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## Sexual health education for behavior change: How much is enough?

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## INTRODUCTION

In the United States, adolescents 15 to 24 years of age account for nearly half of new cases of sexually transmitted infection (STI) each year, and female adolescents 15 to 19 years of age account for 24.2 of every 1000 births, 17% of which are repeat births.<sup>1,2</sup> The provision of evidence-based sexual health curricula is indicated.<sup>1,2</sup> To be effective, curricula need to be implemented with adequate fidelity to enable students to have exposure to core content.<sup>3</sup> However, successful implementation of sexual health curricula in school settings is often compromised by competing academic priorities. For example, standardized testing schedules can reduce the time available to provide effective sexual health curricula. Thus, it becomes important to understand the association between the quantity and quality of program exposure (or “dose”) and students’ sexual health behavior. Understanding the required time-on-task (number of lesson-hours) and the type of sexual health topics most associated with delayed sexual initiation may enable the implementation of evidence-based programs within an increasingly “crowded” academic program without compromising their effectiveness.

### Time-on-Task

To date, little research has been conducted to determine the relative effect of lesson exposure (“dosage”) to an evidence-based program on sexual initiation in youth. At the middle school level, sexual health curricula that are effective in delaying initiation of sex vary widely from six 45-minute sessions (Positive Prevention) to 65 lessons across seventh and eighth grades (Reach for Health Community Youth Service) (**Table 1**).<sup>4-6</sup> Estimates of the time-on-task of sexual health instruction required to influence sexual health behavior also vary, principally as a function of students having a full exposure to a given curriculum.<sup>3,7-9</sup> Kirby et al associated lack of significant effect of the “Postponing Sexual Involvement” curriculum to, in part, the program’s modest five-session duration, citing evidence that more extensive programs (averaging 15 sessions) had demonstrated greater effect.<sup>10</sup> A subsequent meta-analysis of school-based sexual health programs failed to establish that program duration had any effect on outcomes despite high variance in program delivery.<sup>10,11</sup> To date, little independent analysis has been conducted to focus on the effect of exposure.

### Content Topics

Theory-based and empirically based content and methods have also been cited as important in delaying sexual initiation, and comprehensive recommendations exist.<sup>12,13</sup> Sexual health curricula typically provide an array of content (eg, understanding healthy relationships, setting personal rules, identifying risky situations, practicing refusal and negotiation skills in addition to risk reduction skills). The core content of an evidence-based program is the content that is considered most responsible for its effectiveness.<sup>14</sup> Core content is often identified by curriculum developers on the basis of program objectives, but studies empirically evaluating the relative effect of exposure to different sexual health topics are lacking.

The purpose of this study was to determine the association of lesson dosage of an evidence-based HIV/STI and pregnancy prevention curriculum (operationalized here by the *It's Your Game* curriculum) with delayed sexual initiation from middle school to high schools.<sup>15,16</sup> *It's Your Game ... Keep It Real! (IYG)* is an evidence-based sexual health risk reduction curriculum for seventh and eighth grade middle school students<sup>15</sup> developed with a systematic design process, *Intervention Mapping*,<sup>17</sup> and grounded in Social Cognitive Theory<sup>18</sup> and the Theory of Planned Behavior.<sup>19</sup> This 24-lesson hybrid (classroom and computer-based) curriculum comprises 12 lessons of 50 minutes each in the seventh grade and another 12 lessons in the eighth grade (**Table 2**). *IYG* integrates group-based classroom activities with individual computer-based interactive activities.<sup>20</sup> Learning activities are designed to have a positive effect on behavioral knowledge, self-efficacy, behavioral and normative beliefs, intentions, and environmental factors related to healthy dating relationships and delayed sexual initiation. Two randomized controlled trials, conducted in a large urban school district, demonstrated that seventh grade students exposed to *IYG* had significantly delayed sexual initiation by ninth grade follow-up (adjusted odds ratio [OR], 1.29; 95% CI, 1.02-1.64 and adjusted OR, 1.54; 95% CI, 1.20-1.99, respectively) compared with students not exposed to *IYG*.<sup>15,16</sup> These results suggested that *IYG* is a robust program for examining dosage effects.

Research questions comprised the following: (1) If time-on-task (total lesson-hours) and (2) exposure to particular sexual health topics are associated with significant delay in sexual initiation. This post hoc exploratory study is among the first to investigate empirically the association between exposure to an evidence-based sexual health program and delayed sexual initiation among middle school youth.

**Table 1. Duration of Middle School HIV/STI and Pregnancy Prevention Curricula (for Students Younger Than 15 Years) With Evidence for Delaying Sexual Initiation<sup>1</sup>**

Curriculum	Grades	Session Type	Duration
Adult Identity Mentoring (Project AIM) <sup>25</sup>	7	Small group	50-minute sessions (n=10) delivered twice a week for 6 weeks
Draw the Line/Respect the Line <sup>26</sup>	6-8	Classroom	45- to 50-minute sessions for grades 6 (n=5), 7 (n=8), and 8 (n=7)
Heritage Keepers <sup>27</sup>	7-9	Classroom	45-minute sessions (n=10) or 90-minute sessions (n=5) for each grade
<i>It's Your Game ... Keep It Real!</i> <sup>3,15</sup>	7 and 8	Classroom	45- to 50-minute sessions for grades 7 (n=12) and 8 (n=12).
<i>It's Your Game-Tech</i> <sup>3</sup>	8	Computer	35-minute sessions (n=13)
Positive Prevention <sup>4</sup>	9-12	Classroom	45-minute sessions for each grade (n=6)
Reach for Health Community Youth Service (RFH-CYS) <sup>5,6</sup>	7 and 8	Classroom	Sessions for grades 7 (n=35) and 8 (n=30) and community work placement (3 h/wk for 30 weeks)
Reasons of the Heart <sup>28</sup>	7	Classroom	Sessions (n=20) delivered in consecutive class periods

Source: The National Campaign to Prevent Teen and Unplanned Pregnancy Effective Programs Database<sup>29</sup> and/or the Office of Adolescent Health Programs for Replication<sup>30</sup> and Peskin et al.<sup>3</sup>

**Table 2. Components of the IYG Curriculum, Including Exposure Variables of Lesson Hours and Sexual Health Topics**

Component		Seventh Grade												Eighth Grade												Total
Lessons		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24
Session type	Classroom	x	x		x		x	x		x	x		x	x	x		x		x		x		x		x	15
	Computer			x		x			x			x				x		x		x		x		x		9
Number of lesson hours		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	24
Primary content of each lesson <sup>1</sup>	Introduction/wrap-up	x											x	x										x	x	5
	Healthy friendships		x	x																						2
	Setting personal limits: general refusal skills				x	x	x	x																		4
	HIV/STI transmission and pregnancy consequences								x	x					x	x	x									5
	Healthy dating relationships																					x	x			2
	Setting personal limits: sexual refusal skills										x	x							x	x				x		5
	Risk reduction strategies: condom use and contraception									x <sup>2</sup>									x							1

STI, sexually transmitted infection.

<sup>1</sup> Listed in chronological order of exposure in the curriculum.

<sup>2</sup> Tailored activity available for those youth who have already initiated sex.

## METHODS

### Study Design and Participants

A post hoc analysis was conducted on data collected from a randomized controlled trial conducted between 2006 and 2010 in 15 urban middle schools in a large south central US school district.<sup>16</sup> The trial comprised a three-arm study to evaluate the efficacy of two versions of *ITYG* (the original, abstinence-based *risk reduction* version and an abstinence-until-marriage *risk avoidance* version) in delaying sexual initiation compared with a control condition.

Seventy-eight percent of students were classified as economically disadvantaged. Seventh grade students were recruited to reach a quota of 100 per school. Sixty percent of students returned a parental consent form, 83% with permission to participate. Of those students, 93% (n=1742) completed the baseline survey. No significant differences in recruitment occurred across study conditions. Ninth grade surveys were completed by 1333 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.<sup>16</sup>

Data from students who were exposed to the *ITYG* risk reduction curriculum and were not sexually active at baseline (n=314) were retained for post hoc analysis in this study. The *ITYG* risk reduction curriculum was the focus of this study because it met the criteria for an evidence-based program (with demonstrated repeatable effectiveness in two consecutive randomized controlled trials) and was also representative of programs meeting sexual health risk reduction objectives for curricula in the United States.<sup>14</sup> The study was approved by the University of Texas Health Science Center Institutional Review Board and the school district Office of Research Accountability.

### Measures

Measures for this post hoc study included behavioral, exposure, and demographic measures.

*Behavioral outcome measure.* The behavioral outcome for students who reported no lifetime sexual experience at baseline (indicating no to “ever had sex”) was the effect of *ITYG* on delayed sexual initiation (a composite variable comprising initiation of oral, vaginal, or anal sex) at ninth grade follow-up.<sup>15</sup>

*Exposure measurement.* Data on dosage included number of lesson hours (time-on-task) and which lessons were attended (sexual health topic exposure).

*Demographic measures.* Demographic factors that influence sexual behavior (gender, age, and race/ethnicity) were also assessed.<sup>21,22</sup> Race/ethnicity was collapsed into three categories: African-American, Hispanic, and “other,” which included White, Asian, and non-Hispanic multiracial youth.

### Data Collection

The dependent variable of sexual experience was collected with laptop computers through an audio-computer-assisted self-interview (ACASI) at baseline and in ninth grade (26 months after baseline) to increase the reliability of obtaining sensitive information on sexual risk-taking.<sup>23,24</sup> ACASI was also used to collect participant demographics. Surveys were conducted in a quiet location (eg, school library) with laptops positioned so that screens were not visible to others, and headphones were provided. Exposure measures of lesson attendance were collected on attendance logs; these were completed by facilitators for each lesson, who were employed and trained for the research study.

### **Analysis**

Logistic regression models were used to assess the association of lesson exposure on initiation of any sex by the ninth grade. All models were adjusted for covariates of age, gender, and race/ethnicity. ORs were coded as protective; OR >1 indicated an increased likelihood of delayed sexual initiation from seventh grade into ninth grade. The lesson exposure variable for research question No. 1 was time-on-task (number of lesson-hours a student was exposed to), and for research question No. 2 it was content topics (the sexual health topics for lessons attended by the student).

The possible range of lesson-hour exposure of 1 to 24 hours was collapsed into the following categories: 8 or fewer, 9 to 12, 13 to 16, 17 to 20, and 21 to 24 hours. The criterion of 8 or fewer hours provided an appropriate comparative analytic sample and corresponded to an exposure level below that reported by most evidence-based sexual health programs in the empirical literature.<sup>3-6,13,15,25-28</sup> Sexual health topics were categorized by combining lessons with content related to general refusal skills (grade 7, n=4); sexual refusal skills (grade 7, n=2; grade 8, n=3); HIV/STI and pregnancy consequences (grade 7, n=2; grade 8, n=3); healthy friendships (grade 7, n=2); healthy dating relationships (grade 8, n=2); and risk reduction strategies of condom and contraception use (grade 8, n=1) (**Table 2**).

## RESULTS

### Participant Characteristics

Participants were not sexually experienced at baseline and were 61.1% female, 36.3% African-American, and 54.5% Hispanic, with a mean age of 12.6 years (standard deviation [SD]=±0.67) at baseline.

### Intervention Exposure

Implementation of *IYG* ranged from 4 to 6 weeks per grade level. On average, students attended a total of 15 to 16 of the 24 lessons (mean±SD=16.0±6.23; mode=20 lessons; range=2-24 lessons). Percentage attendance ranged from 75.2% to 86.5% for seventh grade lessons and from 55.0% to 78.6% for eighth grade lessons. Of the 314 participants, 15 (4.8%) attended all 24 lessons, with 71 (22.6%) attending all seventh grade lessons and 51 (16.2%) attending all eighth grade lessons.

### Research Question No. 1: Time-on-Task

Successive regression models were generated to determine how many hours of lesson exposure were required to delay sexual initiation in seventh grade youth by ninth grade. These included a referent category of 8 lessons or fewer and successive categories of 9 to 12, 13 to 16, 17 to 20, and 21 to 24 lessons (**Table 3**). No effect was indicated before up to 12 hours of exposure. A significant effect of delayed sexual initiation was demonstrated at 13 to 16 hours of exposure (OR=8.40,  $P<0.001$ ); this effect was retained with movement toward the 17- to 20-hour bracket (OR=2.42,  $P<0.05$ ) and the 21- to 24-hour bracket (OR=4.24,  $P<0.01$ ). These models did not distinguish between seventh and eighth grade exposure.

**Table 3. Research Question No. 1: Association of Time-on-Task (Number of Lesson Hours) With Delayed Sexual Initiation by 9th grade\* (n=314)**

Exposure (hours)	n	OR	95% CI	P Value
8 or fewer hours (reference)	32			
9-12	48	2.54	(1.06, 5.97)	0.058
13-16	56	8.40	(2.16, 12.63)	0.000
17-20	89	2.42	(1.35, 6.51)	0.043
21-24	89	4.24	(1.74, 8.46)	0.002

CI, confidence interval; n, number; OR, odds ratio.

\* Effect size is OR; OR coded as protective; OR >1 indicates an increased likelihood of delayed sexual initiation in 9th grade. All models adjusted for race/ethnicity, gender, and age.

## Research Question No. 2: Content Topics

Models were generated to determine if specific sexual health topics were associated with delayed sexual initiation in ninth grade (**Table 4**). Lessons were entered into the models as percentage exposure for standardized comparison across models. A student attending all lessons covering a topic was coded as having 100% exposure for that topic, a student attending half the lessons was coded as having 50% exposure, and a student attending no lessons was coded as having 0% exposure. The ORs indicated the difference between delay of sexual initiation of a student with full (100%) or partial (50%) exposure to a given topic and delay of someone with no exposure to the same topic. Models 1 through 6 indicated the bivariate independent association of exposure to individual content topics: General Refusal Skills and Sexual Refusal Skills, HIV/STI and Pregnancy Consequences, Healthy Friendships, Healthy Dating Relationships, and Risk Reduction Strategies. A significant association with delayed sexual initiation was demonstrated for General Refusal Skills (model 1) (OR=2.56,  $P<0.05$ ) and HIV/STI and Pregnancy Consequences (model 3, OR=4.05,  $P<0.01$ ). This significant association was retained for HIV/STI and Pregnancy Consequences in the multivariate model (model 7) (OR=4.93,  $P<0.05$ ).

**Table 4. Research Question No. 4: Association of Sexual Health Topics With Delayed Sexual Initiation by Ninth Grade (N=314)**

Sexual Health Topics	OR*	95% CI	P Value
Model 1: General Refusal Skills	<b>2.56**</b>	<b>(1.08, 6.07)</b>	<b>0.032</b>
Model 2: Sexual Refusal Skills	1.92	(0.80, 4.63)	0.146
Model 3: HIV/STI and Pregnancy Consequences	<b>4.05</b>	<b>(1.67, 9.80)</b>	<b>0.002</b>
Model 4: Healthy Friendships	1.50	(0.69, 3.23)	0.306
Model 5: Healthy Dating Relationships	1.34	(0.73, 2.44)	0.343
Model 6: Risk Reduction Strategies, Condom Use/ Contraception	1.51	(0.88, 2.61)	0.137
Model 7: Exposure to all topics			
General Refusal Skills	1.37	(0.38, 4.92)	0.628
Sexual Refusal Skills	1.84	(0.35, 9.73)	0.473
HIV/STI and Pregnancy Consequences	<b>4.93</b>	<b>(1.28, 19.01)</b>	<b>0.021</b>
Healthy Friendships	1.09	(0.43, 2.78)	0.858
Healthy Dating Relationships	1.08	(0.44, 2.67)	0.863
Risk Reduction strategies, Condom Use/ Contraception	1.09	(0.49, 2.41)	0.836

\* OR coded as protective; OR >1 indicates an increased likelihood of delayed sexual initiation in ninth grade. All models adjusted for race/ethnicity, gender, and age.

\*\* Boldface type indicates a significant association.

## DISCUSSION

This study is one of the first to investigate systematically the relationship between dosage of an evidence-based HIV/STI and pregnancy prevention curriculum and delayed initiation of sex in middle school youth. The greatest effect of exposure on reducing sexual initiation was achieved after a minimum of 13 to 16 lesson-hours of exposure and exposure to content on HIV/STI and pregnancy consequences.

### Time-on-Task

This study suggests that 13 hours is a minimal dose to achieve delayed initiation. This is consistent with the findings of Kirby et al suggesting 15 sessions of 45 to 60 minute sessions each, as well as with other evaluation results from trials of evidence-based programs.<sup>3,10,25,26</sup> Greater exposure has traditionally been associated with a greater likelihood of behavioral effect.<sup>31</sup> Miller et al established that a high degree of intervention exposure contributed to the effect of a violence prevention program, and Peskin et al established a dose association with delay in sexual initiation in a post hoc data analysis from a randomized controlled trial.<sup>3,8</sup> However, delayed sexual initiation has been reported with less exposure. Jemmott et al established that eight 1-hour abstinence-only modules could significantly delay sexual initiation,<sup>7</sup> and other evidence-based programs have reported delay with as few as six to nine lessons.<sup>4</sup> These studies had follow-up periods of 12 and 6 months, respectively. Longer-term effects at 2 years have been demonstrated only with curricula requiring greater lesson exposure.

The dose response was not linear. A fluctuation in the OR between lesson exposure categories was observed, with a dip for exposure of 17 to 20 hours (OR=2.42). The reason is unclear. It is possible that this was associated with factors that might have made the exposure categories qualitatively different, such as lesson type, content, channel, or a complex interaction of these. Establishing a “tipping point” for significance provides some guidance on “how much” but raises the question of “qualitative” factors that may enable a shorter lesson exposure still to be associated with long-term delay in sexual initiation.

### Content Topics

Activities that addressed HIV/STI and pregnancy consequences were important for achieving delayed sexual initiation. This content is often a component of sexual health programs. *YIG* helps learners personalize the consequences of HIV/STIs and pregnancy, a characteristic of effective programs.<sup>12</sup> This content is associated with future orientation, goal setting, and the biological aspects of sexual health, including puberty, reproduction, and specific definitions of sex. The lessons are not purely didactic and use theory-based methods of role modeling and simulation and interactive activities to build cognitive skills. It is difficult to determine the extent to which other factors, such as the way the content was delivered or when the content was delivered relative to other content within *YIG*, may have made it more compelling or motivational. It is unclear why skills training, which is acknowledged as core content in effective sexual health education (eg, refusal and negotiation skills training), was not statistically significant in the final model.<sup>14</sup> The findings do suggest that consequences be retained when content delivery is prioritized under constraints of limited class time to devote to sexual health.

Currently, 24 states and the District of Columbia mandate sex education, and 34 states and the District of Columbia mandate HIV education.<sup>32</sup> There are no general requirements, or recommendations, regarding the duration of these curricula. However, content requirements, which vary by state, do exist. Possible content topics include contraception, abstinence, importance of sex only within marriage, sexual orientation, negative outcomes of teen sex, and life skills training (eg, avoiding coercion, healthy decision making, and family communication). This study can contribute data toward future sex education policy. For example, the finding that 13 hours of exposure to risk reduction sex education can delay sexual initiation may be helpful in providing a “prescribed duration” for achieving abstinence at long-term follow-up. Such a guideline could assist in meeting the abstinence goal that is a major focus of sexual health policy. Currently, 37 states mandate that abstinence be “covered or stressed” if sex education is taught. A second example is that the findings in this study suggest maintaining a focus on the consequences of pregnancy. This is consistent with a policy in 13 states that mandates coverage of the negative outcomes of teen sex when sex education is taught.

### **Limitations**

These exploratory results need to be interpreted in light of the study limitations, including restricted sample size, focus on the single behavioral outcome of delayed initiation, mono-operational bias with use of a single evidence-based program, and potential contamination of exposure to varied content when a lesson’s content is defined by the predominant sexual health topic in the lesson. This suggests that caution should be exercised in generalizing these findings to explain the effectiveness demonstrated in other evidence-based programs. Future studies could investigate other possible causative factors, such as session frequency and spacing,<sup>33</sup> differential association with grade,<sup>11,34</sup> and influence of classroom vs a computer delivery channel.<sup>3,35,36</sup> This study suggests a need to continue to explore the factors that contribute most to the effectiveness of evidence-based sexual health curricula, particularly those with demonstrated effectiveness even at low doses.

### **CONCLUSION**

The findings in this study are supportive of previous studies and modestly indicate that providing at least 13 hours of exposure of sexual health content to middle school youth is associated with delayed sexual initiation. The findings also support providing descriptions of reproduction, specific definitions of sex, and framing content in regard to consequences and life goals. These findings may assist schools in meeting the challenge of enabling the effectiveness of evidence-based sexual health curricula, even in an increasingly competitive and constrained academic environment.

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