“It’s Your Game”: An Innovative Multimedia Virtual World to Prevent HIV/STI and Pregnancy in Middle School Youth

Ross Shegog, Christine Markham, Melissa Peskin, Monica Dancel, Charlie Coton, Susan Tortolero

Center for Health promotion and Prevention Research, University of Texas School of Public Health, Houston, TX, USA

Abstract

Early sexual initiation is associated with increased risk of unintended pregnancy and sexually transmitted infection (STI). Effective HIV/STI/pregnancy prevention interventions for middle school youth are urgently needed. “It’s Your Game, Keep It Real” (IYG) is a curriculum delivered in 7th and 8th grade that combines classroom activities with individualized, tailored computer-based activities embedded in a virtual world environment. Interactive multimedia can offer a confidential, tailored, and motivational educational experience. Virtual world game interfaces offer further potential to immerse the learner.

The purpose of this study was to evaluate the multimedia education program component of IYG on student attitudes of importance of the curriculum content, self-efficacy regarding refusal skills, and usability parameters of ease of use, credibility, understandability, acceptability, and motivation to determine that a broader efficacy field test would be indicated. Results of the study indicated acceptable usability criteria and impact on short-term psychosocial outcomes. IYG is currently being evaluated in a randomized controlled trial in ten Texas middle schools.

Keywords:
HIV/pregnancy prevention, multimedia, youth

Introduction

Although adolescent pregnancy and birth rates have declined steadily in the United States over the past decade, adolescent pregnancy remains a serious public health issue.[1] In Texas, 56,086 births reported in 2000 were to mothers aged 10-19; 8,465 of these were reported in Harris County.[2] In 2001, Texas also ranked joint first among states for rate of repeat births to teen mothers: 25% of births to mothers aged 15-19 were repeat births.[3] Teen pregnancy is particularly prevalent among minority populations, especially African American and Hispanics.[2,4]

For the teen mother, consequences of pregnancy include decreased likelihood of completing high school and increased likelihood of relying on welfare. Infants born to teen mothers have lower birth weights, are more likely to perform poorly in school, and at greater risk of abuse and neglect.[5] Overall, the U.S. government spends over $25 billion a year for social, health, and welfare services to families begun by teen mothers.[5]

Adolescent sexually transmitted infections (STI) including HIV also represent serious public health problems. In 2000, youth between the ages of 15 and 24 accounted for 9.1 million (48%) of all new STI cases.[6] The estimated medical cost of these cases was $6.5 billion.[7] At least half of all new HIV infections are estimated to be among those under the age of 25 and most young people are infected through sex.[8] Among youth, teen girls and minorities have been particularly affected.[9] Texas currently ranks fourth among states for the estimated number of persons living with HIV/AIDS.[10,11] In Houston, 319 (75%) of HIV cases reported between 1999-2003 among 13-19 year olds were among African American youth and 59 (13.9%) were among Hispanic youth.[11]

According to data from the 2003 Middle School Youth Risk Behavior Surveillance Survey (MSYRBS), 16% of 7th graders and 19% of 8th graders have engaged in sexual intercourse (implicitly, vaginal intercourse).[12] This is disturbing because early initiation of sexual intercourse has been associated with an increased risk of STIs and pregnancy.[13-16] Among older adolescents, condom rates for oral and anal intercourse are typically lower than for vaginal intercourse,[17-19] and a history of anal sex is predictive of non-use of condoms during vaginal sex.[20]

This evidence points to the urgent need for effective HIV, STI and pregnancy prevention interventions at the middle school level to help delay or mitigate the consequences of early sexual activity.

A 2004 review of HIV, STI and pregnancy prevention programs for middle school populations identified 12 programs that have been rigorously evaluated.[21] Of these programs, seven showed positive behavior change. Two recently published studies also reported behavioral change for interventions at short-term (5 month)[22] and twelve-month follow-up.[23] These programs all incorporated small group activities to address peer pressure and decision-making, role-playing to practice refusal and communication skills, and other interactive, experiential learning techniques. Although these programs all demonstrated some positive behavior change, most showed...
The “It’s Your Game” (IYG) curriculum offers an innovative application of computer-based gaming technology, interactive computer-based activities, and small group classroom interaction that does not currently exist in middle school HIV/STD prevention curricula. The purpose of this study was to evaluate a component of the curriculum, the IYG virtual world multimedia education program, to determine its impact on short-term outcomes and usability parameters to ensure feasibility of the program for field testing in a 10-site randomized controlled trial.

**Methods**

**Study Design:** The design was a single group pre-test post-test usability study conducted in facilities at the University of Texas, Houston Health Science Center.

**Subjects:** A convenience sample (n=14) of Houston middle school students was recruited who were representative of the Houston Independent School District demographic: primarily minority (50% African American) and of approximately equal gender (57% female). This sample tested the 7th grade lessons. Nine students from this sample returned 7 months later to test the 8th grade lessons. This 8th grade sample was 12-14 years of age, 55% African American, and 55% female. A smaller sample size, used in this study, was consistent with recommendations for usability testing given that statistical significance is not required to determine major usability problems and that the best cost-benefit ratio is achieved with 3-5 users in each representative group.[27] Participation was voluntary and written parental consent and child assent was obtained.

**Intervention:** The conceptual framework for the IYG curriculum is based on Social Cognitive Theory (SCT), social influence models and the Theory of Triadic Influence (TTI).[28-30] The curriculum consists of 12 lessons delivered in 7th grade and 12 lessons delivered in 8th grade. In each grade, the curriculum integrates group-based classroom activities (e.g., role plays, group discussion, and small group activities) with personalized journaling, and the IYG virtual world multimedia intervention delivered on laptop computers. The virtual world intervention comprises a total of 8 lessons spread through the 7th and 8th grade curriculum. These lessons comprise 3 functional elements: (1) A 3D virtual world interface featuring an entertainment complex motif (Figure 1); (2) tailored educational activities including interactive 2D exercises, quizzes, animations, peer video, and fact sheets that target determinants of sexual risk-taking (Figure 2); and (3) “real world”-style teen serials with on-line student feedback which allow for real time group discussion in the classroom. In addition, selected computer activities are tailored by gender or by sexual experience and intent so that students receive information and skills-training that is tailored to their needs.

**Figure 1 & 2 - Screen captures of an aspect of the virtual world and an interactive FLASH activity**

A life skills decision-making paradigm (Select, Detect, Protect) underlies the activities, teaching students to select personal limits or rules regarding risk behaviors, to detect signs or situations that might challenge these limits, and to use refusal skills and other tactics to protect these limits. Specific topics covered in the 7th grade include characteristics of healthy friendships, setting personal limits and practicing refusal skills in a general context (e.g., regarding alcohol and drug use, skipping school, cheating), information about puberty, reproduction and STIs, and setting personal limits and practicing refusal skills related to sexual behavior. The 8th grade curriculum reviews these topics and presents additional activities regarding the characteristics of healthy dating relationships including age compatibility, the importance of HIV, STI, and pregnancy testing if a person is sexually active, and skills training regarding condom and contraceptive use.

**Study Protocol:** The Virtual world intervention was tested separately from other classroom curriculum elements. The students accessed the program in a simulated class setting. Each student was provided with a laptop computer with headphones and asked to complete each of the four 35 minute 7th grade computer lessons individually. At the end of each lesson each student completed feedback questionnaires. At the end of the 4th (final) 7th grade lesson each student also completed overall assessment of the program. Sessions were observed by study personnel who logged problems (technical or content related) and provided assistance as required. This protocol was repeated 7 months later for the 8th grade lessons by the students, who were then in 8th grade.

**Data Collection:** Questionnaire, computer-based, and observational data was collected. Demographic data included age, race, gender, computer experience, type and frequency of computer use. Attitudes to the use of computer-assisted instruction were collected using a validated questionnaire.[31] Pre and post lesson ratings on the importance of content domains and self-efficacy (confidence) in performing skills was assessed using semantic differential scales developed for the intervention and embedded in the virtual world interface. Usability parameters including ease of use, credibility, understandability, acceptability, and motivation were assessed using Likert scale ratings adapted from usability assessment instruments reported by Sapperstein et al, 2004.[32] Open-ended
responses on recommendations for improvement of the program were collected via computer and paper and pencil questionnaire.

Data Analysis: Data was analyzed using descriptive and inferential statistics (paired t-tests) with SPSS analytic software.

Results

Demographics: The students were experienced computer users. Most accessed computers at their home (89%), friends (55%), and school (50%). Thirty three percent used computers for more than 1 hour on week days and 77% for more than one hour on weekends. Most frequent uses of computers were school work, visiting websites, and e-mail (all > 50%). Approximately 44% of the sample reported achieving A or B grades at school.

Short-term outcomes: Student attitudes toward the use of computers in education was enhanced in the 7th grade sample, and significantly enhanced in the 8th grade sample (p<0.5). Ratings of the importance of the program content in each lesson increased significantly for all content domains including the importance of keeping ‘good’ friendships, understanding how reproduction works and the possible consequence of sex (HIV/STDs/pregnancy), and the importance of enacting behaviors to limit sexual experience, described as selecting, detecting, and protecting personal rules about choosing not to have sex (all p<0.05). Ratings of self-efficacy for enacting behaviors in these domains also significantly improved (all p<0.5).

Usability: Usability parameters were highly rated across 7th and 8th grade lessons. Ease of use: Virtual world and educational activities were rated as easy to use by 78-100% of students. Credibility: A minimum of 92.9% of students perceived the content as correct and trustworthy across all lessons. Understandability: There was 100% agreement that most words in the program were understandable. Acceptability: Most students (71-100%) rated interface strategies and specific program activities within each lesson as fun and 92.9-100% rated it as helping them make healthy choices regarding sexuality. There was 64.3 – 92.9% agreement that each of the program lessons were as much or more fun than other lessons or favorite video games and 85.7-100% of students rated the lessons as “just right”. Open ended responses suggested satisfaction with the lessons with just two participants suggesting a desire for more media elements in the form of characters and movies.

Discussion

The “It’s Your Game” virtual world multimedia HIV/STD and pregnancy prevention lessons were found to significantly enhance attitudes toward the importance of sexual risk behavior and self-efficacy toward initiating such behavior. The lessons were reported to be easy to use, credible, understandable, acceptable, and of sufficient motivational appeal to students (12-14 years of age) to elicit confidence that the program was feasible for field testing in middle schools as a component of the IYG curriculum. An unexpected ‘by-product’ of this study was the immediate positive effects on attitudes toward the use of technology in education. Together, these results tender support for the emerging interest in gaming interfaces through burgeoning Serious Games and Games for Health research initiatives.[33,34] The capability of computer-based applications to provide interactive and individual tailored experiences that are also confidential is particularly salient when considering the sensitive nature of HIV/STD, pregnancy, and sexual health program content. Furthermore, the technology can provide views and experiences beyond the limited classroom forum, allowing students to gain a realistic appraisal of what constitutes normative sexual behavior. A strength of the program is its ability to provide anonymous input that can be subsequently used within the small group setting of the classroom.

While the small sample size and limited scope is appropriate for the objectives of a usability study of this type [27], some results needs to be viewed with caution. A single group pre- post-test study design was the basis for the reported change in importance, self-efficacy, and attitude to computer-assisted instruction. While these results are encouraging, this design is open to internal threats to validity and does not imply causality.[35] Also, these effects were measured immediately prior to and following the intervention with no long term follow-up.

The combined IYG curriculum is currently being evaluated in a randomized controlled trial in 10 Texas middle schools. Baseline data have been collected from a largely minority sample of 1,321 7th graders comprising 57.1% female, 43.5% black, and 41.9% Hispanic, with a mean age 12.5 (SD=0.69) years. Fourteen percent had engaged in any type of intercourse (12% vaginal, 7.9% oral, 6.5% anal). Impact and outcome data are being collected 5, 14 and 24 months post-baseline. Measures include sexual behavior and intentions (lifetime/current vaginal/oral/anal sex, condom use), beliefs, perceived norms, knowledge, self-efficacy, reasons to/not to have sex, exposure to risky situations. This study will provide behavioral outcome data for the curriculum. Initial 5 month post-test results indicate students receiving the IYG curriculum report program lower prevalence of any type of intercourse during the past 3 months, and positive change in abstinence beliefs, perceived friends’ beliefs about sex, exposure to risky situations, and reasons not to have sex (all p<0.05).

If the IYG curriculum proves effective, dissemination strategies will include a web-based application, a Spanish language version, and “institutionalization of the curriculum within the Houston Independent School District. Future development plans for the IYG virtual world multimedia program are to evaluate its impact when used as a stand alone intervention, separated from the IYG curriculum. The potential for the program to provide multi-user education for naturally occurring peer groups is also being investigated.
Conclusion

These results indicate that the “It’s Your Game” virtual world computer-based program is a feasible modality for HIV/STD, and pregnancy prevention for middle school students. The program meets usability criteria and shows potential in impacting attitudes and self-efficacy regarding refusal skills. The program also shows promise in translating positive attitudes to the use of technology in education. This usability study indicated that field testing on behavioral effects was indicated. The IYG curriculum, containing the IYG virtual world multimedia program, is currently being evaluated in an NIH funded randomized controlled trial in 10 Texas middle schools to determine its impact on sexual behaviors and their antecedents.

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Address for correspondence
Ross Shegog, PhD.
Assistant Professor
Center for Health Promotion & Prevention Research
UT-School of Public Health
7000 Fannin, Suite 2668
Houston, TX 77030
Phone: 713-500-9677
Fax: 713-500-9602
e-mail: Ross.Shegog@uth.tmc.edu