevention of pregnancy and STDs including HIV was assessed with 10 true-or-false items—e.g., "The best way to use a condom is to leave some space at the tip for the sperm" (true) and "The best time to talk to a partner about sex is right before sex, when it's on their mind" (false). Correct responses were summed to create an index with a maximum value of 10.

•*Perceived peer sexual activity.* A single item indicating the proportion of same-age friends engaging in sexual intercourse was used as an indicator of perceived peer sexual activity. This measure was scored on a scale that ranged from 1 ("none") to 6 ("all").

•*Attitudes toward waiting to have sex.* Two items were designed to determine how important students felt it was to wait until they were older to have sex and how important it was to get as much sexual experience as possible; scores ranged from 1 ("not important at all") to 5 ("extremely important"). The second item was recoded so that high values on both variables reflected more positive attitudes about waiting to have sex. The scores were then averaged; higher values indicate a more positive attitude toward waiting.

•*Self-efficacy.* We measured students' perceived abilities to refuse sexual intercourse (refusal self-efficacy), use condoms (condom self-efficacy) and negotiate potentially risky situations (situational self-efficacy). Refusal self-efficacy was assessed at Time 1 with a six-item scale (Cronbach's alpha, 0.89) measuring individuals' ability to refuse sex in various situations (e.g. "How sure are you that you would be able to say no to having sexual intercourse with someone who you want to fall in love with you?").[31] Responses ranged from 1 ("I definitely can't say no") to 5 ("I definitely can say no"). Condom self-efficacy was measured on each survey with five items (Cronbach's alpha, 0.83), such as "I feel confident that I would remember to use a condom even after I have been drinking."[32] Responses ranged from 1 ("disagree a lot") to 5 ("agree a lot"). Situational self-efficacy was measured on each survey with four items (Cronbach's alpha, 0.81) developed in our research (e.g., "How sure you are that you would be able to tell someone that you don't want to have sex now, but you might want to in the future?"). Responses ranged from 1 ("I definitely can't do this") to 5 ("I definitely can do this").

•*Intentions.* Four items, measured at Times 1 and 2, assessed respondents' intentions to have sexual intercourse and to use condoms consistently. Respondents indicated the likelihood of their having intercourse by the end of 10th grade and by the end of 11th grade, using a scale ranging from 1 ("very sure I won't") to 5 ("very sure I will"). Similarly, respondents indicated the likelihood they would use condoms consistently by the end of 10th and by the end of 11th grade (if they were planning to have intercourse by then).

Process Evaluation

Students in both Reducing the Risk groups completed an evaluation of the curriculum during the first class period after completion of the unit. Questions covered how interesting the class was, how much they learned, what activities occurred in the lessons and how much they thought the lessons would affect their behavior; scores ranged from 1 to 5.

Teachers were asked to complete implementation logs after each period. In these logs, they indicated which activities they conducted, the proportion of each activity completed and any difficulties or unusual circumstances they encountered. In addition, project staff observed a random sample of classroom sessions to assess the fidelity and quality of implementation of both interventions. Observers were provided with training on what to look for in each class and with logs to record their findings. Logs included closed-ended questions about whether each activity was completed, how much time was spent on the activity and whether it was delivered appropriately. Open-ended questions asked about students' level of participation, classroom atmosphere and which activities seemed most successful.

In addition, to account for the differences in follow-up and reporting time between those who received the curriculum in the fall (and generally had about a 6–8-month lag until Time 2) and those who received the curriculum in the spring (and generally had about a 3–4-month lag), we statistically controlled for timing of the intervention (fall vs. spring) in all analyses.

TABLE 2. Percentage distribution of study participants at baseline, by selected characteristics

Characteristic	% (N=1,944)
Gender	
Female	53.1
Male	46.9
Race/ethnicity	
White	51.1
Black	35.5
Hispanic	5.8
Other	7.7
Age	
13	0.6
14	53.0
15	35.1
≥16	11.3
Curriculum	
Standard	32.6
Reducing the Risk	23.4
Modified Reducing the Risk	44.1
Sexually experienced	
Yes	39.2
No	60.8
Frequency of condom use†	
Never	10.8
Sometimes	34.6
Always	54.6
Total	100.0

†Sexually experienced respondents only. *Note:* Percentages may not total 100.0 because of rounding.

Hypotheses and Analyses

We expected that students in schools that received the modified Reducing the Risk curriculum would be more likely than their peers in schools that received the original Reducing the Risk curriculum to remain abstinent at follow-up. For sexually experienced students, we expected that those who received the modified intervention would be more likely to have used condoms and less likely to have used alcohol at last intercourse than would those who received the original intervention. However, we also hypothesized interaction effects between curriculum and personality characteristic variables. Specifically, we expected that the effects of the modified version would be stronger for high sensation-seeking individuals and impulsive decision makers than for low sensation-seeking individuals and rational decision makers. In addition, we hypothesized that students in both Reducing the Risk groups combined would be less likely than comparison students to initiate sexual activity, more likely to use condoms and less likely to use alcohol when having sex.

Hypotheses regarding initiation of sexual intercourse and use of condoms and alcohol were tested using logistic regression, and hypotheses regarding frequency of condom use and alcohol use with sex were tested using mixed model hierarchical linear regression.[33] For sexually inexperienced students, we tested the likelihood of remaining abstinent versus initiating sexual activity after completing the curriculum.

Analyses of the effects of change in each mediating variable were conducted first for the overall sample, then separately for high sensation-seeking individuals, low sensation-seeking individuals, impulsive decision makers and rational decision makers. The analyses controlled for educational aspirations, race, gender, relationship status and city.

TABLE 3. Percentage distribution of participants at baseline, by selected characteristics, according to curriculum

Characteristic	Standard (N=851)	Reducing the Risk (N=681)	Modified Reducing the Risk (N=1,149)
Gender**			
Female	58.3	49.4	50.1
Male	41.7	50.6	49.9
Race***			
White	50.1	54.4	44.6
Black	35.7	28.4	41.4
Other	14.2	17.2	14.0
Educational aspirations**			
<two-year degree	9.3	9.3	6.4
Four-year degree	55.6	55.7	50.8
Advanced degree	35.0	35.0	42.8
Total	100.0	100.0	100.0

**p<.01. ***p<.001. *Notes:* Percentages may not total 100.0 because of rounding. Data are shown only for characteristics that differed among groups.

RESULTS

Sample Characteristics and Retention

The sample was a moderately diverse, urban, ninth-grade school sample: Males and females were nearly equally represented; about half of participants were white, and one-third were black (Table 2). Most students were between 14 and 15 years old. Almost 40% of the sample reported being sexually experienced; of those, 55% said that they always use condoms. We tested the comparability of the three curriculum groups on several variables associated with the outcome of interest: gender, race, age, city, relationship status, high school grades, educational aspirations and socioeconomic status. The groups differed on only three of these (Table 3). A significantly smaller proportion of students receiving the standard school curriculum than of those in either intervention were male—42% versus 51% for the original intervention and 50% for the modified intervention. A smaller proportion of those receiving the modified Reducing the Risk intervention than of those in the other groups were white. A significantly lower proportion of Reducing the Risk group participants than of participants in the standard school and modified Reducing the Risk intervention groups were black. And finally, a higher proportion of the modified Reducing the Risk group participants than of the other groups' participants wanted to attain advanced degrees.

Overall, 76% of baseline participants completed follow-up surveys at 3–6 months. Retention was fairly evenly

TABLE 4. Percentage of students engaging in selected behaviors, by time of survey, according to curriculum

Behavior	Standard	Reducing the Risk	Modified Reducing the Risk
Ever had sex			
Time 1	47.4	43.2	42.9
Time 2	50.1	45.2	42.4
Time 3	59.3	51.0	50.7
Used alcohol at last sex			
Time 1	12.2	14.5	10.2
Time 2	7.7	14.7	9.6
Time 3	8.9	10.9	14.4
Used condom at last sex			
Time 1	73.3	77.7	73.0
Time 2	69.9	73.8	70.2
Time 3	65.6	71.8	66.2

Note: Time 1 data were collected near the beginning of ninth grade; Time 2, at the end of ninth grade; and Time 3, at the end of 10th grade.

distributed across the three curriculum groups (74% for Reducing the Risk, 79% for modified Reducing the Risk and 77% for the standard school curriculum), though the differences were significant. The retention rate was slightly lower in Cleveland (76%) than in Louisville (80%). Students who were sexually experienced at baseline were less likely than the sexually inexperienced to be followed up at 3–6 months; 31% and 18%, respectively, did not complete follow-up surveys. Students who did not complete follow-up surveys at Time 2 were older, had poorer grades, had lower educational aspirations and had parents with less education than those who completed the Time 2 follow-up.

Despite extensive follow-up efforts, retention declined to 52% of the initial sample at Time 3 (12–18 months after baseline). A major factor that accounted for this attrition is the low graduation rates in the school districts in which the study took place. The Cleveland public school system has one of the lowest graduation rates in the United States, 28%; one of the Kentucky school districts that participated in the study, the Jefferson County public schools, has a graduation rate of 66%.[34] Thus, the average graduation rate across these school districts is 47%; most dropouts leave school during the 10th or 11th grade.[35] Similar differences to those noted above were observed between those who were retained in the follow-up sample at Time 3 and those who completed the survey at Time 1 but were no longer in the sample at Time 3. The only different result was that males were less likely than females to have been retained; 56% of females from the baseline sample completed Time 3 surveys, while only 50% of males did.

Program Impact

Bivariate analyses reveal no significant differences among curriculum groups in any of the outcome variables at any time (Table 4). However, the results suggest that students in the modified intervention were less likely than others to begin to have sex during ninth grade (i.e., between baseline and Time 2); that by the last follow-up, those in the comparison group were less likely than others to use alcohol when having sex; and that condom use declined slightly in all groups.

Results of multivariate analysis show that our first three hypotheses were not supported. That is, students in the two Reducing the Risk groups did not differ from each other in their likelihood of initiating sexual activity (Table 5), or in their condom use or use of alcohol at the last sexual encounter (not shown). Furthermore, the modified Reducing the Risk intervention was not more effective than the original intervention at changing behavior among high sensation-seeking or impulsive students (not shown).

However, the analyses support our fourth hypothesis. Comparison group participants had significantly greater odds of initiating sexual activity than participants in both Reducing the Risk groups combined (odds ratio, 2.4—Table 5). Students who received the curricula in the fall, those who lived in Cleveland and those who were in a relationship also had increased odds of initiating sexual activity (odds ratios, 1.5, 1.6 and 3.1, respectively). The effects of both interventions were greater for blacks than for whites (5.6 vs. 1.8—not shown).

Our final two hypotheses were not confirmed. Alcohol use with sex and condom use did not differ between students who received the standard school curriculum and those who received either version of Reducing the Risk (not shown).

TABLE 5. Odds ratios from logistic regression analyses assessing the association between selected variables and students' likelihood of initiating sexual intercourse between Time 1 and Time 3

Variable	Odds ratio
Intervention	
Modified Reducing the Risk (ref)	1.00
Original Reducing the Risk	0.71
Curriculum	
Either intervention (ref)	1.00
Standard	2.42*
Gender	
Male (ref)	1.00
Female	0.83
Race/ethnicity	
Nonblack	0.92
Nonwhite	0.90
Timing of intervention	
Spring (ref)	1.00
Fall	1.50*
Educational aspirations	1.10
City	
Louisville (ref)	1.00
Cleveland	1.61**
In relationship	
No (ref)	1.00
Yes	3.06***

*p<.05. **p<.01. ***p<.001. *Notes:* Time 1 data were collected near the beginning of ninth grade; Time 3, at the end of 10th grade. The race/ethnicity variables are each dichotomous; educational aspirations is an ordered categorical variable, with categories ranging from 10th or 11th grade to professional degree. ref=reference group.

Additional analyses using hierarchical linear modeling to assess program impacts at the school level confirm that students in both Reducing the Risk groups had lower odds of initiating sexual activity than students in the comparison group. Frequency of condom use, condom use at last sex, alcohol use at last sex and frequency of alcohol use with sex showed no significant impact of curriculum (not shown).

Comparisons of mean scores for mediating variables reveal few group differences over time (Table 6). Between baseline and Time 2, knowledge gains were significantly greater for both intervention groups (about 1.4 point for each) than for the comparison group (0.7 points). However, these differences were no longer significant at Time 3. Changes in the remaining mediating variables did not differ among groups at either follow-up.

Because behavior change between Time 1 and Time 3 was related to the intervention, but changes in mediating variables differed little among groups over time, we conducted additional analyses to assess the relationship between the proposed mediating variables and initiation of sexual activity. Each variable was entered stepwise as a possible predictor of initiation of sexual activity, while we controlled for the same variables used in earlier analyses. Results show that change in attitude toward waiting to have sex and change in intention to have sex were significantly related to the likelihood of initiation of sexual activity between Time 1 and Time 3 (odds ratios, 1.3 and 1.4, respectively—not shown). Knowledge, refusal self-efficacy, situational self-efficacy, perceived peer sexual activity and response to sexual pressure were not significantly related to initiation of sexual activity.

An additional analysis, in which each significant mediating variable was entered separately, found that changes in intentions partially mediated the intervention effect on initiation of sexual activity, while changes in attitudes fully mediated the effect—i.e., intervention effects were no longer significant once attitude toward waiting to have sex was entered in the equation. This suggests that while the effect of the intervention on this mediating variable was modest (indeed, not significant), the relationship between attitudes and initiation of sexual behavior was strong enough to still mediate the intervention effect.

TABLE 6. Mean scores for mediating variables, among participants assessed at each follow-up, by curriculum

Variable and group	Followed-up at Time 2 (N=1,811)		Followed-up at Time 3 (N=1,424)	
	Time 1	Time 2	Time 1	Time 3
Knowledge (range, 0–10)				
Standard	3.61	4.28***	3.61	4.97
Original intervention	3.80	5.22	3.86	5.35
Modified intervention	4.03	5.35	4.05	5.44
Refusal self-efficacy (range, 1–5)				
Standard	3.75	3.74	3.75	3.81
Original intervention	3.71	3.73	3.76	3.89
Modified intervention	3.78	3.86	3.79	3.92
Condom self-efficacy (range, 1–5)				
Standard	4.21	4.24	4.21	4.32
Original intervention	4.14	4.17	4.07	4.24
Modified intervention	4.28	4.25	4.28	4.32
Perceived peer sexual activity (range, 1–6)				
Standard	3.03	2.86	3.09	2.75
Original intervention	3.26	3.07	3.29	2.91
Modified intervention	3.14	3.04	3.20	2.79
Situational self-efficacy (range, 1–5)				
Standard	3.73	3.79	3.62	3.87
Original intervention	3.65	3.82	3.65	3.87
Modified intervention	3.77	3.93	3.78	4.03
Attitude about waiting to have sex (range, 1–4)				
Standard	2.81	2.66	2.79	2.55
Original intervention	2.84	2.71	2.94	2.65
Modified intervention	2.75	2.69	2.83	2.60
Response to sexual pressure (range, 1–4)				
Standard	1.38	1.30	1.37	1.31
Original intervention	1.32	1.38	1.32	1.35
Modified intervention	1.31	1.27	1.29	1.34
Intention to have sex (range, 1–5)				
Standard	2.60	2.68	na	na
Original intervention	2.36	2.59	na	na
Modified intervention	2.48	2.65	na	na

***Overall group differences between Time 1 and Time 2 significant at p<.001.
Notes: Time 1 data were collected near the beginning of ninth grade; Time 2, at the end of ninth grade; and Time 3, at the end of 10th grade. na=not applicable; intention to have sex was not measured at Time 3.

Process and Implementation

Students generally rated both versions of Reducing the Risk as very interesting, easy to pay attention to and fun; indicated that the class was quite different from their regular health class; and said that they learned quite a lot. Responses averaged around 4 on a scale of 1–5. Students in the original Reducing the Risk group rated their intervention as slightly more interesting than did students in the modified Reducing the Risk group; students in the modified intervention reported more discussions and interactive activities than did students in the Reducing the Risk group.

The majority of components of both Reducing the Risk curricula were successfully implemented, as reported by students within a day or two after the intervention ended. In the modified Reducing the Risk group, 85% of participants indicated that students role-played, while 71% of those in the Reducing the Risk group reported this. Fewer than 5% in either intervention incorrectly indicated that a minister or pharmacist had come to talk about sex or birth control. Seventy-seven percent of those in the modified intervention correctly said that Jim (an HIV-positive male) had visited, and 97% accurately indicated that Deidre (a female with AIDS) had come to speak in their classes. Almost all (97%) of the students in the modified Reducing the Risk intervention indicated that group leaders had led discussions in their classes, 95% indicated that they had videotaped role-playing activities and 92% reported that game shows or talk show formats had occurred in their classes. Most students in the Reducing the Risk group indicated they had called

a health clinic (74%), gone to a store to find out birth control prices (74%) or talked to their parents about sex (87%). Similar questions were asked at Time 3 (end of 10th grade), with similar results.

DISCUSSION

As we expected, the combined Reducing the Risk interventions led to a reduction in initiation of sexual activity over 12–18 months when compared with the standard school curriculum. These effects were even stronger for blacks than for whites, an important finding since this is the first time that Reducing the Risk has been found to be effective in this population.

However, contrary to our expectations, the modified Reducing the Risk program did not result in either a greater reduction of sexual initiation than the original intervention or an increase in condom use. Additionally, no significant differences were found among the three curriculum groups in frequency of condom use or use of alcohol with sex. In short, this study both replicates previous findings[12] of the effectiveness of Reducing the Risk at delaying the onset of sexual activity and suggests that on its first trial, the modified curriculum did not yield a significantly greater impact on behavior, even for high sensation-seeking individuals and impulsive decision makers.

We propose five possible explanations for why the effects of the two versions of Reducing the Risk did not differ. First, the original curriculum and the modified version differed in several key ways, and some of the changes were not well received or not well implemented. A variety of evidence suggests that HIV-positive speakers in the modified curriculum were viewed positively and that the parent discussion activity in the regular curriculum was viewed negatively; it appears that these differences may have favored the modified curriculum. Anecdotal and observational evidence suggests, however, that there may have been problems in implementation or some negative reactions to some of the other differences. Although the peer facilitators generally performed the tasks assigned them, they did not achieve the level of involvement hoped for, making this component of the modified curriculum less than ideal. An animated PowerPoint component, which was used in each video presentation introducing the modified Reducing the Risk lessons, was not perceived to be particularly novel; project staff observing class sessions noted that by the fourth or fifth lesson, these segments engendered a negative reaction. The decision to ask peer leaders to videotape role-playing activities for the class to view was predicated on our formative research that suggested high sensation seekers were often not engaged in the activities of the classroom and had difficulty reading. However, members of the research team observed that videotaping often resulted in students' spending a significant amount of time off-task. In addition, the quality of the tapes made with the inexpensive equipment we provided often made it difficult for students to hear what was being said in the videotaped activities upon review.

Second, differences among teachers, cities and schools within groups may have been large enough to overshadow differences between groups. However, our hierarchical linear modeling took into account the clustered structure of the data and helped partition the proportion of the variation that is due to the multiple levels of data. The results were largely consistent with those we obtained using nonhierarchical approaches (linear and logistic regression), suggesting that this explanation does not account for the lack of differences between the two interventions' effects.

Additionally, while the implementation of the curricula was generally quite good, observations suggested that it varied somewhat. For instance, in some classrooms, the HIV-positive speakers could hardly be attended to because the teachers could not control student behavior. Also, peer facilitators were hardly used in some classrooms in the modified Reducing the Risk group. Thus, variations in the level of implementation may have reduced impact differences between groups.

Third, a variety of statistical complexities may have made it difficult to detect differences between the groups. Although we attempted to select schools that were as similar to each other as possible, northeastern Ohio and north-central Kentucky differ in a number of ways. In particular, the Ohio schools were more urban and had higher dropout rates, poorer attendance and greater racial diversity. Because race and ethnicity, school engagement and sexual activity are strongly related,[36] complex interactions among covariates or interactions between the intervention and the community may not have been fully accounted for in the analyses. Indeed, the effects of the intervention were stronger in Kentucky than in Ohio, possibly because of differences among the groups and communities that may have introduced confounders that were not adequately controlled for.

Fourth, we may not have adequately targeted the important message components. Researchers[16,20,26] have spent much of the last two decades determining the important components of mass media and video messages for high sensation seekers, but this is a first attempt at designing a classroom-delivered message for this group. Perhaps it is more difficult to yield a high level of sensation value in a classroom intervention. Our work with impulsive decision makers has evolved since this study was designed. It is possible that strategies that may be important for impulsive decision makers include deep learning of the desired behaviors so they become automatic, more emotional presentation of the message, increasing students' awareness that they may be impulsive decision makers and teaching how to structure situations in advance so that impulsive decisions are less likely. Of these four components, only two were included as key elements of the current curriculum (extensive role-playing to create deep learning and use of emotion-laden speakers).

Fifth, it may have been difficult to improve upon Reducing the Risk because it was already sufficiently engaging for high sensation-seeking and impulsive students. Indeed, most of the effects of the two interventions were found to be especially strong among high sensation-seeking or impulsive students when they were assessed separately.

What are the implications of these findings? Reducing the Risk continues to be an effective curriculum for delaying the onset of sexual intercourse for a diverse population of urban high school students, including high sensation-seeking and impulsive students. In order to have a significant impact on the development of interventions to reduce sexual risk-taking, we have more work to do in understanding ways of designing classroom messages that further reduce risk behaviors.

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